

**LESSON PLAN TO ACCOMPANY  
THE *LIVING SOIL* DOCUMENTARY  
for Grades 9-12**



**A DOCUMENTARY SHOWCASING  
INNOVATIVE FARMERS WHO ENRICH THEIR SOILS  
TO ENHANCE LIFE ON EARTH.**



# HIGH SCHOOL LESSON PLAN TO ACCOMPANY THE *LIVING SOIL* DOCUMENTARY

*Living Soil* is a 60-minute documentary film available from the non-profit Soil Health Institute. The documentary features diverse scenes of food production and farmers from across the United States. Producers talk about reasons they prioritize soil health and strategies they have used to improve soil health. The film also includes soil health researchers and other soil health experts commenting about new trends and developments in soil health. The film was shot in 2016 and 2017 and released in 2018. Individuals who have viewed the film have rated it very highly for beautiful cinematography, the original music score, and especially the educational content provided.

The film is available to stream and download at [www.livingsoilfilm.com](http://www.livingsoilfilm.com).

This “Living Soil” lesson plan is for **grades 9-12** and is appropriate to classes in agriculture, natural resources, environment, ecology, biology or human nutrition and food systems.

## Primary learning goal:

Develop an understanding of why soil health is important and identify ways that people working in production agriculture are working to improve the health of our nation’s soils, ultimately benefiting all members of our society.

## Specific educational objectives:

- Develop an understanding of the importance of soil health
- Gain awareness of the types of organisms found in soil
- Outline various approaches farmers are taking to improve soil health
- Describe the role of cover crops in protecting and improving soil health
- Define key terms related to soil health
- Identify the importance of soil health to consumers and our society

## Teaching time:

- 1-2 hours plus time for watching the 60-minute film in or out of class

## Bell ringers:

- Why is improvement of soil health important for modern food production?
- What are cover crops and why are farmers using them?

## Items included in this lesson plan:

- Discussion prompts on the film for small group or whole class discussion (page 2)
- Links to soil health fact sheets and additional references and videos (page 3)
- Definition list of terms related to soil health and soil conservation (page 4)
- Writing prompts for individual student reflections on the film (page 4)
- Sample quiz on soil health information covered in the film (page 5)
- Answer key for the quiz (page 6)



## Summary notes for instructors:

The film should serve as inspiration for small group or whole class discussion with your students. After having some group discussion, you can reinforce the learning objectives on soil health by having the students do a writing activity and/or take a quiz on the topic. You may wish to have them read one or more of the brief fact sheets on soil health or cover crops available free on the websites listed under “additional references,” or show one or more additional short videos, possibly of a farmer from your region – the Cover Crop Innovator video series listed below has two dozen short farmer videos (2-3 minutes each) on cover crops and soil health from various parts of the country. You can show a few of these from your region and discuss the key points students heard each farmer say. There are also illustrations, photos, PowerPoint slides and additional videos on soil health available free on some of the websites listed below.

## Class prompts for small groups or whole class film discussion:

- At the conclusion of the film there is a conversation between a Chesapeake Bay fisherman (Ooker Eskridge) and a Pennsylvania farmer (Steve Groff). Student prompts and discussions may include:
  - ▶ What did you find interesting about their conversation?
  - ▶ Did the fisherman feel that water quality in the Chesapeake Bay was improving as a result of more use of cover crops and other conservation practices on farmland?
  - ▶ In Maryland and some other areas near the Chesapeake Bay, over half the corn and soybean fields have cover crops – can this high level of cover crop adoption to improve water quality be replicated elsewhere?
  - ▶ What can help make it happen and what barriers might get in the way?
- Which of the farmers made the biggest impression on you with their remarks and what you saw and heard about their farms? What did you take away from listening to that farmer (or farmers)? What role do each of the farmers play in soil health?
- The film started out with the Dust Bowl era of the 1930s and then made the connection of preserving the soil because we all like to eat. Is there an opportunity to make more people in society aware of the importance of our limited soil resource, and how would you do that?
- One of the farmers (Dan DeSutter from Indiana) talked about how soil organic matter has declined significantly since modern agriculture began, and his desire to restore his soil organic matter. Why is that important and what can help build soil carbon and soil organic matter?
- The farmers and soil experts in the film talked quite a bit about the living organisms and the need to keep them fed and healthy to have a healthy soil. Can you think of any parallels to how a healthy soil ecosystem functions in prairies or forests?

# ADDITIONAL REFERENCES ON SOIL HEALTH

- 1) 2-page fact sheet on “Ten ways cover crops enhance soil health” – joint publication of Soil Health Institute and USDA-SARE <https://soilhealthinstitute.org/wp-content/uploads/2017/12/10-ways-cover-crops-enhance-soil-health-FINAL.pdf>
- 2) Other Soil Health Institute educational resources – publications and videos <https://soilhealthinstitute.org/resources/>
- 3) Soil health fact sheets from the USDA Natural Resources Conservation Service <https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/soils/health/?cid=stelprdb1049236>
- 4) USDA-SARE Cover Crops Topic Room – [www.sare.org/covercrops](http://www.sare.org/covercrops)
- 5) USDA-SARE Cover Crop Innovator Video Series (includes two dozen 2-3 minute video clips of farmers from across the U.S. expressing why cover crops and soil health are important to them) <https://www.sare.org/Events/Cover-Crop-Conferences/National-Conference-on-Cover-Crops-and-Soil-Health/Cover-Crop-Innovators-Video-Series>
- 6) USDA-SARE Cover Crop and Soil Health illustrations, photos, and slide sets <https://www.sare.org/Learning-Center/Topic-Rooms/Cover-Crops/Cover-Crop-Images-Library>
- 7) USDA-SARE Cover Crop Resource Series – short fact sheets on various benefits of cover crops <https://www.sare.org/Learning-Center/Topic-Rooms/Cover-Crops/Cover-Crops-and-Water-Quality-Resource-Series>



# DEFINITIONS AND WRITING PROMPTS ON “LIVING SOIL”

## Define or describe the following terms:

- Soil health
- Soil microbes
- Cover crops
- No-till farming
- Erosion
- Soil organic matter

## Individual learning activities/student reflections:

- Write a reflection (200-300 words) on one of the following three topics:
  - ▶ Select a farmer from the film and write about why that farmer’s comments made and impact on you and what you found interesting about their situation and their approach to soil health.
  - ▶ Given what you learned about soil health in the film, write about why soil health will be important to food production going forward.
  - ▶ After watching the film, describe whether you feel more or less optimistic about the future of agriculture and our food system going forward, and explain why you feel that way.
- Or, write a paragraph each on two of the following four topics:
  - ▶ What was the 1930s era Dust Bowl about and why was it a problem?
  - ▶ Describe at least three of the specific environmental benefits of cover crops.
  - ▶ Why is increased soil organic matter important and what are some farming approaches that can increase the organic matter in the soil?
  - ▶ Given what you learned about soil health in the film, why will soil health will be important to our food production going forward?



Name: \_\_\_\_\_

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

Course: \_\_\_\_\_

Instructor: \_\_\_\_\_

## QUIZ BASED ON THE “LIVING SOIL” FILM

**Directions:** Answer the following questions based upon the video documentary.

1. Why should consumers care about soil health?
2. What steps or practices are farmers using to improve soil health?
3. What types of organisms are present in a healthy soil ecosystem?
4. List four benefits of cover crops, including for soil health
5. Why is it helpful to increase soil carbon and build soil organic matter?
6. Roughly what soil temperature do most soil organisms prefer?
7. Why do plants exude carbohydrates out of their roots to feed soil organisms?
8. Can soil health improvement work on all types of crop farms? Please explain.
9. How do cover crops and improved soil health relate to water quality?
10. Give an example of a way that more farmers can be motivated to use cover crops and other soil health practices.



# — Answer Key for the “LIVING SOIL” Quiz —

1. Why should consumers care about soil health?
  - ✓ *World population is growing and without more productive soil it will be hard to produce enough food. Healthy soil also contributes to less environmental problems and creates a more resilient cropping system that can respond to droughts and other challenges.*
2. What steps or practices are farmers using to improve soil health?
  - ✓ *keeping the soil covered with crop residue and cover crops*
  - ✓ *reducing soil disturbance through no-till or minimum tillage*
  - ✓ *providing living roots to feed soil organisms year round if possible*
  - ✓ *increasing biodiversity through diversified crop rotations and cover crops*
3. What types of organisms are present in a healthy soil ecosystem?
  - ✓ *earthworms, fungi, bacteria, nematodes, protozoa, insects and other arthropods*
4. List four benefits of cover crops, including for soil health.
  - ✓ *increasing soil organic matter*
  - ✓ *improved rainfall infiltration*
  - ✓ *more earthworms*
  - ✓ *better balance of soil organisms*
  - ✓ *less soil compaction*
  - ✓ *nutrient scavenging (preventing nutrient loss)*
  - ✓ *reduced soil erosion*
  - ✓ *nitrogen fixation from legumes*
  - ✓ *cover crop residues can keep soil cooler*
  - ✓ *improved weed control*
5. Why is it helpful to increase soil carbon and build soil organic matter?
  - ✓ *Increased soil organic matter can improve water holding capacity of the soil, improves root growth and over time improves nutrient availability in the soil. Higher organic matter soils are more resilient in face of drought or other severe weather. Sequestering carbon in the soil also removes it from the atmosphere which is beneficial for reduction of carbon dioxide in the atmosphere.*
6. Roughly what soil temperature do most soil organisms prefer?
  - ✓ *Most soil organisms function best at the same temperatures people are comfortable at, or more specifically, in the 70s or low 80s F.*
7. Why do plants exude carbohydrates out of their roots to feed soil organisms?
  - ✓ *Plants have evolved to have a symbiotic relationship with certain soil organisms in which the plants provide carbohydrates to soil fungi and other organisms and in return get nutrients needed by the plants.*
8. Can soil health improvement work on all types of crop farms? Please explain.
  - ✓ *Yes! Whether grain crops, fruits, vegetables, cotton, hay or other types of crops are being grown, all plants benefit from healthier soils. Healthier soils are better at providing water and nutrients to the plants and providing a good growing environment for roots.*
9. How do cover crops and improved soil health relate to water quality?
  - ✓ *Cover crops improve rainfall infiltration, allowing the rain to soak into the soil instead of running off. They can prevent eroding soil from leaving field with nutrients and pesticides. The cover crops can also scavenge, or tie up, nutrients that otherwise might leach into groundwater or run off into surface waters.*
10. Give an example of a way that more farmers can be motivated to use cover crops and other soil health practices.
  - ✓ *Incentive payments from state or federal governments can provide a per acre payment to farmers for using cover crops or certain other soil health practices. Educational programs can help teach farmers about the benefits of cover crops and soil health. Farmer to farmer networking can help farmers understand how soil health practices can work effectively for them and improve their profitability.*