

This issue of the North Dakota Ag Mag focuses on soil and water conservation and livestock and land stewardship in North Dakota. The information and activities are geared primarily toward the state's third, fourth and fifth graders.

Agricultural Conservation

Introduce soil and water conservation to students by asking them what conservation means. Ask them to name ways they conserve water in everyday activities, such as turning the water off when they brush their teeth. Do they help conserve soil, too? Brainstorm how water and soil are used - and conserved - in agriculture.

Answers to “Check which of these you think farmers and ranchers do to conserve resources and be good stewards.”

All nine should be checked since they're all things farmers and ranchers do to conserve resources and be good stewards. Ask students why they think these are all important practices.

Idea: Have students survey their home activities to identify ways to conserve water and make posters to hang around their house reminding them to do these tasks.

Idea: Use measuring cups and pint, quart and gallon containers of water to develop related math problems.

The Ag Mag is distributed three times per year. Subscriptions are free, but if you're not on the mailing list or if you know someone else who wants to be added, contact the North Dakota Department of Agriculture at 1-800-242-7535 or ndda@nd.gov.

This magazine is one of the N.D. Agriculture in the Classroom Council activities that helps you and other K-12 teachers integrate information and activities about North Dakota agriculture across your curriculum in science, math, language arts, social studies and other classes. It's a supplemental resource rather than a separate program.

Answers to Water Erosion

- B. **Contour Farming** — planting crops across slopes to follow the contours of a field to break up the flow of water.
- D. **Terraces** — a series of step-like contours in fields. Each “step” slows the flow of water runoff, slowing the erosion process.
- A. **Dam** — an earthen or concrete structure to stop water flow to trap sediment, stabilize drainage ways and reduce erosion, store excess water temporarily to reduce flood damage, or store water for livestock, irrigation, household or municipal use.
- C. **Grassed Waterway** — seeded grass in areas of a farm field that is prone to heavy water erosion or gullying.

Idea: Fill a long tub or child's swimming pool partially with soil, and prop one end up so the soil is at an angle. Use a watering can to demonstrate how the uncovered soil erodes under a light rain. Pour a bucket of water at the top to demonstrate how the soil erodes with a heavy downpour. Have the students build soil conservation strategies in the soil: plant grass, build terraces, put in dams, etc., then see how the light and heavy “rains” affect the soil.

Idea: For a smaller activity for students to learn about rill, sheet and gully erosion, use <https://study.com/academy/lesson/soil-erosion-activities.html>. Put a little bit of Kool-Aid-like beverage mix under the soil somewhere to show how pollution moves through the groundwater into the surface water.

Bonus Material: The Water Cycle

Though the water cycle isn't featured in this Ag Mag, here is an activity page you can copy and share with students plus ideas for hands-on projects related to the water cycle.

Earth's water is always in movement, and the water cycle, also known as the hydrologic cycle, describes the continuous movement of water on, above and below the surface of the Earth. Since the water cycle is truly a cycle, there is no beginning or end.

Although the balance of water on Earth remains fairly constant over time, individual water molecules can come and go in a hurry. The water in the apple you ate yesterday may have fallen as rain halfway around the world last year or could have been used 100 million years ago by Mama Dinosaur to give her baby a bath.

Idea: Print out The Water Cycle handout on page 3 and have students label the diagram.

Idea: Ask students to describe other cycles they know.

Idea: Discuss other materials that are in liquid, vapor and solid states.

Idea: Have students identify water sources around your area. Discuss where the school's water comes from and how it's treated. Do they get their home water from a city system, rural water district, well or other source?

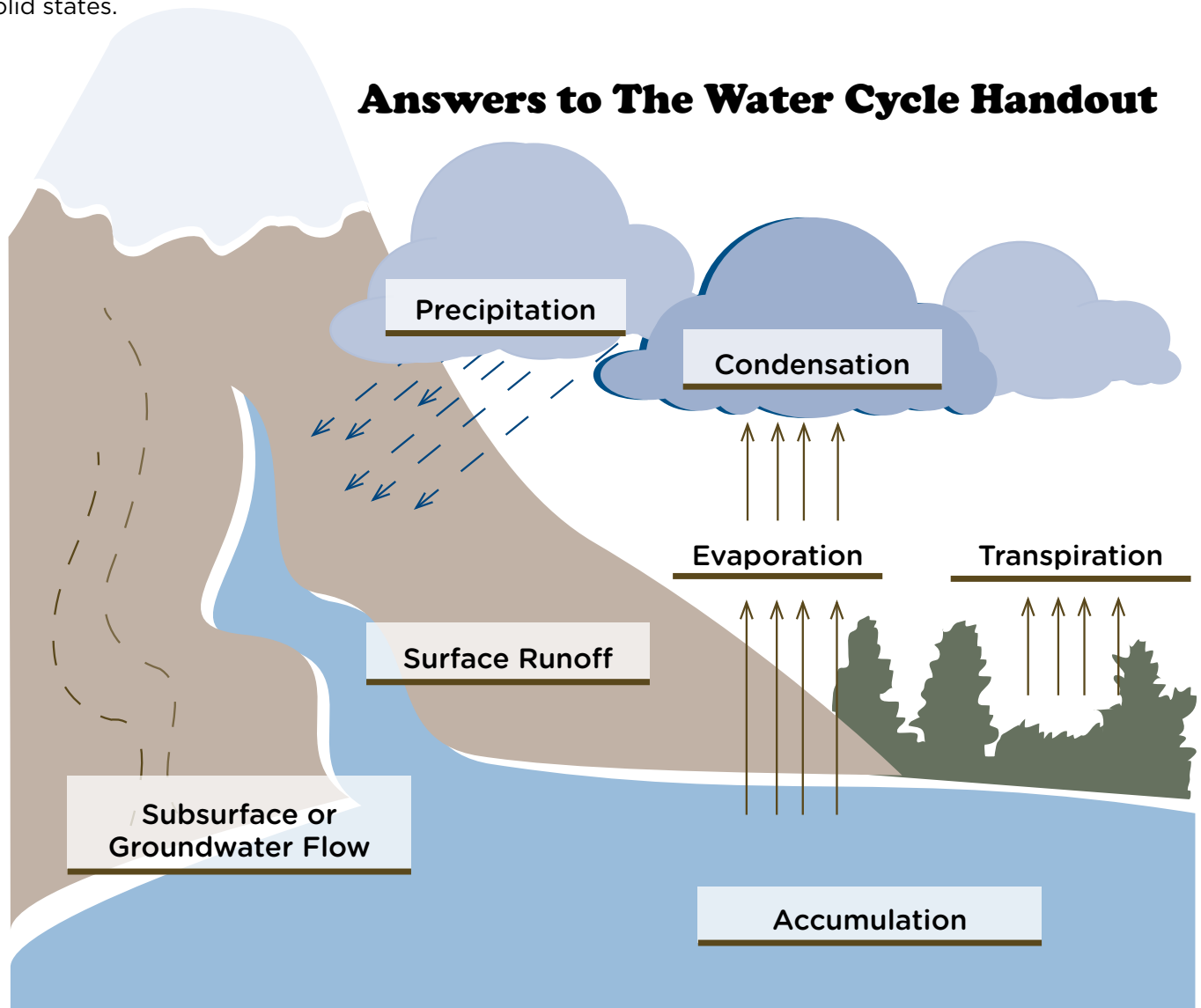
Idea: Have students record and graph precipitation or chart monthly or annual rainfall of the past.

Idea: Use Project WET's Discover the Incredible Journey of Water through the Water Cycle at www.projectwet.org (search for Incredible Journey) to have students learn about the movement of water within the water cycle, the forms water takes in the three states of matter and more.

Idea: Carry out these lessons from the national Agricultural Literacy Curriculum Matrix:

- Caring for the Land — <https://agclassroom.org/matrix/lesson/136/>
- At Home on the Range — <https://agclassroom.org/matrix/lesson/554/>

Answers to The Water Cycle Handout



The Water Cycle

Water is continuously in movement on, above and below the surface of the Earth. Water can change states among liquid, vapor and solid at various places in the water cycle, with these processes happening in the blink of an eye and over millions of years.

Use the following definitions to label the water cycle diagram.

Accumulation — the process in which water pools in large bodies (like oceans, seas and lakes).

Condensation — the process in which water vapor (a gas) in the air turns into liquid water. Condensing water vapor forms clouds in the sky. Water drops that form on the outside of a glass of icy water are condensed water.

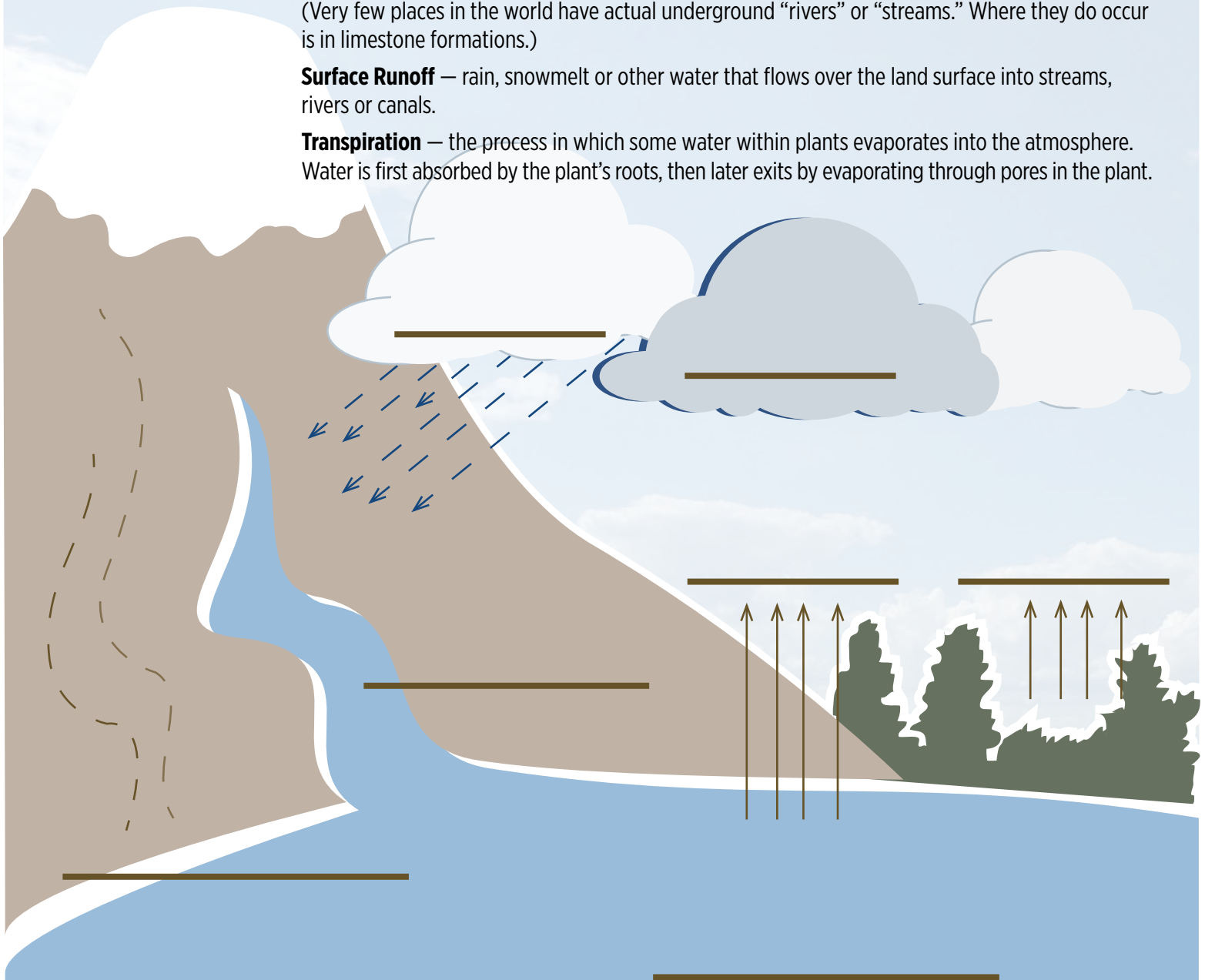
Evaporation — the process in which liquid water becomes water vapor (a gas). Water vaporizes from the surfaces of oceans and lakes, from the surface of the land and from melting snow fields.

Precipitation — the process in which water (in the form of rain, snow, sleet or hail) falls from clouds in the sky.

Subsurface or Groundwater Flow — rain, snowmelt or other water infiltrates into the soil and either collects in aquifers or flows underground through porous soil to streams, rivers or lakes. (Very few places in the world have actual underground “rivers” or “streams.” Where they do occur is in limestone formations.)

Surface Runoff — rain, snowmelt or other water that flows over the land surface into streams, rivers or canals.

Transpiration — the process in which some water within plants evaporates into the atmosphere. Water is first absorbed by the plant’s roots, then later exits by evaporating through pores in the plant.



Plants Need Soil

Idea: Use a basketball, baseball and marble to illustrate soil particle sizes. Soil consists of various sized particles, with sand being the largest, silt the next and clay the smallest. By comparison, think of sand as the size of a basketball, silt a baseball and clay a marble. Air spaces are between these particles. Soil must contain at least 12% oxygen for roots to grow. If soil is compacted, the particles are pressed together, leaving only 2% to 5% of the necessary oxygen in the spaces.

Idea: Have students compare North Dakota's soil types to those around the country. What other soils can be found? What makes the soil in North Dakota different than other places?

Idea: Use educational materials from the USDA Natural Resources Conservation Service. Go to www.nrcs.usda.gov and search for "education resources."

Idea: Have students make edible soil and more with Soil Formation and Edible Horizons lesson at <https://ksagclassroom.org/matrix/lesson/750/maincontent/maincontent/>.

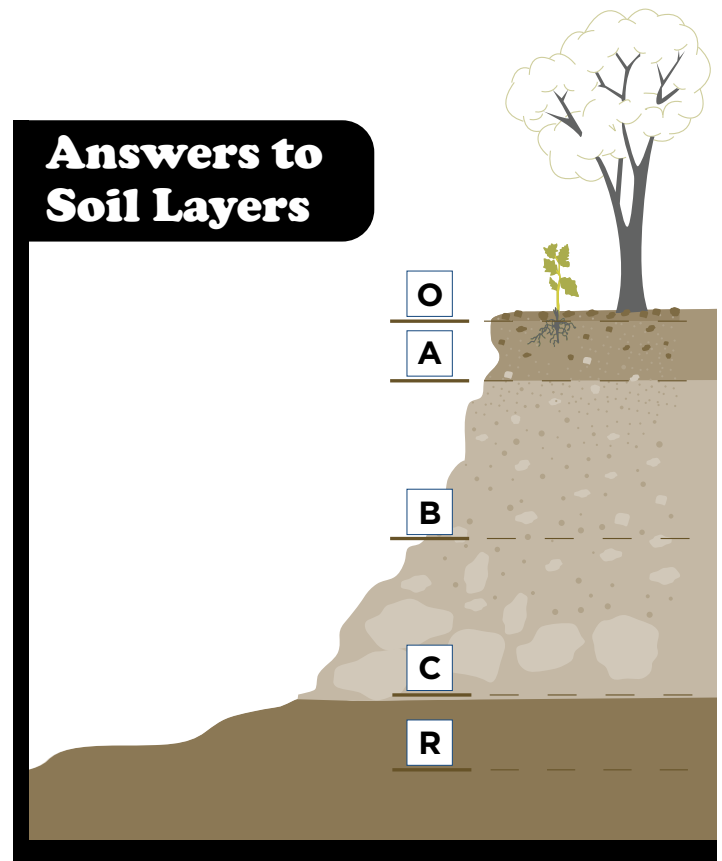
Idea: Have students collect various soil samples. How are they similar? Different?

Idea: Make soil crayons, paint with soil and carry out other soil experiments at <http://urbanext.illinois.edu/soil>.

Idea: Fill a quart jar with water and add a cup of topsoil. Mix it up and watch the soil separate as the larger particles (sand) fall to the bottom first.

Idea: Drill small holes in the bottom of two small clear plastic jars. Fill each jar with a different size of beads. Place the jars in a tub and watch how the water raises the beads. This is caused by capillary action. The smallest beads (clay) will rise the most, and the largest beads will rise the least (sand). Water also can be poured into the jar to watch infiltration. The smallest beads will have the slowest infiltration rate, while the largest beads will infiltrate the fastest.

Idea: Grow soybeans in milk cartons with soil, sand only, water only and other media. Which grows the best? Why?



Answers to Ways to Reduce Wind Erosion

- D. Vegetative wind barriers** — strips of perennial or annual grass planted to hold soil in the ground.
- C. Living snow fence** — a line of short trees, shrubs, crops and/or native grasses often along roads or around homesteads that trap snow as it blows across fields, piling it up before it reaches roads and buildings.
- A. Reduced tillage farming** — any farming method that keeps tillage operations to a minimum and leaves at least 30% of the soil surface covered with plant residue after planting to reduce soil erosion by water or wind. (Conservation tillage also reduces energy use and conserves soil moisture while still maintaining crop yield and crop quality. Other benefits include improved wildlife habitat, reduced labor costs and time savings.)
- B. Windbreak or shelterbelt** — rows of trees that protect a farmer's homestead or reduce wind erosion in farm fields.

Answers to The 1930s: Dust and Depression

1. North Dakota's average precipitation (which includes rain, snow and sleet) was a low of 8.8 inches in 1936 and a high of 24.4 inches in 2019. How many more inches of precipitation was the statewide average in 2019 compared to 1936?
24.4 inches - 8.8 inches = 15.6 inches
2. The highest temperature ever recorded in North Dakota was 121F in Steele on July 6, 1936. The coldest temperature occurred the same year: -60F in Parshall on February 15, 1936. How many degrees Fahrenheit was the difference between those two temperatures in 1936? **121 - (-60) = 181 degrees**
3. A bushel is about the size of a laundry basket. In 1932, North Dakota farmers sold wheat for 36 cents per bushel. Today, a farmer might sell wheat for \$7.70 per bushel. How much more is that per bushel? **\$7.70 per bushel - .36 per bushel = \$7.34 per bushel**
4. If the farmer sells 800 bushels of wheat, how much more would they make compared to their great grandparents in 1932? **800 bushels X \$7.34 per bushel = \$5,872**
5. North Dakota's population in 1930 was 680,000 people. About 121,000 people moved out of the state during the 1930s. What was the state's population in 1940?
680,000 people in 1930 - 121,000 people who moved = 559,000 people in 1940
6. In 2021, North Dakota's population was 775,000 people. How many more people lived in the state in 2021 compared to 1930?
775,000 people - 680,000 people = 95,000 people
7. In 1933, North Dakota had 86,000 farms. In 1940, there were 73,692 farms in the state. How many North Dakota farms were lost due to the Great Depression and drought from 1933 to 1940?
86,000 farms in 1933 - 73,692 farmers in 1940 = 12,308 fewer farms

Idea: Utilize lesson plans, teachers guides and media resources from the National Endowment for the Arts' The Dust Bowl program at <https://edsitement.neh.gov/how-teachers-can-make-most-dust-bowl>.

Idea: Ask a grandparent or older person what life was like during the Dust Bowl.



Answers to Soil and Water Math

1. A farmer is irrigating crops, but 45 gallons of water are leaking from the pipe each day. How many gallons are being lost each week?
45 gallons/day X 7 days = 315 gallons per week
2. In North Dakota, about $\frac{2}{3}$ of soil erosion is caused by wind, and the rest is caused by water. What fraction is caused by water?
 $\frac{3}{3} - \frac{2}{3} = \frac{1}{3}$
3. Nature requires about 500 years to build 1 inch of topsoil. How many years are needed to develop $\frac{1}{2}$ inch of topsoil?
500 years/inch X .5 inch = 250 years

Answers to Farmers and Ranchers are Conservationists

1. To avoid overgrazing, farmers and ranchers practice wise land and (heard or **herd**) management.
2. To improve (**their** or there) knowledge and practice, farmers work closely with soil conservationists.
3. Farmers must (now or **know**) how to rotate crops for best results.
4. Ranchers (**choose** or chose) to work closely with veterinarians to ensure that their livestock remain healthy.
5. Farmers learn to manage (obnoxious or **noxious**) weeds to have greater crop yields.
6. A ewe can recognize the “baa” of (it’s or **its**) own lamb.
7. Farmers and ranchers care for their livestock because it’s the right thing to do (**ethically** or ethnically).
8. Caring for their livestock also makes good business (cents or **sense**).
9. (Conversation or **Conservation**) means taking care of something to prevent loss.
10. (**Precipitation** or Percipitation) includes all moisture falling from the sky as rain, snow and sleet.
11. Soil consists of various sized (particals or **particles**).
12. Soil must contain at least 12% (**oxygen** or oxigen) for roots to grow.
13. A (drout or **drought**) is a prolonged period of abnormally low rainfall, leading to a shortage of water.

Career Corner

Answers to Missing Words in Career Corner Article

- | | |
|-----------------|-----------------|
| 1. Productivity | 5. Nitrogen |
| 2. Watershed | 6. Analyze |
| 3. Pollution | 7. Contaminants |
| 4. Rotation | 8. Management |

Idea: Visit a water treatment facility or a conservation site to learn about the jobs of the employees.

Idea: Have students list and possibly research other careers that involve soil and water.

Idea: Ask someone from the local Natural Resources Conservation Service or Soil Conservation District to visit the class and talk about their career.

Additional Resources

North Dakota Agriculture unit from North Dakota Studies Program, State Historical Society of North Dakota — <https://www.ndstudies.gov/curriculum/4th-grade/nd-agriculture>

On the Farm STEM brings science to life by farmers and ranchers, researchers, nutritionists and veterinarians. The program provides free lessons, activities, online learning tools and professional development events. <https://www.onthefarmstem.com/>

Standards and Benchmarks

Science

Performance Standard

4-ESS2-1: Make observations and metric measurements to provide evidence of the effects of weathering and the rate of erosion by water, ice, wind, or vegetation.

Performance Standard

4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Math

3.NF.1 Understand a fraction $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts. Understand a fraction $\frac{a}{b}$ as the quantity formed by “ a ” parts of size $\frac{1}{b}$.

4.NF.1 Using visual fraction models, explain why a fraction $\frac{a}{b}$ is equivalent to a fraction (*nn XX aa*).

4.NF.3 Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

4.NBT.4 Fluently add or subtract multi-digit whole numbers to the one millions place using strategies flexibly, including the standard algorithm.

English Language Arts

RF.4 Read with sufficient accuracy and fluency to support comprehension. a. Read grade-level text with purpose and understanding.

L.1 p. Correctly use common homophones (e.g., to, too, two; there, their)

L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose words and phrases for effect.

North Dakota Agriculture in the Classroom Activities

This **Ag Mag** is just one of the North Dakota Agriculture in the Classroom Council projects. Each issue of the Ag Mag focuses on an agricultural commodity or topic and includes fun activities, bold graphics, interesting information and challenging problems. Send feedback and suggestions for future Ag Mag issues to:

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Another council teacher resource is **Project Food, Land & People (FLP)**. Using the national FLP curriculum, ND Ag in the Classroom provides 600-level credit workshops for teachers to instruct them in integrating hands-on lessons that promote the development of critical thinking skills so students can better understand the interrelationships among the environment, agriculture and people of the world. Teachers are encouraged to adapt their lessons to include North Dakota products and resources.

Project Food, Land & People's 55 lessons include:

- Amazing Grazing
- Cows or Condos?
- By the Way
- Seed Surprises
- Schoolground Caretakers
- Could It Be Something They Ate?
- What Piece of the Pie?
- and many more.

For information, contact:

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The ND Geographic Alliance conducts a two-day **Agricultural Tour for Teachers**. The tour includes farm and field visits, tours of agricultural processing plants to see what happens to products following the farm production cycle, and discussions with people involved in the global marketing of North Dakota farm products.

For information, contact:

Jeffrey Beck
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Educators may apply for **mini-grants for up to \$500** for use in programs that promote agricultural literacy. The Agriculture in the Classroom Council, working with the ND FFA Foundation, offers these funds for agriculture-related projects, units and lessons used for school-age children. The mini-grants fund hands-on activities that develop and enrich understanding of agriculture as the source of food and/or fiber in our society. Individuals or groups such as teachers, 4-H leaders, commodity groups and others interested in teaching young people about the importance of North Dakota agriculture are welcome to apply.

Examples of programs that may be funded: farm safety programs, agricultural festivals, an elementary classroom visiting a nearby farm and ag career awareness day. Grant funds can be used for printing, curriculum, guest speakers, materials, food, supplies, etc. More ideas and an application are at www.ndffaoundation.com/applications.

For information, contact:

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