AG in the CLASSROOM

Ag@School

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Agriculture - From Field to Table

Imagine you are a truck driver and your office is in Seattle. Your boss gives you the following work schedule. Trace your driving route on the map. In the blanks, write the name of the highway you would use to get to that stop and how many miles you traveled.

1. Pick up raspberry jam at processor in Everett.
   Highway _____ for about _____miles
2. Pick up fresh apples at fruit packing plant in Wenatchee.
   Highway _____ for about _____miles
3. Deliver the apples and the jam to a supermarket in Spokane.
   Highway _____ for about _____miles
4. Pick up a load of wheat flour near Pullman.
   Highway _____ for about_____miles
5. Drop off flour in Pasco; pick up sweet corn.
   Highway _____&_____&_____ for about _____miles
6. Deliver corn to processing plant in Ellensburg.
   Highway _____ for _____miles
7. Pick up hay and deliver to port of Seattle for shipment to Japan.
   Highway _____ for about _____miles
8. What is the total number of miles traveled?
   _____ miles
9. How many different highways did you travel?
   _____
10. How many cities did you visit?_____



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

ag•ri•cul•ture (ag´rə´ kul´chər), n. growing plants and animals for food and other uses

AGRICULTURE IS EVERYWHERE

Agriculture starts with the growing and harvesting of food, fibers, forests, and flowers. **Agriculture is important to each of us because we all eat food**. Not only do farms and ranches produce the food we eat, but also the cotton t-shirts and jeans we wear, leather shoes, and important ingredients for the fuel for our cars, soap, glue, many medicines, tires, books, and thousands of other things we use in our daily lives.

America's farmers are the world's most productive. They produce 16% of the total world food production on just 10% of the world's land. US farmers grow more food using fewer resources than ever before. In Washington State 39,500 farms create a $46 billion food and agriculture industry. That represents 13% of our state's economy. We lead all other states in the production of raspberries, hops, mint oil, cherries, apples, pears, concord grapes, and carrots for processing.

Food comes from farms:

Thank a farmer!

Agriculture: Is Science and Technology

Agriculture is the nation's largest industry. It is everywhere, and involves more than 250 different ag careers. Research and scientific discoveries have led to increased agricultural productivity. The ag industry consists of about 24 million people who produce, process, transport, sell, and trade the nation's food and fiber. Fewer than 2 million people are actually farmers. Growers produce the raw products and other people turn them into the things we eat and use every day. Consider all the jobs from farm to your table, closet, or fuel tank. Explore Ag careers at www.agriculture.purdue.edu/USDA/careers

What is a GMO?

In a laboratory, when a **gene** from one organism is purposely moved to improve or change another organism, the result is a genetically modified organism (**GMO**). (A gene is a distinct piece of a cell's DNA. Genes are coded instructions that determine a particular trait.)

Genetically engineered products are not new. Insulin used in medicine is an example of genetic engineering; the insulin gene from the intestines of pigs is inserted into bacteria. The bacteria grow and produce two protein chains that when combined and processed produce insulin for human injections. Thyroid hormones and hepatitis B vaccine are other examples.

Genetically engineered (GE) crop varieties provide benefits for farmers and the environment. They can increase crop yields, save the farmer time and fuel, and decrease soil erosion. Mostly the genetic improvement is for tolerance of certain herbicides (weed killers) or resistance to certain insects or plant viruses. The rate at which U.S. farmers adopt GE varieties continues to increase even though it costs more to use GE seeds. Currently in the US, GE varieties account for:

- ☆ 90% corn
- ☆ 93% soybeans
- ☆ 90% cotton
- ☆ 95% sugarbeets
- ☆ 90% canola
- ☆ 80% papaya
- ☆ 80-90% of cheese*

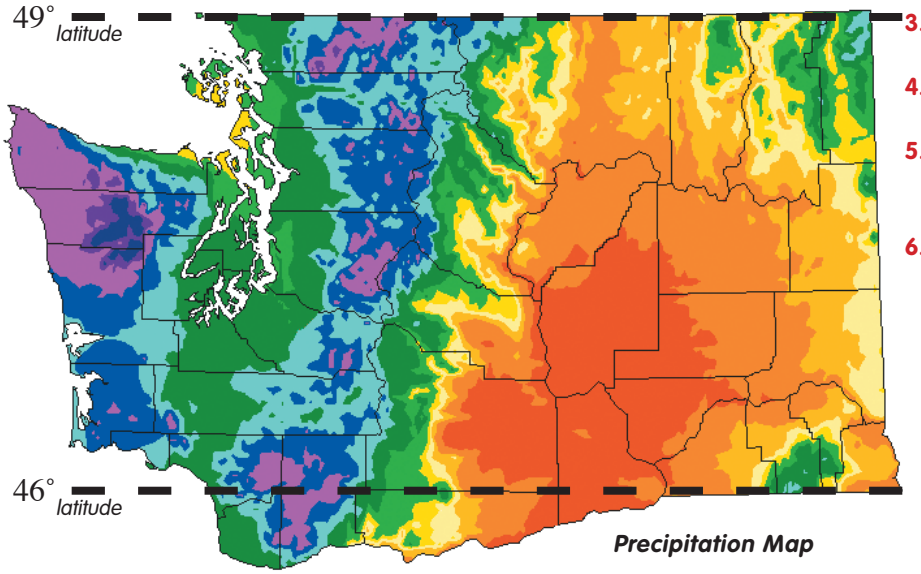
In addition, 60-70% of packaged foods will have ingredients derived from GE crops.

* An **enzyme**, named **chymosin** from the stomachs of young calves is needed to digest milk. It is also needed to make cheese (see page 7). GE chymosin is made by isolating the chymosin gene from calf stomachs and transferring it to bacteria. The bacteria produce chymosin that is then separated and cleaned. Chymosin produced with GM microorganisms contains 80 to 90% active enzyme whereas the natural product collected from calves' stomachs contains only 4 to 8% active enzyme. (An enzyme is a substance produced by a living organism that brings about a specific biochemical reaction.)

AG DEPENDS ON CLIMATE

Climate depends mainly on **latitude**. Latitude governs the angle of the suns rays, length of day, and even prevailing winds. Washington lies between 45° North and 49° North. That puts it in the temperate climate zones (between 30° and 60° latitude). Our basic zones are Maritime and Steppe. Maritime is generally along coasts and has large amounts of rainfall and moderate temperatures. The Steppe Zone is located inland with an average rainfall of 10 - 20 inches. It has hot summers and cold winters. Within the Steppe Zone, Washington has two other zones: Desert, which has less than 10 inches of rainfall, and the Highlands. The Highlands Zone is found in any mountainous area and temperature and precipitation vary with elevation, not latitude. **Our different climate areas are a main reason our state produces such a wide variety of crops.** Use the **precipitation** map to help answer the questions.

1. Outline Washington's wettest area. It is really a rain forest!
2. Which side of the Cascade Mountains gets the most rain? West or East?
3. Where is the Maritime Zone? Where is the Steppe Zone?
4. Most of the wheat is grown in Eastern Washington. Does that crop need a lot of rain?
5. Draw a circle around the desert. Why is this area our most productive agricultural region in the state? Hint: take a peek at page 4
6. Does this precipitation map give clues about where the Highland Zones are located?



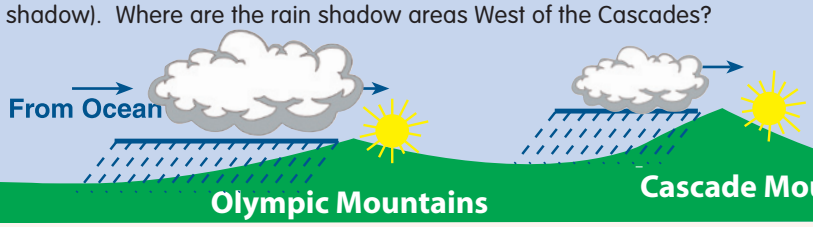
Precipitation Map

Legend (inches of rain per year)

Less than 10	25 to 30	80 to 100
10 to 15	30 to 40	100 to 140
15 to 20	40 to 60	140 to 180
20 to 25	60 to 80	more than 180

The Rain Shadow

Some parts of Washington receive over 100 inches of rain each year. As moist air from the ocean blows east it must rise over our mountain ranges. The air cools as it rises. Cold air cannot hold as much moisture so the clouds must release their moisture in the form of precipitation (rain, sleet, snow or hail). This results in an area that receives less precipitation on the other side of the mountains (the rain shadow). Where are the rain shadow areas West of the Cascades?



CLIMATE

DESERT
HAIL
HIGHLANDS
MARITIME
PRECIPITATION
RAIN
RAINFOREST
RAINSHADOW
SLEET
SNOW
STEPPE
TEMPERATE
WEATHER

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

Grown In Wa

The climate, physical features, and geography cha you cross Washington, dividing our state into distin regions.

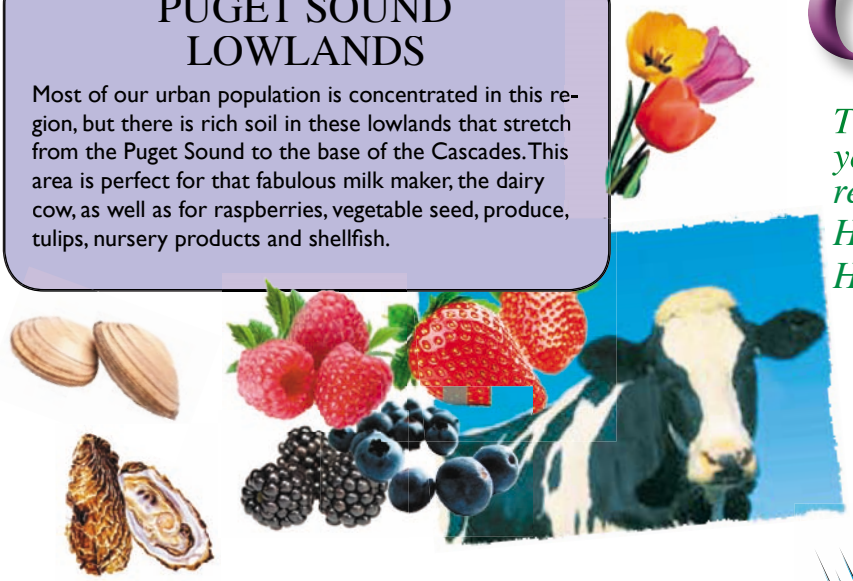
How many regions are there?

How many counties does our state have?

We also have deep-water ports. Place the ports of Seattle, Tacoma, Vancouver, Longview, Grays Harbor, and Port Angeles on the map below.

PUGET SOUND LOWLANDS

Most of our urban population is concentrated in this region, but there is rich soil in these lowlands that stretch from the Puget Sound to the base of the Cascades. This area is perfect for that fabulous milk maker, the dairy cow, as well as for raspberries, vegetable seed, produce, tulips, nursery products and shellfish.

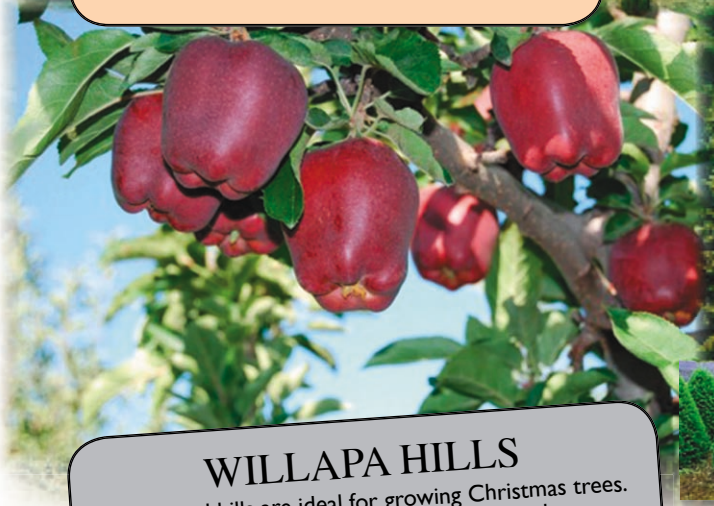


OLYMPIC PENINSULA

The Olympic Mountains provide timber and recreation. Forest products like an evergreen shrub named salal, are collected and shipped nationwide to florists. Lavender is a favorite floral crop from this region.

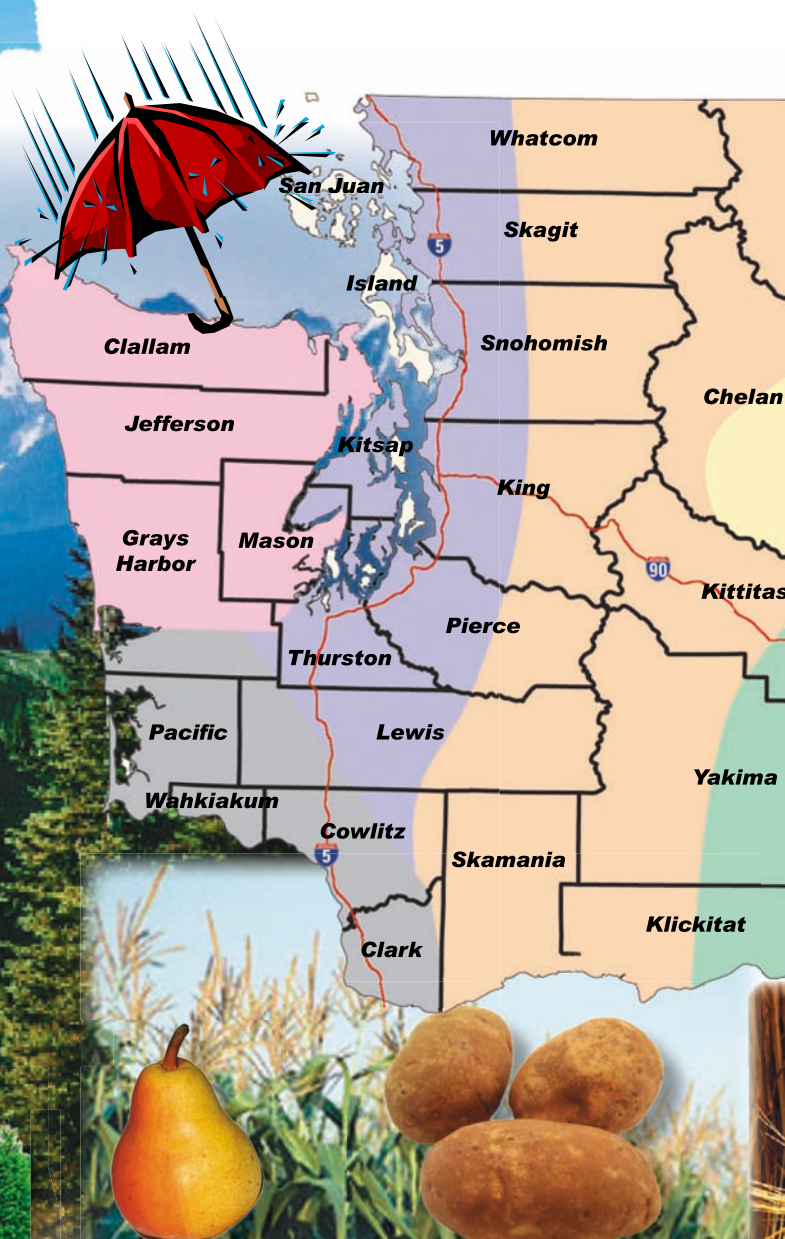
CASCADE MOUNTAINS

The Cascades have spectacular peaks and lots of timber and recreation areas. The lower elevations provide grazing areas for cattle as well as land that grows timothy hay and apples.



WILLAPA HILLS

The coastal hills are ideal for growing Christmas trees. Trees are harvested in the fall and bundled in large stacks. This region also produces cranberries, oysters, and is home to many farm markets and community supported agriculture (CSA) operations.



COLUMBIA BASIN

The dry region east of the Cascades is a huge lava plateau with rich soils. The heart of the basin receives less than 10 inches of precipitation yet this region is our most productive agricultural region. The reason is **irrigation**. The Columbia River and its tributaries provide water for a region that has ideal conditions for alfalfa, potatoes, corn, mint, grapes, apples, cherries, and many other crops.

Washington

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OKANOGAN HIGHLANDS

The Okanogan Highlands are rugged foothills between the Cascades lying on the west, and the Rocky Mountains to the east. Here beef cattle graze among another valuable renewable resource, trees. Trees provide paper, pencils, furniture and houses. This region also grows a variety of fruit trees.

BLUE MOUNTAINS

The Snake River skirts around the Blue Mountain range in the southeast corner of our state before it feeds into the Columbia River. Cattle graze among sagebrush and timber. Wheat, barley, asparagus, onions, green peas and grapes are grown here. This region also boasts the most inland seaport serving the **Pacific Rim** at Lewiston-Clarkston.

~ Hooray! Washington is #1~

Washington leads the nation in the production of several crops (2011 crop data). Identify the counties or regions that are named below.

(1) Red Raspberries – 92.3% of US supply – Delicious and nutritious, grown for eating fresh, or in jams, jellies, and pies, raspberries can be harvested mechanically. Whatcom county leads the state with over 90% of this crop. www.red-raspberry.org

(2) Hops –79.2% – Hops are used to flavor beer. The Yakima valley produces three-fourths of the state's hops. The dry climate along with lots of irrigation water from the Yakima River create ideal conditions for this crop. www.usahops.org

(3) Mint Oil – Grant and Adams counties lead the state in production of mint. Every pound of oil will flavor 30,000 sticks of gum or 1000 tubes of toothpaste. Of the total US supply, Washington produces:

78.7% Spearmint Oil 26.1% Peppermint Oil (2nd in nation)

(4) Sweet Cherries – 58.6% – Cherries are one of the fastest maturing fruits. In just 60 days blossoms mature into sweet, tasty fruit. They are picked, packed, and shipped to markets in the U.S. and more than 42 countries around the world. Leading cherry counties are Yakima, Grant, Chelan, Benton, and Okanogan counties. www.nwcherries.com

(5) Apples–57.4% – Apples are the crop that consumers most often link with Washington state. Five areas all share ideal growing conditions -- weather, soil and water. These areas can be seen at www.bestapples.com/growers/regions/index.shtml (Okanogan, Lake Chelan, Wenatchee Valley, Columbia Basin, and Yakima Valley)

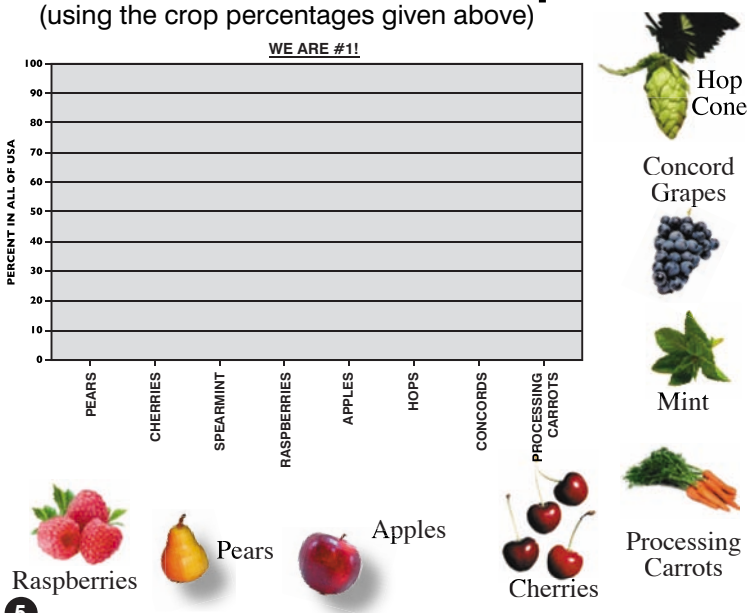
(6) Pears – 47.9% – The pear has been grown by man for more than four thousand years. Washington pears are picked by hand, and are prized for their flavor and long storage life. Yakima county has the most acres of pears, followed by Chelan, Okanogan, Grant, and Douglas. www.usapears.com

(7) Concord Grapes – 37.3% – These are the grapes used to make grape juice and jams and jellies. We also grow 23% of Niagra grapes which are used to make white grape juice. All these grapes are harvested by machine. Yakima, Benton, and Franklin counties grow the most concord grapes.

(8) Processing Carrots – 35.6% – Carrots provide 30% of the Vitamin A in the US diet. Carrots are sliced or diced to be frozen or canned. Benton, Franklin, and Grant counties grow these carrots. Carrots for the fresh market are grown in both Western and Eastern Washington.

Make Your Own Bar Graph:

(using the crop percentages given above)

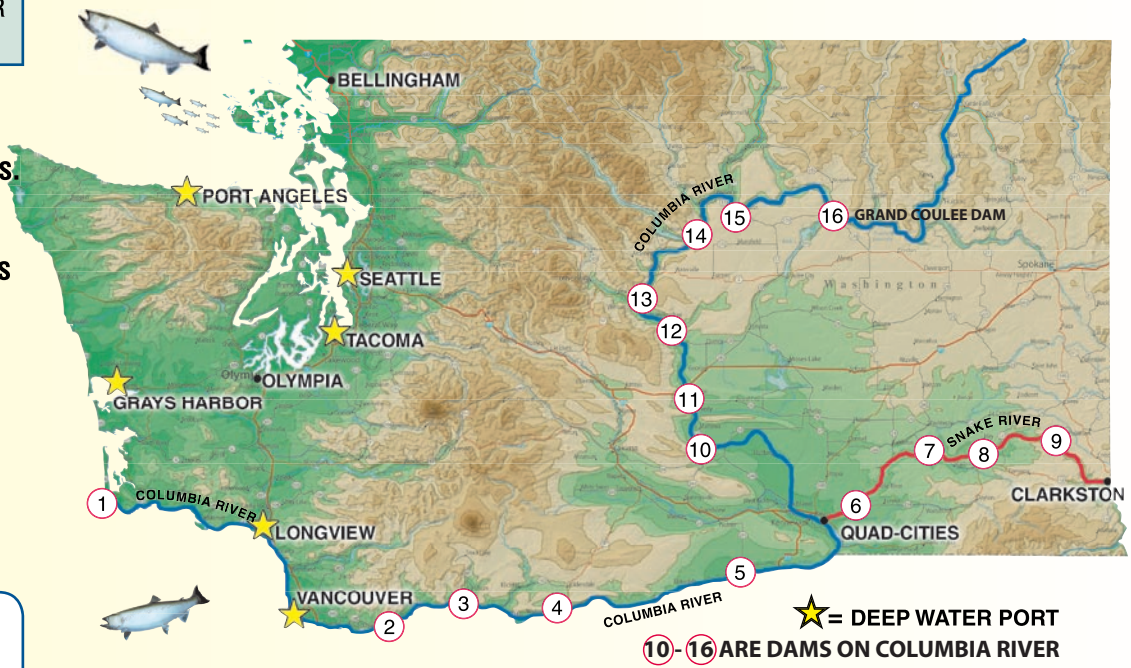


GATEWAY TO THE PACIFIC

TWO MAJOR RIVERS IN WASHINGTON

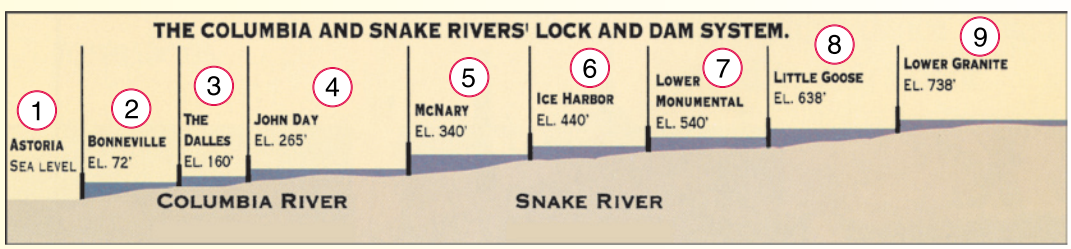
COLUMBIA RIVER
SNAKE RIVER

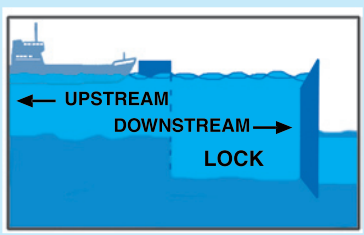
Washington is blessed with great soil and a climate for growing many different crops. That's not all! Our mighty rivers and ocean ports help us move all kinds of products throughout the Pacific Rim at an affordable cost. That means that wheat trucked from Montana and potatoes grown in Idaho, as well as items from our own state, can travel by water to ports around the globe.



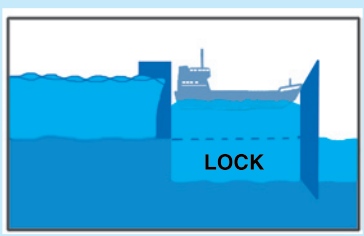
A Water Stairway

The Columbia and Snake Rivers form a highway for boats and barges. This could not happen without a series of 8 locks and dams that make a stairway in the river. Between the port of Clarkston and the Pacific Ocean the rivers drop over 700 feet. Like a water stairway, the locks allow boats to move up and down the rivers.

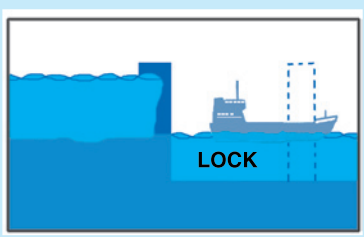




(Fig. 1)



(Fig. 2)



(Fig. 3)

A lock and dam work together. The dam holds back water, creating a pool. The lock is a rectangular water chamber near the dam with watertight gates at each end.

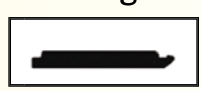
To lower a boat or barge, the lock is filled with water to the upstream level. The barge moves into the lock. The upstream gate closes and water is drained out of the lock, lowering the barge to the downstream level. The downstream gate opens and the barge leaves the lock.

Boats can travel the other direction, too, moving from lower to higher water levels. Through locks, boats can travel past dams, waterfalls and other obstacles.

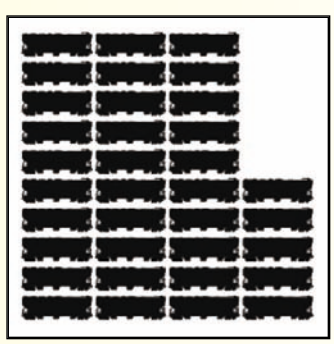
That's A Lot of Wheat!

In 2011, Washington farmers produced 10,072,800,000 pounds of wheat. How many tons is that? Nearly 85% of the crop is exported. Barges are the most efficient transportation to deep water ports.

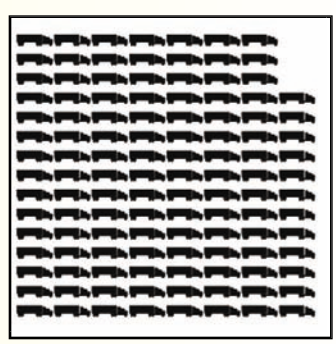
3500 tons of wheat shipped on 1 barge



= 35 rail cars



= 117 Semi Trucks



Cheese-Wonderful, Flavorful Cheese

Little Miss Muffet
sat on a tuffet,
Eating her curds
and whey;
Along came a spider
and sat down beside her,
And frightened
Miss Muffet away

What are curds and whey? Would you eat them?

Anyone know what a "tuffet" is?

Cheese is a food made from milk in a wide range of flavors, textures, and forms. Most cheese in the US is made from cows' milk, but around the world cheese can be made from the milk of camels, goats, horses, reindeer, sheep, water buffalos, and yaks. Hundreds of types of cheese from various countries are produced. How many varieties can you name? Which is your favorite?

The following description of cheese production comes from www.eatwisconsincheese.com

1. Milk Intake

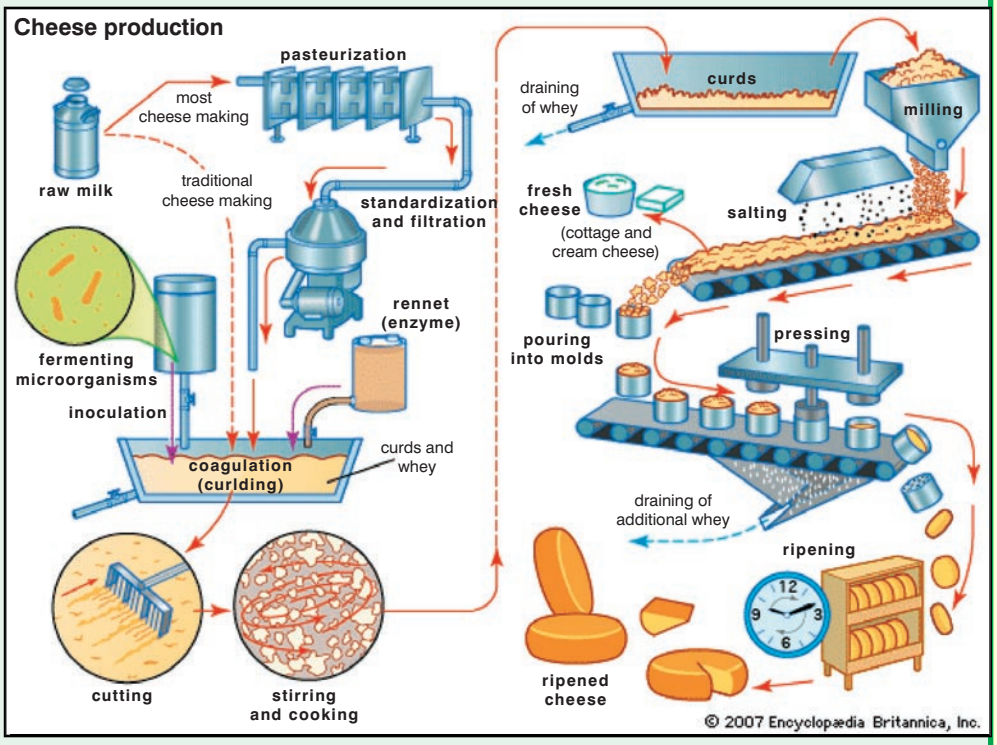
Quality cheese begins with quality milk. Milk is first tested for quality and purity. It takes approximately 10 pounds of milk to make one pound of cheese.

2 - Standardization

Next, the milk is weighed and pasteurized to ensure product safety and uniformity.

3 - Starter Culture & Coagulant

Starter cultures, of lactic acid bacteria, are added to start the cheesemaking process. They help determine the ultimate flavor and texture of the cheese. Next, a milk-clotting enzyme called rennet (chymosin is the primary active ingredient) is added. The lactic acid and the rennet cause the milk to curdle or coagulate (changing a liquid into a soft, semi-solid mass). This results in **curds** (a custard-like mass of the milk solids, fats, proteins, etc.) and **whey** (mostly water).



4 - Cutting

It's then cut into small pieces to begin the process of separating the liquid (whey) from the milk solids (curds).

5 - Stirring, Heating & Draining

Cheesemakers cook and stir the curds and whey until the desired temperature and firmness of the curd is achieved. The whey is then drained off, leaving a tightly formed curd.

6 - Curd Transformation

Different handling techniques and salting affect how the curd is transformed into the many cheese varieties.

7 - Pressing

Pressing determines the characteristic shape of the cheese and helps complete the curd formation. Most cheeses are pressed in 3 to 12 hours, depending on their size.

8- Curing

Depending on the variety and style of cheese, another step may be curing. Curing is used for aged cheeses and helps fully develop its flavor and texture. The cheese is moved to a room that is carefully controlled for required humidity and temperature and may be aged for 10 years or more.

Wheat Feeds the World

What's so special about wheat? Wheat has been a staple in our food supply for over 12,000 years. All parts of the wheat kernel, from the outer bran to the inner germ, supply nutritious ingredients in a variety of breads, cakes, cereals, pastas and more. Wheat is a delicious part of healthy eating, low in fat and high in complex carbohydrates that fuel our bodies with long-lasting energy.

...The kernel is also the seed from which the plant grows.

…More foods are made with wheat the world over than with any other cereal grain.

…One 60-pound bushel of wheat provides about 42 pounds of white flour, 60 to 73 loaves of bread, or 42 pounds of pasta.

…Assuming a sandwich was eaten for breakfast, lunch, and dinner, it would take 168 days to eat the amount of bread produced from one bushel of wheat.

…A modern combine can harvest 2,000 bushels (60 pounds = one bushel of wheat) per hour.

Production

Wheat was first grown in the US in 1602 as a hobby crop. The first Northwest wheat crop was planted in 1825 at Fort Vancouver, Washington. Today, the Northwest produces 91 percent of US white wheat. Washington is the 4th largest wheat producing state in the nation with more than 2 million acres in production (1 acre is about the size of a football field).

Processing

Most wheat is milled into flour. Thousands of years ago, milling wheat into flour involved crushing the wheat and other grains between stones. This was a difficult and slow process. Those stones have evolved into machinery that turns the wheat into a fine powder. At one point in history there were as many as 160 flour mills in Washington. Today there are less than ten.

Transportation

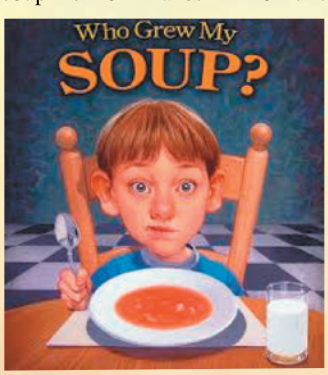
The bulk of Washington wheat, about 85-90%, is exported. There are three main modes of transportation used to get our grain to the Pacific Northwest ports along the Columbia River: trucks, barges and trains. Over 60% of Washington's wheat exports travel by barge from ports along the 400-mile Columbia-Snake river system to Portland.

Marketing

Washington wheat is marketed around the world especially to nations in the Middle East, Japan, Taiwan and South Korea. If 85% of it is exported, how much do we use domestically? A farmer's livelihood depends on the wheat market. Prices are constantly changing depending on world supply and the needs of the consumers. Once the wheat has been harvested and sold, it is time to think about next year's crop

Who Grew My Soup?

Who Grew My Soup? written by Tom Darbyshire, tells a story of a young boy named Phineas Quinn and his curiosity about the vegetables that are in the soup his mom makes him for lunch. He declares that he will not eat his soup until his questions are answered about who grew his soup. This leads Phineas on a journey from farm to farm, learning about amazing vegetables and the farmers that grow them.



Visit: www.myamericanfarm.org to play on-line games and explore fun family activities.

It's all about agriculture.

Max the Farm Dog

Follow Max the Farm Dog on Facebook and learn interesting facts about Agriculture in Washington State.