Ag@School TEACHER GUIDE
Volume 14, Issue 3 2014/2015

Welcome to Ag@School!

Class sets of this magazine, aimed primarily at the 4th grade level, are **FREE** to subscribing Washington teachers. This is the last of three issues for 2014-2015. **Your subscription for next year will NOT be automatically renewed.** Please visit our website www.waic.net (choose publications tab) 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 standards that will help your students meet state requirements.

This issue is designed to help students understand:

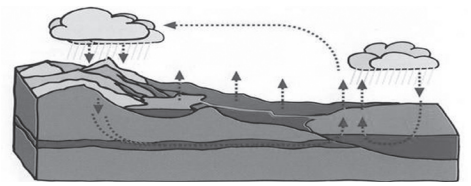
- The dependence of all living things on soil
- Sustainable agriculture uses technology to use resources today without depleting them for tomorrow
- Pollination occurs when pollen is transferred from an anther to the stigma in flowering plants
- The water cycle
- One third of our food is dependent upon pollinators like honey bees.
- 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: topsoil, humus, erosion, pollination, stamen, pollen, pistil, stigma, perennial, biennial, precipitation, percolation, evaporation, transpiration, condensation, drupes, high-yield, self-pollination, and cross-pollination



Grant Opportunity

The Washington Ag in the Classroom organization is pleased to offer a grant (up to $500) to groups or individuals sponsoring programs or projects that promote agricultural literacy. The proposed project must be targeted to young people from 5-18 years of age and should enhance student knowledge of a contribution made by agriculture. The funds will be available to any school-aged students, teachers, and others in the community who are involved with agriculture. Applications are due September 1st.

Visit our website,
http://www.agclassroom.org/wa
for more information and to apply.

Washington Standards

Science:

EALR 3 – APPG, APPH
EALR 4 – PS2A-C
ES2B-C-D-E-F
LS1B, LS2B

Math:

4.1.E, 4.1.F, 4.2.B

Social Studies:

2.2.1

Integrated Environmental & Sustainability:

Std. 1

Reading:

CCSS RI 4.4 and RI 4.7

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 – Every Day is Earth Day

April 22 is Earth Day—a day intended to inspire awareness and appreciation for the earth's natural environment. 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. Sustainable agriculture must be environmentally friendly by taking care of the soil and using water efficiently, but it must also be profitable enough to keep farmers in business, and able to improve the quality of life for the farmer, farm workers, and all of society.

Cover – answers: 1. solar energy 2. soil 3. water 4. air

Life on Earth

Remind students that our very existence depends on plants that turn the energy from the sun into food energy. Refer to Ag@School, Volume 9, Issue 1, page 7 for a short review of how plants use chlorophyll and water in a process called photosynthesis to make food energy. (Past copies available at www.waic.net)

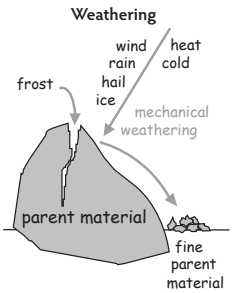
- Our food comes from plants, or from animals that eat plants
- Plants produce oxygen that we need to breathe in
- Plants use carbon dioxide that we breathe out
- Plants cool the atmosphere, catch and hold water, keep the soil from blowing away, and provide homes for many living things

Page 2 "Fruitful State" answers

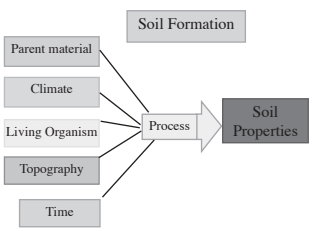
1. Apple Capital of the World
2. Eastern WA has less precipitation (and irrigation is controlled water application)
3. 9800 X 7400 = 69,560,000# or 34,780 tons
4. Whole grapes have more fiber than juice; both juice and whole grapes are much superior nutritionally than sugar-packed jelly

Page 3 How Soil is Made

The world has thousands of different soils (70,000 just in the US). Parent rock (like lava, limestone, granite) is broken apart into finer particles by a process called weathering. Temperature and water are critical in this process. Water dissolves minerals and is important in chemical reactions. Freezing and thawing also break down rocks. Plant roots can enter cracks in the rocks and break them apart. Roots can form acids that help break down particles. When plants and animals die, they add organic matter to the weathered parent material. Bacteria, fungi, and worms enrich the soil by breaking down organic matter to form topsoil. Soil formation is very slow, taking thousands or even millions of years.



How Is Soil Made: 5 soil forming factors



1. ***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 breaks 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.

The Soil is Alive

The soil is home to an incredible number of organisms, most of them so tiny we cannot see them without a microscope. They decompose organic matter, take nitrogen from the air and make it available to plants, improve soil structure, and control crop pests. There are all manner of creepy-crawlies---algae, bacteria, rotifers, fungi, protozoa, nematodes, arthropods, earthworms---all part of the soil food web. The human food system would collapse without the complicated food web that exists in the soil. We are totally dependent upon the soil web to provide and maintain the growing environment for larger plants that feed us and the animals we use for food. Farmers understand this delicate balance. They know if they treat the soil well, it will be able to keep giving back…not just for us today, but for future generations too.

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

Page 5 – Pollination Crossword

Across: 3- nectar 5 – pollination 7 - pollen 8 – bees 9 – ovule

Down: 1 – seed 2 – stamen 4 – stigma 6 – anther 7 – pistil

Page 6 – Water Cycle

Discussion starters:

- How is water cleaned through the water cycle (evaporation---also large particle contaminants like silt are trapped in the 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.

Page 7 answer

.90 X .90 = .81 or 81% of the US supply of frozen red raspberries are produced in Whatcom County

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).

Water in the atmosphere is mostly in the form of water vapor. If it all fell as precipitation at once, the Earth would be covered with only about 1 inch of water. Students should recognize that each zero to the right of a decimal point is also a factor of 10. For instance, if told that all plants and animals contain 0.0001% of the total water, they should reason that the atmosphere contains 10 times as much (0.001%). They should also be able to recognize that 0.001% is the same as 1/1000 of 1%.

Answers to TG page 4

New Words: 13, 6, 5, 9, 2, 3, 14, 4, 11, 1, 7, 8, 10, 12

Jumble:

clue words: pollen, bush, cry, most

answer: honey comb

Two items that are only food: honey and milk

Answers to TG page 5

1. Evaporation 2. Condensation 3. Precipitation

Tip for Teachers!!

Subscribe to Dr. Watts, Science for Kids, Agricultural Research Service

Visit www.ars.usda.gov/is/kids. Especially check out the Teacher's Desk tab to find Ag-Tivities, Crosswords & More, Whiz Kids, and a really excellent page called Hot Links for Teachers—Cool Sites for Kids. You will find a wealth of information and fun activities.

Don't Miss This!

Visit: www.myamericanfarm.org

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

It's all about agriculture!

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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 this mission. Teachers may reproduce any pages for use.

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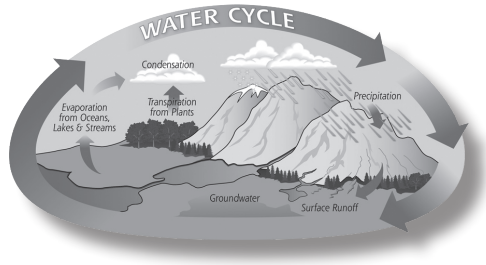
WHAT NEW WORDS DID YOU LEARN?

These words were used in this issue of Ag@School.
Can you match the words to the definition?

1. Precipitation
2. Erosion
3. Evaporation
4. Sustainable agriculture
5. Sand
6. Condensation
7. Pollinators
8. Biennial
9. Percolation
10. IQF
11. Transpiration
12. Ground water
13. Humus
14. Drupes

_____decayed organic matter in the soil
_____process of water vapor turning into liquid
_____largest of the three soil particles
_____movement of water into soil through cracks, holes and pores
_____movement of soil by wind or water
_____changing from a liquid or solid state to a gas or vapor
_____a fruit containing a single seed or pit
_____using technology and resources to keep farms profitable, improve human lives, yet respect the environment
_____evaporation of water from plant surfaces
_____rain, snow, hail, sleet, dew and frost
_____creatures that transfer pollen from one plant to another
_____plants with a two year life cycle
_____flash freezing to preserve quality of food
_____wells and aquifers tap this important resource



Jumble

Unscramble each of the clue words.

PENOLL
HSBU
CYR
MOTS

How did the bee groom his hair?

He used a _____ _____

Take the letters that appear in ◯ boxes and unscramble them for the answer as suggested by the cartoon.

There are two items that humans eat that are only food (they are not a plant or animal part or a fruit or seed) Their only purpose is to be food.
Can you name them? _____ _____

Tell What You Learned

1. Explain what a farmer might do to prevent soil erosion.
2. Describe how pollination occurs.
3. Considering the importance of the fruit industry in Washington, persuade the reader to support more research about honey bee health.
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.

Pollination Song

To the tune of: "This Land Is Your Land"

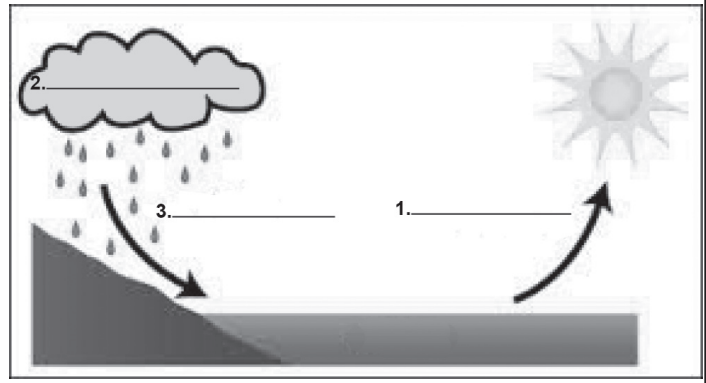
What does a plant need
To make a new seed?
Three things give flowers
Reproductive powers—
the sticky pollen,
the slender stamen,
and pistils make the flower whole.
What gets the pollen going
To keep new plants growing?
Different kinds of birds do,
Or the wind that's blowing.
Butterflies and bees,
Carry pollen they need
That's what makes pollination work.

If a flower's not scented,
Or brightly colored,
And the flowers are smaller
In clusters tighter
With stamens longer
the signs are stronger
This plant spreads pollen on the wind.
When bright colored flowers
Have a sweet perfume
And a sugary nectar
Then chances are good
That birds and insects active
Find the plants attractive
And they'll spread the pollen as they go.

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!



Fill in the blanks from the Water Cycle song

Ag@School Funding

Many businesses, organizations, and public agencies contribute money and time to provide this magazine to you at no cost. They are listed on Page 6 of the Teacher Guide. You can practice using the internet to learn about these organizations and businesses. Please choose one or two names, research the addresses on the internet, and write a letter of thanks to the sponsors.

Visit
www.waic.net
FOR LINKS TO:

- Lessons
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- Student Websites
- and more!

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

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