Western STEM Connection- Forest Succession

Organization:

Title: Western STEM Connection- Forest Succession

Summary: Students review a locally conducted STEM study focused on soil's ability to sequester carbon throughout different stages of vegetation succession. Students learn how to visually identify nutrient-rich vs. nutrient-poor soil.

Inquiry Question: Inquiry Question 1: Forest Harvesting: How does observing the land teach us that an ecosystem is comprised of interdependent beings (including humans) which all have important roles and responsibilities that must be fulfilled in order for an ecosystem to thrive?

Duration: 1 class period

Learning Environment: Outdoor

Season: Summer, Spring, Fall

Materials:

- Forest Succession What's in the Soil and Why Does it Matter.pdf
- Ten-minute video accompanying this Learning Bundle that discusses from an Indigenous and Western Scientific perspective the capacity of different types of soil to sequester carbon
- Carbon Sequestration Discussion Questions.pdf
- Class field trip to Elbow Lake Environmental Education Centre (ELEEC)
- Introduction to Soil Worksheet.pdf
- Equipment to dig soil pits
- High vs. low-nutrient soil samples

Curriculum Links:

Grade 9 Destreamed: A1.1, A2.4, B1.1, B2.7
Grade 10 Academic: A1.8, D1, D1.1, D2.3, D3.1, D3.5, D3.6
Grade 10 Applied: A1.8, D1, D1.1, D1.2, D3.1, D3.4, D3.7

Meta Data:

Content Type: Activity

Bundle: Food

Theme: Global Climate Change

Subject Area: Biology, Chemistry, Environmental Education, Geography, History, Outdoor Education, Science

Curriculum Focus: 9, 10

Teacher takes students to three different places outdoors, each representing a different stage of vegetation succession from field to forest. In each space teacher should allow students the opportunity to silently reflect using their five senses and record their observations. For

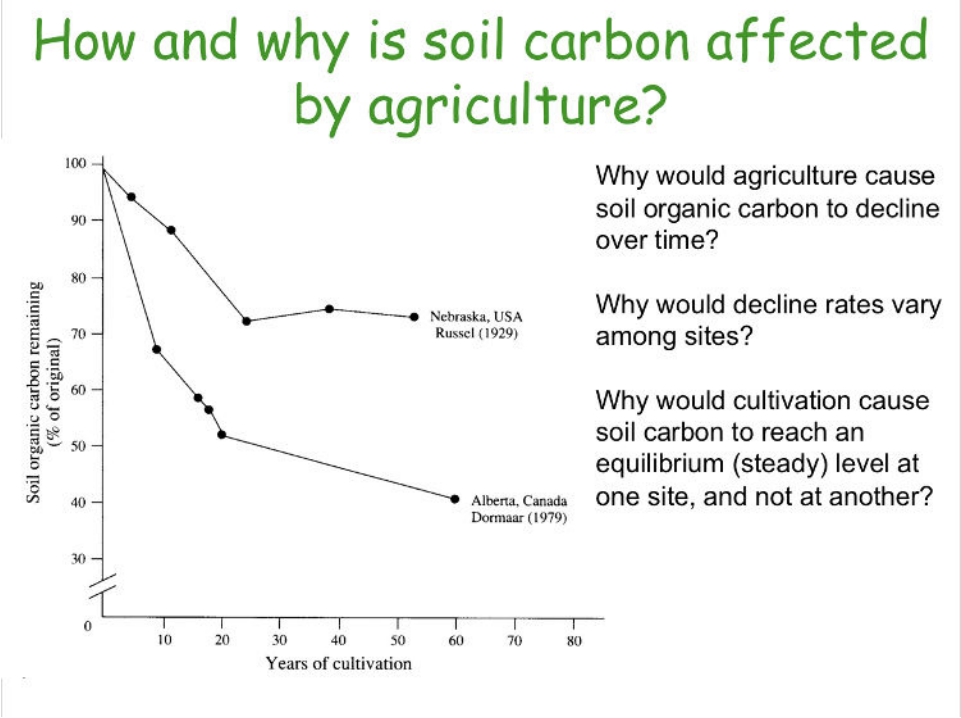
instance, students can record what animals and plants they see? How much light is available in each space? What is the soil is like in each area? How the density of plants changes in each space? When students are done have them share their reflections in a group discussion. Reflection should touch on how conditions of light, heat, moisture levels and plant density change as field transitions to forest. Students can also reflect on the adaptations plants and animals must make in order to survive in these different environments (eg: seed dispersal mechanisms, food preferences etc.) (Activity idea adapted from *Keepers of the Earth: Native American Stories and Environmental Activities for Children* by Joseph Bruchac p. 149).

- Next students review a summary of the following STEM article that examines the capacity of different soil types to sequester carbon. Summary included in **Forest Succession What's in the Soil and Why Does it Matter.pdf** accessible to grade 10 students.

  Foote, R. and Grogan, P. 2010. Soil Carbon Accumulation During Temperate Forest Succession on Abandoned Low Productivity Agricultural Lands. ***Ecosystems*** *13:795-812.*

Key points from the research to highlight with students:

- Mature forests accumulate CO2 from the atmosphere and restores carbon content in soil and are effective long-term carbon sinks.
- Agricultural practices (primarily monocultures) reduce the amount of carbon and nitrogen in farmland soil (eg. Soil carbon is released after ploughing but little new carbon is added back because the crop planted is harvested and taken away. Also, Corn takes up N from soil and doesn't restore it).
- Abandoned farmland will naturally undergo vegetation succession to forest in this region.
- Abandoned farmland becomes a carbon sink and accumulates increasing amounts of plant and soil carbon as it develops into forest.
- It isn't the soil-type that's important in determining how much C and N are taken up; but instead, how long a farmland has been abandoned (eg: the more time for vegetation succession toward mature forest, the more soil and plant carbon is sequestered.
- Furthermore, the transition from agriculture crop monoculture to shrubland and then forest greatly increases the biodiversity of plant and animal species.



- Students watch the ten-minute video accompanying this Learning Bundle that discusses from both an Indigenous and Western Scientific perspective the capacity of different types of soil to sequester carbon.
- Teacher leads a class discussion surrounding the findings of the research article and the content of the ten-minute video using discussion questions found in **Carbon Sequestration Discussion Questions.pdf**.

Optional Extension Activity: Nutrient Rich vs. Low-Nutrient Soil

- This activity will be offered at the Elbow Lake Environmental Education Centre.
- Teachers review characteristics of soil with students with handout in the **Introduction to Soil Worksheet.pdf**. Students visit Elbow Lake and dig a soil pit at Elbow Lake. Based on the descriptions in the handout students hypothesize whether the soil is carbon rich or not.

  OR
- Teachers have students observe (unlabeled) soil samples and share their observations (similarities/differences). Teachers have students infer what healthy soil looks like ie: (high nutrient) vs. (low nutrient).
- Teachers ask students to predict which soil sample is from a monoculture farmland and which is from a mature forest.

