



Classes of Wheat



There are five classes of wheat planted in the United States.

Hard Red Winter wheat is used to make bread flour and located in the Great Plains.

Hard Red Spring wheat is used for high-protein blending and located in the Northern Plains.

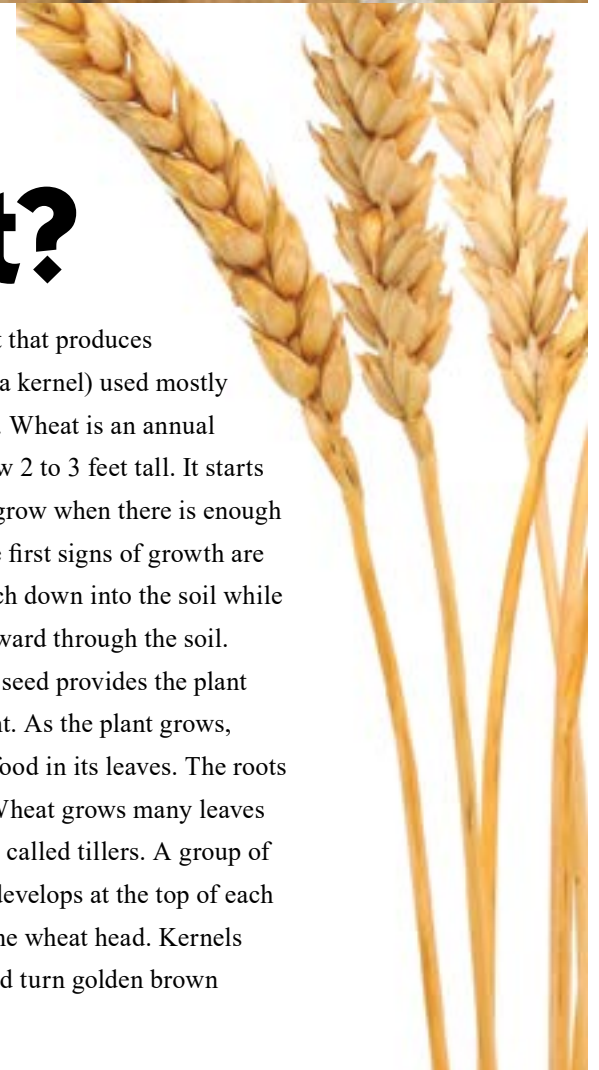
Soft Red Winter wheat is used to make cakes, cookies and crackers and is located in the Eastern States.

White wheat is used for the flour to make noodles, crackers and cereals. It is located in Washington, Oregon, Idaho, Michigan and New York.

Durum wheat is used to make pastas and located in North Dakota and Montana.

What Is **Wheat?**

Wheat is a grain (a plant that produces a dry edible seed called a kernel) used mostly for human consumption. Wheat is an annual grass plant that will grow 2 to 3 feet tall. It starts as a seed and begins to grow when there is enough moisture in the soil. The first signs of growth are tiny root hairs that stretch down into the soil while a small shoot pushes upward through the soil. Tissue within the wheat seed provides the plant with its first nourishment. As the plant grows, it uses the sun to make food in its leaves. The roots get food from the soil. Wheat grows many leaves and sends up 3-12 stems called tillers. A group of flowers, called a spike, develops at the top of each tiller and matures into the wheat head. Kernels within the head grow and turn golden brown before harvest.



Wheat in Illinois:

The variety of wheat grown in Illinois is soft red winter wheat. Although soft red winter wheat does not have the protein and gluten levels required for yeast breads, it is used in other food products such as flat breads, cereals, cakes, cookies, pretzels, pastries, pancakes, and biscuits, just to name a few. It is also used in non-food items such as glue, pastes, cosmetics, vitamin E extracts, pharmaceuticals, pet food, livestock feed, and straw. Southern Illinois offers a longer growing season and allows wheat to be harvested in time to plant soybeans as a “double-crop.” Wheat is seeded, and after initial fall growth, is dormant throughout winter. Growth resumes in late winter. About that time, growers apply fertilizers to maximize production. Wheat begins to head about the first week in May. Harvest begins in the middle of June in the south and ends in July in the north. In 2015, Illinois was ranked 12th in the United States for Winter Wheat production. Illinois’ total production in bushels was 33,800,000.



Wheat FACTS



- A kernel is a wheat seed. There are about 50 kernels in a head of wheat and 12,000 to 14,000 kernels in a pound.



- Did you know that straw comes from wheat? Straw is baled and used as bedding for animals.

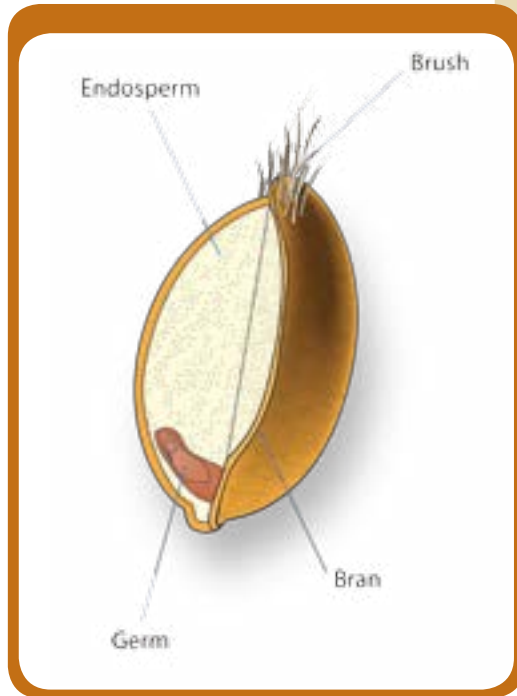


- Wheat is grown in nearly every state. Because it is such a versatile crop, it is being harvested somewhere in the world every month of the year.



- A bushel of wheat weighs about 60 pounds and yields about 42 pounds of white flour or 60 pounds of whole wheat flour.

Wheat Kernel



There are three parts of a wheat kernel: the endosperm, the bran, and the germ. The endosperm is the inner part that is used for white flour and contains protein, carbohydrates, iron, riboflavin, niacin, and thiamin. The bran is the outer coating, which is used for cereals, livestock & poultry feed, and contains a large amount of B-complex vitamins. The germ is near the bottom of the kernel and is sometimes added to baked goods. The germ will grow into a new plant if the kernel is planted. If the endosperm, bran, and germ are ground together (or milled), you get whole-wheat flour.



There are four basic parts of a wheat plant:

Head: Contains the kernels

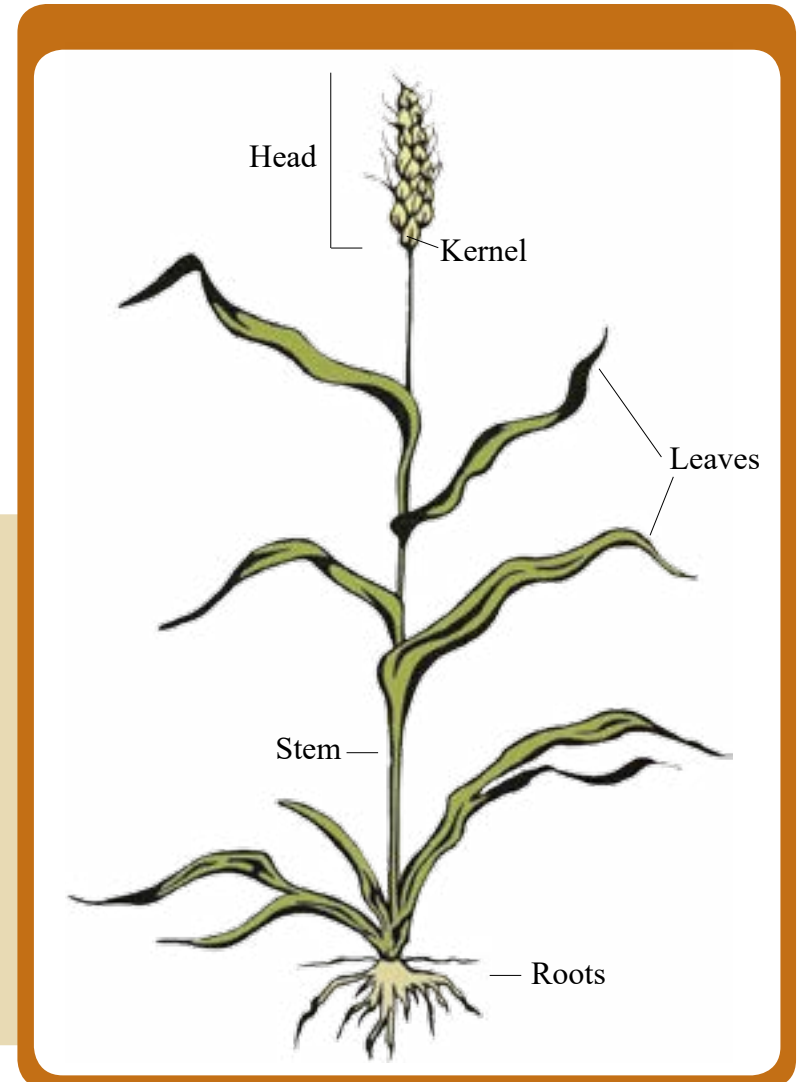
Stem: Supports the head and is known as straw after harvest

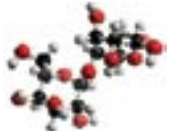
Leaves: Conduct photosynthesis

Roots: Hold the plant in the soil

*Don't forget the beard! The beard is the bristle-like part of the wheat plant that covers and protect the kernels.

Wheat Plant





Wheat Production

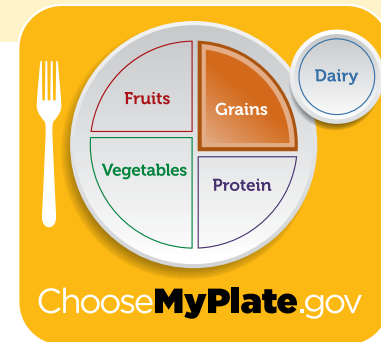
Wheat is planted by a drill that digs tiny furrows just deep enough to plant the wheat seed. The drill drops the seed into the furrows and covers them with soil. After planting, a wheat kernel begins to absorb moisture and swell. The stem starts growing towards the surface of the soil and the primary roots begin growing. A few weeks later, the plant starts growing above the ground. In the spring, the stems will elongate and heads will appear. When the wheat flower is pollinated, it will develop into wheat kernels. About 30 to 60 days after flowering, the wheat kernel becomes ripe. The kernels will increase in size and gradually harden. The entire plant becomes dry and turns golden brown. Depending on the variety of wheat, ripe kernels can be white, yellow, red, or purple.

Farmers will harvest the wheat after it ripens and when the moisture level makes up no more than 14% of the kernel's weight. This is because the wheat has to be dry enough to be stored without spoiling. The farmers can take samples of their crop to a grain elevator to test them for moisture. Some rub the wheat head in their hands, blow away the chaff (straw-like outer covering of the kernel), and chew some of the grain. If the wheat is hard and makes a gummy substance when chewed, it is ready to harvest.



Nutrition

Wheat products provide us with complex carbohydrates, which are the most efficient source of energy and aid in brain functions. Complex carbohydrates are slowly released in the bloodstream. Wheat foods also provide protein, thiamin, riboflavin, niacin, iron, and zinc. Foods made with wheat are in the Grains Food Group on MyPlate.



MILLING

Suggested Reading: *Farmer George Plants a Nation* by Peggy Thomas

Materials Needed:

- Wheat Stalks
- Salt or Pepper Grinder
- Clear container

Directions:

1. Show students wheat stalks.
2. Discuss the parts of the wheat stalk with the students so they can understand the directions for dissection.
3. Dissect the wheat using the following steps:
 - A. Hand out stalks of wheat to the students.
 - B. Break the head off the stem.
 - C. Make a straw out of the stem by breaking it to avoid the nodes.
 - D. Lay the wheat head flat on a hard surface and pat with your hand to shake out the kernels.
 - E. Count their kernels.
4. Put the kernels of wheat into a salt or pepper grinder and have the students mill their wheat into flour.
5. Talk about different ways to grind wheat. The Native Americans did it using rocks, etc. Have students design their own method of grinding wheat and then test their machines.
6. Talk about the uses of wheat flour to make pastas, breads, desserts, etc.



Mill



Millers grind wheat kernels into fine powder to make wheat flour. Wheat flour contains a protein substance called gluten. Wheat flour is great for baking because the gluten makes the dough elastic. Wheat flour is used to make many foods. Bread, cakes, cookies, crackers, pies, rolls, cereal, and pasta are just some of the foods made with wheat. Wheat germ and wheat germ oil are derived from the wheat kernel and are used to improve the flavor and nutritional value of foods.



Growing & Exporting



Wheat was originally a wild grass. In 1777, it was grown only as a hobby crop. Today, the U.S. is one of the largest exporters of wheat. Over 30,000 varieties of wheat are grown in 42 states around the U.S. The Plains states and the Pacific Northwest produce the most. Exports from Illinois account for 6% of all U.S. agricultural exports. Nearly 50% of the U.S. wheat crop is sold and exported to about 60 nations around the world.



Cover Crops

Wheat is a good cover crop that can also double as a cash crop. Like other cereals, it has excellent erosion control, nutrient uptake, and residue production for surface cover.

Benefits?

- Reduce erosion – water & wind
- Improved soil quality/health (tilth & biology)
- Improved organic matter
- Improved soil hydrology
- Improved water quality
- Reduced weed, pest & disease pressure
- Reduced production costs (fertilizer & pesticides)
- Minimize nutrient loss – improved fertility
- Excellent forage/feed source
- Improved profitability & sustainability

Illinois 2015 Soft Red Winter Wheat Statistics

Planted acres	Harvested acres	Production	Yield bushels per acre	Price Received dollars per bushel
540,000	520,000	33,800,000	65	\$3.85

Wheat Timeline

7000-6000 B.C.-

Swiss lake dwellers ground wheat kernels, mixed flour with water, and baked the first flatbreads.



3000 B.C.-

Egyptians cultivated wheat and baked bread.

1683 -

The first bagel rolled into the world when a baker from Vienna, Austria, was thankful to the King of Poland for saving Austria from Turkish invaders. The baker reshaped the local bread so that it resembled the King's stirrup. The new bread was called "beugel," derived from the German word for stirrup, "bugel."



7000 B.C.

This Ag Mag complements and can be connected to the following Common Core and Next Generation Science Standards:

Common Core Standards: ELA-Literacy.RI.4.1; ELA-Literacy.RI.4.3; ELA-Literacy.RI.4.4; ELA-Literacy.RI.4.5; ELA-Literacy.RI.4.7; ELA-Literacy.RI.4.10; ELA-Literacy.L.4.3

Next Generation Science Standards: Structure, Function, and Information Processing: 3-LS1-1; 4-LS1.A; Inheritance and Variation of Traits: 3-LS3.1; 3-LS3.B

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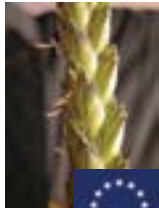
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Wheat Timeline

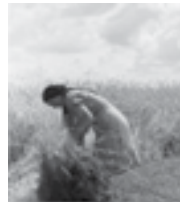
1777 -

Wheat was first planted in the U.S. as a hobby crop.



1800 -

U.S. harvest rate is 8 acres per day.



1921 -

Wonder bread was originally produced by the Taggart Baking Company. It was named by Elmer Cline, the Vice-President of Wonder Bread/Taggart.



1999 -

U.S. harvest rate is 120 acres per day.



2008/2009 -

U.S. farmers grew nearly 2.4 billion bushels of wheat on 63 million acres of land.



2014 -

Illinois planted 740,000 acres of winter wheat.



2000 A.D.

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To learn more about Agriculture, visit us at www.agintheclassroom.org, or contact your county Farm Bureau® office or Agriculture in the Classroom, Illinois Farm Bureau®, 1701 Towanda Avenue, Bloomington, IL 61701.



Career Corner

Ken Davis
Cereals Product Manager
KWS
Champaign, IL



Describe how you became interested in working with wheat?

After working primarily with corn and soybeans for six years, I was intrigued by the opportunity to learn about cereals crops. Wheat is planted on more acres than any other field crop in the world. This shows a tremendous opportunity to learn from a large market.

Tell us about your current job as a cereals product manager.

My role facilitates the development and commercialization of new cereals varieties for farmers. By working in between research and production, I coordinate trials, marketing and seed multiplication to deliver products to the field.

What role do you think Illinois wheat will play in the future of agriculture?

Illinois is not currently thought of as a wheat producing state, rather, a leader in corn and soybean production. If we can add value through developing higher yielding varieties and new technology, Illinois could carry a similar message as a leading producer of soft red winter wheat by using the same tools common to corn and beans.

What course of study helped prepare you for a career involving product management?

Agricultural economics began my preparation for a career in agriculture. After graduation, six years of field experience helped add production agriculture and agronomy to my area of understanding. Most recently, I have enrolled in ISU's seed business and technology program to add more research and development fundamentals, while learning on the job at KWS.

Jim Schielein
Northern Illinois Grower
Dixon, IL



Tell us about your background in agriculture and describe your current farming operation.

I grew up in Chillicothe, Illinois, on a small dairy farm of about 25 cows and 500 acres of crop land and pasture. We ended the dairy in 1978. In 1985, I moved to Dixon, Illinois, to operate a farm for which my family had traded ground. My father and I grew our operation from the original farm to about 2,000 acres that we managed together. In 2008, we took on a farming partner to share equipment and rent ground with, which helped us become more efficient. Today, our family farm is strictly grain, raising corn, soybeans and a small amount of wheat.

What challenges are associated with growing wheat in Northern Illinois?

Right now, most of Illinois wheat is grown in Southern Illinois, very little in Central Illinois, and only a small amount in Northern Illinois. Due to the longer growing season, wheat is more popular in the south because of the ability to grow a crop of wheat and a crop of soybeans in the same year, which is called double cropping. Wheat in northern Illinois is often raised for the straw (used for animal bedding) and not necessarily for grain. I use my wheat acres for its beneficial attributes in my crop rotation. In the future, for wheat to be able to compete with the other major crops, advances in genetics for resisting disease and increasing yield will be required. As far as increasing acreage grown in Illinois, the economics of wheat needs to improve in order for growers to justify increasing acreage.

Do you use your wheat as a cover crop? How is this beneficial?

I use wheat as part of my crop rotation to break up the usual corn/soybeans rotation. Adding wheat to my crop rotation is very beneficial to my soils and to my overall crop yields.

What is one thing you want everyone to know about agriculture today?

Satellite technology has fundamentally changed agriculture and will do so even more in the future. This will give many opportunities for young people to stay involved in agriculture.

Steve Stallman

IAA Board Member/Southern Illinois Grower
Chester, IL



Tell us about your background in agriculture and describe your current farming operation.

I have been a farmer all my life. My dad turned the family farm operation over to me when I was 21 and I have been farming ever since. I really like what I do and I make a living doing it. I farm 1,200 total acres of wheat, corn and soybeans. Wheat has always been an important part of my cropping rotation, and it fits very well with the rolling hills in Southern Illinois.

How is growing wheat different from growing other crops?

Growing wheat is somewhat different than other crops. Wheat is a two-year crop; it is planted in the fall, lays dormant all winter long and then is harvested the next year. The great benefit of wheat is it creates ground cover through the winter months, which helps control erosion on the slopes of Southern Illinois. Another benefit of farming wheat in Southern Illinois is we have a longer growing season. This allows us to plant a crop of soybeans in the same field after the wheat is harvested. This is known as double cropping. Those soybeans won't yield as well as full season soybeans however it greatly increases the profit potential for the corn soybeans double crop situation.

*You are currently a member of the Illinois Farm Bureau® board.
What inspired you to become a member?*

I have been involved in the Farm Bureau for over 40 years. The Farm Bureau® is extremely important to all farmers, and I have always had the interest to look out for the well-being of all farmers. I feel honored that my district elected me to this position and had the confidence in me to serve as their director.

As a farmer and Illinois Farm Bureau board member, how do these two roles influence one another?

I think an IAA board member needs to be an active farmer to understand the true farm economy and how it affects a farm family's life.

What is Gluten?

Gluten is a general name for the proteins found in wheat (durum, emmer, spelt, farina, farro, KAMUT® khorasan wheat and einkorn), rye, barley and triticale. Gluten helps foods maintain their shape, acting as a glue that holds food together.

Find the Gluten

Materials Needed:

- Any combination of the following flours:
 - Whole wheat flour
 - Bread flour
 - All-purpose flour
 - Pastry flour
 - Gluten flour
 - Instant flour
- Water (1/2 to 3/4 cup for each flour you will use)
- Bowls (one for each flour you will use)



Directions:

1. In separate bowls, measure out 1 cup of each flour. Make sure you label each bowl with the type of flour you used.
2. Slowly add about 1/2 to 3/4 cup water to the flour in each bowl, and knead each mixture until it forms a soft, rubbery ball of dough. Let the balls of dough sit for about 10 minutes.
3. Once you have let the balls of dough sit, add a few inches of water to each bowl. Knead the dough in the water. (With low-gluten cake or pastry flours, you may want to put the dough in cheesecloth in order to hold it together.)
4. You'll notice the water turning milky as it washes away the starch in the dough. Keep pouring out the cloudy water that collects in the bottom of the bowl and add fresh water. Slowly, your dough will begin to break down.
5. When the water no longer becomes milky, there is no more starch in the dough, leaving nearly pure gluten. Notice how much smaller and stretchier your dough has become.
6. Repeat steps 3 to 5 for each of your flour types. How does the texture of each one differ as you wash away the starch? Does it take the same amount of time for each one? Are the balls of gluten the same size for each type of flour?

Adapted from: The Accidental Scientist: Science of Cooking • <http://www.exploratorium.edu>