Carbon Hoofprints
Clearing the Air

NEBRASKA
AGRICULTURE
IN THE CLASSROOM
NEBRASKA FARM BUREAU FOUNDATION
www.nefbfoundation.org

What is carbon?

About 37,200 results (0.24 seconds)

USA Today

Farm Bill 2023 could include measures to fight climate change

Even before anyone's seen the actual text of the proposed Farm Bill, some in Congress are pushing to take money away from climate change...

1 hour ago

USDA

USDA Releases Assessment on Agriculture and Forestry in Carbon Markets

A key deliverable under the Growing Climate Solutions Act, the report identifies opportunities and needed solutions to improve farmers'...

2 weeks ago

UCI News

UC Irvine-led science team shows how to eat our way out of the climate crisis

Irvine, Calif., Nov. 6, 2023 — Agriculture is one of the hardest human activities to decarbonize; people must eat, but the land-use...

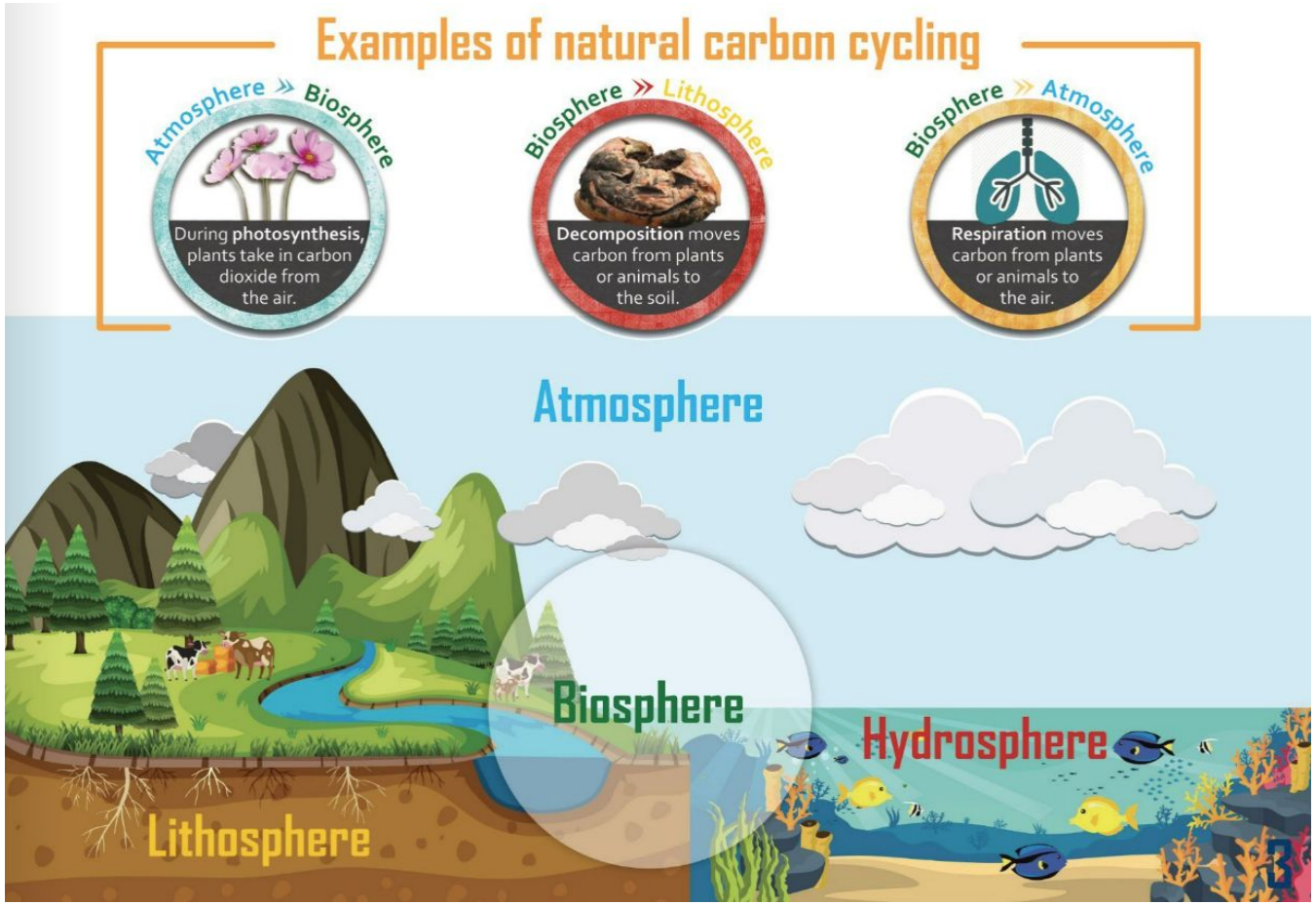
4 days ago

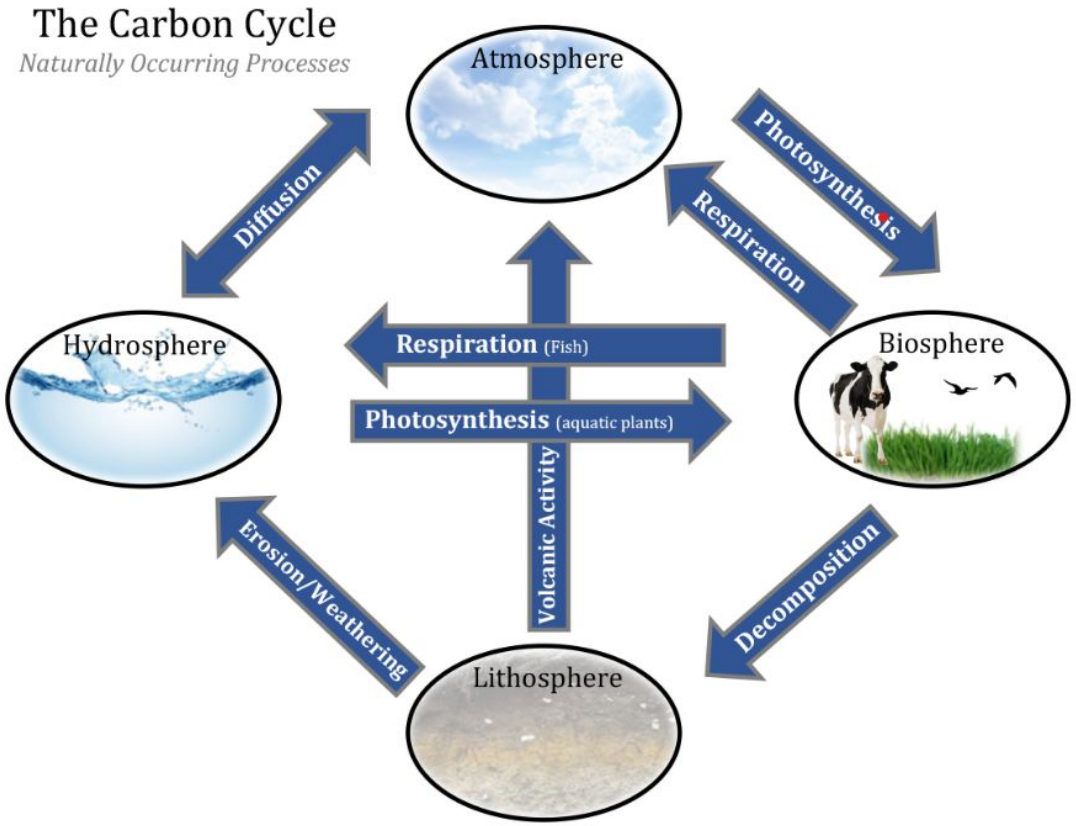
Financial Times

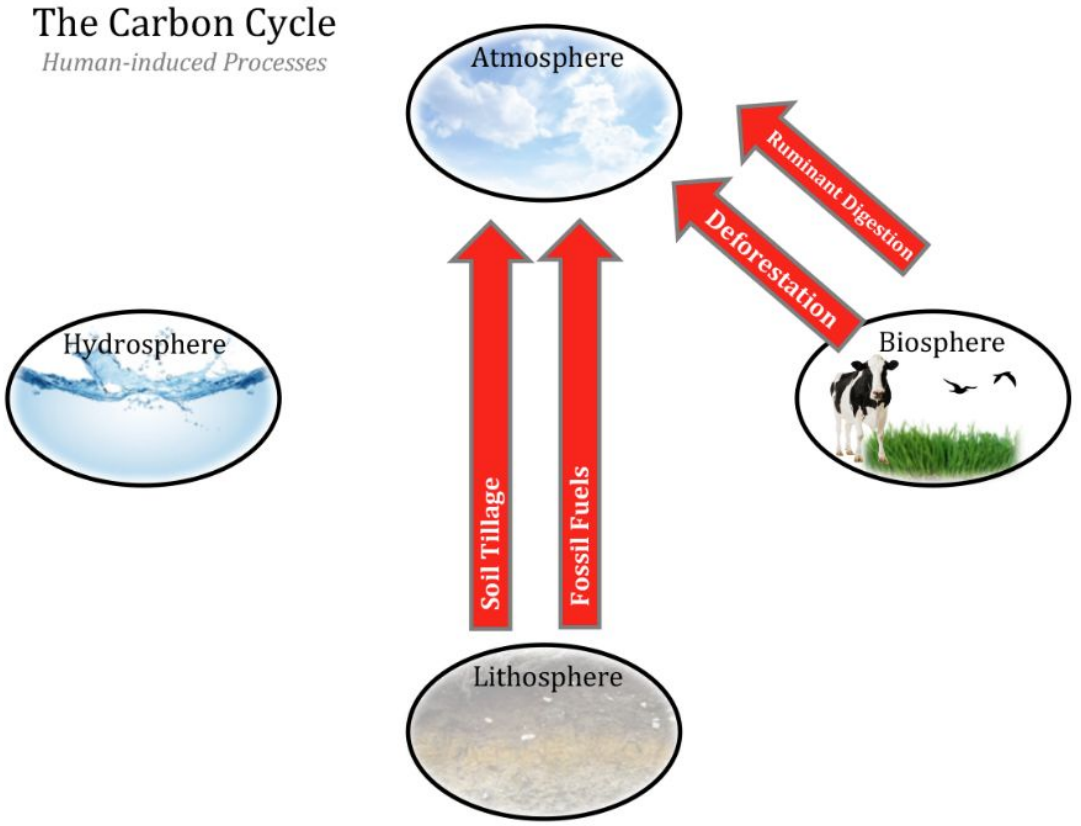
EU farmers should pay for their carbon emissions, says Denmark

Climate minister steps up calls to bring agriculture under bloc's CO_2 trading system.

5 days ago




The Carbon Cycle
Naturally Occurring Processes
Atmosphere
Diffusion
Photosynthesis
Respiration
Hydrosphere
Respiration (Fish)
Biosphere
Photosynthesis (aquatic plants)
Volcanic Activity
Erosion/Weathering
Decomposition
Lithosphere


The Carbon Cycle
Human-induced Processes
Atmosphere
Ruminant Digestion
Deforestation
Hydrosphere
Biosphere
Soil Tillage
Fossil Fuels
Lithosphere

Increased carbon cycling can lead to climate change

How can agriculture use science and technology to secure a sustainable food supply?

Mitigation

Actions we can take to reduce climate change by reducing the flow of carbon.

For example: Driving less or using energy efficient appliances

Adaptation

Adjusting to the actual climate as well as the expected future climate. It includes dealing with the negative effects and taking advantage of beneficial opportunities.

For example: Longer growing seasons and carbon sequestration

Carbon Capture and Storage in Nebraska

Today, Nebraska farmers sell more than

750 million bushels of corn

to the state's biofuel facilities

who use it to produce more than

2.3 billion gallons of ethanol

wich creates the by-product Carbon Dioxide ($C0_2$).

But there is a rising global demand for low carbon ag products.

The rapid rise of electric vehicles is reducing long-term demand for ethanol.

Tallgrass is repurposing the Trailblazer pipeline to transport $C0_2$ which will enable production of low-carbon ethanol and establish a supply of CO_2 for other industries such as:

- Sustainable aviation fuel
- Breweries, bottlers, and meat processing operations
- Concrete and industrial manufacturing
- And other CO_2 uses but not Enhanced Oil Recovery

How it Works

Nebraska farmers grow corn.

Biofuel producers buy the corn to create ethanol which produces a byproduct called carbon dioxide..

The CO_2 is captured and transported ia Trailblazer, an underground pipeline–which is 1000x safer than transporting via truck.

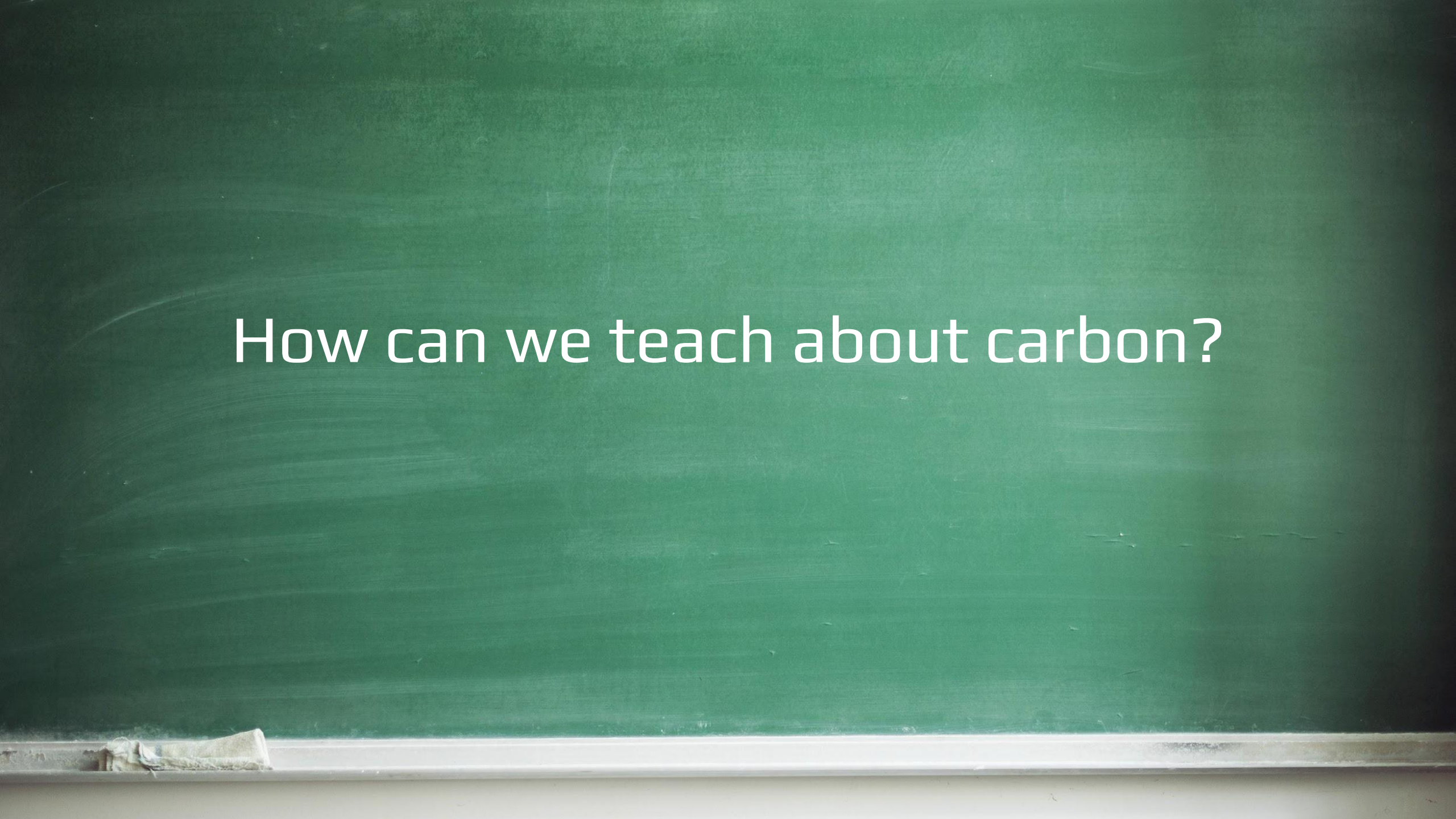
Along the path, the CO_2 can be utilized by companies for bottling, food transportation, sustainable aviation fuel, and more.

The remaining CO_2 is permanently stored geological sequestration 8,500 feet underground in Southeast Wyoming, far away from drinking water.

The biofuel is then used to meet global demand for low carbon, reliable, fuels.

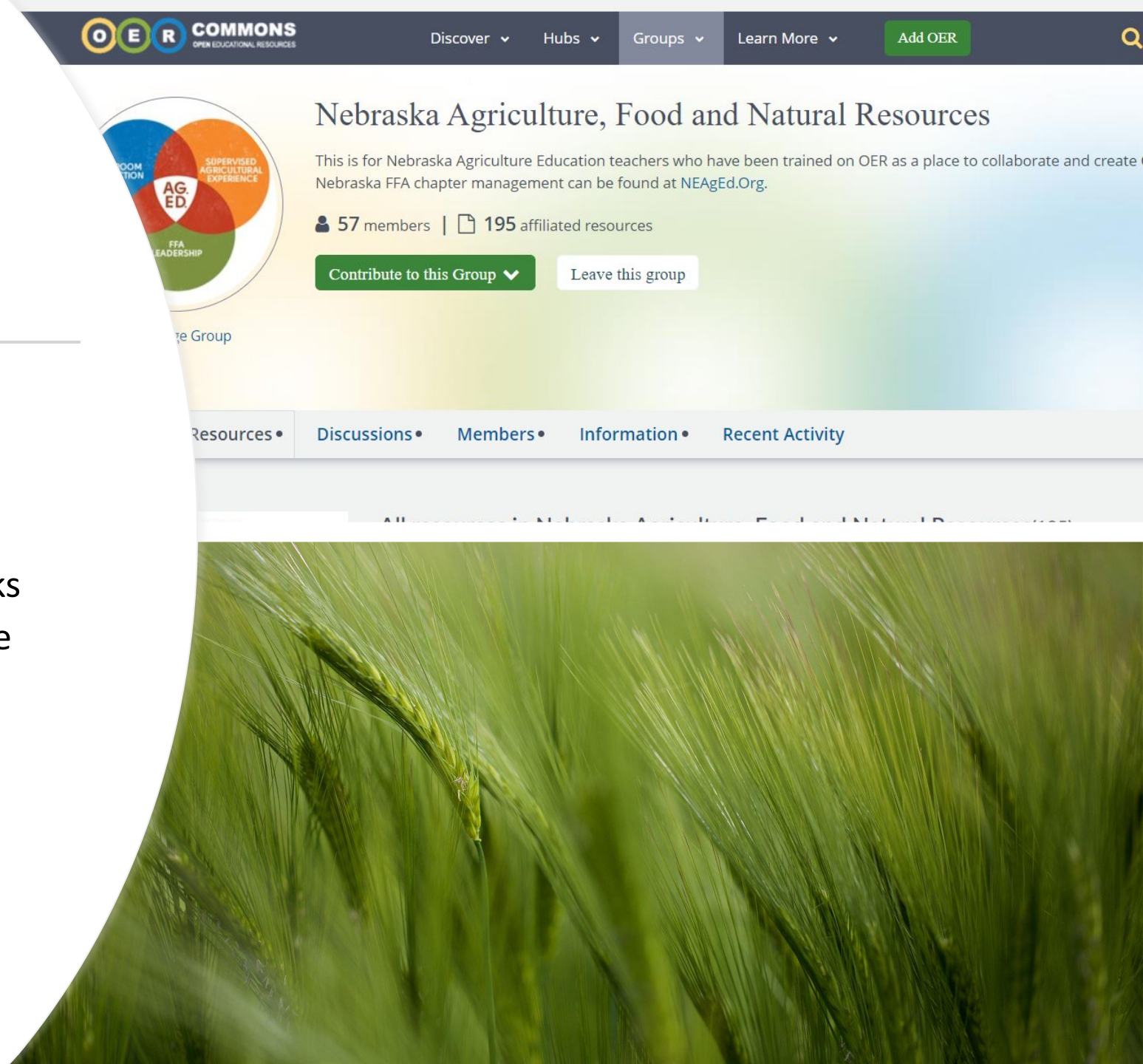
Evaluate

- The carbon cycle is a natural process.
- When evaluating long term food sustainability, agriculturalists should consider the carbon footprint of agricultural activities.
- Practices, such as carbon sequestration, are being implemented to ensure a sustainable food supply for our future.
- The answer is not less farming, it is smarter farming.


How can we teach about carbon?

Tallgrass Lessons

- Written by FFA Foundation
- Three Lessons
  - The Carbon Cycle
  - Carbon Sequestration: How it Works
  - Carbon Sequestration in Agriculture



National Agriculture in the Classroom

www.agclassroom.org

Curriculum Matrix

Air: KEEPING IT FRESH

What are three things we use every day that we can't see?

Many of us never consider that some of the most important things we use every day are not readily visible to us! A few examples include gravity, our brains, sound waves, Wi-Fi signals, our stomachs, radio waves, electricity, cell phone signals, and air. **Air** is something that is important to farmers and ranchers. Air allows plants to grow and livestock to breathe. Knowing the type and quantity of contaminants that agriculture can release into the air is important to ensure plant growth, safety in community health, and accurate climate change predictions.

DIG deeper

Why is it important for farmers and ranchers to be good stewards of the air?

When fertilizer is made and machinery is used for crop management, carbon dioxide (CO_2) is released into the atmosphere as a greenhouse gas. Another gas, nitrous oxide (N_2O), can be emitted into the air when fertilizers are applied in too great of amounts. These are known as greenhouse gases. Excess greenhouse gases can contribute to environmental issues such as extreme weather, wildfires, and drought. Today, many farmers are applying alternative fertilizers and making fewer trips over their fields to reduce greenhouse gases.

Carbon & Farmers

Wouldn't it be awesome if you could get paid for doing the right thing? What if the next time you chose to be honest in a difficult situation, someone handed you $20? You'd look for every way possible to be more helpful! Well, that's exactly what's happening in agriculture. Farmers and livestock producers are getting paid for making choices that benefit the environment! Through various companies, producers can obtain carbon credits that equate to real cash in their pockets. Sound confusing? It works like this: Carbon is a chemical element just like hydrogen, oxygen, or lead. It is the chemical backbone of all life on earth and can be found in plants and animals, the atmosphere, the ocean, and fossil fuels like coal and oil.

When soil is tilled, carbon is brought to the surface where it combines with oxygen to become carbon dioxide (CO_2). This CO_2 is considered a greenhouse gas that can cause the thawing of glacial masses, flooding, unpredictable weather patterns, and more. When farmers practice conservation tillage methods and plant cover crops, they are releasing less CO_2 and keeping (or even increasing!) soil carbon. Livestock producers also help climate change when they practice rotational grazing and keep more plant matter and soil roots (carbon) in the ground.

After producers implement these conservation methods, and their soil carbon levels are measured, they can get paid for the carbon they have retained! **Monolith** is an innovative company in Lincoln that's paving the way for a cleaner environment. While many processes that produce energy and fertilizer release carbon dioxide into the air, Monolith has found a new way to produce these necessary ingredients for life!

Monolith takes methane, which exists in what we call natural gas, and separates it into carbon and hydrogen atoms. The hydrogen atoms are used to make energy and fertilizer for farmers, and the carbon gets used immediately in products like tires, rubber goods, and paints! By using the carbon in these ways, Monolith prevents it from entering the atmosphere and becoming carbon dioxide. Now that's a 'cool' process!

Discover NEBRASKA

Agriculture Edition ISSUE 1

Feeding the World and Protecting the Environment

Imagine: It's a Tuesday, and you get done with an exhausting basketball practice. You aren't sure what could possibly take your mind off your weary legs and sore arms, when you suddenly remember that it's Taco Tuesday, and you and some friends are headed to a local restaurant! Quickly, your mind switches to the crisp tortilla chips and savory tomato and cilantro salsa that will be waiting for you at the restaurant table. While the restaurant only needs 15 minutes to serve food to its customers, do you know it takes many months and the use of many natural resources to produce the food you'll enjoy?

A natural resource is something that is found in nature and can be used by people. Examples can include water, air and even the soil. Not just people need natural resources. Plants and animals on farms and ranches need natural resources to live. Nebraska's farmers and ranchers are good stewards of the natural resources that have been entrusted to their care.

DIG deeper

What is your favorite meal?

Think of the agricultural goods and natural resources involved in its production.

LET'S TAKE THE TACOS YOU ORDER, FOR EXAMPLE.

Corn Tortillas

Corn is produced using no-till farming to minimize soil loss due to erosion and watered at specific times and in precise amounts to conserve water.

Beef

Raised in a pasture using rotational grazing so that plants don't get eaten down too low and soil organic matter and biotic life can remain high.

Fried Ice Cream

Milk used to make ice cream is produced on a dairy farm that prevents air pollution by converting the gas its cows produce into energy to power the dairy!

With the knowledge that farmers are working to care for our environment, you can rest easy knowing you'll be able to enjoy Taco Tuesdays long past your basketball playing days!

GREENHOUSE EFFECT EXPLORATION LAB GUIDE

Part A: Experiment

What is a greenhouse? What does it do? How might the Earth be like a greenhouse? In this short experiment, you and your partner will investigate the greenhouse effect.

Prediction:

After reading through the experiment steps below, I predict that the air temperature inside of the plastic bag with the carbon dioxide (Thermometer A) will be _____ (higher/lower/the same) in comparison to the air in the plastic bag without the carbon dioxide (Thermometer B).

The reason that I think this will happen is:

_____

_____

Equipment Needed:

- 2 thermometers
- 2 small paper cups
- 2 large plastic bags that will seal
- 2 tablets of sodium bicarbonate
- Timer, watch, or clock
- A sunny area to work, either outdoors or indoors

Procedure

1. Pick a spot outdoors that will be in full sunlight for at least 45 minutes.
2. Put both thermometers in direct sunlight and allow them to remain undisturbed there for three minutes.
3. After three minutes, record the temperature of each thermometer in the top row of the data table labeled "initial."
4. Place a cup of water into one of the plastic bags. Be careful not to spill an y water in the bag. Place the thermometer in the bag next to the cup. Have one person drop both of the sodium bicarbonate tablets into the cup of water. As soon as the sodium bicarbonate has bee added, seal the bag.
5. Place another cup of water into the second bag. Place the second thermometer next to it and seal the bag.
   - The bag with the sodium bicarbonate represents the greenhouse effect in our atmosphere because the sodium bicarbonate tablet releases carbon dioxide.
   - The bag without sodium bicarbonate represents our atmosphere without greenhouse gases like carbon dioxide.
6. For the next 45 minutes, check the thermometers and record the temperature every five minutes.

Discover Nebraska: Agriculture Edition

- Bell Ringer
- Discussion Prompt: Why should farmers care about the air?
- Lab Activity

Next Steps

Virtual Webinar - November 28th 12:15 – 12:45

- Climate Smart Agriculture

Complete Tallgrass Lesson Plan

- Submit Photo *prior to December 20th*

Stipend = $250

- *Limited to first 25 submissions*


Questions?

Thank You!

This workshop presented with support from

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Nebraska Farm Bureau Foundation www.nefbfoundation.org