

Module 4 Soil and Climate Change

Part 1: Soil and Climate: The Connections

Map Carbon Flow activity (*PDF included with workshop materials*)

Part 2: Soil and Climate: The Carbon Cycle

- Bank Account Analogy:
 - Article: (*PDF included with workshop materials*)
 - Longbottom, T., et al (2022), What's Soil Got to Do with Climate Change. *GSA Today*, 32(5), p 4-10.
 - Comic: (*PDF included with workshop materials*)
 - Berhe, A. A, & Sequential Potential. (2021). *What's soil got to do with climate change?*. Retrieved from <https://escholarship.org/uc/item/4d76p54r>
 - Ted Talk:
 - https://www.ted.com/talks/asmeret_asefaw_berhe_a_climate_change_solution_that_s_right_under_our_feet
- Soil Carbon Drawdown: How? Video: <https://www.youtube.com/watch?v=xXo-9x1bSDU>
- GLOBE Soil (Pedosphere) Protocols, including Bulk Density: <https://www.globe.gov/do-globe/globe-teachers-guide/soil-pedosphere>

Part 3: Soil and Climate Change: Classroom Connections using a 5E Lesson-set

Description: This 5-E sequence is centered on the connections between soils, climate change, and our food system. Visit the slide deck for additional support

- Grade-level: 6-8, 9-12
- Instructional Time: ~ ten 50-minute class periods
- NGSS Performance Expectations - This 5E lesson-set will develop proficiency in the following PEs:
 - [MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics](#)
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
 - [MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics](#)
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
 - [HS-ESS2-2 Earth's Systems](#)
Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
 - [HS-ESS2-6 Earth's Systems](#)
Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
 - [HS-ESS2-7 Earth's Systems](#)
Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
 - [HS-ESS3-1 Earth and Human Activity](#)
Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Engage

Locate a photo of an example of drought

Explore

- Data Access: My NASA Data Earth System Data Explorer
 - Monthly soil moisture data in millimeters - for North America
 - Set time for animation from Jan 2015 to Dec 2021
 - Monthly Precipitation Anomaly in millimeters/day - for North America
 - Set time for animation from Jan 2015 to Dec 2021
- Drought: Withering Plants
Activity: https://www.windows2universe.org/teacher_resources/withering_crops_activity.html
Video: <https://www.youtube.com/watch?v=cBqr43QbfBE>
- Salinization Lab: <https://teachingapscience.com/soil-salinization-lab/>
- The Sponge Model: <https://www.doctordirt.org/teachingresources/sponge>
- The Runoff Simulation: <https://stroudcenter.org/virtual-learning-resource/runoff-simulation/>

Explain

- Activity: Carbon dioxide probe: <https://www.glbc.org/outreach/educational-materials/measuring-soil-microbial-activity>
- Reading: What is Carbon Sequestration and How does it work?
<https://clear.ucdavis.edu/explainers/what-carbon-sequestration>

Elaborate

- Video: CO2 Drawdown - Where Should the Water Go? <https://www.youtube.com/watch?v=xv-n54NTd9M>
- Reading: Berhe, A. A, & Sequential Potential. (2021). *What's soil got to do with climate change?*. Retrieved from <https://escholarship.org/uc/item/4d76p54r>
- Simulation: Can we feed a growing population? <https://learn.concord.org/has-land>

Evaluate

- Review the provided task found on the slide deck, add details for your teaching scenario, and create a rubric to share with students.
- Video: Soil Carbon Cowboys <https://www.youtube.com/watch?v=MDoUDLbg8tg>