2013
Number 6

Natural Inquirer

The *Natural Inquirer* Monograph Series

Food for the Soil:
Soils and the Amount of Salmon-Derived Nutrients in Southeast Alaska

USDA

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

The
Natural Inquirer
Monograph Series

Food for the Soil:
Soils and the Amount of Salmon-Derived Nutrients in Southeast Alaska

Produced by
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Cradle of Forestry in America Interpretive Association

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CRADLE of FORESTRY Interpretive Association IN AMERICA

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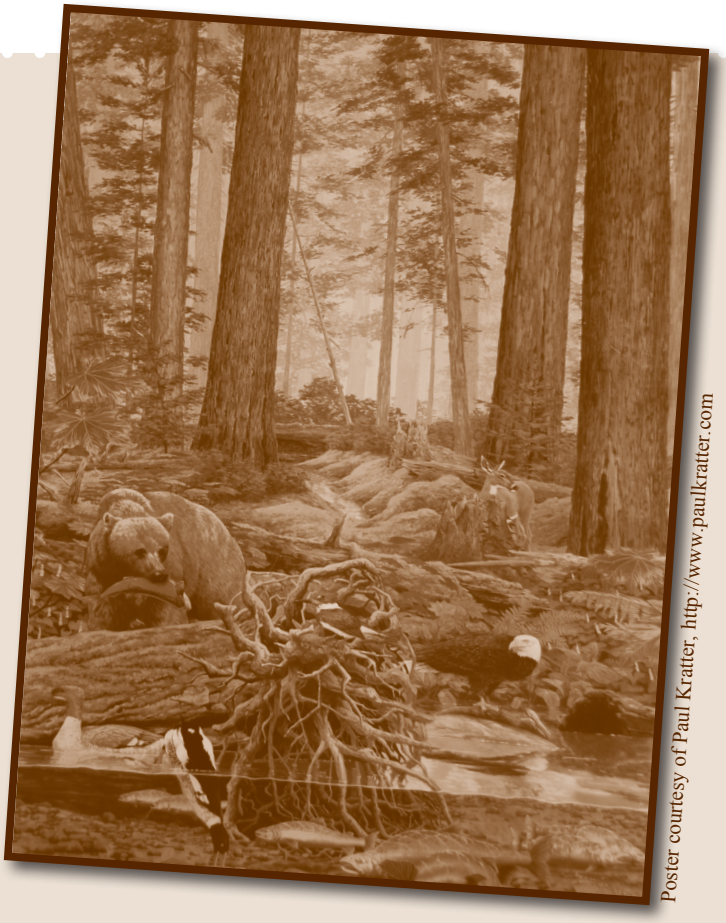
FEATURE:

Food for the Soil:

Soils and the Amount of Salmon-Derived Nutrients in Southeast Alaska



Poster courtesy of Paul Kratter, http://www.paulkratter.com

Join us in being green!

The following Educator Resources are now available exclusively on the *Natural Inquirer* web site,

http://www.naturalinquirer.org.

Click on the "Food for the Soil" cover or go to "Educational Resources" to access these resources.

- Note to Educators
- Food for the Soil Lesson Plan
- Food for the Soil Word Search
- Reflection Section Answer Guide

Who Are Scientists?

Scientists are people who collect and evaluate information about a wide range of topics. Some scientists study the natural environment.

To be a successful scientist, you must:

Be curious:
Are you interested in learning?

Question everything:
Do you think about what you read and observe?

Be enthusiastic:
Are you enthused about a particular topic?

Be open-minded:
Are you willing to listen to new ideas?

Be careful:
Are you accurate in everything that you do?

Welcome to the *Natural Inquirer* Monographs!

Scientists report their research in a variety of special books. These books enable scientists to share information with one another. A monograph is a book about research that focuses on a single science project. This monograph of a *Natural Inquirer* article was created to give scientists the opportunity to share their research with you and other middle school students.

The monograph presents scientific research conducted by scientists in the Forest Service, an agency of the U.S. Department of Agriculture. If you want to learn more about the Forest Service, you can read about it on the inside back cover of this monograph, or you can visit the *Natural Inquirer* Web site at **http://www.naturalinquirer.org**.

All of the research in this *Natural Inquirer* monograph is concerned with the natural environment, such as trees, forests, animals, insects, outdoor activities, and water. First, you will "meet the scientist" who conducted the research. Then, you will read about one of the many interesting aspects of science and about the natural environment. You will also read about a specific research project. The research article is written in the format that scientists use when they publish research in scientific journals. Then YOU become the scientist as you go through the FACTivity associated with the article. Don't forget to look at the glossary and the special sections highlighted in the article. These sections give you extra information that is educational and interesting. At the end of each section of the article, you will find a few questions to help you think about what you have read. These questions will help you think like a scientist. The questions will help you think about how research is conducted. Your teacher may use these questions in a class discussion, or you may discuss these questions in a small group.

Each *Natural Inquirer* monograph will help you explore the exciting world of science and prepare you to become a young scientist. You will learn about the scientific process, how to conduct scientific research, and how to share your own research with others.

Visit **http://www.naturalinquirer.org** for more information, articles, and resources.

Editorial Review Board

Sandy Creek Nature Center Teen Day Camp

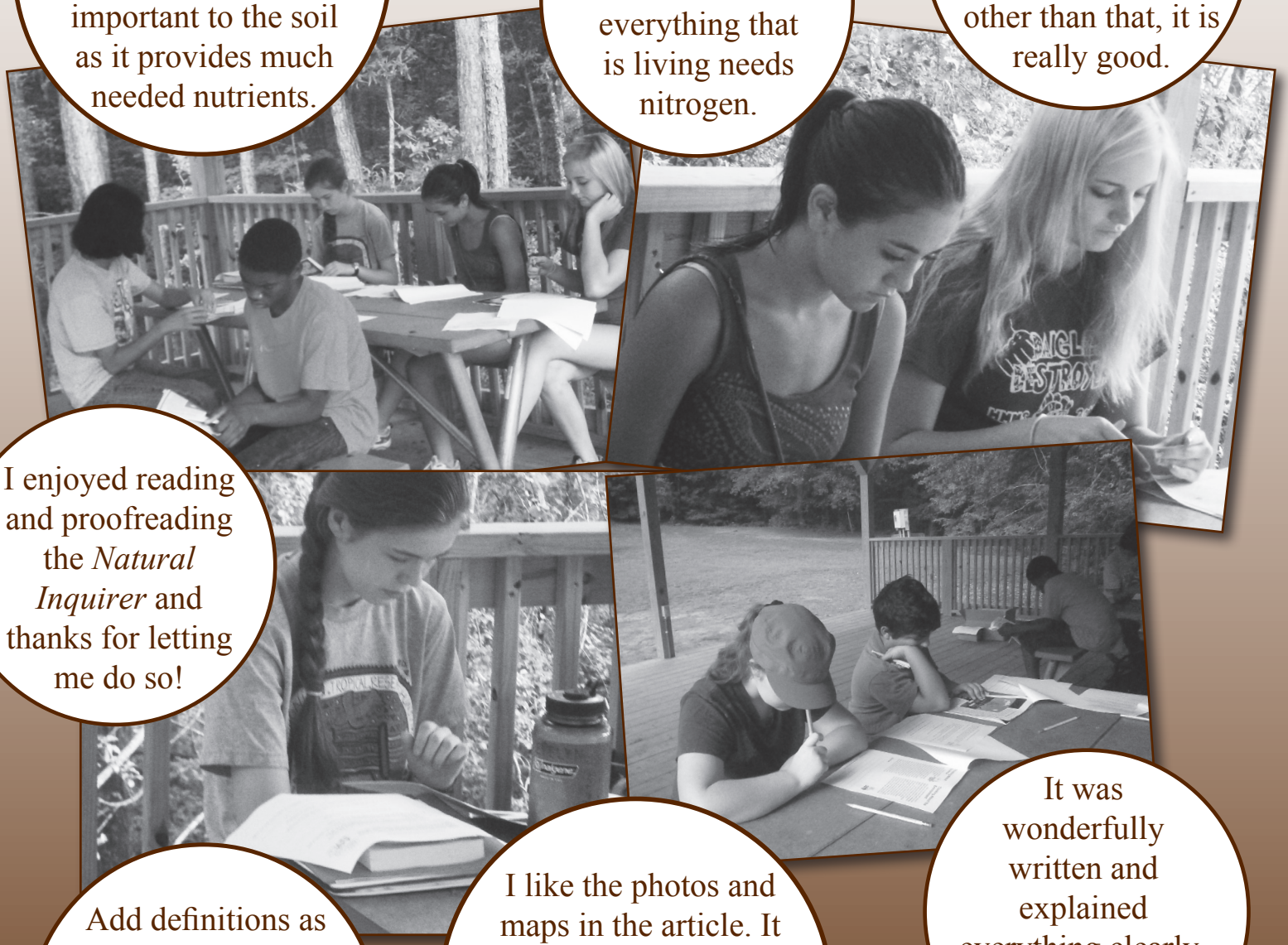
Athens-Clarke County, Georgia

Mr. Jonathan Bast, Camp Director

The most important thing I learned is that salmon-derived nutrients are very important to the soil as it provides much needed nutrients.

The most important thing I learned is that everything that is living needs nitrogen.

I would suggest having more text per page so reading can be more fluent but other than that, it is really good.



I enjoyed reading and proofreading the *Natural Inquirer* and thanks for letting me do so!

Add definitions as footnotes as well as glossary so you don't have to keep flipping for the meanings of the words.

I like the photos and maps in the article. It made the article more interesting and easy to understand. I learned many things about soil and SDN.

It was wonderfully written and explained everything clearly. Beautiful and clear layout.

Food for the Soil:

Soils and the Amount of Salmon-Derived Nutrients in Southeast Alaska

Glossary words are in bold and are defined on page 21.

Meet the Scientist!

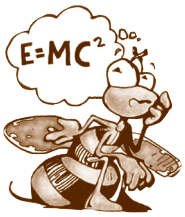
Dr. David D'Amore,
Soil Scientist

My favorite science experience was conducting bird surveys in the forest. I assisted the bird survey crew and had to get up before dawn, which meant 2 a.m. in Alaska. We hiked up into the forest, sat down in an area, remained very quiet, and listened to the different birds calling in the early morning light. During my normal work days, I would be moving around making all kinds of noise, measuring trees, shouting instructions, or digging soil pits. I was amazed to hear the "noise" of the forest once I was quiet enough to listen.

Thinking About Science

Science is a process of asking questions, learning, and understanding. Sometimes, scientists will make a discovery. The scientists find out later, through more research and experiments, that what they recently discovered may be a little bit different than what they originally found. This process is why thinking critically and asking questions about what you read and learn is important. You may be the one who comes up with a new way of thinking about something.

As you read this article, take a few moments to write down some questions you have about what you are learning. Use the space provided below or write your questions on a separate sheet of paper. At the end of the article, see if your questions were answered. If not, ask your teacher for more information or do a little extra research about what you want to know. Scientists engage in this process of reading, reflecting, forming questions, and researching continually. Now it is your turn.



Questions

Thinking About the Environment

Have you heard the word "nutrient?" What does the word nutrient make you think about? Nutrients are substances that nourish living organisms. Nutrients are essential for **sustaining** life and keeping people and the environment healthy. A lack of nutrients can lead to illness. What is one type of nutrient you need to stay healthy? In the natural environment, many different nutrients are needed to help keep the environment healthy. In this study, the scientist was particularly interested in nutrients found in the soil. Some common nutrients in the soil are nitrogen, phosphorus, calcium, and potassium. The main nutrient that the scientist learned about in this study was nitrogen.

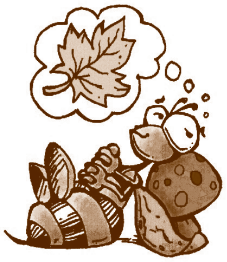


Figure 1. The nitrogen cycle explains the relationship of the element nitrogen to other elements, plants, animals, and bacteria.

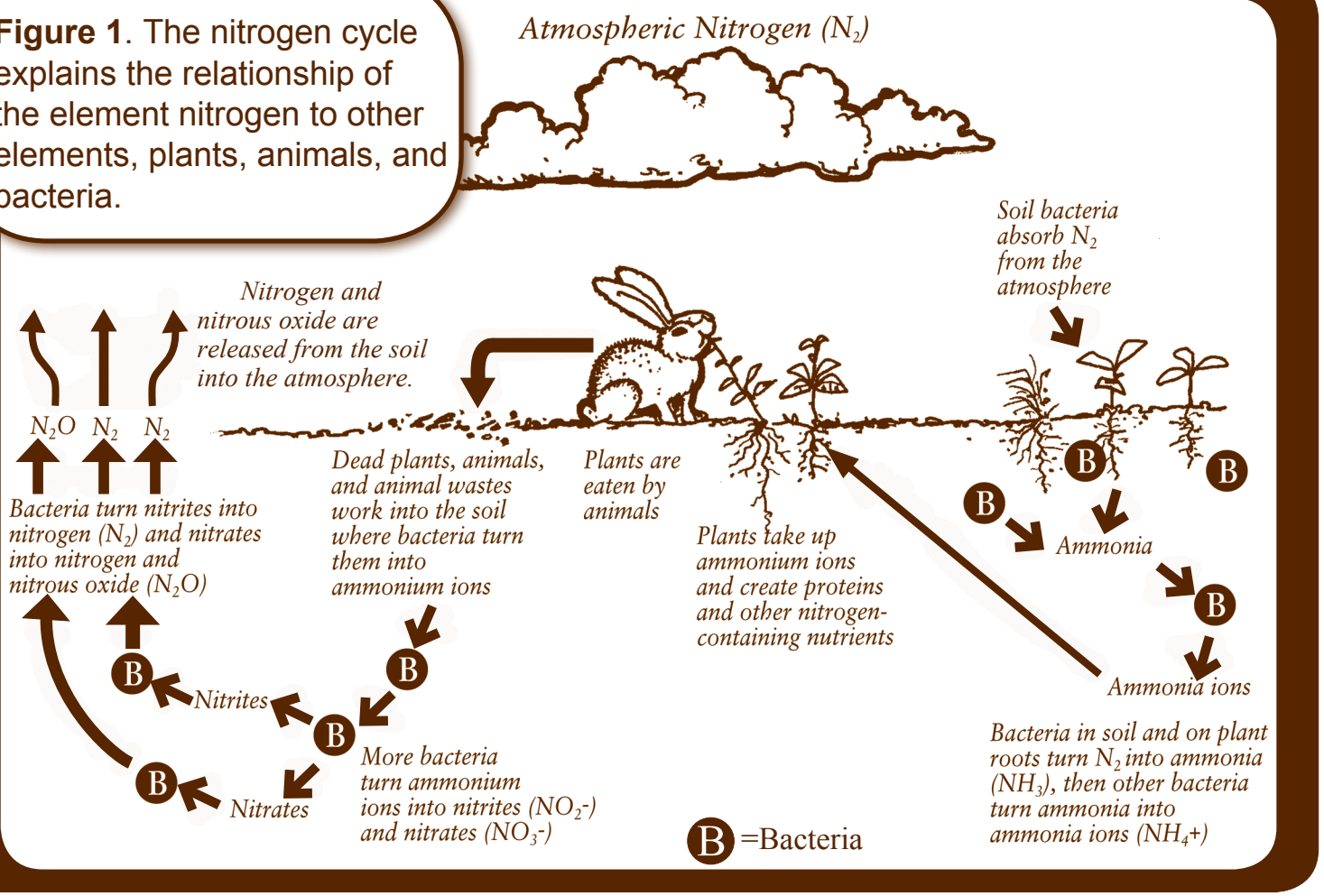


Illustration by Michelle Glenn.

Nitrogen in Our Environment

Did you know that nearly 80 percent of Earth's atmosphere is made up of nitrogen (N_2)? Nitrogen is found in many different forms all around us (figure 1). Plants and animals need nitrogen to grow and maintain their tissues. Even though 80 percent of Earth's atmosphere is made up of nitrogen, most of that nitrogen is in a gaseous form that plants and animals cannot use. The nitrogen needs to be changed into a more useable, solid form.

Certain types of plants and bacteria help change the nitrogen into a useable form. This process is called "nitrogen fixation." Plants that are not nitrogen fixers typically get their nitrogen from the soil. Other organisms have fixed the nitrogen these plants get from the soil. Humans need nitrogen, too. Humans get most of their nitrogen from food.

Another interesting fact about nitrogen is that it has two stable **isotopes,** ^{14}N and ^{15}N. Scientists can identify the different proportion of isotopes in living and once-living things. Identifying these different proportions helps scientists figure out the source and flow of nitrogen in a particular area. In this study, scientists wanted to know how much nitrogen in the soil was coming from salmon. Look at figure 1. How do you think salmon fit into the nitrogen cycle?

Introduction

Salmon-derived nutrients (SDN) come from lots of **spawning** salmon (figure 2). The nutrients are distributed through many different ways. Bears and other **piscivores** may carry the salmon to different locations. Additionally, SDN can be found during floods, through the breakdown of salmon **carcasses**, and in the urine and feces of piscivores (figures 3a and 3b). Scientists have found that these nutrients are helpful to water and land habitats that lack some of the nutrients.

The scientist in this study wanted to find out how the role of SDN may change in a certain type of landform. **Geomorphology** is the study of landforms and the processes that shape these landforms. In this study, the scientist wanted to examine the soil geomorphology of an area. Specifically, the scientist looked at how **alluvial soil** affected the role of SDN in the North Pacific coastal rainforests of southeast Alaska (figures 4 and 5).

Figure 2. Spawning salmon provide nutrients. Photo courtesy of U.S. Fish and Wildlife Service.

Figure 3a and 3b. A bear is a piscivore. Name one other piscivore.

Photos courtesy of Steve Hillebrand, U.S. Fish and Wildlife Service.

Figure 4. Alluvial soil forms from material that river water deposits onto floodplains.

Photo courtesy of Dr. David D'Amore.

Figure 5. Coastal temperate rainforests are cool and moist. The area studied by the scientist is a coastal temperate rainforest. Temperate rainforests lie between the tropical and polar regions of Earth.

Poster courtesy of Paul Kratter, http://www.paulkratter.com.

Reflection Section

In the form of a question, describe what the scientist wanted to learn.

Why are nutrients important?

Number Crunch

Earth's Climate Regions

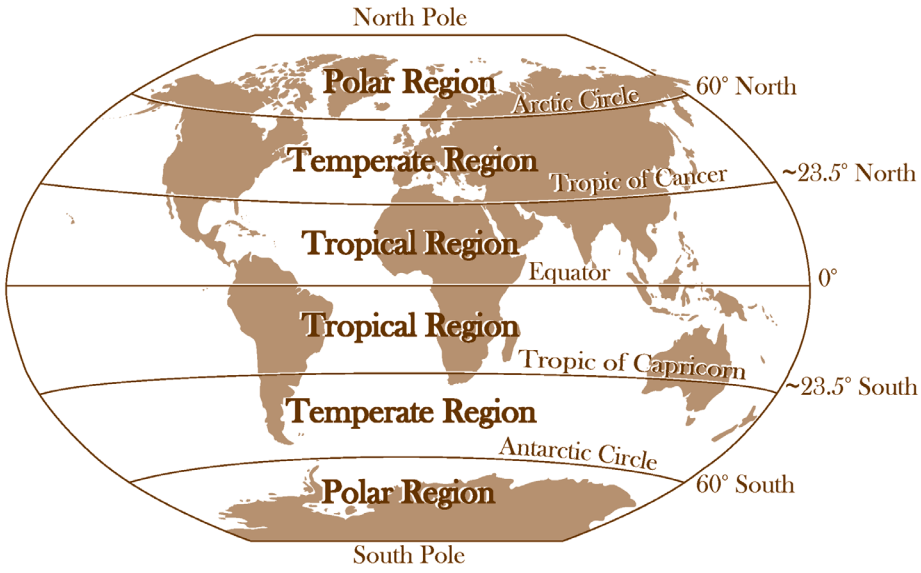


Illustration by Stephanie Pfeiffer.

What percentage of Earth is covered by the temperate region? Hint: Figure out how many degrees of latitude are in both temperate zones combined. Divide this amount by 180 degrees. You divide by 180 because the combined number of degrees latitude from the north pole to the south pole is 180. Degrees of latitude are imaginary lines around Earth used to identify the distance between the Equator and the poles.

Methods

The scientist chose seven **watersheds** on Prince of Wales Island. Prince of Wales Island is located in southeast Alaska and is a coastal temperate rainforest. Within these watersheds, the scientist chose eight study locations (figure 6). The scientist determined the locations by looking at the types of floodplain channels and alluvial soil maps. The study locations that the scientist sampled included two different soil series. The names of the soil series are Tonowek and Tuxekan (figure 7). A soil series is a way to classify individual soils that have similar characteristics.

To classify the soils found at each site, the scientist used shovel and **auger surveys** to identify the features of each soil (figures 8a, 8b, and 8c). The scientist took samples from the same place three times (figure 9). He then weighed and dried these samples. The scientist determined the amount of carbon and nitrogen in each sample by using a carbon and nitrogen analyzer (figure 10). The scientist also measured the amount of different nitrogen isotopes in different soils.

Reflection Section

As a class, look at a watershed map of your area. What watershed do you live in? Why do you think watersheds are important? (For more information on watersheds, check out these Web sites: http://cfpub.epa.gov/surf/locate/index.cfm and http://ga.water.usgs.gov/edu/watershed.html).

Why do you think the scientist took samples from the same area three times?

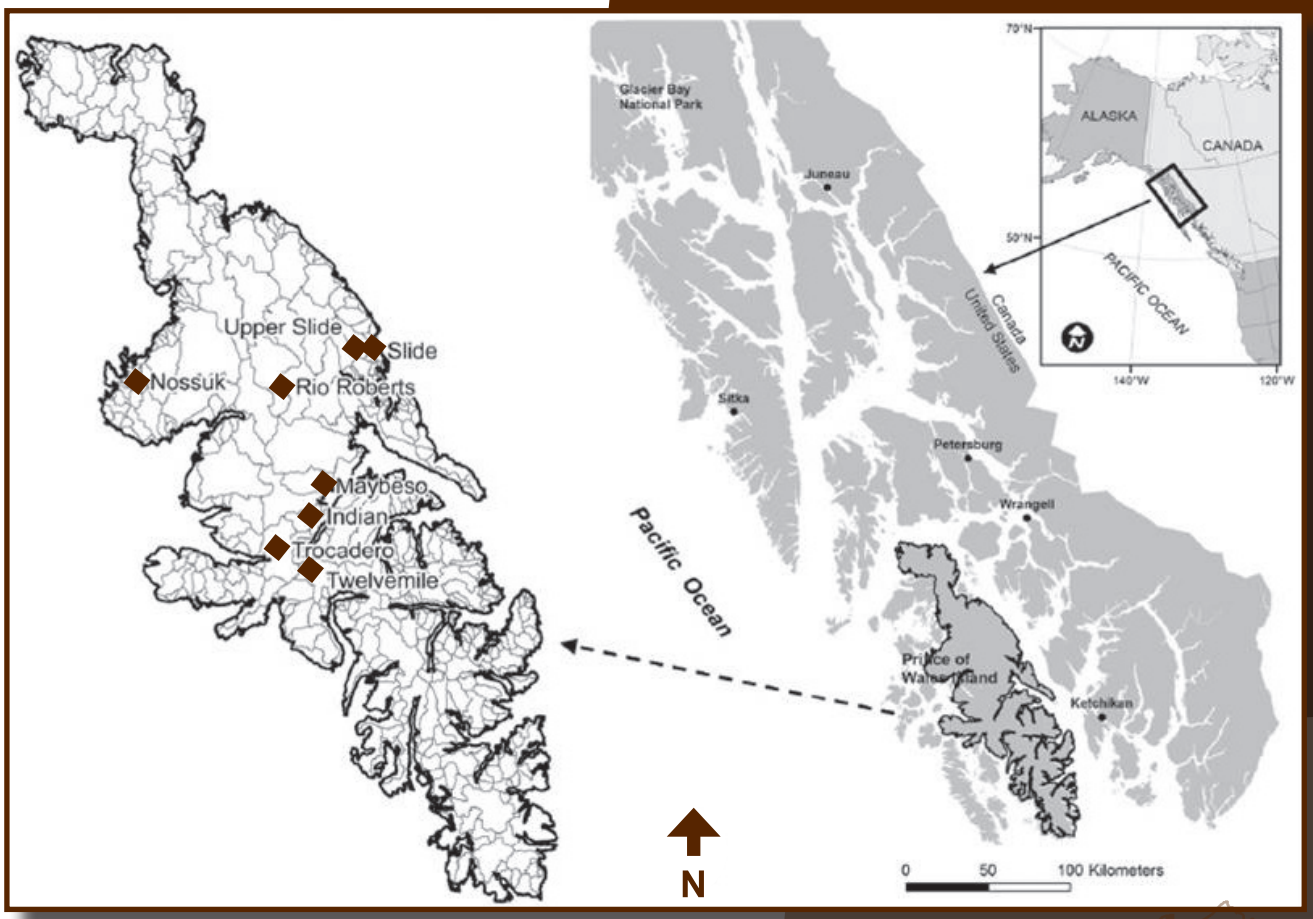


Figure 6. The study locations are labeled with names and designated by a diamond shape.

Figure 7.

Study Location	Soil Series Studied
12-mile	Tonowek and Tuxekan
Indian	Tonowek and Tuxekan
Maybeso	Tonowek and Tuxekan
Nossuk	Tonowek
Rio Roberts	Tonowek and Tuxekan
Slide	Tonowek
Trocadero	Tonowek
Upper Slide	Tonowek

Note: Where both Tonowek and Tuxekan are mentioned in the chart, it means that both soils were examined at the study location.

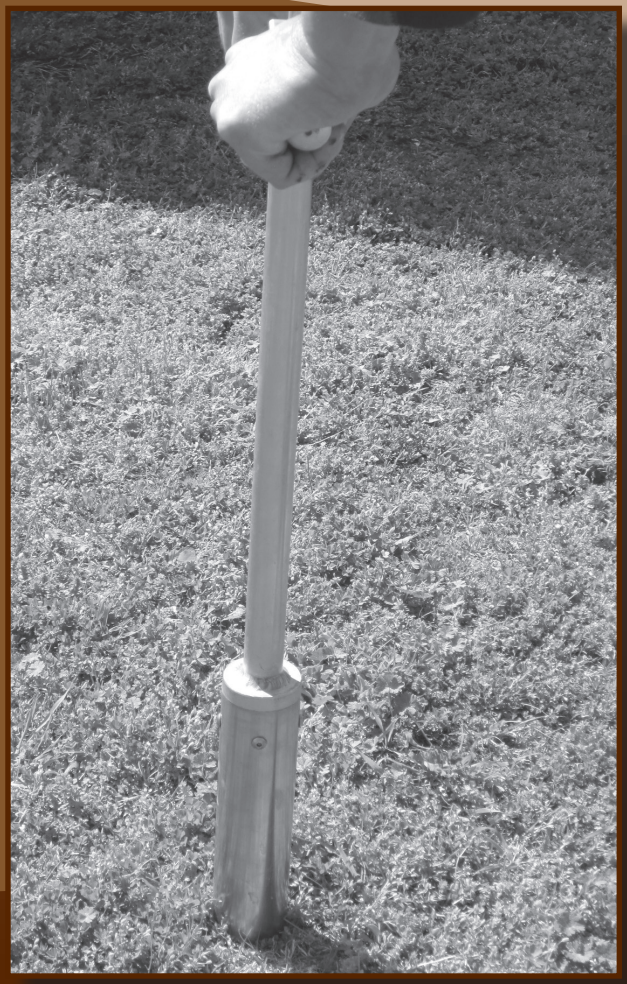
8a

Figure 8. An auger is commonly used to study soils because it enables scientists to take a deeper sample of the soil. Photos 8a and 8b are of a soil auger, also known as a bucket auger. Photo 8c shows a soil corer.

Photos courtesy of Jessica Nickelsen, with thanks to Dr. Mac Callaham, Forest Service.

8b

8c



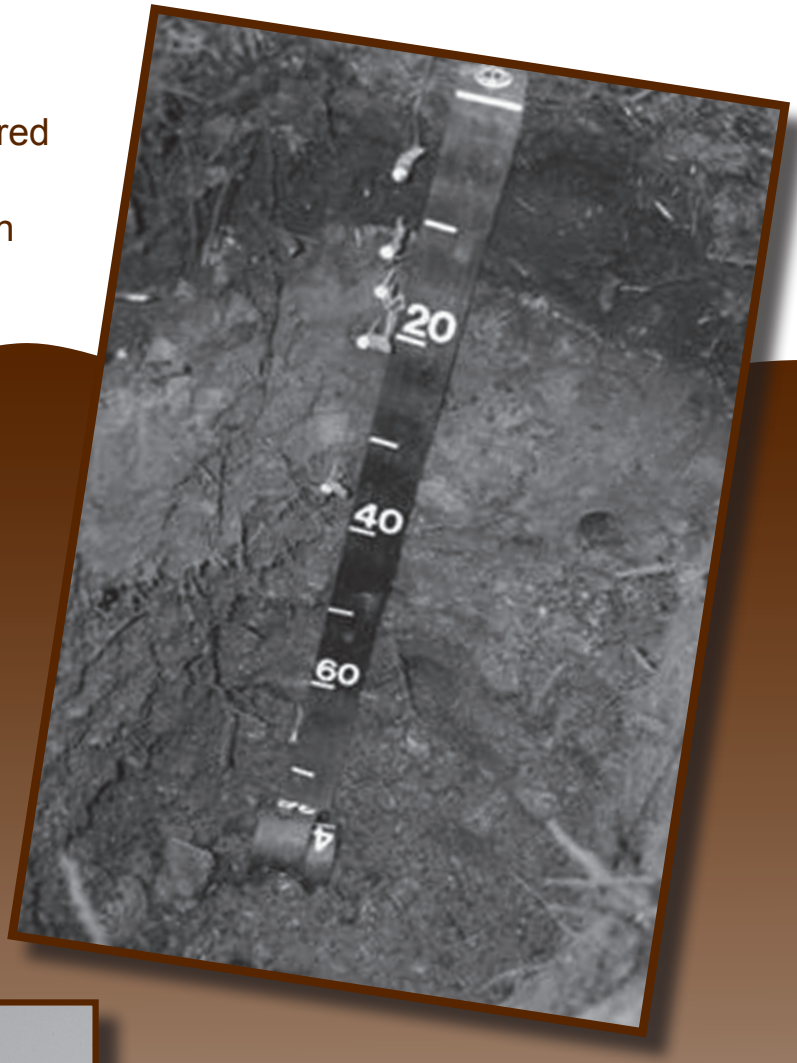


Figure 9. The scientist measured the depth of the soil using a flexible measuring tape at each location.

Photo courtesy of Dr. David D'Amore.

Figure 10. Carbon-nitrogen analyzers help scientists determine how much carbon and nitrogen are in a sample. The analyzer in this picture helps determine carbon, nitrogen, and hydrogen concentrations.

Courtesy of the University of Kentucky Center for Applied Energy Research (http://www.caer.uky.edu/).

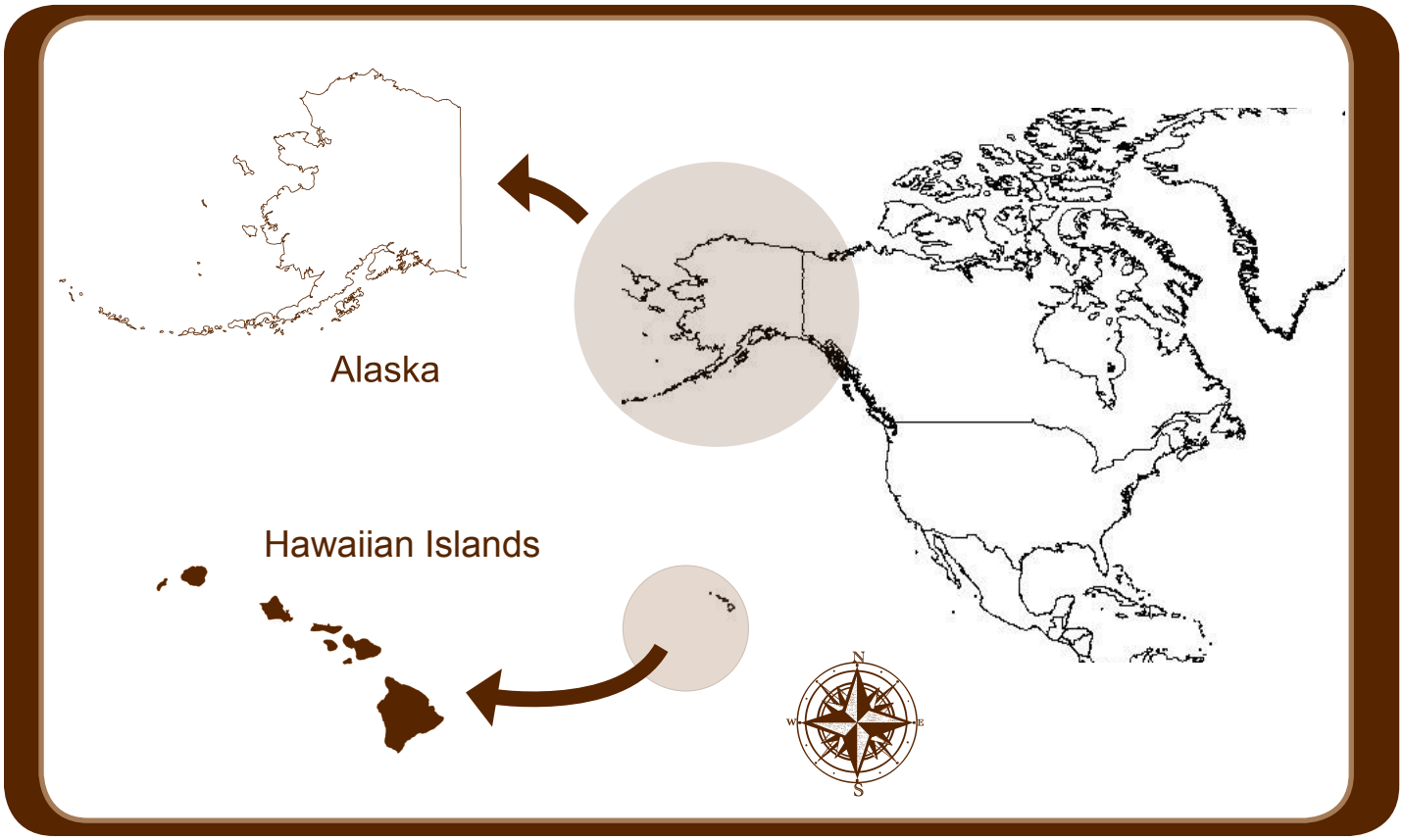
Does a Soil's Age Affect Its Nitrogen Content?

The Island of Hawai'i is the largest and the youngest of the Hawaiian Islands. Comprised of ash from four volcanoes, the soils on the Island of Hawai'i are relatively young when compared with **continental** soils. Hawai'i is about 400,000 years old. Scientists have found that soils on the Island of Hawai'i are low in nitrogen. These soils have had less time than continental soils to acquire nitrogen from plants and from the remains of dead plants and animals. (See figure 1 on page 9.)

The scientist in this study of southeastern Alaska was interested in the amount of nitrogen in the soil. Do you think the scientist would find more or less nitrogen in Alaskan soil than is present in soils on the Island of Hawai'i?

Because comparing the Alaskan soil to the Hawaiian soil was out of the scope of this scientist's study, we do not have an answer. Alaskan soils, however, are older than Hawaiian soils. So, logic would suggest that Alaskan soils are higher in nitrogen than soils on the Island of Hawai'i.

Pretend you are a scientist interested in this comparison. Write a research question that you might want to answer.



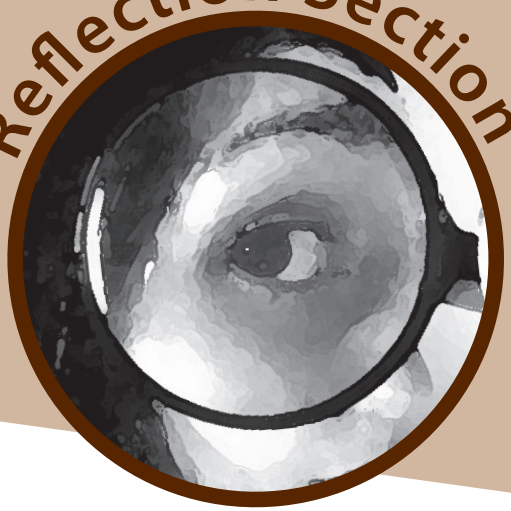
Findings

The scientist found the type of soil series can affect the amount of nutrients available. He found that carbon and nitrogen concentrations were higher in Tuxekan soils when compared with Tonowek soils. The scientist discovered that the Tonowek and Tuxekan soils are located very close to streams with a high degree of salmon spawning. The amount of nitrogen isotopes found in the two soil series varied depending on the depth of the soil sample taken.

In addition, the age of the soil affected the amount of nutrients present. The nutrient results were consistent with the ages of the soil. Tonowek soils are young and do not have a lot of **organic** material such as nitrogen. The Tuxekan soils are older and have more organic material from plants.

The amount of ^{15}N isotope in the Tonowek soils ranged from 1 to 4 parts per thousand, with a **mean** of 2.2 parts per thousand. Almost all of the Tuxekan soils had more than 4 parts per thousand of ^{15}N isotope, with a mean of 6.1 parts per thousand.

Reflection Section



Which soil had a higher concentration of nitrogen?

Why would you want to know the mean value of a range of numbers?

Discussion

The scientist found that different types of soils were related to the amount and form of nitrogen in the soil. This finding means that it is important for scientists to take into account the different soil types present when trying to estimate the effect of SDN. Now that the scientist knows it is important to include soil type in a study of SDN, he can create a better model to determine the importance of SDN in a particular area.

Reflection Section

If the scientist does not take into account the amount of nitrogen in the soil, what might happen to his estimate of how much nitrogen is available from SDN?

Imagine a forested area near your house or a forested area you have visited before. How do you think the nitrogen cycle applies to this area?

Glossary

alluvial soil (ə **lü** vē əl soi(ə)l): A fine-grained soil that tends to be fertile. It is typically deposited by water flowing over floodplains or in riverbeds.

auger survey (**o** gər **sər** vā): The examination or inspection of soil with a variety of tools made like a spiral or screw and used for boring holes or moving loose material.

carcass (**kär** kəs): The dead body of an animal or other once living thing.

continental (kän tə **nen** təl): Of, relating to, or characteristic of a continent.

geomorphology (**jē** ō mor **fä** lə jē): The study of landforms and the processes that shape these landforms.

isotope (**ī** sə tōp): Any of two or more species of atoms of a chemical element with the same atomic number and nearly identical chemical behavior but with differing atomic mass or mass number and different physical properties.

mean (mēn): The average in a set of numbers.

organic (or **ga** nik): Of, relating to, or derived from living organisms.

piscivore (**pī** sə vor): A fish-eating animal.

spawn (**spän**): To produce young especially in large numbers.

sustain (sə **stā**): Keeping up or prolonging life.

watershed (**wä** tər shed): A land area that delivers water and sediment to a major river via small streams.

Accented syllables are in **bold**. Marks are from http://merriam-webster.com.

Adapted from D'Amore, D. V., Bonzey, N.S., Berkowitz, J., Ruegg, Janine, and Bridgham, S. 2011. *Holocene soil-geomorphic surfaces influence the role of salmon-derived nutrients in coastal temperate rainforests of southeast Alaska.* Geomorphology 126: 377-386. http://www.treesearch.fs.fed.us/pubs/39654

The title "Food for the Soil" is derived from the saying, "Laughter is food for the soul." This saying means that laughter helps improve a person's mood and makes people feel better overall. To find out more about how laughter may improve health, check out http://www.umm.edu/news/releases/laughter2.htm.

If you are a Project Learning Tree-trained educator, you may use PLT Activity #70, Soil Stories, as an additional resource.

If you are a Project WILD-trained educator, you may use WILD Activity Eco-Enrichers as an additional resource.

FACTivity

Time Needed: One class period.

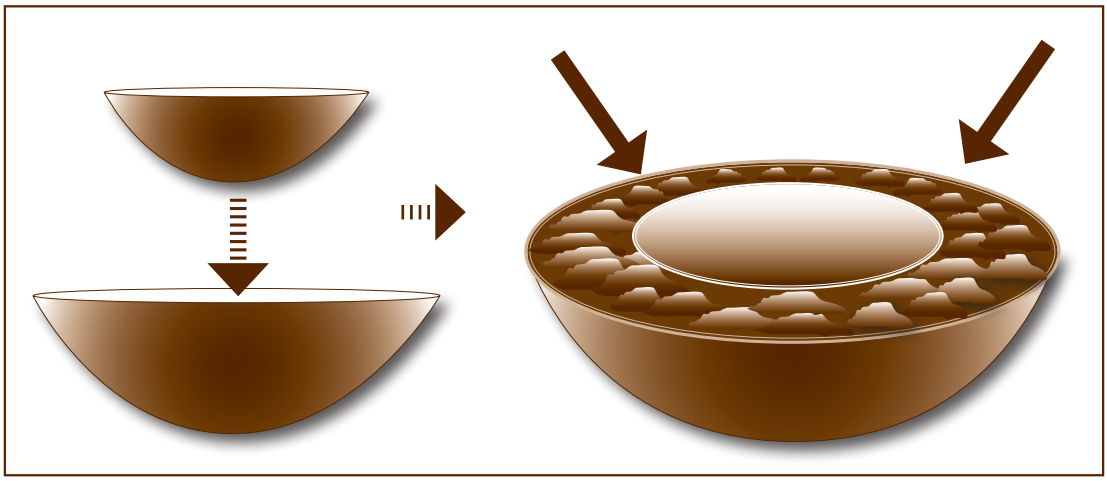
Materials Needed:

- Two bowls (a large one and a smaller one that fits inside the larger bowl) for each group of students.
- One package of Pepperidge Farm® Goldfish® crackers (six to seven fish for each group) or a similar type of cracker.
- One pitcher of water for each group.
- A large tray, towel, or newspaper to put under the bowls in case of spills.
- Water.
- Soil, sand, or some type of filling material that represents the banks of a river (enough for each group to use some).

In this FACTivity, you will create a model of what happens to things in a river when a flood occurs. Scientists often create models to help them understand better how something works. The method your class will use to figure out what happens to things in a river when a flood occurs is—

The teacher will divide the class into groups of three to four students. Each group will have two bowls (one large, one small), a pitcher of water, some Goldfish® crackers, and some supplies (soil, sand, or filling material) to create a riverbank. Note: For quicker cleanup, your teacher may provide some newspaper, a towel, or a tray on which to place the bowls.

A. Place the small bowl inside the large bowl. Then fill the large bowl with soil, sand, or whatever material you choose to represent a riverbank. (The larger bowl represents the banks that surround a river.) The large bowl should be filled up to the edge of the small bowl (see illustration).



B. Fill the small bowl with water. Fill it all the way to the top, then place your Goldfish® in the water. (The small bowl represents the river, and the Goldfish® represent salmon and other fish in the river.)

C. Refill your pitcher of water so that it is full. Quickly pour water from the pitcher into the small bowl. Observe what happens to the fish.

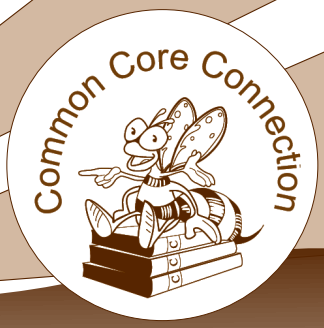
D. Discuss the following questions with your class in a class discussion or in small groups (as directed by your teacher):

1. Pouring the water into the small bowl from the pitcher represented what part of a flood?
2. What happened to the Goldfish® in the water?
3. What happened to the surrounding riverbank (the area in the larger bowl)?
4. Do you think this FACTivity is a good model for what happens during a flood? Why or why not?
5. What could you do to improve this model?
6. How does the activity you did relate to the article you just read?

Extension: With your small group, design your own model of flooding. The model should be a physical model, similar to the one created in the FACTivity. Then, create your model and test it.

Math Extension: Count how many fish came out of the "river" (small bowl) onto the "riverbank" (large bowl). Then, calculate the percentage. Compare the percentages across the classroom and repeat the experiment. Create bar charts to compare. Discuss the findings.

Common Core FACTivity



Common Core Standards Addressed:

- RI.7.1; RI.7.2; RI.7.8; RI.7.10
- W.7.1; W.7.2; W.7.4; W.7.5
- SL.7.1; SL.7.4
- L.7.1; L.7.2; L. 7.3; L.7.6
- RST.6-8.1; RST.6-8.2; RST.6-8.6; RST.6-8.7; RST.6-8.10
- WHST.6-8.1; WHST.6-8.2; WHST.6-8.4; WHST.6-8.5

Time Needed: One class period.

Materials:

- *Food for the Soil* article, one for each group of students (or one per student).
- Paper.
- Pencils.

In this FACTivity, you and your classmates will work together to analyze the research study and provide a brief presentation on your findings to your classmates.

The question you will answer is: What was the scientist's purpose in completing this research study, and how did he go about conducting the study? The following is the method your class will use to complete this FACTivity.

Read “Food for the Soil” aloud as a class. After the article has been read, you will divide into small groups of 4-5 students per group. In your groups, read the Reflection Section questions aloud to each other. One student can read all of the questions, or you may take turns reading the questions. Start with the Reflection questions in the Introduction and then continue until you have read all of the Reflection Section questions in the article. As you read the questions aloud with your group, take a few minutes to discuss the questions with your group members. Take notes of the discussion. You will use these notes later to write answers to each question. You may ask questions within your group to help understand the article and Reflection questions. Examples of some questions you may ask within your group are:

1. How do the pictures/illustrations provided help you understand the research?

2. What was the scientist’s main reason for conducting this research? How do you know?

3. Are there any vocabulary words used in the article that will help you answer the questions?

4. What questions do you have after reading this article and the Reflection Section questions? How might you go about finding answers to those questions?

After you have discussed the Reflection questions with your group, work together to write a single group, answer for each question. Taking turns with all of the other members of the group present your group’s answers to the class. You may make your presentations verbally or you may incorporate visual displays (for example, use a poster to demonstrate the research and research method used).

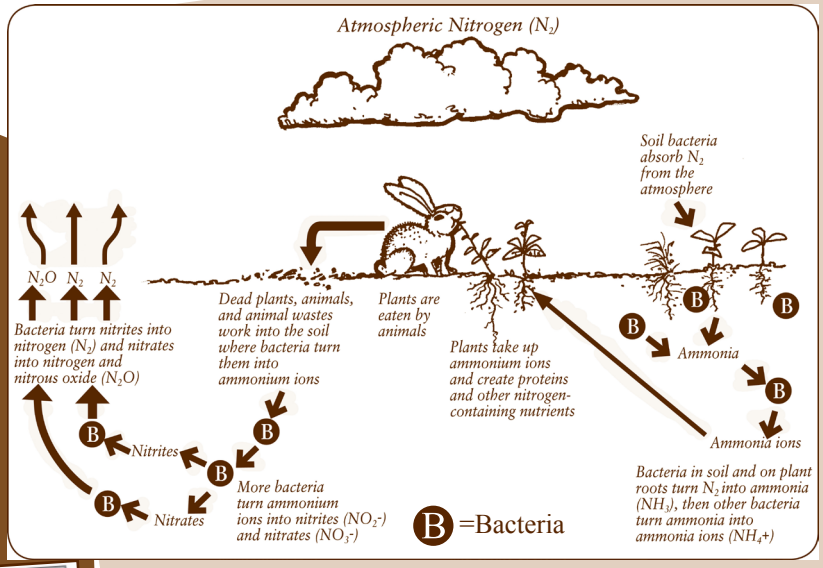
Extension:

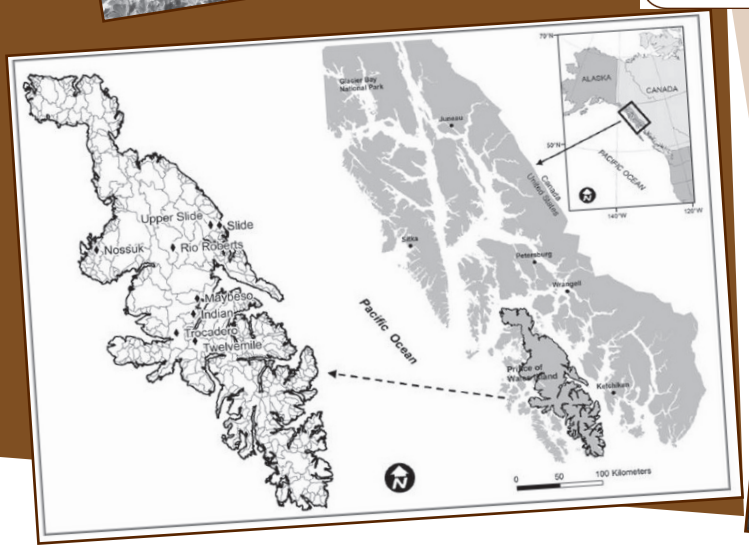
Type your group’s answers to the Reflection Section questions and submit them in an email to the *Natural Inquirer* team at jessica@naturalinquirer.org.

Common Core Connection

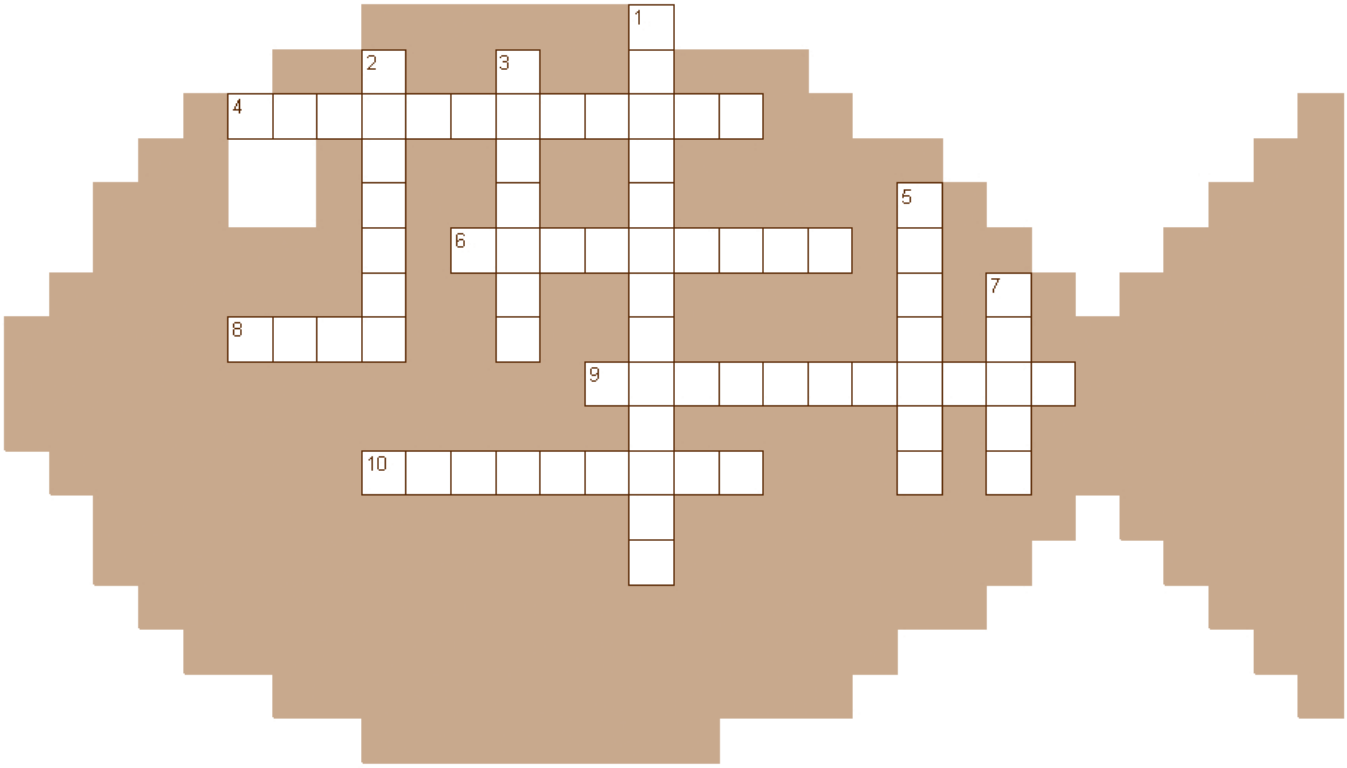
Food for the Soil
Photo Challenge

Use one or two sentences to explain what each of these illustrations is about. Try it without looking back at the article! You may do this activity as a class discussion or write your explanation on a piece of paper. Be sure to participate in a class discussion if you write your explanation.





Food for the Soil Crossword



Across	
4. A fine-grained soil that tends to be fertile.	9. Of, relating to, or characteristic of a continent.
6. A land area that delivers water and sediment to a major river via small streams.	10. A fish-eating animal.
8. The average in a set of numbers.	

Down	
1. The study of landforms and the processes that shape these landforms.	5. Of, relating to, or derived from living organisms.
2. Keeping up or prolonging life.	7. To produce young, especially in large numbers.
3. The dead body of an animal or other once living thing.	

Which National Science Education Standards Can Be Addressed Using This Monograph?

National Science Education Standard	Where and How the Standard is Addressed
Abilities Necessary To Do Scientific Inquiry	Introduction: Identifies the question scientists want to answer; Findings and Reflection Section questions: Thinking critically and logically to make relationships between evidence and explanations.
Understanding About Scientific Inquiry	Thinking About Science: Thinking critically about science and questioning; Methods and Findings: Scientific explanations emphasize evidence and logically consistent arguments.
Populations & Ecosystems	Introduction: Interaction of organisms, soil composition and nutrient deficiency.
Structure of Earth System	Introduction, Methods, Findings, and Discussion: Soil and composition of soils, how the decomposition of salmon influences the available nutrients in the soils.
Science & Technology in Society	Meet the Scientists: Science and technology have advanced through the contributions of many different people.
Understandings About Science & Technology	Methods: Using tools for analysis like the carbon-nitrogen analyzers.
Science as a Human Endeavor	Meet the Scientist: The human experience of science.
Nature of Science	Methods and Findings: Scientists formulate and test their explanations of nature using observation, experiments, and models.

Web Resources

EPA's Surf Your Watershed
http://cfpub.epa.gov/surf/locate/index.cfm

U.S. Geological Survey (USGS) Watershed Information Page
http://ga.water.usgs.gov/edu/watershed.html

USGS You Are What You Eat–Isotopes
http://wwwrcamnl.wr.usgs.gov/isoig/projects/fingernails/foodweb/isotopes.html

Gould League Interactive Food Webs
http://www.gould.edu.au/foodwebs/kids_web.htm

WINTER 2013 No. 2

Nature-Oriented Parenting®

A guide for caregivers to teach children about the natural world

A Companion to the *Natural Inquirer*

...Be natural

Go Play in the Dirt!

When I was a child, few outdoor activities helped shape my imagination like the simple act of playing in the dirt. Sounds strange, I know. Nevertheless, there was just something about digging, tunneling, and the joy that always came with looking at my dirty, black-stained hands and knowing what a great time I had. As I watch my 18-month-old daughter grabbing handfuls of dirt, leaves, and weeds when she's outside, I feel extremely proud. She doesn't feel the need to shy away from staining her clothes, hands, and knees. She takes each handful, inspects it closely for anything wiggling, and proceeds to dump it into either my lap or her lap. Then she smiles and the game repeats. We should all take note of the dirt on our hands and how it got there. Was it really so bad? Sure, it may stain your clothes once in a while, but it should be a reminder of the fun that we can have. After all, isn't that what a washing machine is for?

Adam DeWitte–Director of Education, CFAIA

The *Nature-Oriented Parenting* Newsletter is designed for cutting out of the journal and taking home to share with parents or other caregivers. Please encourage students to cut along the dotted line, then take the page home to share with family or caregivers.

Wildlife Spotlight: Red Wiggler Worm

Photo Credit: Holger Casselmann

If you've ever tilled your garden to prepare for the season's crop and marveled at the healthy color and rich texture of the soil, you have a worm to thank. Specifically, you should thank *Eisenia fetida*, or the red wiggler worm. These little composters are key ingredients in breaking down vegetation in your compost bin, aerating the soil to allow air and moisture to help, and turning that decomposing matter into rich, fertile soil. It is not known how or when the wigglers, originally from Europe, managed to make their way across the ocean to North America, but it is known that they now inhabit every continent on the planet except Antarctica. The worms are bought and sold all over the world for their unique skills in the art of vermicomposting, or using worm species to help break down plant and vegetable matter into fertile soil. Thanks to a microbe in the worm's digestive system, the soil they create is said to be "living" and can be thought of as an organic fertilizer. This organic worm is perfect for your garden and so much better than nonorganic fertilizers that can seep into waterways and harm aquatic wildlife. So take a bite of that tomato, pick a few zucchini, and enjoy a summer watermelon at your next picnic. Remember that the reason those crops are performing so well is right under your feet.

Adopt-a-Tree in Your Yard

Just like you, trees are interdependent. Trees depend on their environment for nourishment, shelter, growth, and reproduction. Trees provide a number of benefits to humans and other animals. People often discover they have a favorite tree. Trees, without question, are worthy of closer study. Begin with your child by adopting a tree in your yard or neighborhood. Use a journal or scrapbook to record your observations. You can—

1. Find out what kind of tree it is. Use the shape of the leaves and fruits to identify species.
2. Make a sketch of the tree. Draw the shape of its trunk, branches, and canopy (treetop).
3. Make a rubbing of the tree's bark by using a piece of white paper and the edge of a crayon.
4. Outline the leaf for your journal or attach a leaf to a page using glue.
5. In your journal, write down the names of any animals that you see around the tree. Are birds perched in the branches? Are spiders making webs on the tree? Are caterpillars feeding on the leaves? Is a pet using it for shade?
6. Take photographs of the tree during the different seasons. How is the tree changing?
7. In your journal, fill in the rest of this sentence: "One especially cool thing about my tree is…"
8. Record in your journal exactly when the leaves begin to fall, when new buds form, and when fruits begin to drop.
9. Record in your journal if there are any animals eating or using the fruits that the tree produces? If so, what animals?

Family Outdoor Activity: Plant a seed!

As you study the trees in your yard or in the forest, take note of any acorns or nuts around the area. If they're whole and haven't been bitten into by wildlife, you may just have a new tree to plant. What's the best (and cheapest) method?

Here are some pointers:

1. Make sure the seed has been shelled. Remove acorn caps and any hull.
2. Find a medium-sized paper or Styrofoam™ cup and punch a hole in the bottom for drainage.
3. Fill the cup with potting soil or dirt from outside that is dark brown or black in color. This color soil is usually the most fertile and would be the closest to a nut's natural habitat.
4. Place the nut in the soil about ¼ in (0.635 cm) from the top, or just deep enough for the soil to cover it up. The idea is to make sure the taproot has plenty of room to grow below while also allowing the first shoot to punch through the shell and above the soil on top.
5. Place the seed in a bright location, preferably one that gets a few hours of direct sunlight each day.
6. Water every few days, or enough to soak the cup through. Allow the soil to dry before rewatering to make sure it doesn't produce mold.
7. The first shoot should make an appearance after a week or two, at which point, move the seedling to an area that gets up to 5 or 6 hours of sunshine each day.
8. When the seedling has reached a height of about 6 or 7 in (15.24 or 17.78 cm), it will be ready to plant in the yard. Give it plenty of room and watch it grow.

"He that plants a tree loves others besides himself…"

— Thomas Fuller, 1732

Cradle of Forestry In America Interpretive Association
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http://www.naturalinquirer.org
http://www.scienceinvestigator.org

What Is the Forest Service?

The Forest Service is part of the U.S. Department of Agriculture (USDA). It is made up of thousands of people who care for the Nation's forest land. The Forest Service manages 155 national forests and nearly 20 national grasslands, including large areas of trees, streams, and grasslands. National forests are similar in some ways to national parks. Both are public lands, meaning that they are owned by the public and managed for the public's use and benefit. Both national forests and national parks provide clean water, homes for animals that live in the wild, and places for people to do fun things in the outdoors. National forests also provide resources for people to use, such as trees for lumber, minerals, and plants for medicines. Some people in the Forest Service are scientists whose work is presented in the *Natural Inquirer*. Forest Service scientists work to solve problems and provide new information about natural resources so that we can make sure our natural environment is healthy, now and into the future.

Learn more about the Forest Service by visiting http://www.fs.fed.us

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What Is the Cradle of Forestry in America Interpretive Association?

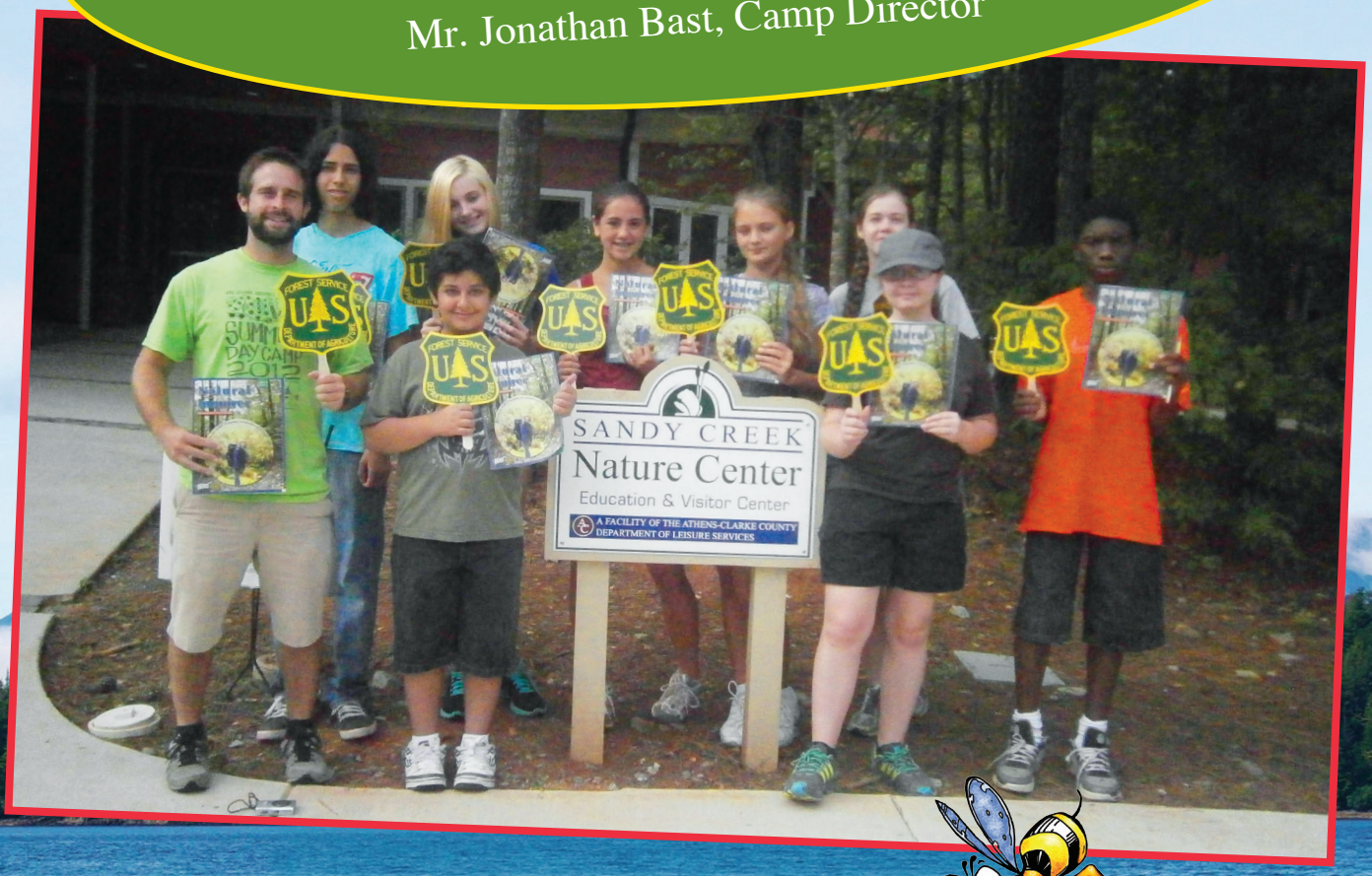
The Cradle of Forestry in America Interpretive Association (CFAIA) is a 501(c)3 nonprofit organization based in Brevard, NC. The CFAIA strives to help people better understand ecology through recreation and education opportunities. Its projects include—

- Campground and recreation area management.
- Educational programs and services, including the *Natural Inquirer, Investi-gator*, and *Nature-Oriented Parenting*.
- Sales of forest-related gifts and educational materials.
- Workshops, newsletters, and publications.
- Partnership with the Forest Service to provide programming at the Cradle of Forestry Historic Site.

Learn more about the CFAIA by visiting http://www.cfaia.org

Student Editorial Review Board

Sandy Creek Nature Center Teen Day Camp,
Athens-Clarke County, Georgia,
Mr. Jonathan Bast, Camp Director



Web Resources:

Natural Inquirer
http://www.naturalinquirer.org

Investi-gator
http://www.scienceinvestigator.org

Forest Service Conservation Education
http://www.fs.usda.gov/conservationeducation

Cradle of Forestry in America Interpretive Association
http://www.cfaia.org

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