

“Solutions-Oriented Learning” Storyline

5-Regenerative Agriculture

Storyline introduction and overview:

Soil quality is an important aspect of growing food. In this storyline, students will discover what soil is made of and how carbon is an important part of soil quality as well as how carbon moves between plants, soil, and air. Students will learn how Indigenous people used practices such as composting. Finally, students will explore what regenerative agriculture practices are and how they can be a solution to how the climate is changing over time.

[NGSS Learning Progression for this Storyline](#): The 5th grade storyline is part of a larger learning progression that includes students mastering standards pre-K to 12th grade. Take a look at how the 5th grade performance expectations fit in a continuum of learning for your students.

<p>Placemaking:</p> <p>The Inland Northwest is home to many farms that grow a diverse number of crops. This farming, known as agriculture, can change and impact the land, soil, water, air, plants and animals around it.</p>	<p>Anchoring phenomena:</p> <p>Soil is made up of many different materials.</p>	<p>Drawdown:</p> <p>Regenerative Agriculture Nutrient Management Conservation Agriculture Composting</p>
<p>Indigenous and other relevant cultural connections:</p> <p>Show the Honorable Harvest by Robin Kimmerer</p>	<p>NGSS PEs (progress towards):</p> <p>5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.</p> <p>5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</p>	

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Estimated time required to implement this storyline: 3 weeks (approximately 12 hours)

NGSS PEs:

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Science & Engineering Practice (SEP)	Disciplinary Core Idea (DCI)	Cross Cutting Concept (CCC)
<p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.</p>	<p>For 5-ESS3-1. ESS3.C: Human Impacts on Earth Systems Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments.</p>	<p>Systems and System Models A system can be described in terms of its components and their interactions.</p>
<p>Developing and Using Models Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena.</p>	<p>For 5-LS2-1 LS2.B: Cycles of Matter and Energy Transfer in Ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.</p>	<p>Systems and System Models A system can be described in terms of its components and their interactions.</p>

Learning Sessions

	Materials List:	
	Learning session	Materials
	1.	The Honorable Harvest - Robin Kimmerer.
	2.	<ul style="list-style-type: none"> Jars of sand, clay, silt and compost

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	<ul style="list-style-type: none"> • What’s the Dirt on... Dirt?
3.	Copies of pre-assessments for each student
4.	<ul style="list-style-type: none"> • Epic (free resource for teachers!), Where Does Food Come From? • My American Farm Games
5.	<p>Greenhouse in Jar</p> <ul style="list-style-type: none"> • Two thermometers • A notebook • Pencil or pen • A clear container, such as a jar • Watch or clock • A sunny area, either outside or inside
6.	Think Regeneratively
7.	<ul style="list-style-type: none"> • What Contains Carbon? • Carbon Cycle Role Play <ul style="list-style-type: none"> ○ 14-28 of a small, lightweight object to represent carbon (e.g. ping pong balls.) ○ Carbon Cycle Role-Play Cards (7 total, one per group) ○ Chalk, if needed for drawing regions • Soil Solutions to Climate Problems • Keys to Stewardship
8.	<ul style="list-style-type: none"> • Secrets to Healthy Soil <ul style="list-style-type: none"> ○ Ziploc bags for collecting soil samples ○ Soil sample from top layer of a soil high in organic matter, 1 per group ○ Funnel and capture containers, 1 per group ○ 1½" square piece of coarse screen, 1 per group ○ Wet paper towels, 1 per group ○ Light source with a shade (direct light) ○ Hand lenses ○ Soil nutrient testing kit (optional) ○ <i>Creatures in the Soil</i> handout • The Rotten Truth
9.	Dependent on teacher choice- see options in the learning sessions
10.	Copies of post assessments for each students

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1.	Grounding Native Ways of Knowing:	Estimated time: 30 minutes
<p>Show the 3 min video that discusses how to Indigenous people harvest food. The Honorable Harvest - Robin Kimmerer. Lead a discussion on the relationship students’ have with plants. Why does Dr. Kimmerer suggest introducing yourself to the plants you harvest?</p>		
2.	Examining phenomena: Soil is made up of many different materials.	Estimated time: 50 minutes
<p>Students watch What’s the Dirt on... Dirt? The teacher then provides jars of sand, clay, silt, compost. Have an open discussion with students. Students generate a list of questions, such as:</p> <ul style="list-style-type: none"> ● What is soil made of? Is it made of living or nonliving things? ● What animals or bugs live in soil? ● Are there nutrients in soil? ● What can grow in soil? ● Do farmers need soil to grow food? 		
3.	Pre Assessment:	Estimated time: 30 minutes
<p>5-Regenerative Ag Pre-Assessment 5-Regenerative Ag Assessment Rubric</p>		
4.	Guiding question: What is agriculture? What role does it play in our daily lives?	Estimated time: 50 minutes
<p>Tasks:</p> <ol style="list-style-type: none"> 1. Students read the book, Epic (free resource for teachers!), Where Does Food Come 2. Students play game Thrive on My American Farm. 3. Students participate in a discussion around the question “What role does agriculture play in my life?” Encourage students to be specific. 		
5.	Guiding question: How is the climate changing?	Estimated time: Two 50 minute sessions

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	<ol style="list-style-type: none"> 1. Students research the difference between weather and climate. 2. Students will explore how the climate has changed over time by reading the Big Questions posed in NASA's Climate Kids website. There is also a game that students can play to try to capture CO2 from the atmosphere. 3. Students make observations about climate in the Greenhouse in a Jar demonstration.
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6	Guiding Questions: What is regenerative agriculture? How does regenerative agriculture improve soil quality?	Estimated time: Two 50 minute periods
	<ol style="list-style-type: none"> 1. Students study the graphics shown in Think Regeneratively and discuss the difference between the 3 models from the graphic in terms of soil. (Degeneration makes soil quality get worse, sustaining keeps the soil the same, regeneration improves the soil) 2. Students explore the website Regenerative Agriculture to discover the principles and the practices of regenerative agriculture. Each student will choose one practice to create a poster to show how this practice improves soil quality. Students can then present this work to the class. 3. Post the following claim: ‘Regenerative agriculture is a solution to drawing down carbon through improving soil quality’” Students use the information in the resources above to evaluate this claim. 	

7.	Guiding Questions: How is carbon stored and released from soil?	Estimated time: Four 50 minute sessions
	<ol style="list-style-type: none"> 1. Students investigate what common items contain carbon. What Contains Carbon? 2. Students participate in the Carbon Cycle Role Play to understand how carbon cycles through biosphere and atmosphere. 3. Watch Soil Solutions to Climate Problems 4. Play game on Keys to Stewardship on My American Farms 	

8.	Guiding Questions: What role does composting have in improving soil quality?	Estimated time: Two 50 minute sessions
	<ol style="list-style-type: none"> 1. Students will explore how the diversity of life in soil contributes to soil fertility using Secrets to Healthy Soil. 	

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	<ol style="list-style-type: none"> 2. Students will observe and explain the decomposition process using The Rotten Truth and learn the methods and ingredients for making compost. 3. The Indigenous Peoples were also active composters and used three methods of composting. <ol style="list-style-type: none"> a. Sheet Composting where compostable materials were layered with soil. Composting while planting. Uneaten fish parts or other animal parts were planted with seeds as a nutrient source. b. Seed balls. Seeds were balled in clay and compostable materials. The seed balls were then thrown to plant the seeds. The seeds were protected by the clay balls which kept them moist, while the compost provided nutrients as the germinated and grew <p style="text-align: center;">Each student practices one of the three traditional methods used by Indigenous Peoples.</p> 4. Students use their compost model to describe how carbon moves between the plants, soil, and air.
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9.	Possible Extensions	
	<ul style="list-style-type: none"> ● Students pick a local crop and list all the people (jobs) that are involved to get that crop to a family. Bring in (or show) a drone and have students guess how a drone is used in agriculture. ● Buy the following books from Epic - a source of online books as classroom copies to support the storyline: “Green Gardening and Composting” pages 12-19 “From Garbage to Compost” “Soil” ● Discuss riparian buffers to protect streams on farmlands or invite your local conservation district representative to discuss this with students. Show students infographic on water use by agriculture. ● Practice a sit-spot after using “The Honorable Harvest”, honoring the plants/soil/etc. around you ● Soil Conservation District, Water Conservation District “Wheat Week” (great connections) 	

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	<ul style="list-style-type: none"> • More connections: Farmers! (Career connection, help with content), bring in to classroom / ask to visit field to see and touch the soil • Pen-pal classroom across the state, data collection connected to this storyline (even do a soil shipment trade!) • Have access to other demonstrations / labs from the upper grades <p>Resources:</p> <ul style="list-style-type: none"> • Erosion and Weathering Article • How to Prevent Erosion Activity • Buffer Strips: Common Sense Conservation
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10	Post Assessment:	Estimated time: 30 minutes
	5-Regenerative Ag Post-Assessment 5-Regenerative Ag Assessment Rubric	

[OER Tracker - 5th Grade Regenerative Agriculture](#)

Pacific Education Institute would like to acknowledge and thank the writing team for their work. The team included Sarah Franko, Sharon Schneider, Sarah Neuman, Kendra Robinson-Harding, Mike Nepean, Megan Rivard, Michelle Townshend, and Shelley Stromholt. In you have comments or questions please contact info@pacificeducationinstitute.org

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