



## Welcome to Ag@School!

Class sets of this magazine, aimed primarily at 4th grade level, are **FREE** to subscribing Washington teachers. This is the last of three issues for 2011-2012. **Your subscription for next year will NOT be automatically renewed.** Please visit our website [www.waic.net](http://www.waic.net) to complete a survey and re-subscribe or unsubscribe. Thank you in advance for your feedback. The first issue next year should arrive at schools the end of September.

Produced by Washington Ag in the Classroom, Ag@School is designed to help teachers meet student educational goals as well as develop agricultural literacy. The teacher guide connects information to specific GLEs and EALR's that will help your students meet state requirements.

This issue is designed to help students understand:

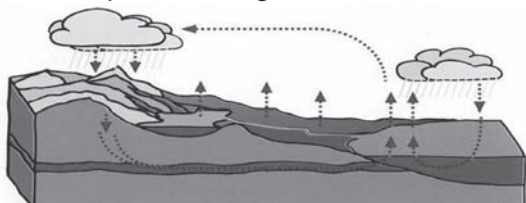
- The dependence of all living things on soil
- The use of the scientific method
- The soil is teeming with organisms (many microscopic) that are the decomposers in the food chain
- The water cycle
- Choosing highly colored fruits and vegetables provides excellent nutrition
- Every day is Earth Day for agriculture.

Reproducible activities in the teacher guide expand on concepts covered in the magazine. Included in the guide are vocabulary words, connections to state guidelines, answers to questions in the magazine, and post tests.

### Vocabulary Words

Each issue introduces several words or word combinations that may be unfamiliar to students. These will appear in bold type the first time they are used.

Words in this issue include: variable, hypothesis, erosion, topsoil, weathering, precipitation, percolation, evaporation, transpiration, condensation, food chain, food web, producers, consumers, decomposers, nematode, protozoa, arthropod, root vegetable and colostrum.



### Ag@School funding

Many businesses, organizations, public agencies and individuals contribute money and time to provide this magazine for you at no cost. They are listed on Page 6 along with a suggested activity for research and writing letters of thanks. We suggest using the activity as a small group project both for internet research practice and, of course, letter writing experience.

### GLE & EALR Connections

#### Science:

- 4-5 INQ A-B-C-D-F-G page 2
- 4-5 APPH page 8
- 4-5 PS2 A-C page 7
- 4-5 ES2B C-D-E-F page 2, 3
- 4-5 LS1E page 6
- 4-5 LS2A A-B-C pages 1, 4-5, TG page 2

#### Math:

- 4.5.F page 7
- 4.1.E TG page 3

#### Health & Fitness

- 1.5.1 page 7-8 TG page 3

#### Social Studies:

- 2.2.1 pages 1, 7, 8

#### Reading:

The articles and activities throughout the magazine link to most reading standards. They can be used to build skills in outlining, vocabulary, comprehending important ideas, reading factual material, or reading to learn new information.

#### Writing:

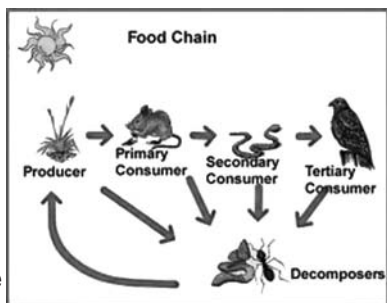
The post test is designed to help prepare students to write. The prompts include the four modes of writing: expository, narrative, descriptive and persuasive.

### Cover - Food Chain Basics

April 22 is Earth Day—a day intended to inspire awareness and appreciation for the earth's natural environment. Identifying food chains and food webs (a collection of food chains within an ecosystem) is basic to understanding the intricacies of the world around us. Farmers understand that the bounty of crops they are able to produce is dependent upon the sun's energy, adequate water, and a healthy soil ecosystem.

## Food Chain

A food chain shows only a portion of the food web involving a simple series of species (e.g., plant, herbivore, predator) connected by feeding links. A food web aims to depict a more complete picture of the feeding relationships, and can be considered a bundle of many interconnected food chains occurring within the community. Food webs can be very complicated as seen even in the basic information about the soil food web presented on pages 4 and 5 of Ag@ School.



Body size tends to increase as one moves up the food chain. Because individuals of small-bodied species require less energy and food than individuals of larger-bodied species, the same amount of energy can support a greater number of the smaller-bodied species. Therefore, species at lower levels in the food web tend to be more numerous than those at higher levels.

Some energy is lost at each transfer between consumer and prey. A general rule of thumb is that only about 10% of the energy harvested by plants is consumed and converted into herbivore biomass, only 10% of that makes it into biomass of primary carnivores, and so on.

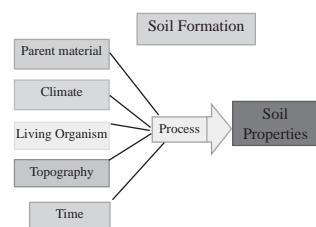
Decomposers are a critical component of the food web because they recycle nutrients that otherwise would be tied up in accumulating detritus

## Page 2 - The Scientific Method

Discuss with students why each step of the scientific method is important. Ideally you have scales to weigh the candy before, during, and at the conclusion of the experiment. At least provide a means to visually assess the size. The control jar is the one that is not agitated. The variable in the experiment is the amount of agitation used in each jar. You could also use small clods of dirt, although those samples should contain sufficient clay so they won't fall apart immediately in the water.

Check out the websites for more fun activities with soil: [www.soils.org/digdeeper](http://www.soils.org/digdeeper) and [www.wtamu.edu/~crobinson/DrDirt.htm](http://www.wtamu.edu/~crobinson/DrDirt.htm)

### How Is Soil Made: 5 soil forming factors



**Parent Material:** Chemical and physical weathering break down rocks over time. The parent material dictates what texture the soil has, whether it is sand, silt, or clay (or a combination). Texture affects the soil's ability to store water and nutrients, and therefore affects plant growth.

2. **Climate:** The higher the precipitation and temperature, the greater the weathering.

3. **Living organisms:** the number of organisms in the soil depends upon the climate. Soils in warmer, moister climates have more microbes. The organisms break down the humus in the soil and turn it into usable nutrients for more plant production. More plant production adds more humus. This increases the soil's nutrient content and water holding capacity.

4. **Topography:** Soil formation on steep slopes will not be as great because the water will run off and not percolate through the soils and may also cause loss of soil through erosion.

5. **Time:** the more time that passes, the more intense the soil forming processes are, which usually means the soil is deeper.

## Page 4-5 - The Soil is Alive

If microscopes are available for your use, it is well worth the effort to examine soil samples under magnification. Observing this fascinating world may be just the impetus students need to encourage further scientific investigation. There are also short You-tube videos of soil microbes and pond water organisms.

### Size Comparison

Students may have difficulty imagining how small microbes can be. For comparison's sake visit: <http://www.cellsalive.com/howbig.htm>

## Food Beneath Our Feet

Other root vegetables include radishes, beets, sugar beets, turnips, potatoes, yams, horseradish, jicama, parsnips, and rutabagas.

The edible part of a carrot is actually a taproot. The foliage above ground is fine and lacy. In fact, the wild carrot is actually a familiar wildflower known as "Queen Anne's lace".

### Grow a carrot top:

- Select fresh, large-sized carrots (not baby-carrots, not carrots with tops on, not peeled carrots)
- Remove the top two inches and set aside; you can eat the rest
- Put a 1" layer of pea gravel in a deep saucer. Place the carrots on top of the gravel, cut-side down, and add more pebbles to hold them in place, leaving about an inch of carrot exposed above the gravel.
- Space carrots about 2" apart in saucer
- Add water to the top of the pebbles and maintain that water level at all times. Place in light on windowsill.

The carrots will develop feathery green leaves that grow out of the tops.

If you purchase carrots with the green leaves attached, the tops should be cut off before storing in the refrigerator. Otherwise, they will cause the carrots to wilt as they pull moisture out of the root.

Carrots are biennial, meaning it takes two years to complete their lifecycle and produce seeds. Unpicked carrots will send up a tall stem in the second year of life, which produces flowers and eventually seeds.

## Vitamin A

Although vitamin A is a fat-soluble vitamin found only in foods of animal origin, some fruits and vegetables contain plant pigments, called carotenoids, which can be converted into vitamin A by your body. Beta carotene was first identified in carrots (giving them their orange color) thus the name was derived from the word carrot.

Vitamin A plays an important role in vision, bone growth, reproduction, cell division, and cell differentiation. Vitamin A helps regulate the immune system, which helps prevent or fight off infections by making white blood cells that destroy harmful bacteria and viruses. Vitamin A promotes healthy surface linings of the eyes and the respiratory, urinary, and intestinal tracts.

## Page 7 - Water Cycle

Review the physical states of solid, liquid, and gas in the water cycle. A good mental hook for remembering the water cycle is to put it to music:

### Water Cycle Song

(to the tune of "She'll be Coming 'Round the Mountain")

Water travels in a cycle yes it does,  
 Water travels in a cycle yes it does,  
 It goes up as **evaporation**  
 Forms clouds as **condensation**  
 And comes down as **precipitation**  
 Yes it does!

### Discussion starters:

- How is water cleaned through the water cycle (evaporation---also large particle contaminants like silt are trapped in percolation process)
- What impurities might be left behind when water evaporates?
- What can people do to prevent impurities from getting into the water in the first place?

Reinforce that salt water cannot be used for drinking water or to water plants and animals. The amount of water in the world is constant although it changes location and physical form.

### Total Water on Earth - Check the Math

Explain to students that the chart on page 7 is a combination of a pie chart and a bar graph. The bar graph is expanding the very thin slices of the pie chart that represent groundwater and surface water. (In fact, for visual reasons, the surface water portion of the graph is out of scale so that it can even be seen). Students should be impressed by how much of the water is contained in the oceans, and how little of the total is surface water (lakes, rivers, and the atmosphere).

The surface water category representing 0.001% of the total water breaks down to:

Lakes	0.017%
Soil	0.005%
Atmosphere	0.0001%
Rivers	0.00001%

Have students count the zeros; notice that there is 10 times more water in the atmosphere as in rivers (.0001 vs. .00001).

## Page 8 - Dairy Cows

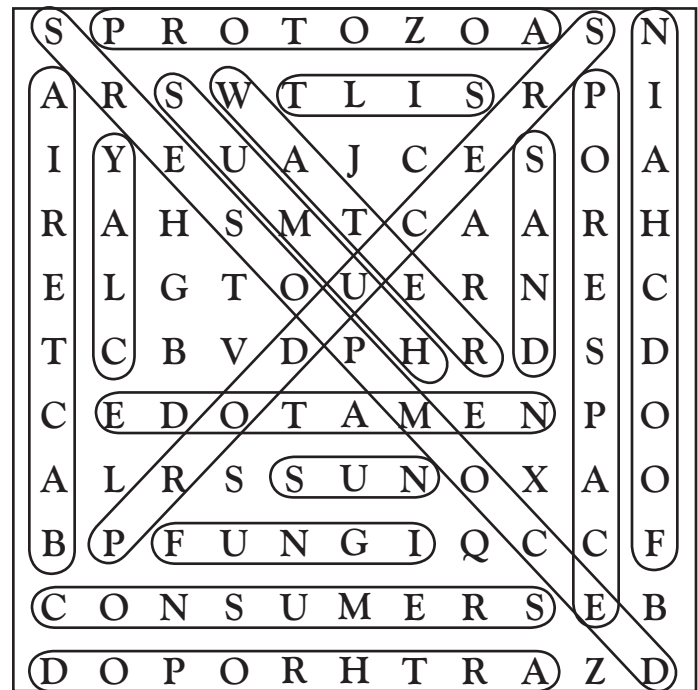
The goal is to have a cow calve once a year. Their gestation is about nine months. Cows are bred back at three months after calving and they are milked for ten months after calving. The two month "dry" period puts extra energy into the last two months of the calf's development rather than milk production.

The dairy cow licks the calf dry after birth which stimulates its circulation. The calf usually stands within a short time and will sometimes then suckle. But the calf gets its own mother's milk and is hand-fed the first 2 quarts of colostrum

within hours of birth. The milk collected from the cow for the first 2-4 milkings after a calf is born will be kept separate from milk collected from the rest of the herd. This keeps colostrum milk out of the general collection.

The colostrum that is collected is more than the calf can drink so that extra colostrum is poured into special buckets provided by LaBelle and placed in a LaBelle owned freezer. LaBelle collects buckets of frozen colostrum by truck to process at their facility in Bellingham. They basically remove all the water from the colostrum and end up with a milk powder.

## Soil Food Chain Basics - Answers



## Soil Truth - Answer

We need soil

Visit [www.waic.net](http://www.waic.net)

FOR LINKS TO:

- Lessons
- Activities
- Information
- Student Websites
- and more!

**Washington Ag in the Classroom**  
 is your launch pad for information and activities about all fields of agriculture!

## Publication and Credits

Ag@School is a publication of Washington Agriculture in the Classroom, a non-profit entity created in 1981 to encourage and help teachers increase agricultural literacy in their students. Both public and private groups including the WA Dept. of Agriculture, WSU, commodity commissions, farm organizations, agribusinesses and individuals, support the mission. Teachers may reproduce any pages for use.

Graphic design by Mike Hendricks, Hendricks Design.  
 Edited by Robyn Meenach.

# It's the Soil Truth!

Consider what you have learned about soils. Read each of the following statements and color in the circle next to each statement that is true. The colored letters will spell the Soil Truth!

- (W)..... A handful of soil contains thousands of nematodes.
- (H)..... Soil contains minerals, but no nutrients.
- (E)..... Medicines are made from some soil bacteria.
- (N)..... It takes a long time to break down rocks and minerals into soil.
- (D)..... Humus blocks soil pores.
- (E)..... Decomposers in the food chain return nutrients to the soil..
- (F)..... Climate does not affect soil formation.
- (E)..... Soil has parents (parent material).
- (R)..... There is no air in soil.
- (D)..... Bricks are made from clay found in soils.
- (S)..... Most of our food is grown in or raised on soils.
- (P)..... Silt is the largest soil particle.
- (L)..... Topography is the study of microbes living in the soil.
- (O)..... Many Washington soils contain volcanic ash.
- (F)..... Ecosystems do not depend on soils
- (I)..... Carrots like sandy, well-drained soil.
- (L)..... Earthworms improve the ability of soil to hold water.
- (B)..... Rain and wind do not cause erosion.
- (S)..... Decreasing the amount of organic matter improves soils.

What is the Soil Truth? \_\_\_\_\_



## Don't Miss This!

Visit:

[www.myamericanfarm.org](http://www.myamericanfarm.org)

to play on-line games and explore fun family activities.

**It's all about agriculture!**

# Tell What You Learned

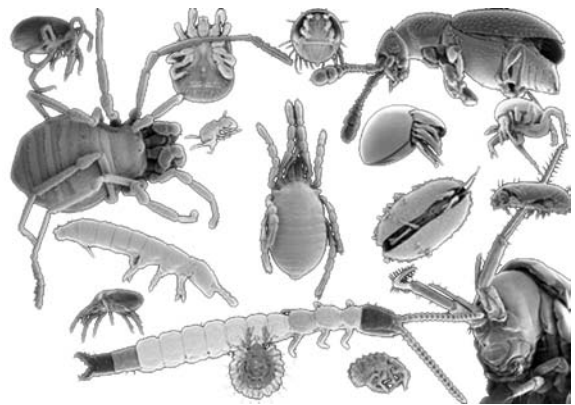
1. Explain how soil is formed.
2. Describe the difference between a true baby carrot and a manufactured baby carrot.
3. Persuade the reader of the importance of decomposers in the food chain. Tell what jobs they do.
4. Write a narrative tracing a drop of water through the water cycle, beginning when the drop fell from the leaf of a plant. Include details such as where it landed, where it traveled, and the different forms it became as it passed through the cycle.



## SOIL FOOD CHAIN BASICS

S	P	P	O	T	O	Z	O	A	S	N
A	R	S	W	T	L	I	S	R	P	I
I	Y	E	U	A	J	C	E	S	O	A
R	A	H	S	M	T	C	A	A	R	H
E	L	G	T	O	U	E	R	N	E	C
T	C	B	V	D	P	H	R	D	S	D
C	E	D	O	T	A	M	E	N	P	O
A	L	R	S	S	U	N	O	X	A	O
B	P	F	U	N	G	I	Q	C	C	F
C	O	N	S	U	M	E	R	S	E	B
D	O	P	O	R	H	T	R	A	Z	D

ARTHROPOD	BACTERIA
CLAY	CONSUMERS
DECOMPOSERS	FOODCHAIN
FUNGI	HUMUS
NEMATODE	PORESPACE
PRODUCERS	PROTOZOA
SAND	SILT
SUN	WATER



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