



Ag@School

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Give A Cheer For SOIL!

The entire earth—every ecosystem, every living plant and animal—depends upon soil. It is a complex mixture of minerals, air, water, and organic matter (living organisms and decaying remains of once-living plants and animals). Farmers know that on average it takes 500 years to create an inch of topsoil, so they understand the importance of taking good care of the soil. After all, every day is Earth Day for agriculture!



Today's Children... **Tomorrow's Leaders**

soil, n. the top layer of earth suitable for growing plants





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.

Think and Discuss:

Why is conservation important to a farmer?

Why must farmers make a profit?



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.

Sustainable Agriculture:

Using technology and resources to keep farms profitable, improve human lives, yet respect the environment.

A VERY "FRUITFUL" STATE

WASHINGTON IS A TOP PRODUCER OF APPLES, PEARS, SWEET CHERRIES, RED RASPBERRIES AND CONCORD GRAPES.

TREE FRUIT



Washington produces 60% 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 60 countries around the world. We also produce nearly 46% 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 known 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. Over 29% of America's red raspberries are grown in Washington, most of those in Whatcom County



3. If WA harvests 9,200 acres of red raspberries and the yield is 7,910 pounds per acre, the total harvest will be _____ pounds. (2015 NASS data)

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 44%. We also produce 26% of the nation's Niagra grapes and are second nationally in the production of wine grapes.

Washington's wine industry contributes more than \$3 billion to the state's economy. Wine tourism attracts nearly two million visitors annually. Nearly all our grapes are raised east of the Cascades.



4. Which is your favorite – grape juice, grape jelly, or table grapes? _____

Which one is better nutritionally? _____

Pollination

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.

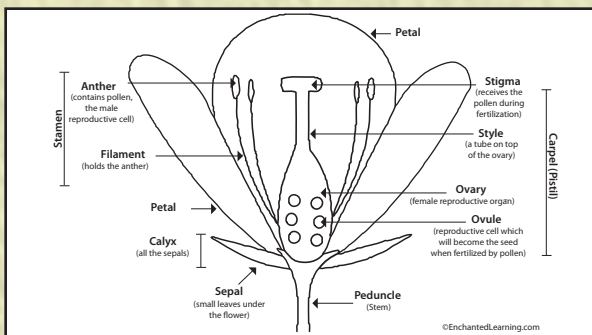


How does pollination work?

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 dull 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.

Thanks to the University of Illinois for the information on this page; see more at:

<http://www.life.illinois.edu/entomology/pollinators/docs/Pollination%20Activity%20Book.pdf>

Videos about pollination can be seen at:

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

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.

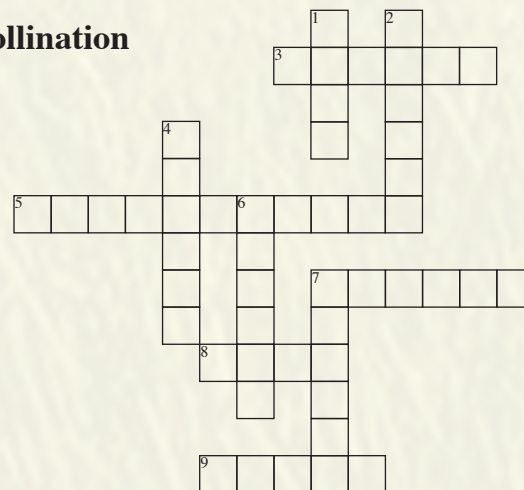
To learn more about different pollinators; insects, bats, birds.

Check out---<http://www.buzzaboutbees.net/about-bees.html>
<http://kidsgrowingstrong.org/Pollination>



<http://youtu.be/ge3EM8AE>
RV0?list=FLAdHP75YXIMQOBLyBWC4JA

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

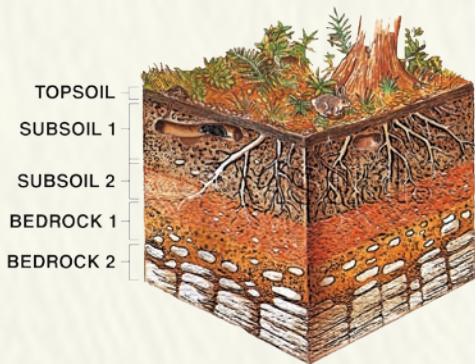
1. Created when pollen fertilizes ovule
2. Male plant parts
4. Top of pistil
6. Part of stamen producing pollen
7. Female plant parts

3 Basic Soil Particle Sizes



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) with half filled with air, and half filled with water

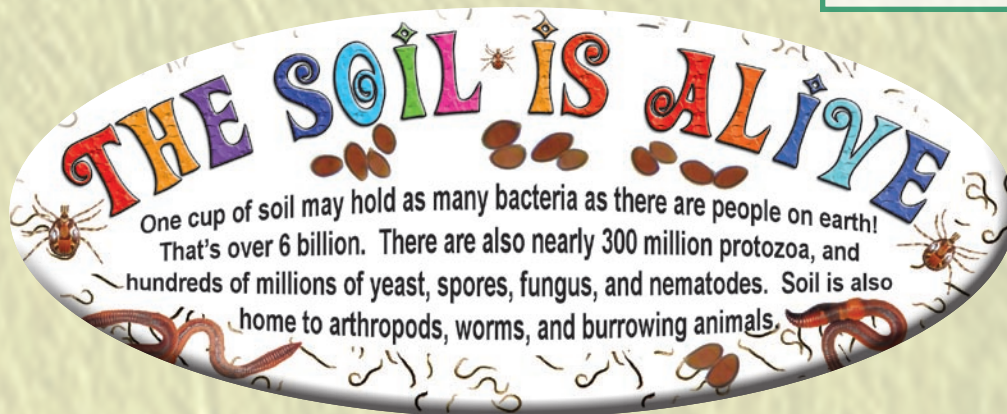
Without decayed organic matter (**humus**), the soil loses its capacity to retain the water and air that soil organisms need.

Natural resources fit together like puzzle pieces on earth. Caring for soil and water helps us to produce food today, and in the future.



Fill in the blanks with the correct response.

1. The sun provides _____ energy.
2. Healthy _____ provides nutrients _____ by plant roots.
3. People, crops, animals, industry, aquatic organisms, and _____ supply oxygen to the atmosphere.
4. Trees and crops use carbon dioxide and _____ to make food, making the atmosphere _____ healthy.



SOIL CONSERVATION



With help from science, farmers have developed conservation practices that reduce soil loss. The movement of soil from one place to another by wind or water is called **erosion**. Erosion can occur anywhere but is usually worse in places that are steep or where there are no plant roots to hold the soil in place. Stopping erosion is important because it can take hundreds of years for nature to replace just one inch of good topsoil.

One conservation practice is planting windbreaks. Another conservation method includes farming with the contour of the land and planting strips of crops across hillsides (these

methods slow down the gravity flow of water). Another is **conservation tillage**. To stop erosion many farmers now use equipment and methods that use less tillage. When land is tilled (plowed or cultivated), soil particles are exposed to wind and water erosion. The more times a farmer disturbs the soil, the finer the particles become and the worse the erosion potential. Following harvest, crop residue is left in the field and often the field is not disturbed until it is time to plant the next crop. The roots hold the soil in place. Less tilling means fewer tractor trips across the fields and less air pollution from dust and burning fuel and less fuel used.

INS WITH...

like puzzle pieces to sustain life
water resources allows farmers
the future.



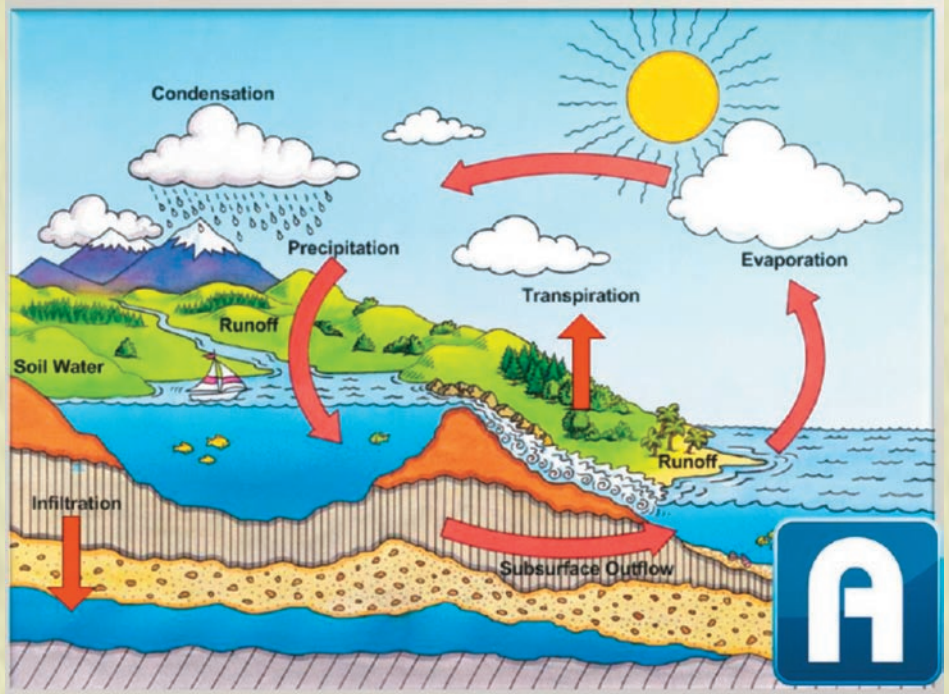
resource:

which plants need to grow.
nutrients and minerals that are taken up

life, and recreation all must share the

produce oxygen,
ier for people.

Water—The Most Common Material on Earth



<http://youtu.be/vYBjPE0wekw>

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.

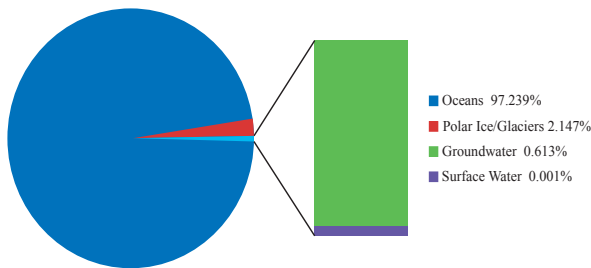
Percolation: The movement of water into soil through pores, holes and cracks.

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.

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%)



Water Cycle

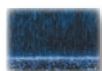


Clouds

Evaporate



Precipitate



Condensate



e	d	p	h	m	s	i	x	e	f	m	u	m	p	c	u	g
v	i	y	p	r	e	c	i	p	i	t	a	t	e	p	i	a
a	u	r	o	c	g	h	s	w	v	h	z	n	f	g	s	o
r	o	q	m	k	a	f	p	b	o	u	f	a	j	p	o	k
n	o	i	a	z	s	h	v	h	w	s	c	p	c	t	h	l
o	f	r	i	c	s	d	u	o	i	c	a	w	e	b	y	i
d	c	a	w	a	t	e	r	v	a	p	o	r	r	v	u	a
d	v	j	t	d	o	u	s	c	w	x	r	y	x	v	e	d
j	a	g	c	e	n	i	t	e	r	i	v	e	r	z	a	w
c	s	c	r	a	b	a	a	e	c	o	n	d	e	n	s	a
t	e	z	w	b	g	q	s	p	v	g	y	m	m	u	m	v
b	f	y														



Solid

Liquid



Gas



Ice



Water Vapor



Forestry

Trees grown in managed forests are essential to our lives. Just look around. Products made from trees can be found everywhere from plywood and paper to components in toothpaste and artificial bones. Wood naturally stores carbon, helping slow climate change. When it's used in buildings as lumber and cross-laminated beams, that carbon is stored away permanently. The great news is that wood harvested in Washington is grown sustainably. That means this resource will continue to produce wood and store carbon for generations to come.



Private foresters practice guidelines for keeping water clean and cool for fish. When they harvest, foresters leave some trees for wildlife habitat. The open areas created by harvesting timber provide berries for wildlife to eat. Birds, squirrels and other animals make their homes in growing trees. As trees mature and fill in the open areas, foresters remove some trees to prevent wildfires and keep the forest healthy. Foresters also control weeds and brush so the baby trees they plant will grow strong and healthy.

Each year forest landowners in Washington plant an average of 52 million tree seedlings in areas that have been harvested; about three trees for every one harvested. Through their detailed planning and wise stewardship, Washington's private timberland owners will continue to create jobs from healthy forests lasting indefinitely into the future.



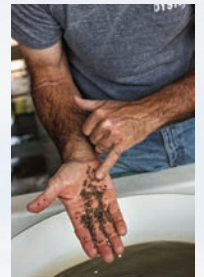
Foresters manage the land that keeps Washington world famous as the Evergreen State! Contributed by Washington Friends of Farms & Forests

Clams in Agriculture?

Did you know Washington State is the nation's leading producer of farmed clams, oysters, and mussels? That's right. We harvest almost 10 million pounds of Manila clams every year and sell them across the country. The value of all shellfish harvested in Washington in one year is \$182 million!



Wait, why are we talking about shellfish in an agriculture article? We harvest so many clams, oysters, mussels, and geoduck we have to replant every year with seed. Did you notice words in that last sentence that related to farming? Exactly! We consider commercial shellfish production farming. Many of the companies in WA include the word "farm" in their name.



Just as we plant corn and carrot seed in the ground, we seed baby shellfish in the water and wait for them to grow. Nature feeds the shellfish with the phytoplankton floating through the salt water. Farmers have to beware of pests like moon snails, sea stars, shrimp, and ducks instead of slugs or crows. Then the farmers pick or dig the crop and take it to market. So yes, shellfish are an agricultural item. (It takes one to three years for each of these baby oysters to grow to full size.)



As recently as 40 years ago farmers relied on Mother Nature to provide the new baby shellfish every year. Each species of shellfish needs the right conditions to grow; the water needs to be the right temperature and salinity, phytoplankton needs sunlight to grow to feed the shellfish, and the water needs to be healthy and free of pollution.

Clams, oysters, and mussels are filter feeders. They suck water in through their siphons, circulate it through their gills to keep the nutrients, and force the extra water and waste back out. By doing this, shellfish clean our waters.

The photo on the left shows regular seawater. You can see the water gets clearer in the two middle photos where the oysters have been filtering. The right photo shows water with the algae removed and no oysters.)

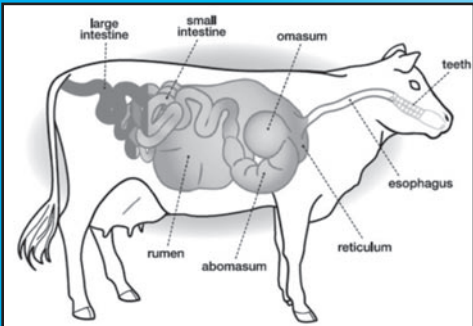
Each of us need to be stewards of the tidelands. Excess fertilizer put on lawns or golf courses can be washed by the rain into the water system. Even the poo from our dogs and cats could affect the shellfish we eat. The rain washes the poo into the rivers that lead to the bay. The shellfish filter that water through their stomachs and can become polluted if there is too much poo in the water. It is our responsibility to prevent sewage spills and to think before we put anything in the water.



Shellfish farmers work really hard to keep their growing areas clean. Puget Sound, Hood Canal, Willapa Bay and Grays Harbor are beautiful waterways that can produce the best shellfish in the world. Please help us keep that water clean so that we can all enjoy the feast from the sea!



The Marvel of Ruminants



The ruminant digestive system
https://cfaifc.org/matrix/lessonplan_print.cfm?lpid=292
 California Foundation for Agriculture in the Classroom

Cattle, sheep, and goats and their wild cousins (such as deer and gazelles) are all herbivores, which means their diet consists entirely of plants. However, they are also something more: they are **ruminants** (ROO-muh-nintz). Ruminants have a complex digestive system with three chambers before their true stomach, which is like a human stomach. Billions of bacteria live in the largest compartment, called the rumen. These organisms produce substances that digest plant fibers, releasing plant nutrients for use by both the bacteria and host animal. The bacteria use the nutrients for energy and to make more bacteria. The ruminant host uses the freed plant nutrients and the bacteria to meet its nutritional needs.

Cattle and sheep are mostly grazers, which means they mostly eat grasses and with their heads down. Goats prefer to browse, which means they like to eat shrubs and other plants at eye level. All ruminants can browse or graze, depending on what and how much food is available. Ruminants can help make land that is too dry, wet, rocky, or hilly for farming still able to produce food.



Livestock can obtain their own food on rangeland or pasture or food can be provided for them in a paddock or barn. Many beef cattle are on rangeland for at least part of their life. Many dairy cattle have food brought to them because their nutritional needs are so high. Regardless of how food is provided to ruminant livestock, their caretakers must care for the soil, plants, water, and animals properly to protect our environment while producing wholesome and high-quality food for us all.

Did You Know?
 Rumen bacteria make vitamins B and K, so ruminants do not need to have them added to their diets.



Susan Kerr, DVM, PhD, PAS –
 WSU NW Regional Livestock & Dairy Extension Specialist

Agri Beef Company Profile

From simple beginnings as a cattle ranching and feeding company in the 1970s Agri Beef has expanded to include every step of the beef supply chain, including ranching, cattle feeding and nutrition, and beef processing. This comprehensive approach allows Agri Beef to sell some of the highest quality beef in the United States to restaurants and grocery stores across the US and over 30 countries worldwide. Agri Beef raises and produces beef with a dedication to the sustainability of natural resources and ranching way of life, the total quality of their beef products, animal well-being, and their responsibility to the health and happiness of their employees and communities.



Feed Yard Manager

An Agri Beef feed yard manager must wear many hats and their job is never ending. Not only do they oversee everything from cattle care, feed and nutrition, to yard maintenance and business financials, they look over the proper and responsible use of natural resources. They develop creative solutions for things such as manure management; we turn ours into high quality plant fertilizer. Feed Yard Managers also work closely with government agencies like the Washington Department of Ecology on dust control and air quality. At the end of the day, they ensure we are raising cattle adhering to our STAR Commitment – our dedication to Sustainability, Total Quality, Animal Well-Being and Responsibility. To learn more about our company and careers visit www.agribeef.com.



FOOD for THOUGHT

WASHINGTON POTATOES...

Have **MORE POTASSIUM** than a banana

Nutrition Facts
Serving Size 1 Potato (148g) 1 Potato

Amount Per Serving	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 100g	20%
Dietary Fiber 10g	20%
Protein 10g	20%
Vitamins & Minerals	
Vitamin A 0%	0%
Vitamin C 45%	90%
Folate 0%	0%
Iron 0%	0%
Calcium 0%	0%
Phosphorus 0%	0%
Potassium 10%	20%
Magnesium 0%	0%

Provide **45%** of your daily **VITAMIN C** needs, which is more than a **TANGERINE**

Have the **EQUIVALENT** amount of **PROTEIN** as half of a glass of milk

Also contain **MORE FIBER** than an equal serving of **OATMEAL**, and are one of the top vegetable sources of **VITAMIN B6**



Every Day is Earth Day for Agriculture!



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 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!

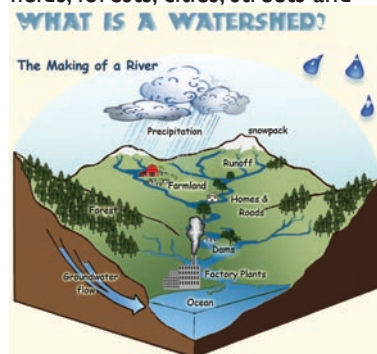
What is a Watershed?

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. _____



Apple Maggots in Washington

Did you know that Washington State grows more apples than any other state in the country? It's true! And apples are Washington's number one crop, meaning it is the crop with the highest dollar value.

But certain pest insects have a mission to turn our tasty and nutritious apples into a brown, nasty mush. This pest is called the apple maggot. The apple maggot is a problem in about half of Washington, but luckily we have stopped them from thriving in most of the areas where the majority of Washington's apples are grown.



Did you know that your family can play a big role in stopping apple maggots? Apple maggot flies don't fly very well. So they try to hitch a ride on fruit grown at home or in the wild. When you take apples from your backyard or from a tree you find in the wild where the apple maggot lives, you might give them a ride into a new area and help them spread.

To stop apple maggot from spreading, the Washington State Department of Agriculture has established quarantine areas. A quarantine is an area out of which you cannot take something. In this case, you cannot take homegrown or foraged fruit out of the apple maggot quarantined areas. It's best to leave homegrown fruit at home. If you go camping or travel and want to take fruit along and you live in a quarantine area, you need to buy fruit from the store which is certified as pest-free.



LIBRARY CORNER

Soil! Get the Inside Scoop

This book will help get kids excited about the living world of soil. Targeted for children aged 9-12, this 36-page, full-color book explores how soil is part of our life—the food we eat, the air we breathe, the



water we drink, the houses we live in, and more. Along the way, readers learn about different kinds of soil and meet the scientists who work with soil every day.