

# The Story of Wheat for Kids

Grades 3-5



# Have you ever been on a wheat farm?

If you live in North Dakota, there's a good chance you have since there are thousands of wheat farms in the state.

North Dakota farmers lead our nation in the production of hard red spring wheat and durum wheat each year, and rank first or second in total wheat production.

Do you like to eat bread, pasta, cereal, pretzels, tortillas and a bunch of other goodies made with wheat? Do you want to know more about wheat? Well, read on and you'll discover how farmers grow wheat and how this golden crop becomes the foods we love.

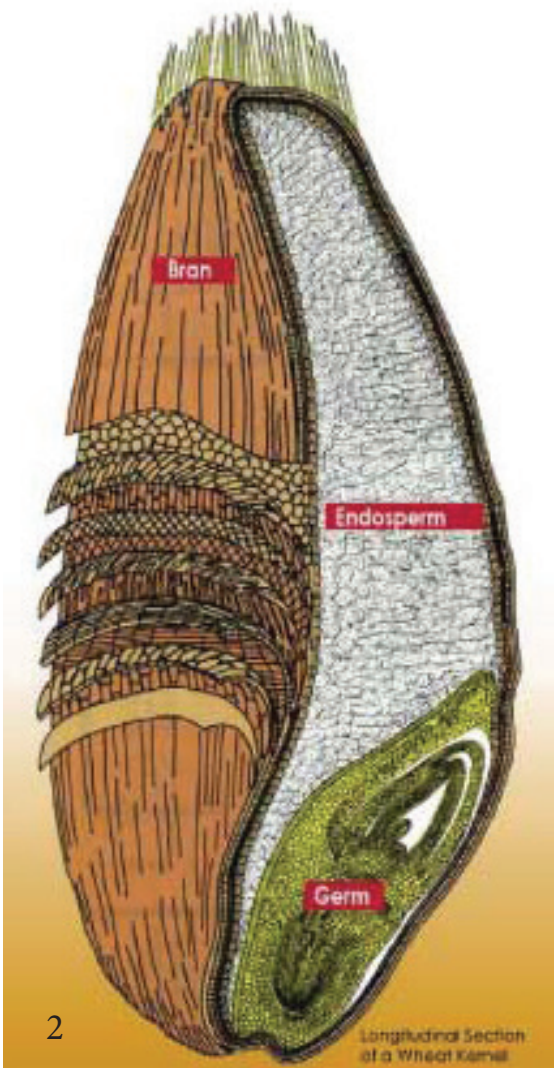


## Meet The Kernel

Here is a wheat kernel, or seed. It is enlarged so you can see how complex one kernel is. Kernels are very tiny — even smaller than our little fingernails! There are about 50 kernels in a head of wheat and 15,000 to 17,000 kernels in just one pound!

The large inner portion of the kernel is called the endosperm. It's the part that's ground to make white flour. The hard outer coating is the bran, sometimes used in cereals, muffins and breads. This portion is made of many layers.

Finally, the tiniest part of the kernel is the germ. It's the part that grows into a new wheat plant if the kernel is planted in soil. Whole-wheat flour is made when the whole kernel is ground or milled. Whole-wheat flour contains all three parts of the kernel.



# Wheat is “Classy”



There are hundreds of varieties of wheat grown in the United States, but they are grouped into six classes based on hardness, color and time of planting. The six classes of wheat are hard red winter, hard red spring, soft red winter, soft white, hard white, and durum.

Millers and bakers need to know what class of wheat they’re using, since each makes a different type of flour and is used in different types of foods. Hard wheats are used to make breads and rolls. The soft wheats are used in cakes, cereal, pastries and crackers. Durum, the hardest wheat of all, is used mainly to make pasta — macaroni, spaghetti, lasagna and more. Hard red spring wheat, the highest in protein, can be used as a blending wheat for all-purpose flour and bread products and is also used for buns, pizza crust, bagels, frozen dough and other specialty products.



Hard Red Winter



Hard Red Spring



Soft Red Winter



Soft White



Hard White



Durum



# Sowing the Way



North Dakota farmers grow hard red spring and durum wheats, as well as a small amount of hard red winter wheat. North Dakota farmers raise about two-thirds of all the durum and half of all the hard red spring wheat grown in the United States. Because of the cold winters in our state, most wheat is sowed, or planted, in the spring — April or May — when the soil temperature is warm enough for the wheat to begin to grow, or germinate.

Long before the wheat can be planted, though, some work needs to be done to prepare the soil. Some producers till the soil prior to planting with special equipment. Tillage is similar to hoeing a garden because it breaks the soil into small pieces and kills weeds that grow early in the spring. Many producers now use minimum tillage practices to limit soil disruption and preserve soil moisture and health. They use equipment that only minimally breaks up the soil or till only where necessary. Other producers use no-till practices, planting the crop directly into the field with no preparation. Fertilizer is applied prior to or during seeding. Fertilizer for a plant is comparable to the food you eat – it provides the nutrition for the plant to grow.

The moisture, or water, in the soil is what makes the wheat plant start to grow. At first, the germ, or the growing part of the seed, gets its food from the endosperm. As the wheat grows taller, though, it gets food from the soil and through its roots. The wheat plant's green leaves also make food from the sunshine through a process called photosynthesis.

Once the soil has dried out and is prepared, producers plant the crop using either a drill or air seeder. Both pieces of equipment open a furrow in the soil, drop the seed in at an even depth, cover the seed and pack the soil. Farmers work hard to fight insects, plant diseases and weeds in order to provide you and your family with a tasty, safe and abundant food supply.



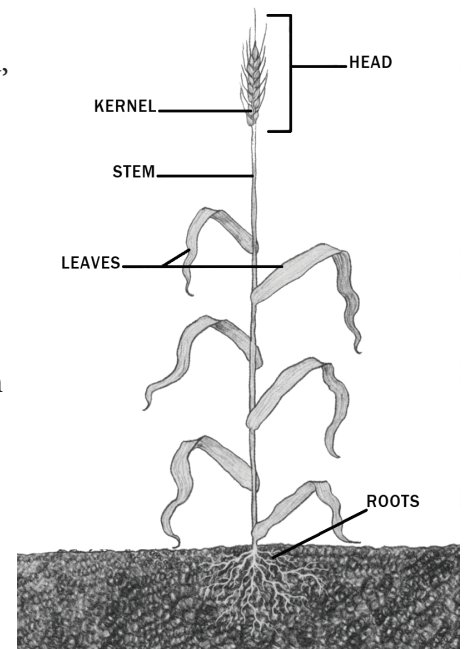
# Amber Waves



Warm, moist days make the wheat plants grow quickly. They usually grow to be 2 to 4 feet high. A wheat plant has four basic parts: head, stem, leaves and roots. The head is what contains the kernels. The stem supports the head, the leaves conduct photosynthesis and the roots hold the plant in the soil.

Toward the middle of July, green wheat plants turn a rich golden color. You know the song, "Oh beautiful for spacious skies, for amber waves of grain. . ." The song was written because a ripe wheat field is something beautiful to see. The song could have been written about a wheat field in North Dakota!

Farmers have to move fast when the wheat is ripe, or ready to harvest. While Mother Nature usually cooperates with them, farmers race to harvest the crop, because a ripe wheat field can be destroyed by wind, rain, hail and even fire. Wheat can't be harvested if it's rainy. Wheat needs to be dry to be stored without spoiling.



# You've Got the Ripe One, Baby

How do farmers know when the wheat is “just right” for harvest? Most harvesting equipment has the technology to test for moisture so producers have an idea if it is ready. To get a more accurate reading, many farmers take a sample of wheat to the local elevator to see if it is dry enough. Other farmers check their wheat the “old-fashioned” way. They rub the wheat head in their hands, blow away the chaff, or the strawlike outer covering of the kernel, and chew some of the grain. If the kernels are hard and make a gummy substance as they are chewed, the farmers know the wheat may be ready to cut.

Because of all the different climates, wheat doesn't ripen at the same time everywhere in the United States. Harvest begins in May in hot southern states like Texas and Oklahoma, and then moves north as the summer goes along. In North Dakota, harvest usually begins in early August and lasts until mid-September, about the time you start a new school year.

Wheat is harvested with a giant machine called a combine. It cuts, separates and cleans grain all at the same time. Before the combine was invented, wheat farmers had to use two separate machines for harvest — a reaper, or binder, to cut the grain and a threshing machine to separate the kernels from the chaff and



stems. The combine is so named because it “combines” the jobs of both machines.

Combines have made wheat harvesting much faster and easier. It used to take three whole days to cut and thresh an acre of wheat, a piece of land more than half as large as a football field! Today, though, with a large combine and modern technology, an acre of wheat can be harvested in less than four minutes!

What exactly does “harvesting” mean? It means the wheat kernels are removed from the wheat plant and placed into a hopper on the combine. When the hopper gets full, the wheat is unloaded into a truck and hauled to a storage bin on the farm or to a grain elevator.

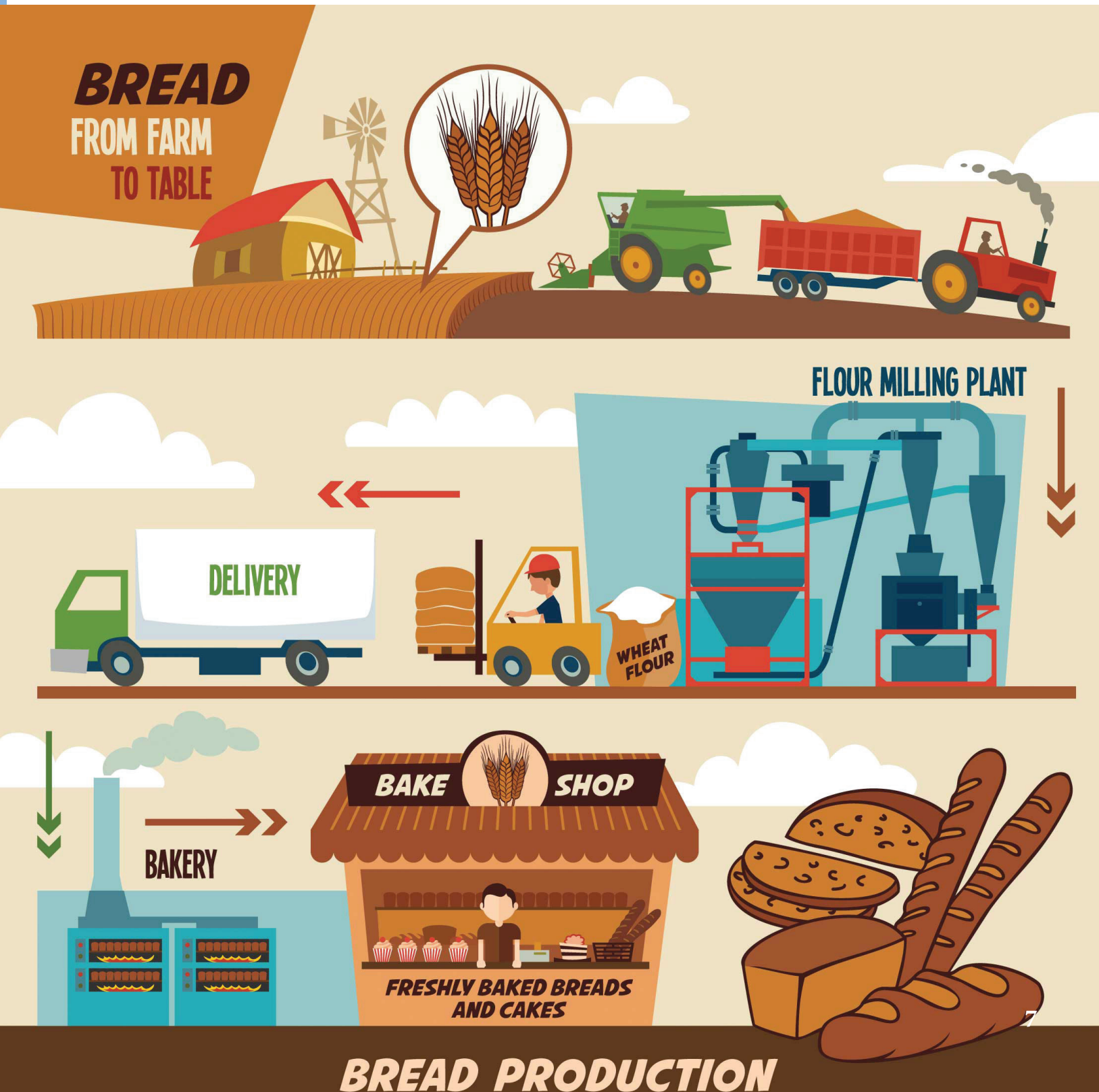
# To Market, to Market



The storage bin at a grain elevator sometimes looks like a giant white silo, but in North Dakota it is usually a large, silver building. The grain is emptied into a pit, and then gets raised or “elevated” into one of the tall bins.

At the elevator, each load of wheat is sampled and graded for quality. The price a farmer gets for the wheat depends on its grade. The better the grade, the more money the farmer receives.

From the elevator, the wheat is sent by train or truck to a mill where it’s ground to make flour for our food. The type of flour produced depends upon what type of wheat it was made from.



# It's Magic!



Nothing tastes as good as a slice of fresh bread right out of the oven! It's soft, fluffy and chewy-good! Flour can be made from other grains like rye, oats and barley. Wheat flour is used most often in baking because it contains a protein called gluten. Some other grains have gluten too, but not as much as wheat.

You will learn how gluten works, but first you need to know about another ingredient in bread called yeast. Yeast is what makes bread rise, or increase in size.

When yeast is mixed with warm water and flour to make bread dough, the yeast gets "active" and makes thousands of tiny air bubbles. These bubbles need to be trapped in the dough so it will rise and become light. That's where the gluten comes in.

Gluten is stretchy — sort of like bubble gum! The gluten traps air bubbles from the yeast and keeps them in the dough. All the tiny holes in a slice of bread were formed by gluten bubbles. Since other grains don't have as much gluten as wheat, bread made from other grains is heavier. Therefore, wheat flour is usually combined with other flours to make rye, pumpernickel, barley and other multi-grain breads.



## THIRSTY EXPERIMENT

Gluten is a "thirsty protein" that soaks up a lot of water. You can see how much gluten is in different kinds of flour with a simple experiment. You'll need 1 cup of wheat flour and 1 cup of rye or barley flour. First, mix enough water with the wheat flour to make a smooth, clay-like dough. Next, mix the same amount of water with the rye or barley flour and stir. What do you discover? Because there isn't enough gluten in the other-grain flour to soak up the moisture it stays sticky and wet.



# Lotsa Pasta



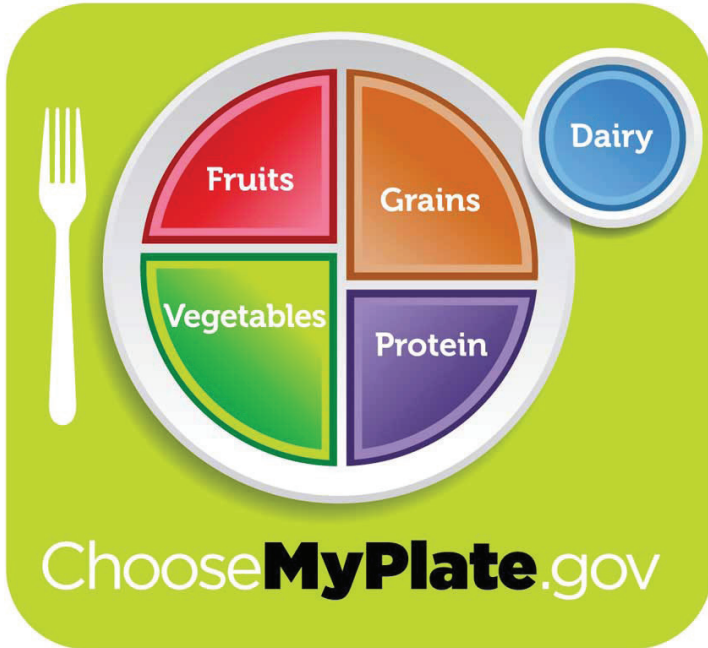
While hard red spring wheat is used to make breads, durum wheat is used to make pasta. "Pasta" is from the Italian word for paste — meaning a combination of flour and water. It's used to describe the 600 shapes and sizes of pasta products made from durum wheat.

Before durum can be used in foods, it must be milled into semolina, the coarsely ground endosperm of a durum wheat kernel. At a processing plant, semolina and water are mixed to make pasta dough. The dough is kneaded, and then forced through dies, or metal disks with holes, to create many pasta shapes. The size and shape of the holes in the dies determine the shape of the pasta. That's how pasta can take the form of flat ribbons, bows, sea shells, twists, tubes, rings, stars, and many other shapes that make eating noodles oodles of fun.

After being forced through the dies, the wet pasta is dried in special machines, packaged and sent off to the grocery store where you and your family buy the pasta to make your favorite meals.



# The Energizer



The red section on the upper left is for fruit. Fresh fruit makes a great snack, pack a piece in your backpack for when you get hungry. Dried, frozen and canned fruits are great too.

The circle next to the plate is for the dairy group. Dairy foods are made from milk which include yogurt and cheese. Calcium from milk is important for building strong bones and teeth.

The last section on the plate on the bottom right is for protein. Lean beef, pork, chicken, turkey, fish, nuts, beans, peanut butter and eggs are all from this group. They provide iron and protein, which is important in building muscles.

The different colors remind us to eat foods from all the foods groups.

Do you see the plate divided into sections above? The plate reminds us of the kinds of foods and how much of each we should eat.

Some sections of the plate are bigger than others to show that you should eat more foods from those groups and fewer foods from groups in the smaller sections. The grain and vegetable groups are the largest.

The orange part of the plate on the upper right is for the grain group. Wheat is the most common grain eaten in the United States. Other common grains include barley, oats, corn and rice. We need to include grains in our diet for the energy and other nutrients that they provide.

Wheat foods provide complex carbohydrates that give our bodies energy to run, play and work. Complex carbohydrates help our thinking brains so we can get good grades in school. Fiber in wheat foods keeps our digestive systems moving on schedule. Wheat also has B vitamins and iron that our bodies use to turn food into energy, muscles and healthy nerves. Athletes eat a lot of wheat products for these reasons. They know wheat foods give them energy without many calories.

Next is the green vegetable section on the bottom left side of the plate. Some kids don't eat enough vegetables. It is important to eat dark green and orange vegetables, like broccoli, carrots, spinach and sweet potatoes.

Some food groups have larger sections on the plate. That shows us that we need to eat these food groups most often. Foods with added sugar and fat should be eaten less often. Candy, chips and soda are for eating once in a while, in small amounts, as long as we exercise.

For example, in the grains group, pasta is a healthy, lowfat choice. Cakes, cookies, pies and donuts are also in the grain group, but are high in fat and added sugar. Eat these foods on special occasions and find fun ways to exercise everyday.



# At Least Half the Grains You Eat Should Be Whole Grain

When you choose whole grains for at least half your grain servings each day, you get all three healthy parts of the wheat kernel. Fiber from the bran is important for good health, and so are the vitamins, minerals and other nutrients.

Just because bread is brown, it's not necessarily whole grain. You'll know a food is made from whole grain if the words "whole" or "whole grain" appear before the grain's name in the ingredient list. Look at the ingredient label on food packages such as bread and tortilla wrappers or pasta and cereal boxes.

The other half of your daily grain servings can come from other grain foods. White flour milled from the endosperm of the wheat kernel is used to make white bread. Regular pasta is made with semolina milled from the endosperm of the durum kernel. White flour and semolina are enriched with iron and four B-vitamins known as thiamin, riboflavin, niacin and folic acid. Enriched grain foods like white bread have twice the folic acid, thiamin, and riboflavin of whole wheat. Folic acid helps moms give birth to healthy babies.

## Eat From Every Food Group Everyday

GRAINS	VEGETABLES	FRUITS	DAIRY	PROTEINS
6 OUNCES	2 ½ CUPS	1 ½ CUPS	3 CUPS	5 OUNCES

WHAT COUNTS AS AN OUNCE?  
Here is an easy guide for the grains group:

- ✓ 1 slice bread
- ✓ ½ bun or pita
- ✓ 5-7 crackers
- ✓ 1 small tortilla
- ✓ ½ English muffin or bagel
- ✓ ½ cup cooked pasta
- ✓ ½ soft pretzel
- ✓ 1 small waffle or pancake
- ✓ 1 cup of cereal

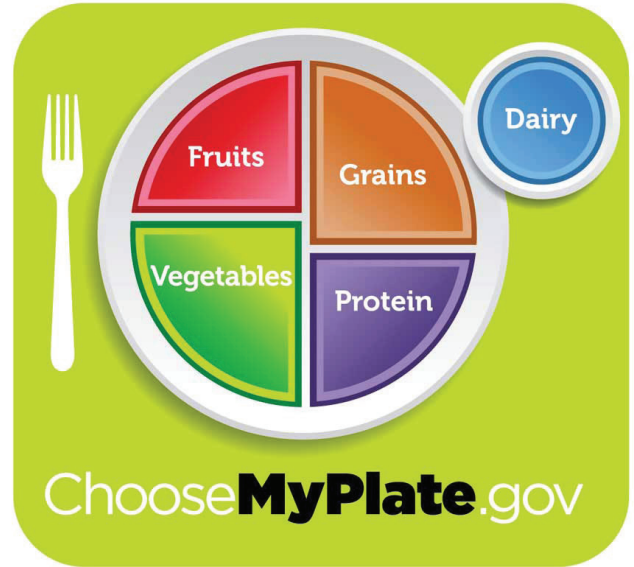
This amount of food is based on 1,800 calories, the estimated energy requirement for a moderately active 9- to 10-year-old.

# Choose Healthier Foods From Each Group

Every food group has a section on MyPlate. Choose the food group in which each of these foods belong.

G = Grains F = Fruits D = Dairy V = Vegetables P = Protein

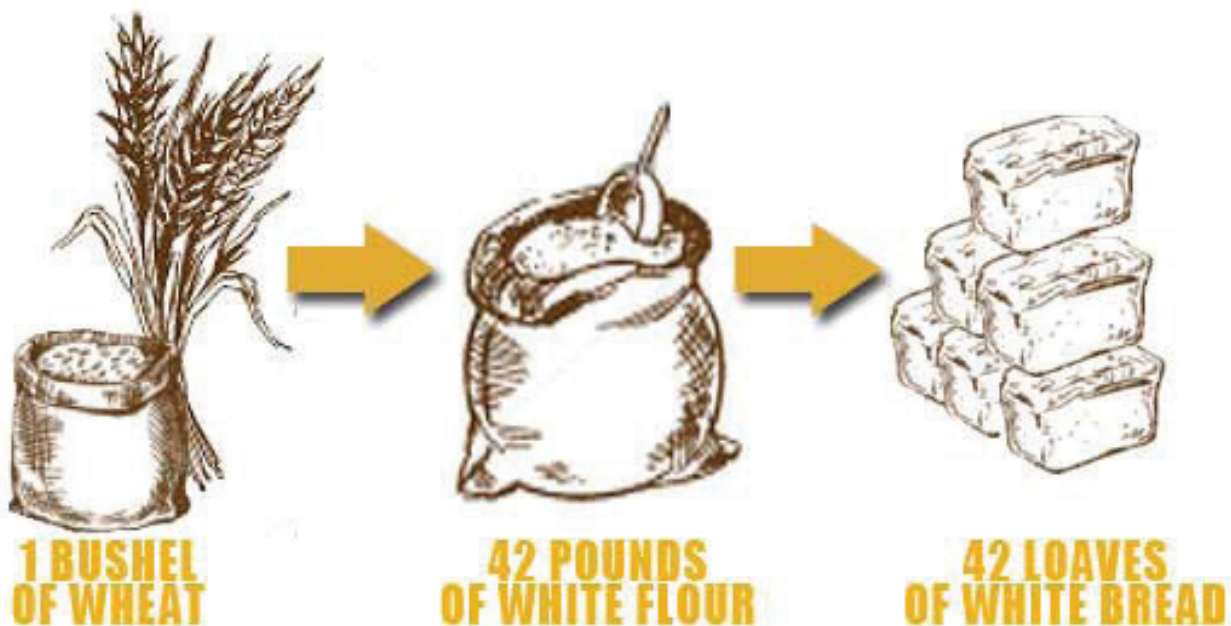
- \_\_\_ Whole-wheat bread
- \_\_\_ Broccoli
- \_\_\_ Chicken nuggets
- \_\_\_ Yogurt
- \_\_\_ Baked sweet potato
- \_\_\_ Peach
- \_\_\_ Roast beef
- \_\_\_ Cereal
- \_\_\_ Milk
- \_\_\_ Watermelon



## Bushels of Fun

Wheat is often bought and sold by the bushel, a unit of measurement for dry goods. A bushel of wheat weighs 60 pounds. From one bushel, a flour mill can make about 59 pounds of whole-wheat flour or 42 pounds of white flour. A bakery then can make 64 one-and-a-half pound loaves of whole-wheat bread or 42 one-and-a-half pound loaves of white bread.

One bushel of wheat yields 42 loaves of white bread. The average one-and-a-half pound loaf, the size we usually find in the supermarket, has 24 slices.  $24 \text{ slices} \times 42 \text{ loaves} = 1,008 \text{ slices of bread}$ . That's enough to make 504 sandwiches! If you ate a sandwich for breakfast, lunch and dinner, it would take about 168 days to eat all the white bread from one bushel of wheat!



# World Class Traveler



The wheat grown here and in the rest of the United States travels to other countries so people there can eat wheat foods too.

Many countries do not have the land or ideal climate to grow wheat, or they may need different qualities of wheat for certain food products. These countries import wheat from other countries. On average, about half or the wheat grown in the U.S. is exported, or sold, to other countries.

We export wheat to more than 50 countries around the world. Just think, that wheat growing in a field near you in North Dakota could end up anywhere in the world! For spring wheat, the largest export destinations are the Philippines, Japan, Taiwan, Korea and Mexico. Italy and Algeria are large buyers of U.S. durum.



## Who Gets the Dough?



While wheat flour is the main ingredient in bread, the price of wheat has little to do with the price of bread. Did you ever wonder where the money goes when your family buys a loaf of bread at the supermarket?

A one-and-a-half pound loaf of white bread — the size we usually find in the supermarket — costs about \$4.00. Of that amount, the farmer gets only 10 to 20 cents. Others along the line that help produce the bread also get a portion of that money. The elevator, flour mill, bakery, railroad and trucking companies, and the supermarket all get paid for their role in producing the loaf of bread.



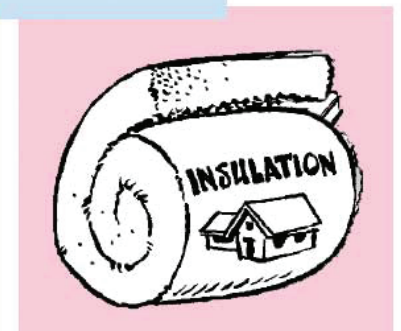
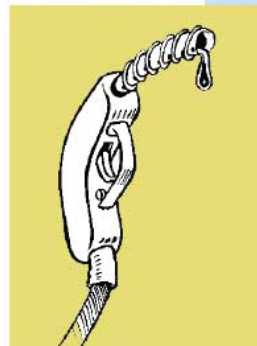
# Beyond the Table



When you hear the word “wheat,” do you automatically think of bread, pasta and other wheat foods? Most people do. But did you know that wheat can be used for things other than edible goods? Wheat and wheat straw have many alternative uses that make wheat such a valuable crop. All the items listed below can be made from wheat.

Place an X beside those that you and your family use each day.

- cosmetics
- pet, livestock and fish feed
- drugstore products
- eating utensils
- ethanol for gas purification
- fiber board
- food thickener
- food trays and containers
- genetic tests
- insulation
- packaging materials
- paper
- laundry soap
- roofing and building materials
- shooting targets
- sweetener
- trash bags



# Summary



Well, now you know all about wheat, the major crop grown in North Dakota. Let's see what you remember about this important, versatile grain. Following are some activities to test your memory and wheat I.Q.!

# Activities



## IDENTIFY THE PARTS

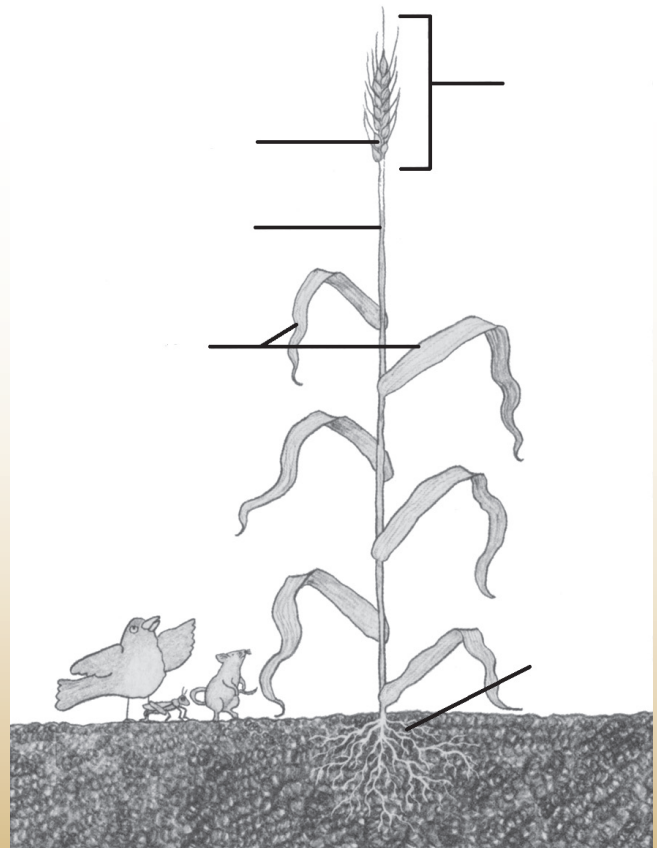
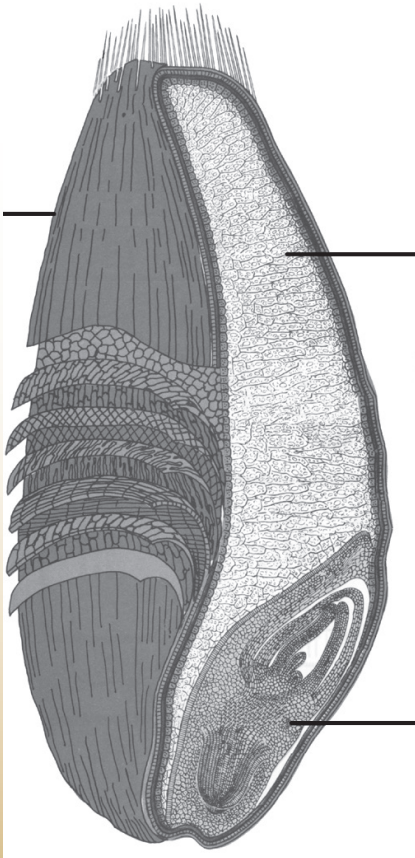
Fill in the blanks with the correct part(s) of the wheat kernel. You will use these words:

**bran endosperm germ**

- \_\_\_\_\_ 1. I am the hard outer covering of the kernel.
- \_\_\_\_\_ 2. I am the smallest part of the kernel.
- \_\_\_\_\_ 3. I am the largest part of the kernel.
- \_\_\_\_\_ 4. I am made of many thin layers.
- \_\_\_\_\_ 5. I make white flour.
- \_\_\_\_\_ 6. I am where the new wheat plant begins to grow.
- \_\_\_\_\_ 7. We make up whole-wheat flour.
- \_\_\_\_\_ 8. I nourish the young plant when it starts to grow.
- \_\_\_\_\_ 9. I am used in cereals.
- \_\_\_\_\_ 10. I am the part you touch when you hold a whole kernel of wheat.

Identify the **endosperm, bran** and **germ** of this wheat kernel.

Fill in the parts of the wheat plant: **leaves, head, roots, stem, kernel**



# Scrambled Terms



## UNSCRAMBLE THESE WORDS

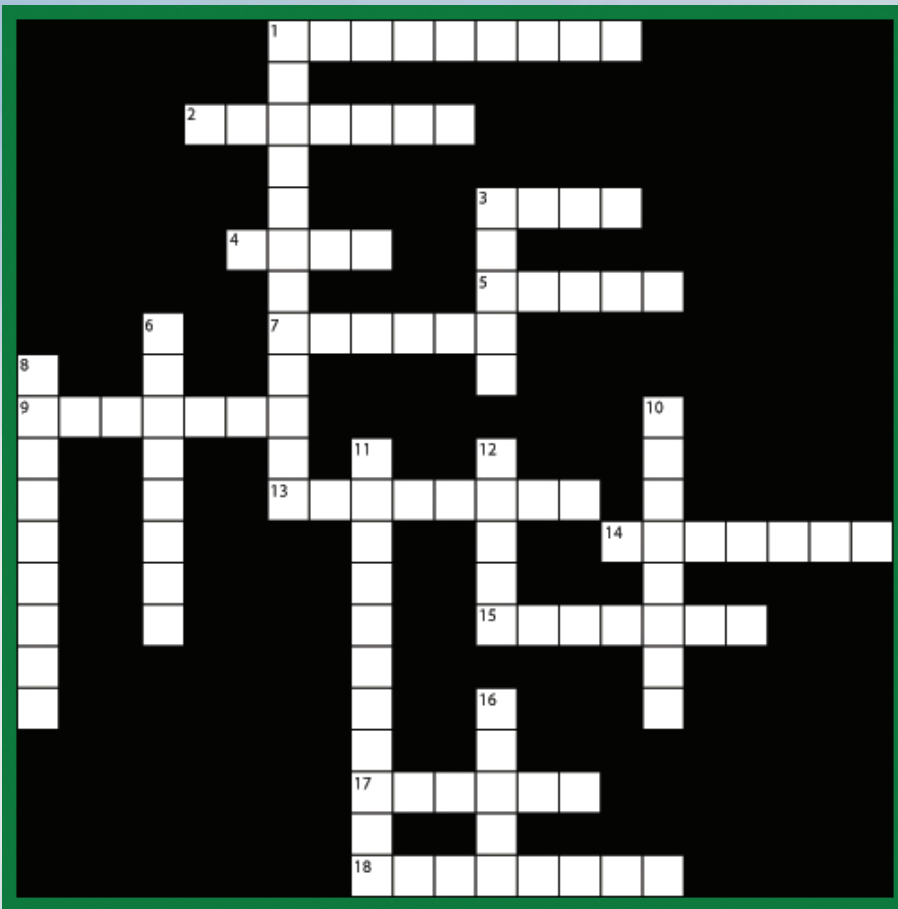
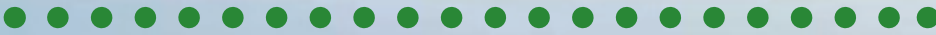
- \_\_\_\_\_ 1. tprox — selling products to another country
- \_\_\_\_\_ 2. ceosrev — saving the soil
- \_\_\_\_\_ 3. htsnhsspooytei — the way wheat plants make food using sunshine and soil nutrients
- \_\_\_\_\_ 4. drah dre sgrnip — the class of wheat highest in protein and used to make yeast breads
- \_\_\_\_\_ 5. asniemol — the coarsely-ground durum endosperm used to make pasta
- \_\_\_\_\_ 6. obnmeci — cuts, separates and cleans grain all at the same time
- \_\_\_\_\_ 7. race — a piece of land more than half as large as a football field
- \_\_\_\_\_ 8. draeg — the price farmers receive for their wheat at the elevator depends on this
- \_\_\_\_\_ 9. mdruu — class of wheat used to make pasta
- \_\_\_\_\_ 10. lubshe — wheat is often bought and sold by this unit of measurement for dry goods

## CROSS-OUT

Cross out the letters G, J, K, Q, U and Z to reveal good things wheat foods provide for your growing body.

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

# Wheat Foods Crossword Puzzle



## WORD BANK

gravy  
 sandwich  
 spaghetti  
 ravioli  
 pretzel  
 bread  
 licorice  
 pancake  
 buns  
 flour  
 macaroni  
 roll  
 bagel  
 waffle  
 lasagna  
 cereal  
 tortilla  
 Cream of Wheat  
 croissant  
 breadsticks

### Across

1. A flaky, rich, crescent-shaped roll.
2. A salted snack food shaped like a bow.
3. Hamburgers and hot dogs are served on this bread.
4. A small, round loaf of bread eaten with a meal.
5. Eaten on mashed potatoes, rhymes with navy.
7. A breakfast food with square-shaped dents all over it.
9. Round and flat, this breakfast food is served with syrup.
13. The outer covering of tacos.
14. A baked dish made of layers of broad, flat pasta, cheese, tomatoes and meat.
15. Small pockets of pasta filled with meat or cheese.
17. A breakfast food served in a bowl and covered with milk.
18. A peanut butter and jelly \_\_\_\_\_.

### Down

1. A hot, cream-style cereal.
3. A hard, glazed, ring shaped roll; often spread with cream cheese.
6. A rope candy that is usually red, black or brown.
8. Long, skinny pasta shape often eaten with meatballs.
10. Curved, tubular pasta shape often served with cheese.
11. Long, narrow strips of bread often served with pasta and pizza.
12. Finely ground wheat kernels used to make bread.
16. Served toasted for breakfast.





# Noodle Doodle



When in the late 1700s Yankee Doodle stuck a feather in his cap and called it macaroni, he was actually patting himself on the back for his fashion ingenuity, for “macaroni” was slang for stylish (the most chic and popular dish of the day being macaroni).

Legend has it that in the late 13th century, German bakers made large figures out of noodle dough in the shapes of men, stars, birds and sea shells, which they called collectively “dough men.”

These bakers went to Genoa, Italy, to sell their product, but the Italians found them too expensive and exclaimed, “Macaroni,” meaning “but it’s too dear.” So the Germans reduced the size, and with the size, the price. They made a bundle of money and the name stuck.

Want to make your own grain food? It’s important to remember to wash your hands with soap and water before making any type of food. Let’s get started! Pretzels make an excellent snack.



# Pretzels



1½ cups warm water (105-115° F)  
2 packages active dry yeast  
¼ cup sugar  
½ teaspoons salt  
¼ cup vegetable oil

4-4½ cups bread or all-purpose flour, divided\*  
1 egg white  
1 tablespoon water  
Sesame seeds or poppy seeds

*\*Up to two cups of whole-wheat flour may be substituted for an equal amount of all-purpose flour.*

Measure warm water into large bowl. Sprinkle in yeast; stir until dissolved. Add sugar, salt, oil and 3 cups flour; beat until smooth. Gradually add remaining flour to make a soft dough.

Knead dough by hand 10 minutes on a lightly floured surface. Cover bowl and let rest 30 minutes. Divide dough into 24 pieces; cover and let rest 5 minutes. Roll each into a uniform 18-inch rope. Shape into a pretzel by making a circle, overlapping the two ends, twisting them once and then pressing them onto the bottom curve of the circle. (Dough may also be shaped into 8-inch breadsticks.)

Place on greased baking sheets. Beat egg white and water together; brush pretzel tops. Sprinkle with sesame or poppy seeds. Bake in a preheated, 425° oven for 12 to 15 minutes or until golden brown. Remove from baking sheets; cool on wire rack. Eat when cool and enjoy!

## Nutritional Analysis

*With 24 pretzels, each provides 108 calories (21 percent from fat), 2.4 grams protein, 2.5 grams fat, 19 grams carbohydrates, 0.7 grams fiber and 134 milligrams sodium.*



# Answers



## CHOOSE HEALTHIER FOODS FROM EACH GROUP

- G Whole-wheat bread
- V Broccoli
- D Yogurt
- V Baked sweet potato
- F Peach
- P Roast beef
- G Cereal
- D Milk
- F Watermelon

## IDENTIFY THE PARTS

### Wheat kernel parts

1. bran
2. germ
3. endosperm
4. bran
5. endosperm
6. germ
7. bran, germ, endosperm
8. endosperm
9. bran
10. bran

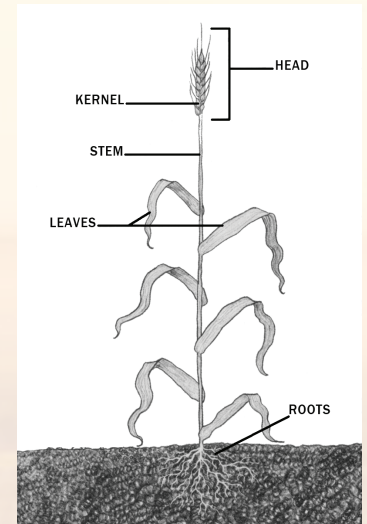
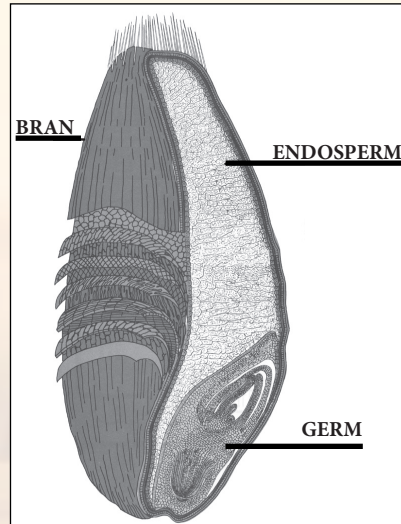
## TERM UNSCRAMBLE

1. export
2. conserve
3. photosynthesis
4. hard red spring
5. semolina
6. combine
7. acre
8. grade
9. durum
10. bushel

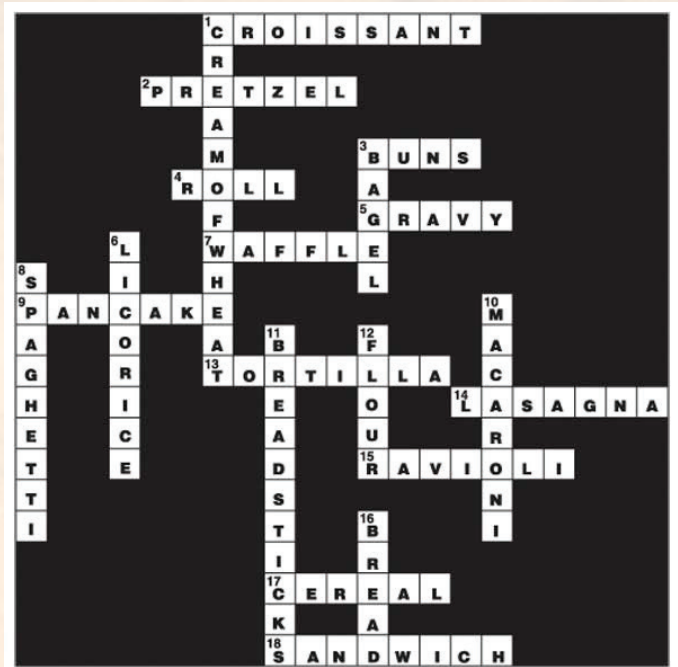
## NUTRITION CROSS-OUT

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

## WHEAT KERNEL DIAGRAM WHEAT PLANT DIAGRAM



## WHEAT FOODS CROSSWORD PUZZLE



Complex Carbohydrates, Fiber, Low-Fat, Vitamins, Protein



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e-mail: [ndwheat@ndwheat.com](mailto:ndwheat@ndwheat.com)  
[www.ndwheat.com](http://www.ndwheat.com)

*Adapted from "Wheat for Kids" in 1994. Revised in 1999, 2001, 2005, 2011 and 2016.*