Ag@School

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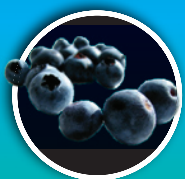
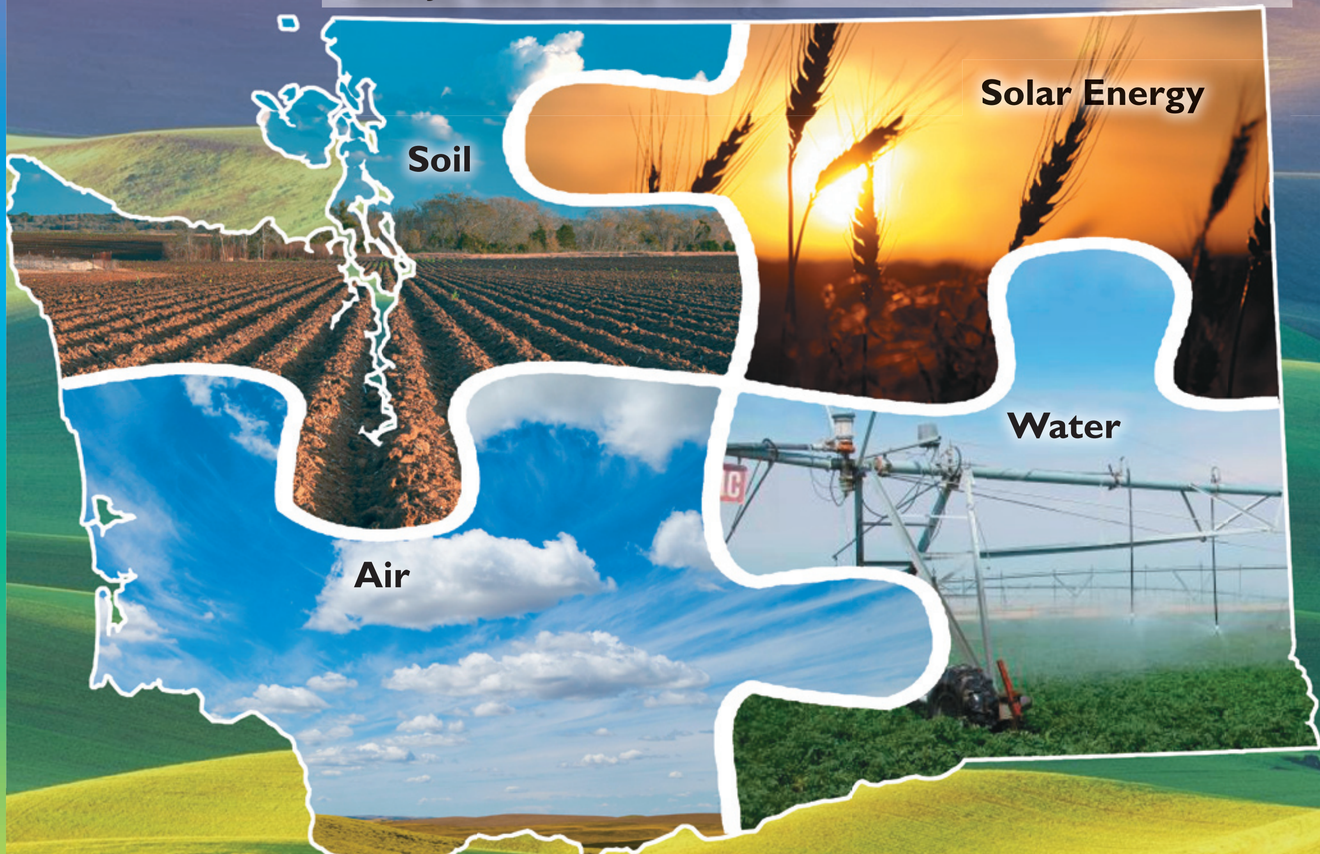




Earth Day is Every Day for Farmers!

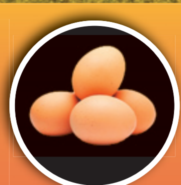
Renewable natural resources fit together like puzzle pieces to sustain life on earth. Caring for soil and water resources allows farmers to produce food today, and in the future.



Fill in the blanks with the correct resource:

1. The sun provides ____________________ which plants need to grow.
2. Healthy ________________ provides nutrients and minerals that are taken up by plant roots.
3. People, crops, animals, industry, aquatic life, and recreation all must share the _______________ supply.
4. Trees and crops use carbon dioxide and produce oxygen, making the ________________ healthier for people.



Today's Children... Tomorrow's Leaders

Natural resources can be grouped into two groups: renewable and non-renewable. **Renewable** resources will naturally replenish themselves over time, like wind, solar, plants, trees, etc. **Non-renewable** will be gone forever once used, like coal, fuel, etc.


Farmers are Environmentalists

Farmers were environmentalists long before it became popular to be one. Farmers care about **natural resources** because their business depends on them. They work at keeping water and soil clean and healthy because they will eventually pass the farm on to their children.

Good **conservation** practices are part of a sustainable agricultural system. Sustainable agriculture is growing food, fiber and forestry products that are:

1) Environmentally friendly now and in the future:
2) Profitable enough to keep farmers in business:
3) Acceptable to society.

Farmers and ranchers provide habitat for 75% of our nation's wildlife. Trees on farms and ranches provide shelter for birds and many animals . Fish and waterfowl live in the freshwater streams that run through farmland. Many animals survive winter by eating crop residue left in the fields after harvest.

Think and Discuss:

Why is conservation important to a farmer?

Why must farmers make a profit?

SUSTAINABLE AGRICULTURE ...

American agriculture is the most earth-friendly in the world. Our farmers know they need to be friends of the land, soil and water. Why? If they treat the earth well, it will be able to keep giving back… and not just for us today, but for future generations too.

Sustainable agriculture meets the needs of today but does not use up resources for the future . It must be:

- Environmentally friendly; taking care of the soil so it will remain productive now and in the future
- Profitable enough to keep farmers in business
- Able to improve the quality of life for farmers and all of society

Both conventional agriculture and organic agriculture can be sustainable.

Organic food is produced <u>without using</u> fertilizers made with synthetic ingredients, genetically engineered seeds, or synthetic pesticides (but natural pesticides and mineral salts can be used).

Organic food accounts for just over 6% of total sales in Washington. Organic production certainly meets the first condition of sustainability being environmentally friendly. Organic food is usually more expensive than conventionally produced food. It needs to be, because it is often more expensive to produce organic crops because there is more labor involved. The majority of organic foods are higher cost fruits and vegetables. It is easier to farm organically on smaller farms, or with established fruit trees or vines that do not require annual planting.

Sustainability <u>does not mean</u> raising crops without the benefit of commercial fertilizers, pesticides or biotechnology.

Large-field crops like grains are less likely to change to organic because there is not enough profit to pay for the extra labor, while growing fewer bushels, and losing a year of production when producing green manure.

Remember to be sustainable, farmers have to make enough money to stay in business.

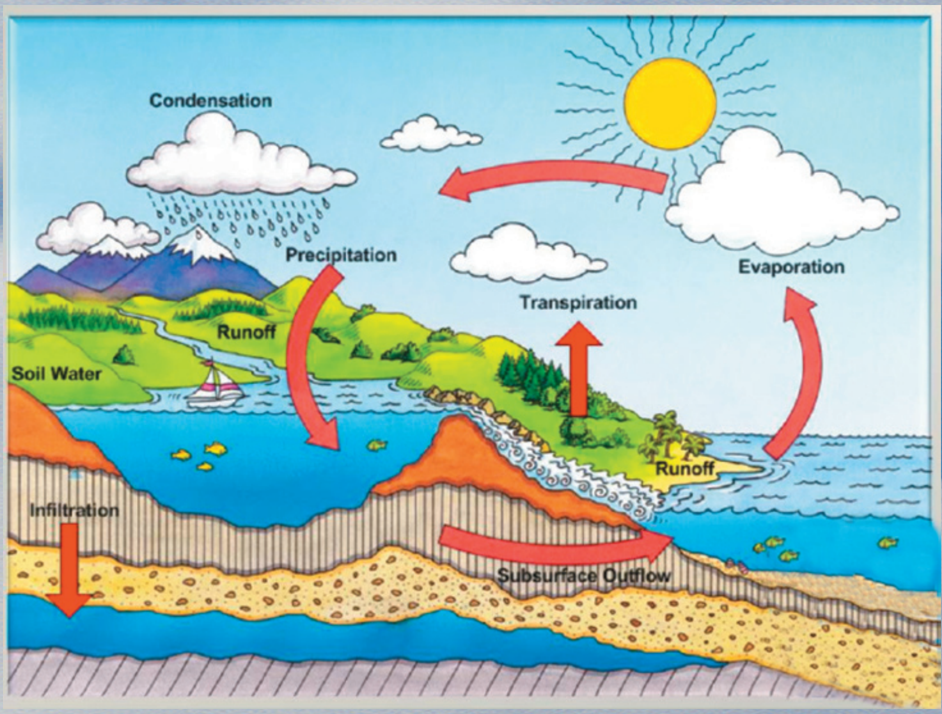
It is true that organic production does not use synthetic (man-made) fertilizers. If we went to only organic production, we would have to produce the necessary nitrogen (the main plant nutrient) by either:

- Converting 1/3 of all crop land into green manure production (where crops are plowed down into the soil). This is a great method for improving the soil and adding nitrogen, but it takes that land out of production for that growing season (and perhaps for a second year in dryland Eastern Washington in order to build up enough soil moisture for a grain crop).
- Or increasing the number of cattle to produce the manure necessary to replace synthetic fertilizer. The US currently has 97 million head of cattle; we would need to add another billion head. Can some of them stay in your backyard?

Isn't organic food better?

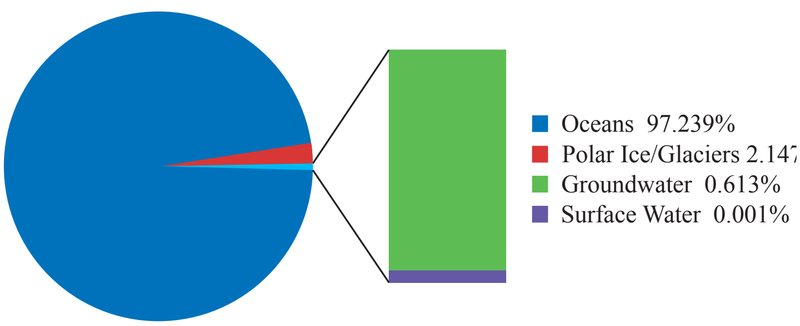
The answer is more about varieties and handling than production systems. Locally grown food (whether organic or conventional) may indeed taste better. Characteristics that make fruits and vegetables ship well, process easily, or extend the shelf-life may come at the expense of flavor and texture. Buying from local growers gives you the chance to try varieties of red, juicy strawberries, flavorful tomatoes, and carrots with more vitamin A.

Water–The Most Common Material on Earth



Total Water on Earth

Remember that about 70% of the earth is covered by oceans and those oceans hold more than 97% of all the water. Just over 2% of the water is frozen in glaciers. That means that less than 1% of the earth's water is available for drinking, and most of that is groundwater. The very thin purple line at the bottom of the bar to the right of the pie chart represents all the combined water in lakes (0.017%), the atmosphere (0.001%) and rivers (0.00001%)



How Much Water is Enough? There's An 'App' for That!

Farmers can use their smart phones or computers to operate center pivot irrigation systems. They can also use an irrigation scheduling program that will calculate how much water to use based on soil types, weather (rain, wind, heat), crop being grown, how much water has already been applied, etc. The goal is to keep crops growing at an optimum without wasting water. WSU researchers at Prosser developed the program.

The water cycle is the circulation of the earth's water in a never-ending process. The heat from the sun causes (1) water from the ocean, streams, lakes, and even plants to evaporate. As the water vapor rises, it is cooled by the upper air. Cold air cannot hold as much water vapor as warm air so (2) water vapor condenses into water droplets and creates clouds. The wind carries clouds over the land and (3) water falls back to earth as precipitation.

Water is Life!

All living things (plants, animals, humans) must have water to survive. **The amount of water on earth stays the same. It is never 'used up', but continues to move through the water cycle**. However, the water in a specific location can change in amount or form, sometimes we have a drought and sometimes we have extra snow or rain. A growing human population puts pressure on available water.

Condensation: The process of water vapor in the air turning into liquid. As water vapor rises it cools and becomes liquid again. These droplets form around dust particles in the air and become clouds.

Evaporation: Changing from a liquid or solid state to a vapor or gas. Only pure water evaporates. Substances like salt and minerals are left behind when water evaporates.

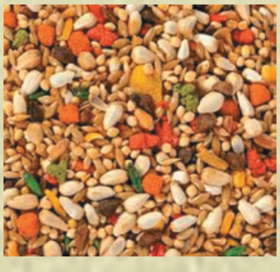
Groundwater: Water which has seeped below the earth's surface and is held there in the underlying sand and gravel. Water bearing layers are called **aquifers**. In Washington, 2/3 of the people get their drinking water from aquifers.

Percolation: The movement of water into soil through pores, holes and cracks.

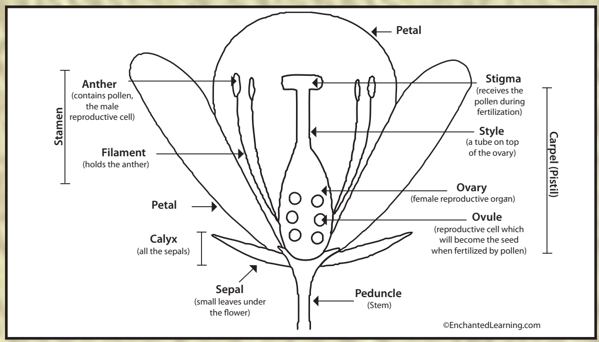
Precipitation: Rain, snow, hail, sleet, dew, and frost.

Transpiration: Water that is absorbed by plants, usually through the roots, is evaporated into the atmosphere from the plant surface through leaf pores.

Pollination is the transfer of pollen from an anther to the stigma in flowering plants and it starts the production of seeds, or fruits that contain seeds.



How does pollination work? It all begins in the flower. Flowering plants have several different parts that are important in pollination. Flowers have male parts called **stamen** that produce a sticky powder called **pollen**. Flowers also have a female part called the **pistil**. The top of the pistil is called the **stigma**, and is often sticky. Seeds are made at the base of the pistil, in the **ovule**.



For pollination to occur, pollen must be moved from an anther to the stigma. When pollen from a plant's stamen is transferred to that same plant's stigma, it is called **self-pollination**. Self-pollination means that an individual flower on a plant stem can pollinate itself, or other flowers on the same individual plant stem. Wheat, other grains, and most grasses are self-pollinators.

When pollen from a plant's stamen is transferred to a different plant's stigma, it is called **cross-pollination**. The plants must be of the same species. For example, only pollen from a daisy can pollinate another daisy. Pollen from a rose or an apple tree would not work.

How does pollen from one plant get moved to another?

About 80% of plant pollination requires the help of other living, moving creatures such as insects, birds, or bats, to transfer pollen from one plant to another.

When animals such as bees, butterflies, moths, flies, and hummingbirds pollinate plants, it's accidental. They are not trying to pollinate the plant. Usually they are looking for food, either the sticky pollen or a sweet **nectar** made at the base of the petals. When feeding, the animals accidentally rub against the stamens and get pollen stuck all over themselves. When they move to another flower to feed, some of the pollen can rub off onto this new plant's stigma.

What about the other 20% of plants, how are they pollinated?

Some plants, especially grasses, most conifers, and some deciduous trees, are pollinated by wind. Plants that are not self-pollinators, but need to be pollinated by wind often have long stamens and pistils to enable pollen grains to be blown from one plant

onto another. Since they do not need to attract animal pollinators, they can be dully colored, unscented, and have small or no petals since no insect needs to land on them. There are also a small number of water plants that rely on water movement for pollination. Videos about pollination can be seen at:

http://www.neok12.com/Pollination.htm

Achoo!

Why does pollen trigger allergies?

Examining the weird, spiky shapes of pollen gives us a clue about why it sticks to insects as they transport it between flowers. For the same reason, pollen tends to stick in our noses when we breathe it in. The protein in pollen can cause allergic reactions in some people (sneezing, coughing, and watery eyes).

Electron microscope images of pollen

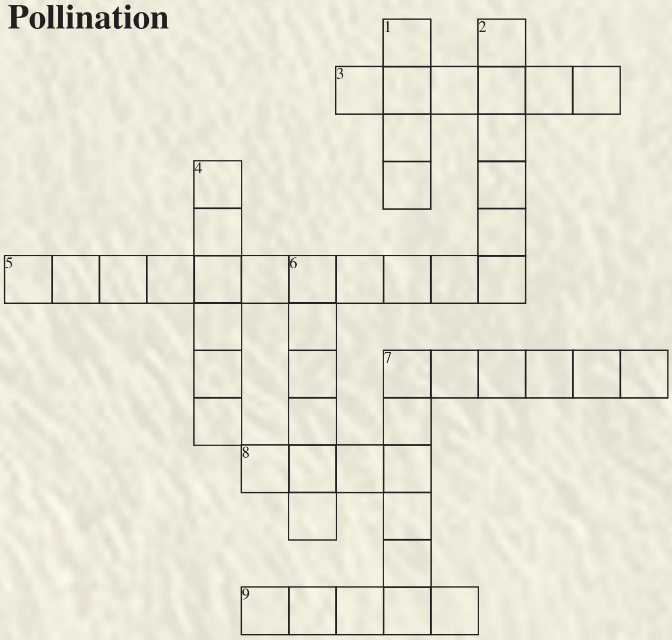
Why we should care about pollinators?

1. One out of every 3 bites of food we eat is courtesy of a pollinator.
2. Birds and other animals are even more dependent upon fruits and seeds than we are.

To learn more about different pollinators; insects, bats, birds.

Check out---http://www.buzzaboutbees.net/

Pollination

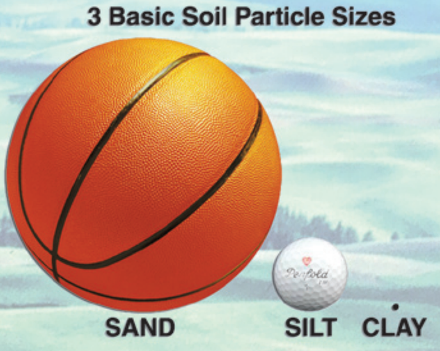


Across

3. Sweet fluid in flowers
5. Pollen reaching the stigma
7. Male reproductive cells in plant
8. Important pollinators; produce honey
9. Female reproductive cells in plant

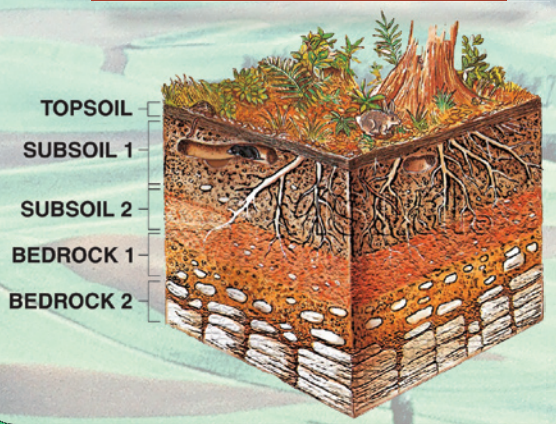
Down

1. Created when pollen fertilizes ovule
2. Male plant parts
4. Top of pistil
6. Part of stamen producing pollen
7. Female plant parts



CAN YOU DIG IT?

Soils are made of three basic particles called sand, silt, and clay. The difference in size between the three would be like comparing a basketball (sand), a golf ball (silt), and the tip of a ballpoint pen (clay). Soils from different locations vary in their amounts of each of the three particles. The amount of each type of particle is important because that determines the capacity of the soil to hold water and air. In the Columbia Basin, soil can be very sandy. Whereas near Mica, WA the soil is nearly all clay. In fact, there is a business in Mica that uses the soil to make bricks.



Ideally soil is:

45% particles (sand, silt, and clay)
5% organic matter (dead plants and animals)
50% empty space (pores) half filled with air, and half filled with water

Without decayed organic matter, **humus**, the soil loses its capacity to retain the water and air that soil organisms need.

Grazing Benefits Animals and Soil Alike

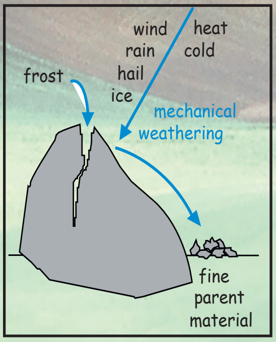
Beef is one commodity that is produced in all 39 of the counties in Washington State. Cattle and other **ruminants** (animals with a four-compartment stomach) such as sheep and goats are able to utilize land that is not useful for growing crops. This land may be too steep, too rocky, or even too wet to grow other crops. Grazers and browsers convert solar energy (in the form of grass and other plants) into nutritious high-protein foods for the human diet.

Some of the many environmental benefits of well-managed grazing land are: plant growth is promoted, soil erosion is reduced, brush is controlled, and at the same time the ground is fertilized with manure. Grazers can clear excess vegetation from forest undergrowth which reduces the fuel load for wildfires.

Grazing along streams removes excess plant matter that would otherwise decompose into the water (think about how water in a vase of flowers looks and smells after a few days). Grazing animals are also used in cities to control overgrowth. Well-managed grazing utilizes land which is not good for growing crops and it can also improve the water quality and habitat for fish and wildlife.

How Is Soil 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.



What is a Watershed?

A **watershed** is the land area that delivers run-off water to the area's lowest point – a stream, river or lake. Small watersheds flow into bigger ones until they eventually reach the ocean. This water travels across and under fields, forests, cities, streets and lawns.

We all live in a watershed and everything we do in our watershed affects its water. Run-off from streets, yards, farms and forests eventually end up in our water.

• Do you live in a watershed?__________

• Can you think of two actions you might take at home or school to help stop pollution in your watershed?

1. ________________________________

____

2. ________________________________

____

Earth Day is Every Day for Farmers & Ranchers!

Earth Day was first celebrated on April 22, 1970, and has been celebrated on the 22nd of April each year since. Farmers and ranchers celebrate the earth every day by protecting and conserving the Earth's resources all year round. Farmers and ranchers know that without plants - all humans, animals, and agriculture could not exist. Caring for the environment allows the needed renewable resources to continue to be produced now and into the future.

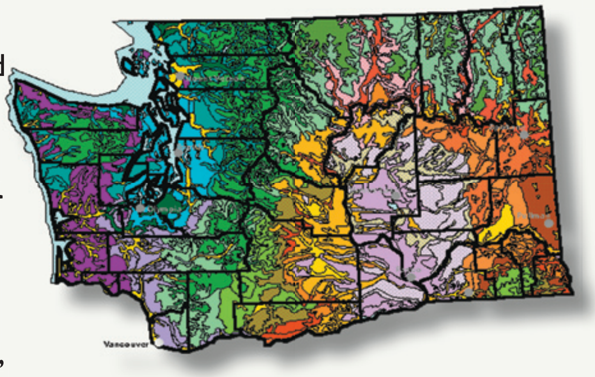
More than 90% of US farms are operated by individuals or families. Maintaining and improving the environment is necessary to keep the family business going. Today's farmers are restoring wetlands, reducing soil erosion, protecting wildlife, and generating far less waste than ever before. Every day is Earth Day for agriculture!

Tokul -- Washington State Soil

You probably already know that Washington's state flower is the Western rhododendron, the bird is the Willow goldfinch, and the tree is the Western hemlock, but did you know that we also have an official state soil, named Tokul? The name Tokul comes from a small community and creek in King County. The State of Washington has more than 1,000,000 acres of Tokul soils located on the western side of the Cascade Mountains, from south of Seattle north to the Canadian border.

Tokul soils are among the most productive soils in the world. These soils support conifer trees, which are the source of Washington's nickname, the Evergreen State.

Washington was the first state to recognize a soil that formed in volcanic ash (Andisols) as a state soil. Volcanic ash is one common feature of the soils throughout the state. These Andisols are used for crop production, timber production, livestock grazing, recreation, and watershed.



A Very "Fruitful" State

Washington is a top producer of apples, pears, sweet cherries, red raspberries and Concord grapes.

Tree Fruit

Washington produces 69% of all US apples, but accounts for 90% of all apples exported to other nations. Our slogan "The Best Apples on Earth" certainly describes Washington apples that are shipped to over 60 countries around the world. Washington produces nearly 45% of the pears grown in the US. Thanks to advancements in Controlled Atmosphere (CA) storage technology, fresh apples and pears are available to consumers nearly year-round. The three main tree fruit regions are the Wenatchee Valley, Columbia Basin and Yakima Valley. These areas are ideal because of the mild climate, dry growing season, good soils, and plentiful irrigation water from nearby rivers.

1. *Because we produce over half of the U.S. crop of this fruit and ship them world wide, Washington is know as the ______________ Capital of the World.*

A Berry Nice Place

Berries are grown in many areas of our state but the major production area is the Puget Sound lowlands. The soil and climate there are great for blueberries, strawberries, raspberries and blackberries. Most cranberries are grown in the Willapa Hills region. 60% of America's red raspberries used in processing (quick frozen berries, concentrates, purees and other products) are grown in Washington, most of those in Whatcom County

3. *If WA harvests 9,600 acres of red raspberries and the yield is 8,070 pounds per acre, the total harvest will be ________________ pounds.*

How many tons? _________________

Stone Fruit

No, they don't grow out of rocks! **Stone fruits** have a large, hard seed called a pit. Cherries, apricots, peaches, nectarines, plums and prunes are all stone fruits produced in our state. Weather is very important to a stone fruit grower. Rain and hail can damage the tender fruit and destroy an entire crop in the blink of an eye.

Even gentle rain on cherries is bad. A water drop collects in the dimple where the stem is attached and causes the cherry's skin to split open. This ruins the fruit. If it rains a grower might pay a helicopter to hover over his trees to blow the water off and dry the fruit quickly.

2. *Comparing weather across the state, why would most stone fruit be grown in Eastern Washington?*
____
____
____

Grapes

The grape industry has grown to become Washington's 9th most valuable crop. We lead the nation in production of Concord grapes (used for juices and jams) at 42%. We also produce 25% of the nation's Niagra grapes and are second nationally in the production of wine grapes.

Nearly all our grapes are raised east of the Cascades.

4. *Which is your favorite – grape juice, grape jelly, or fresh grapes? __________________*

Which one is better nutritionally?
____

LIBRARY CORNER

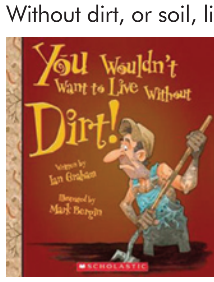
The Thing About Bees

A love poem from a father to his two sons, and a tribute to the bees that pollinate the foods we love to eat.

"Sometimes bees can be a bit rude.
They fly in your face and prance on your food."

And yet… without bees, we might not have strawberries for shortcakes or avocados for tacos! Shabazz Larkin's The Thing About Bees is a Norman Rockwell-inspired Sunday in the park, a love poem from a father to his two sons, and a tribute to the bees that pollinate the foods we love to eat. Children are introduced to different kinds of bees, "how not to get stung," and how the things we fear are often things we don't fully understand.

You Wouldn't Want to Live Without Dirt!



Without dirt, or soil, life would have developed differently and we humans probably wouldn't be here at all. Soil supplies a surprising variety of raw materials for making things and provides the foundation for growing the plants that feed us. This book is full of information about the ways soil has been used by humans over the centuries. Each spread highlights a different topic, including types of soil, life in the soil, growing plants, soil erosion, and protecting soil resources for the future. Many sections also include suggestions for activities that can be used to further explore soil in the classroom.