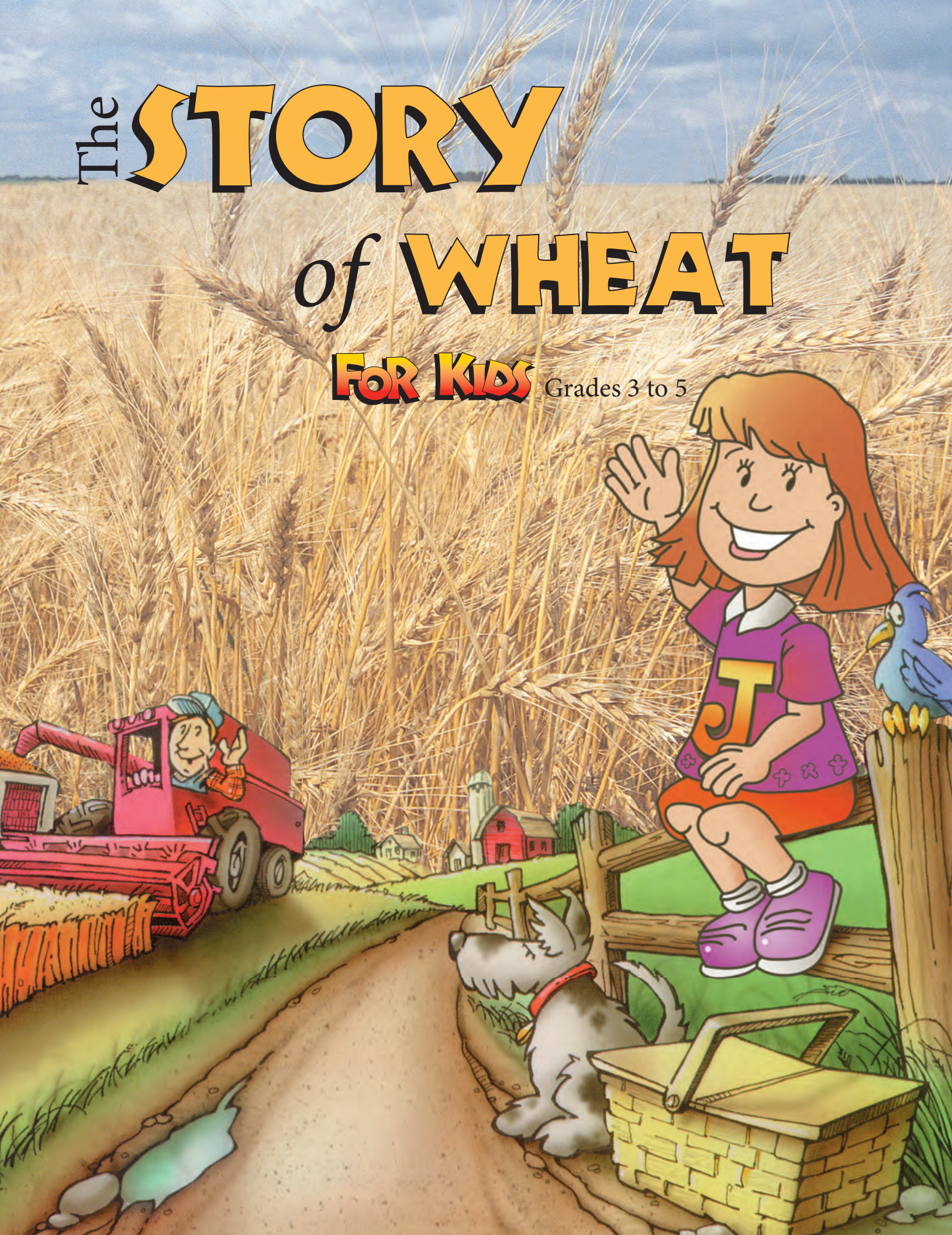


The **STORY** of **WHEAT**

FOR KIDS Grades 3 to 5



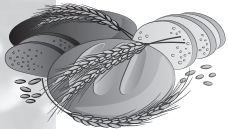


Have you ever been on a wheat farm? If you live in North Dakota, there's a good chance you have since there are thousands of wheat farms in the state. North Dakota farmers lead our nation in the production of hard red spring wheat and durum wheat each year, and rank second in total wheat production.

How do I know so much about wheat? My name is Jenny Johnson and I live on a North Dakota wheat farm. Besides, I 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 too? Well, come with me and you'll discover how farmers grow wheat and how this golden crop becomes the foods we love.

MEET THE KERNEL



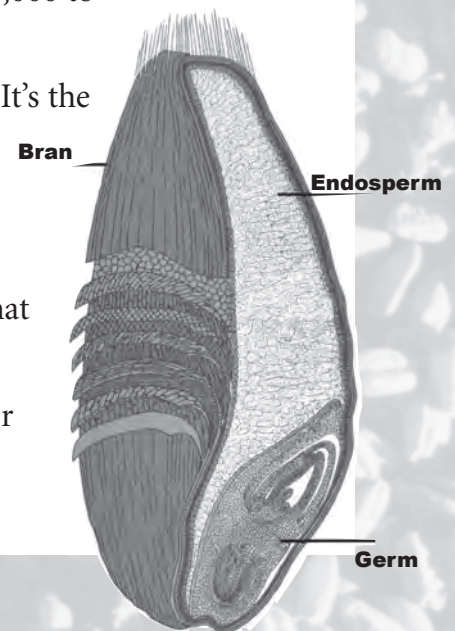
Here is a wheat **kernel**, or seed. It is enlarged so you can see how complex one kernel is. Kernels are very tiny — even smaller than our little fingernails! There are about 50 kernels in a head of wheat and 15,000 to 17,000 kernels in just one pound!

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.

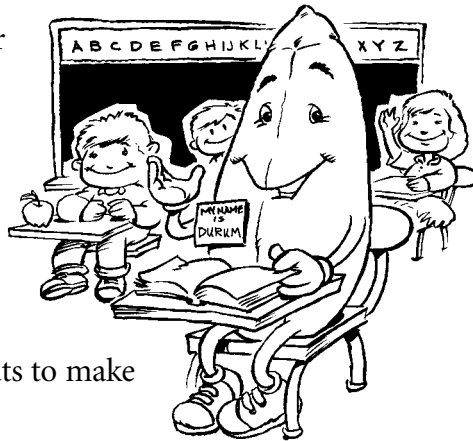


WHEAT IS “CLASSY”

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 spring, hard red winter, hard white, soft red winter, soft 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 in my favorite, pasta — macaroni, spaghetti, lasagna and more. Hard red spring wheat, the wheat highest in protein, can also be blended with other classes of wheats to make all-purpose flour.



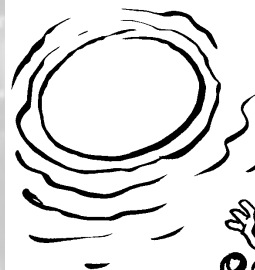
SOWING THE WAY

North Dakota farmers, like my mom and dad, grow hard red spring and durum wheats. 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, much work needs to be done to prepare the soil. My mom and dad use a **field cultivator** or **chisel plow** pulled by a tractor to till the soil. Tillage is similar to hoeing a garden because it breaks the soil into small pieces and kills weeds that grow early in the spring. When the soil is blackened and a proper seedbed has been prepared, my parents plant wheat with a **grain drill**. The drill opens a furrow in the soil, drops the seed in at an even depth, covers the seed and packs the soil.

My uncle Joe prepares and plants his fields in a little different way. He uses a **no-till drill** that places the wheat seed in the soil without turning the soil over. This method of planting helps prevent the soil from **eroding**, or wearing away. It **conserves**, or saves, the soil and its nutrients.



Whatever method farmers use, they 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.



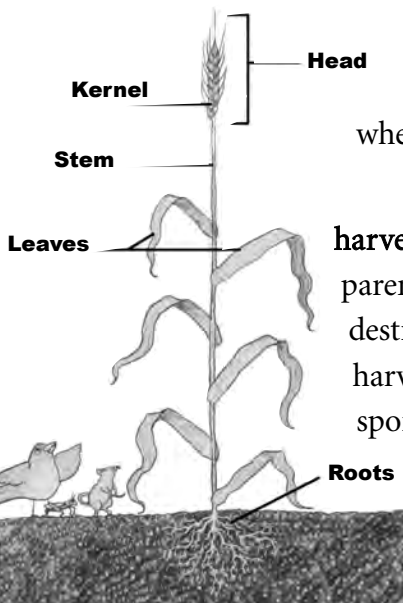
The **moisture**, or water, in the soil is what makes the wheat plant start to grow. At first, the germ, or the growing part of the seed, gets its food from the endosperm. As the wheat grows taller, though, it gets food from the soil and through its roots. The wheat plant's green leaves also make food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

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, my parents 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 GOT THE RIPE ONE, BABY

How do farmers know when the wheat is “just right” for harvest? Many farmers take a sample of wheat to the local elevator, where the wheat is tested to see if it’s dry enough to harvest. Other farmers, like my dad, 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 is ready to be 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 we 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, my grandparents tell the story of how they 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.

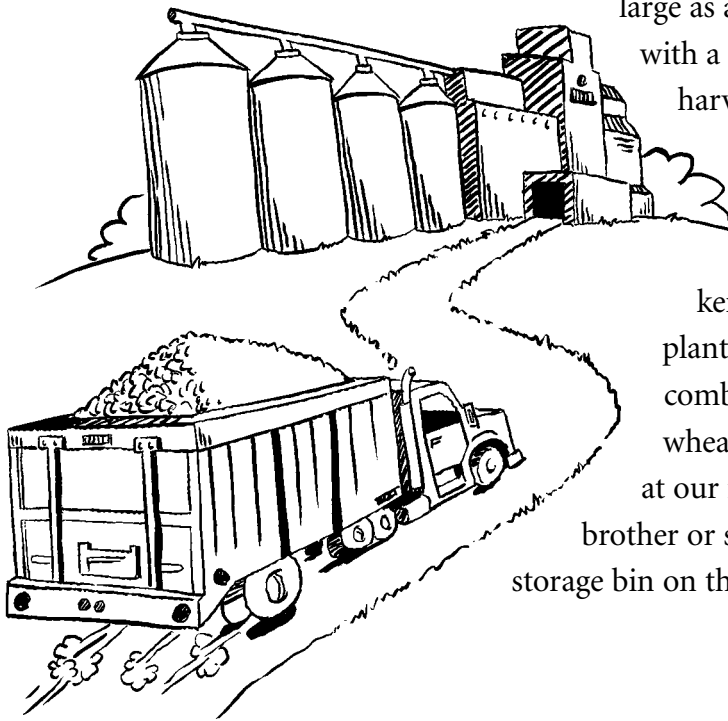
Combines have made wheat harvesting much faster and easier. It used to take three whole days to cut and thresh an **acre** of wheat, a piece of land more than half as

large as a football field! Today, though, with a large combine, my parents can harvest an acre in less than six 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, which, at our farm, is usually driven by my older

brother or sister. The grain is hauled to a storage bin on the farm or to a grain elevator.

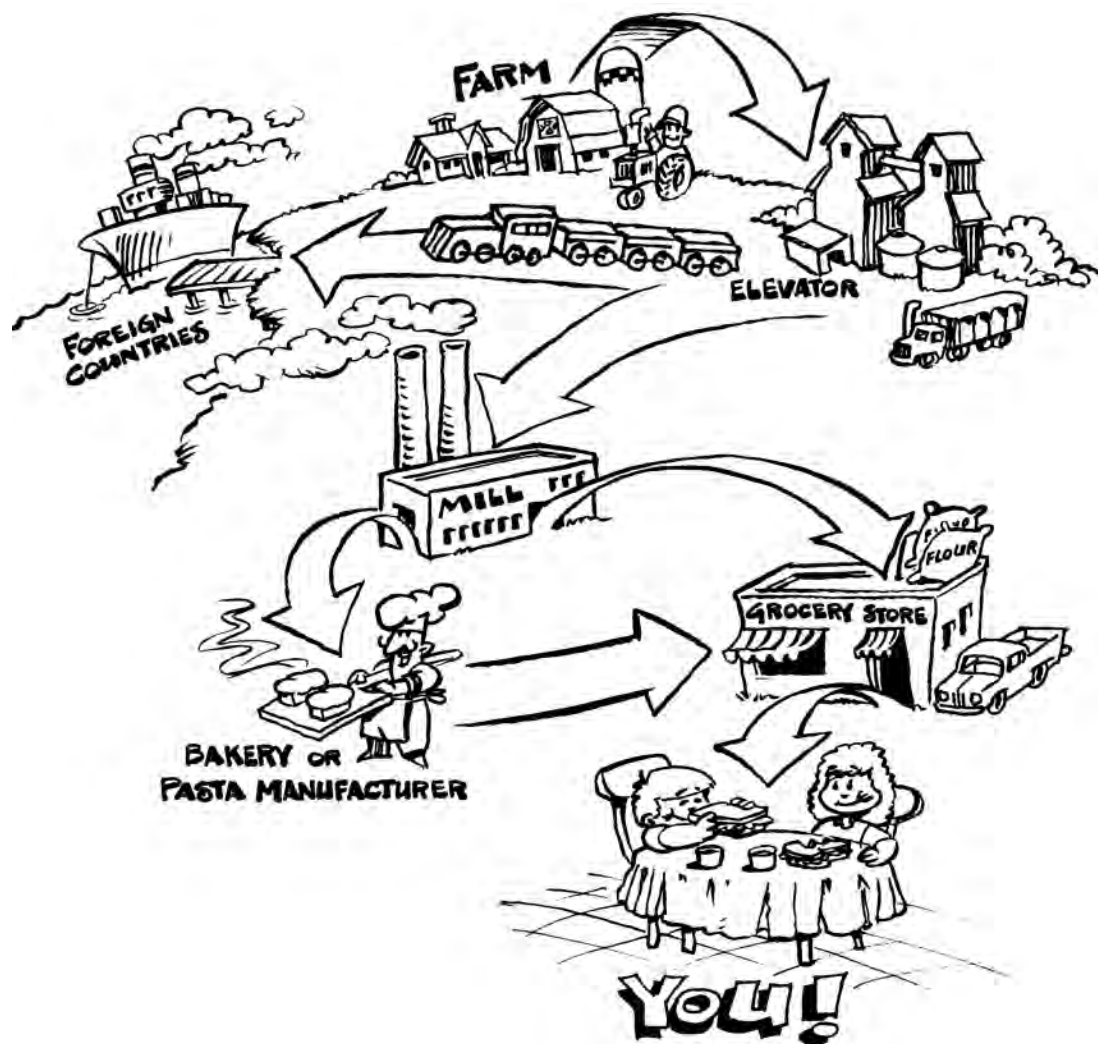


TO MARKET, TO MARKET

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. In my hometown of Wheaton, like many others, the grain elevator is the only skyscraper around!

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, just like some of my friends’ allowances depend on the grades they get in school! 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 magical protein called **gluten**. Some other grains have gluten too, but not as much as wheat.

I'll show you 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.

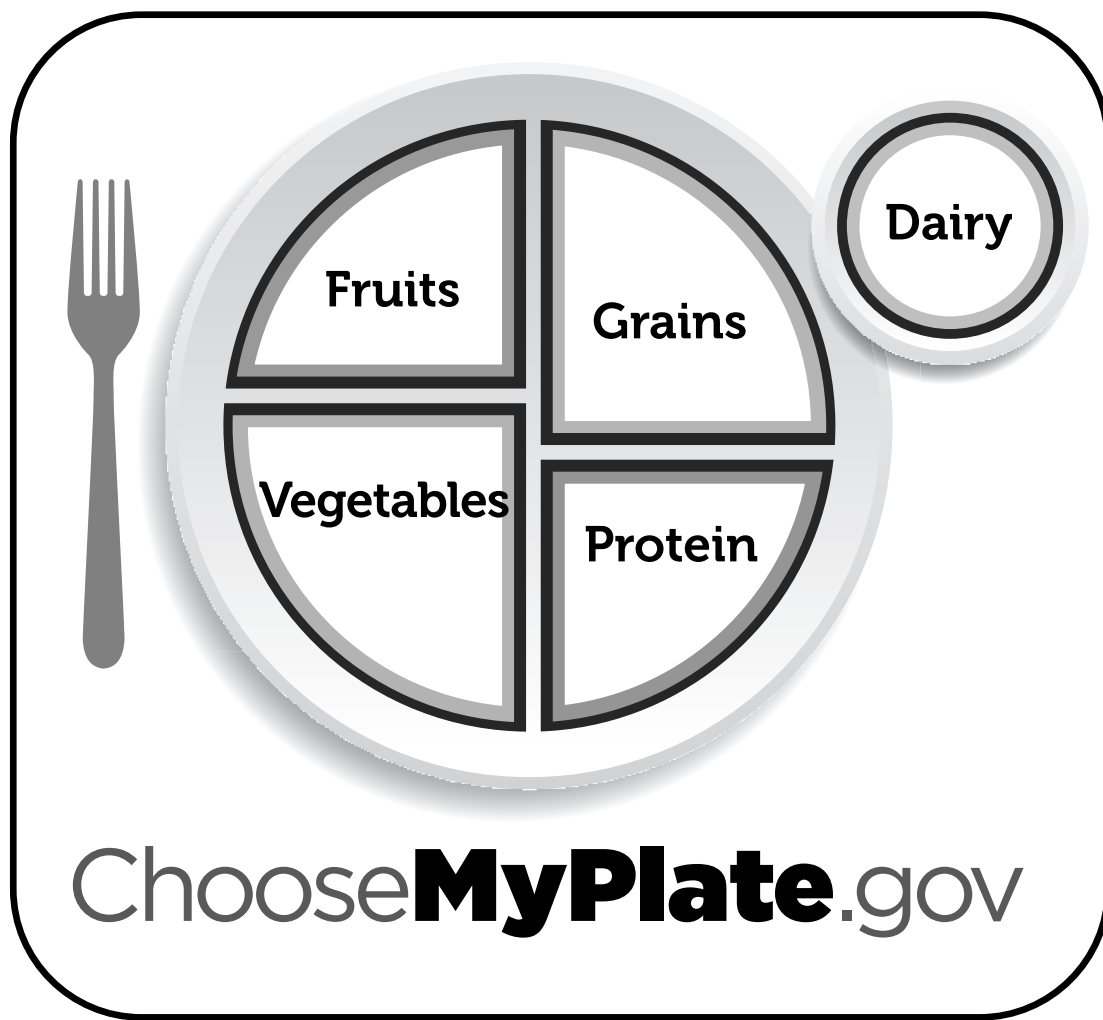
LOTS A PASTA

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



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 part of the plate on the upper right is for the grain group. Color the grain section orange. 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 vegetable section on the bottom left side of the plate. Color it green. Some kids don't eat enough vegetables. It is important to eat dark green and orange vegetables. I like broccoli, carrots, spinach and sweet potatoes.

Color the next section in the upper left of the plate red for fruits. I always put fresh fruit in my backpack and eat a piece of fruit as a snack every day. Dried, frozen and canned fruits are great too.

The circle next to the plate is for the dairy group. Color it blue. 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. Color it purple. 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.

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. I eat these foods on special occasions. Then I run up and down the stairs a bunch of times, or find another fun way to exercise!



Now with your plate colored orange, green, red, purple, and the circle colored blue, remember to eat every color every day. The different colors remind us to eat foods from all the foods groups.

For more nutrition lessons, visit www.choosemyplate.gov
Nutritional information is also available at www.wheatfoods.org.

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 EVERY DAY

Jenny Johnson is 9 years old. She's physically active sometimes. Each day, she needs to eat:

Grains	Vegetables	Fruits	Dairy	Protein
6 ounces	2 1/2 cups	1 1/2 cups	3 cups	5 ounces

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

WHAT COUNTS AS AN OUNCE?

Here is an easy guide for the grains group:

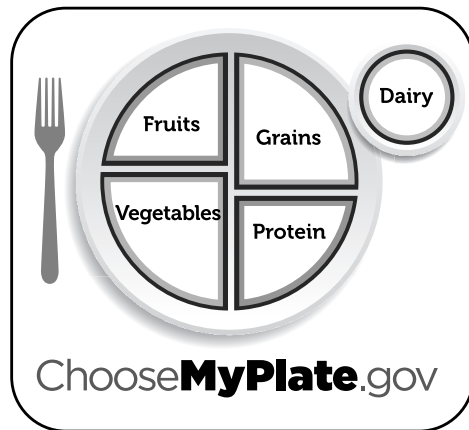
- ✓ 1 slice bread
- ✓ 1/2 cup cooked pasta
- ✓ 1/2 bun or pita
- ✓ 1/2 soft pretzel
- ✓ 5-7 crackers
- ✓ 1 small waffle or pancake
- ✓ 1 small tortilla
- ✓ 1 cup of cereal
- ✓ 1/2 English muffin or bagel

CHOOSE HEALTHIER FOODS FROM EACH GROUP

Every food group has a section on my plate. 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



Grains Vegetables Fruits Dairy Protein

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.

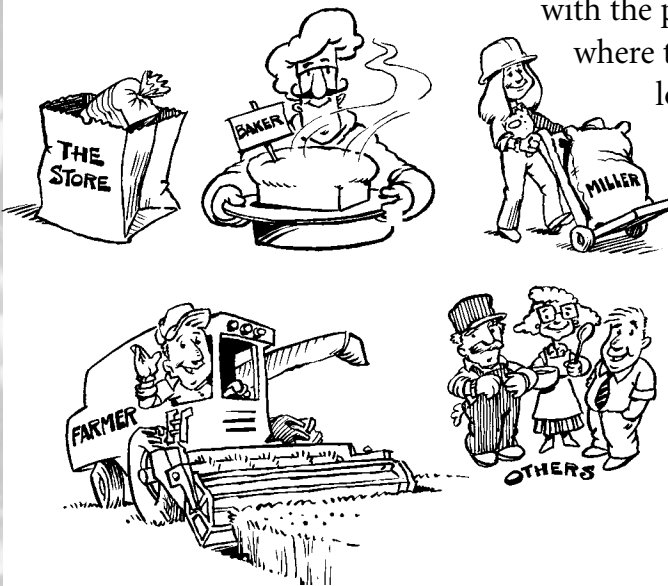
Not all children grow up eating bread like you and me. Instead, some eat mostly rice foods. Wheat farmers in the United States send people to foreign countries to teach people there how to make wheat foods and to use bread, cereal and other wheat foods in their daily diets. When these people realize wheat foods are good for them and taste good too, their countries buy wheat from American farmers.



Wheat farmers **export** their wheat, or sell it to other countries, because they raise more than we Americans can eat. In fact, the United States sells about half the wheat we grow to about 100 different nations around the world — everywhere from Japan to Venezuela.

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?

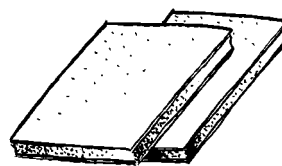
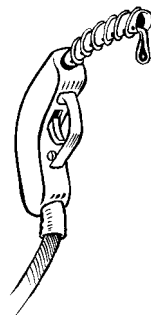
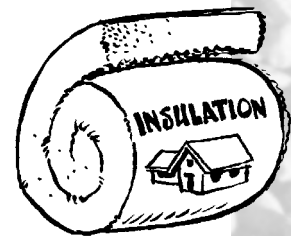
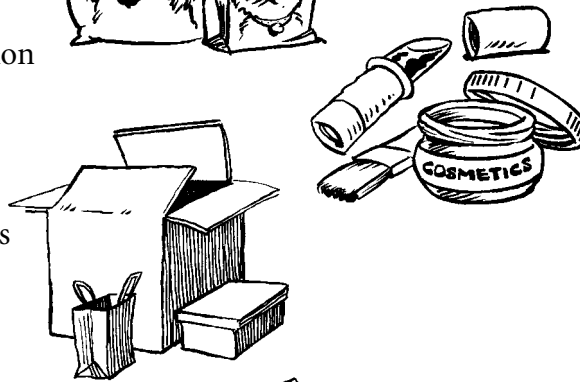
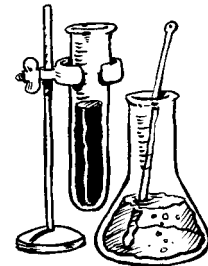
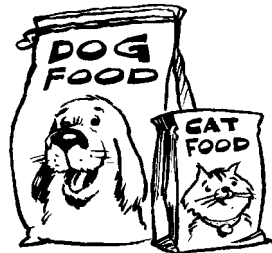


A one-and-a-half pound loaf of white bread — the size we usually find in the supermarket — costs about \$3.00. Of that amount, the farmer gets only 10 to 20 cents. The rest of the money provides jobs for other people who help make wheat into bread. It pays people who work at the elevator, flour mill, bakery, railroad, and trucking companies, and the supermarket, as well as the cost to package it.

BEYOND THE TABLE

When you hear the word “wheat,” do you automatically think of bread, pasta and other wheat foods? I know I do, because these treats are some of my favorite foods! 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 crop my family raises on the farm. 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:

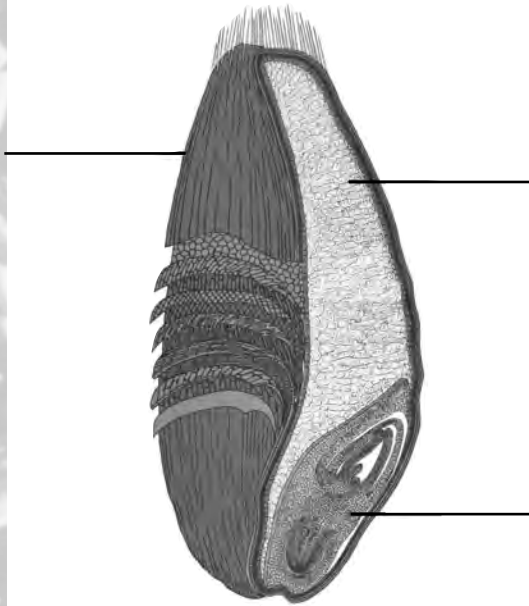
bran

endosperm

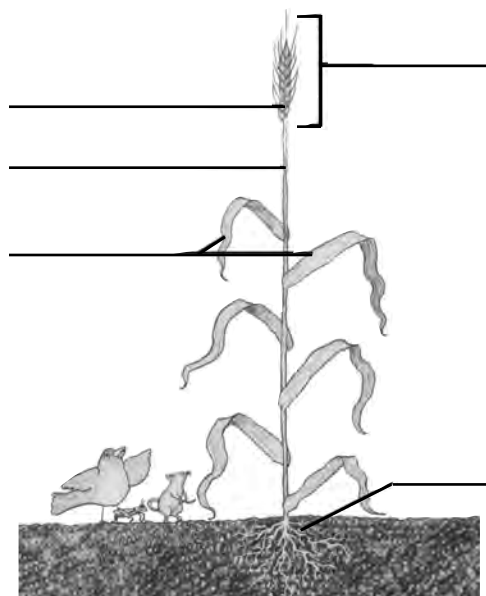
germ

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.

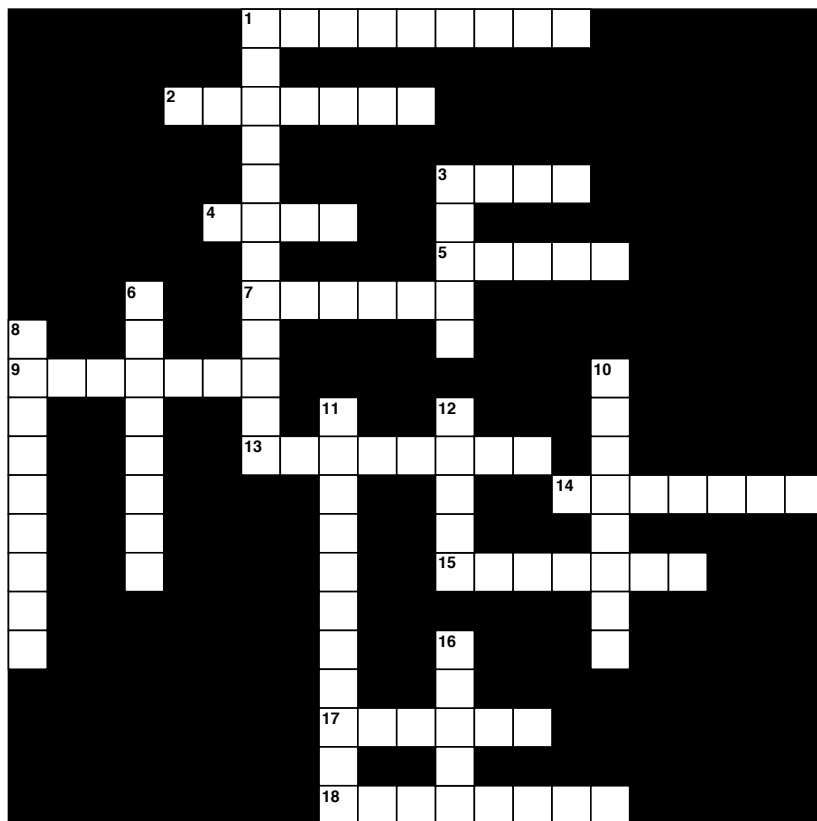
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
1. **tprox**e — selling products to another country
 2. **ceosnrev** — saving the soil
 3. **htsnhsspooytei** — the way wheat plants make food using sunshine and soil nutrients
 4. **drah dre sgrnip** — the class of wheat 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, “Ma caroni,” 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

1 1/2 cups warm water (105-115° F)	4-4 1/2 cups bread or all-purpose flour, divided*
2 packages active dry yeast	1 egg white
1/4 cup sugar	1 tablespoon water
1/2 teaspoons salt	sesame seeds or poppy seeds
1/4 cup vegetable oil	

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

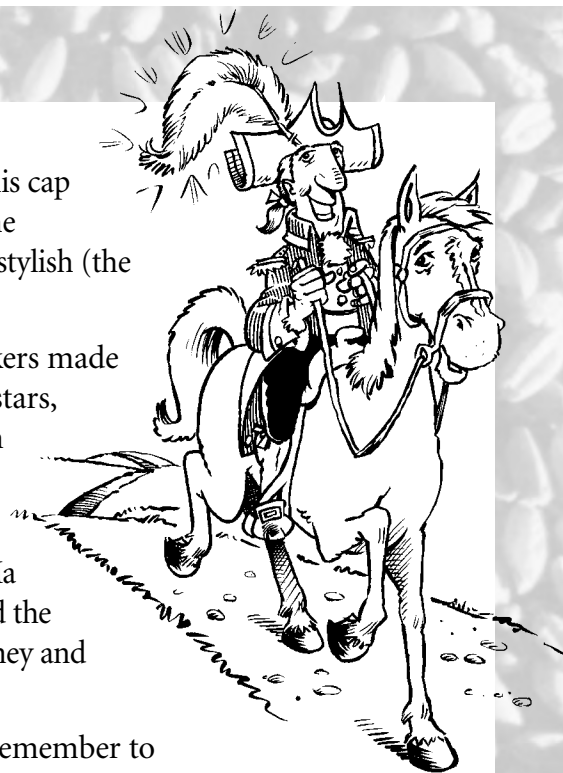
Measure warm water into large bowl. Sprinkle in yeast; stir until dissolved. Add sugar, salt, oil and 3 cups flour; beat until smooth. Gradually add remaining flour to make a soft dough.

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.

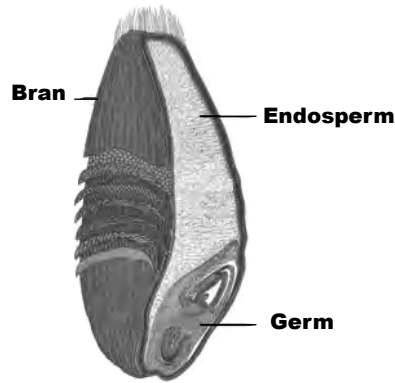


ANSWERS

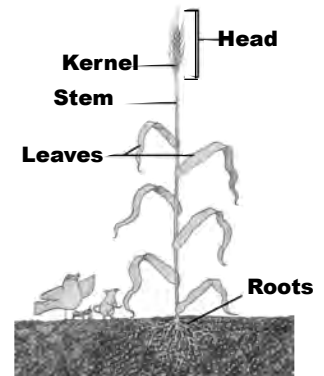
CHOOSE HEALTHIER FOODS FROM EACH GROUP

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

WHEAT KERNEL DIAGRAM



WHEAT PLANT DIAGRAM



IDENTIFY THE PARTS

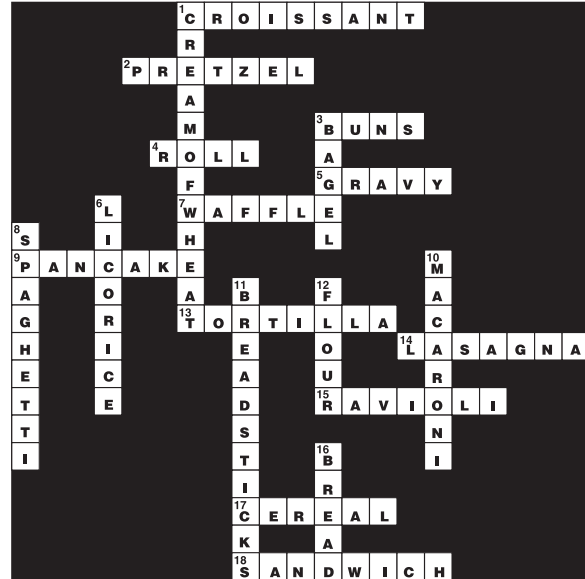
Wheat kernel parts

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

WHEAT FOODS CROSSWORD PUZZLE



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 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

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



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