

Lesson Plan: **Life in the Soil**

This lesson is ecology themed, and based on creative, hands-on group work.
Students look at how food is grown and how it relates back to soil and the ecosystem. Exercises include a group lab where students examine real soil samples, and a short film that helps students put exercises in a real-world context.

Appropriate for university undergraduate courses on ecology,
and common core standards for K-12:

C3 Framework for Social Studies; D2.Geo.5 (grades 3-5); D2.Geo.5 (grades 6-12)
Next Generation Science Standards; ESS3-4 (grades 3-4, MS, HS); HS-LS2-8 (grades 9-12)

related short film:

Life in Soil in Japan and Korea
an excerpt from the documentary film
“Final Straw: Food, Earth, Happiness”

Lesson Developed by

finalstraw 
food / earth / happiness

In cooperation with



Objective

SWBAT demonstrate the importance soil to the ecosystem by examining samples of dirt in peer groups and devising their own real world answers and actions to combat contemporary ecological issues.

- Cultivate a relationship to soil and the environment through the foods they eat
- Understand that healthy soil contains many kinds of life
- Understand that there are positive ways to treat soil, and destructive ways to treat soil
- Formulate actions they can take in their own lives to help support the environment

Lesson Background

According to the United Nations Food and Agriculture Organization [our soils will be gone within 60 years](#) if we continue our modern day farming methods. This issue, caused by large scale industrial agriculture, is predicted to lead to worldwide starvation and numerous irreversible ecological issues. In response, the UN, along with hosts of scientists, politicians, and farmers are calling for a move away from industrial-scale chemical farming and towards small-scale, regenerative (sustainable) farming as a cornerstone of modern agriculture.

Film directors Patrick Lydon and Suhee Kang spent four years exploring such regenerative farms in Japan, Korea, and the United States, investigating the relationship between farming methods and the ability for the soil to produce food. The experiences of these farmers reflects a growing body of scientific research showing how small-scale, low-input agriculture may be the only option for feeding the earth's population into the future.

The regenerative farming movement took root in the late 1940's Japan with revolutionary farmers such as Masanobu Fukuoka (author of the book *One Straw Revolution*) as a way of farming that recognizes nature as a connected system, and values the life in the field as a way to grow crops without plowing, fertilizers, or synthetic chemicals.

Specific to this lesson plan is the process by which we till (dig up), and apply chemicals such as pesticide and herbicide to the soil in order to grow food easily, cheaply, and on large scale; and how these practices kill life in the soil, ultimately destroying farmland and the ecosystems connected to it.

As a response to this issue, small-scale, local, regenerative farming has seen a great resurgence, with farmers taking care of life in the soil in a way that can both reverse ecological destruction of our modern industrial farms, and feed the world.

Materials

- **Soil samples*** (1 per group)
 - Type 1 - Industrial farm (dry, dust-like, includes rocks, sand)
 - Type 2 - Small scale 'regenerative' farm (moist, dark color, with worms and living things)
- **Tape / adhesive / clips (for posting chart paper to wall)**
- **Trays or Containers (for examining soil samples)**
- **Print Outs (see below)**

* Type 1 can be found anywhere that little vegetation exists. Type 2 can be found in a forest, in moist organic garden soil, or can be donated by local organic garden center. If the lesson is hosted by Final Straw, these soil samples will be provided.

Common Core Standards Alignment (USA)

Common Core Standards Integrations

C3 Framework for Social Studies

D2.Geo.5 (grades 3-5)
D2.Geo.5 (grades 6-12)

Next Generation Science Standards

ESS3-4 (grades 3-4, MS, HS)
HS-LS2-8 (grades 9-12)

Subject Areas

- Biology
- Social Studies
- Language Arts
- Environmental Science
- Philosophy
- Cultural Geography

Vocabulary

- Consumption
- Agriculture
- Ecology
- Industrial
- Organic
- Regenerative
- Microorganism

Lesson Road Map

The lesson is arranged into the following sections:

- **PART 1 – Knowledge Check:** how does your favorite food connect to the soil? []
- **PART 2 – Examine Soil:** group lab work on soil investigation []
- **PART 3 – Share:** talk about your soil investigations []
- **PART 4 – Short Film:** watch a short film on life in the soil []
- **PART 5 – Evaluate:** K-8, T-chart on soil health / MS HS College, class discussion on actions []

PART 1 – Knowledge Check / Favorite Foods and Soil (20 minutes)

MATERIALS – blackboard or whiteboard

Teacher will ask the class what their favorite food is, as students respond vocally, their responses are written on the board. From the responses, choose one that includes multiple easy-to-identify ingredients and use it as an example for how food relates back to the soil.

Next, work with students to trace the ingredients of a food back to the soil.

Ex:

Teacher: What is a hamburger bun made from?

Student: flour and water!

Teacher: Good. Where does flour come from?

Student: Wheat!

Teacher: Good. And the wheat? Where does it grow?

Student: Soil!

For example, a hamburger might look something like below:

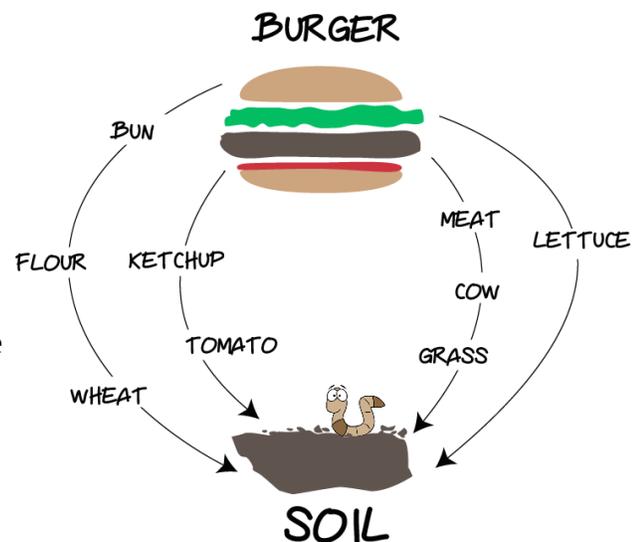
- **meat** → from a cow → a cow eats grass (or it should) → grass is grown in soil
- **tomato** → is grown in soil
- **lettuce** → is grown in soil
- **ketchup** → includes tomato → is grown in soil
includes sugar → from sugar cane → is grown in soil
- **bun** → from wheat → is grown in soil

The key is to identify that much of the food we eat is reliant on healthy soil.

Guide the students through this opening exercise interactively, allowing them to make as many of the connections as possible for themselves.

The list that your students help to come up with does not need to be comprehensive or complete, just enough to get the idea across that all of their foods are connected to soil in some way.

A completed chart on the board might look like the image at right.



PART 2 – Examine / Soil Investigation Group Work (20 minutes)

MATERIALS – soil investigation worksheets, magnifying glasses, pencils

After the exercise is complete, present each group with one soil sample* and a soil investigation worksheet. Inform students that they are tasked with the role of “ecology investigation” teams, carrying out the roles below.

Group Member Roles / Tasks

Groups of 4 students each, assigned the following roles:

- **2 diggers / identifiers**
carefully extracts soil, and identify and explain what they see to their group
- **1 writer**
records the findings of the identifier(s) on soil investigation worksheet
- **1 illustrator/designer**
records drawings of elements in the soil, by illustrating on chart paper

soil investigation worksheet			
Examine the elements below	poor quality ←		→ good quality
size of pieces	fine (like dust)	medium (chunks that break apart)	large (with pieces of wood/leaves)
living organisms	none	one or a few	many
moisture	very dry	mostly dry / a little moist	not dry / very moist
color	light brown	medium brown	dark brown or black



soil investigation worksheet			
Examine the elements below	poor quality ←		→ good quality
size of pieces	fine (like dust)	medium (chunks that break apart)	large (with pieces of wood/leaves)
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* soil samples should be collected ahead of time, from various types of soil (for instance, a forest, an organic garden, near a stream, a park, a dusty field, parking lot, etc...) These can be collected by the teacher, or you might assign to students the task to carefully collect small amounts of soil or “dirt” from near where they live.

PART 3 – Share / Class Discussion (20 Minutes)

Sharing Investigations. Have students post their chart papers on the wall / board, and ask each group to speak about their findings to the class.

Identify soil samples. Tell the students where their soil samples came from. Note the qualities of the industrial scale farm soil versus the soil from organic and small scale regenerative farms.

Suggested prompts for discussion:

- What is different between the soil samples, what is similar?
- What do they think caused their soil to have (x) quality?
- Do they think food/plants they identified earlier could be grown in their soil? Why? Why not?
- Can they remember a place they've been with similar soil? How did that place feel?

PART 4 – Film Excerpt / Life and Soil (5 or 20 minutes)

The film excerpt will help students put their soil explorations into context. The farmers who are interviewed explore the notion of why life in the soil is so important, and also how various agriculture practices have positive and negative effects on this life.

Watch the film:

20 Minutes Version (H.S. & University) – https://www.youtube.com/watch?v=mEC_qqn6epg

5 Minutes Version (K-8) – <https://youtu.be/GVofz5WDjQA>

PART 5 – Evaluate / What Actions Can We Take? (15 minutes)

KIT MATERIALS – Food and soil images, magnets (one per student)

Talking Point: The film excerpt ends with the notion that “we don’t all have to be farmers” to solve our soil crisis. What does the farmer mean by this? How can altering our everyday actions help to spur positive ecological change?

Activity: Class Surveys / (for Grades K – 8):

Draw a “T” chart on the board, labeling one side “**benefits the soil**” and the other side “**harms the soil**”.

Hand out one of the provided photos to each student, and ask them to place their photos on the side of the “T” chart where they think they belong. Have a group conversation about why the students placed the photos where they did.

benefits the soil	harms the soil

Activity: Discussion Points (M.S. / H.S. / University)

Allow the discussion to be broad and encompassing of all aspects of life, not just food. This is where the students come up with their own answers.

It is important to not allow the conversation to dwell for too long on problems, instead try to focus these conversations towards suggesting positive individual or community actions for change.

- **How does the way we treat the soil affect the long-term survival of our own species?**
- **How do our food consumption habits affect the environment?**
(eg: Do small-scale local farmers have *more* or *less* responsibility to take care of the soil versus a large-scale industrial farm? Do our consumption habits support or discourage certain type of farming?)
- **How might other consumption or human habits affect the soil?**
(eg: electronics, cars, sewage, things that require mining of minerals, fossil fuel extraction, industry...)
- **How do cultural habits effect soil and ecosystems?**
(eg: Does a city filled with fertilized lawns support healthy soil ecosystems?)
- **Can simply being in touch with nature alter our views/actions?**
(eg: hikes, walks, bike rides, surfing, visiting a local farm)
- **What role might personal urban/suburban gardens play?**
(e.g. How much food could be provided locally through gardens? Is a local garden more or less ecologically friendly than an industrial farm?)

Take Home Actions

The following take home actions can be downloaded from Final Straw. Further links for finding seed and/or lists of local resources are also freely available on the Final Straw website at”

<http://www.finalstraw.org/study/>

Growing food in your home or classroom

– give easy-to-grow seed packets (herbs are a simple one) to students with home growing instructions.

Buying local food / Farmers market

– give local farmers market list to students to bring home.

How healthy is the soil in your neighborhood?

– have students examine soil in their neighborhood and report back to the class. You could also have students collect soil samples beforehand, and use these samples for the exercise.

Resources

For the teacher, or students who are interested to dig deeper into ecological issues and solutions surrounding agriculture and consumption.

“Industrial Agriculture: Outdated and Unsustainable,” by Union of Concerned Scientists

<https://www.ucsusa.org/our-work/food-agriculture/our-failing-food-system/industrial-agriculture>

UN Research: Small-Scale Farming is the Only Way to Avoid Food Crisis

<http://www.yesmagazine.org/planet/un-only-small-farmers-and-agroecology-can-feed-the-world>

Interview with Larry Korn about his time with Masanobu Fukuoka

<http://www.finalstraw.org/masanobu-fukuoka-and-natural-farming/>

“Soil is the Stomach of the Plant,” by Patrick Holden, Director of The Sustainable Food Trust

<http://www.resilience.org/stories/2015-04-21/soil-is-the-stomach-of-the-plant>

“Treating our Soil like Dirt is a Fatal Mistake,” by George Monbiot

<http://www.theguardian.com/commentisfree/2015/mar/25/treating-soil-like-dirt-fatal-mistake-human-life>

Find Updated Lesson Plans

This lesson plan is in development. You can check for new and updated lesson plans at our website:

<http://www.finalstraw.org/soil-edu/>