



# ENJOYING THE HARVEST



NEW MEXICO DEPARTMENT OF  
CULTURAL AFFAIRS



# Enjoying the Harvest

**Grades 3-5**

## Vocabulary:

**Bran**

**Endosperm**

**Germ**

**Grain**

**Mill**

**Miller**

**Photosynthesis**

**In this activity, students will identify the parts of a wheat plant and wheat kernel and investigate the process of milling wheat kernels into flour.**



## Enjoying the Harvest

In this activity, students will identify the parts of a wheat plant and wheat kernel and investigate the process of milling wheat kernels into flour.

### Vocabulary:

**bran:** the multi-layered, hard outer covering of a kernel of cereal grain

**endosperm:** nutritive matter formed within a seed in seed plants

**germ:** the embryo of a seed in the seed of a cereal grain

**grain:** the edible seed or seed-like fruit of grasses that are cereals

**mill:** a machine used in treating (by grinding, crushing, stamping, cutting, or finishing) raw material

**millers:** a person that grinds grain into flour

**photosynthesis:** the process through which a green plant turns water and carbon dioxide into food when the plant is exposed to light

## Background Agricultural Connections

Bread has been an important part of the human diet since early times. Loaves baked over 5,000 years ago have been found in ancient Egyptian tombs. Wheat has been discovered in pits where human settlements existed 8,000 years ago. In the Stone Age, solid cakes were made from crushed wheat. Bread provided ancient civilizations with a reliable food source.

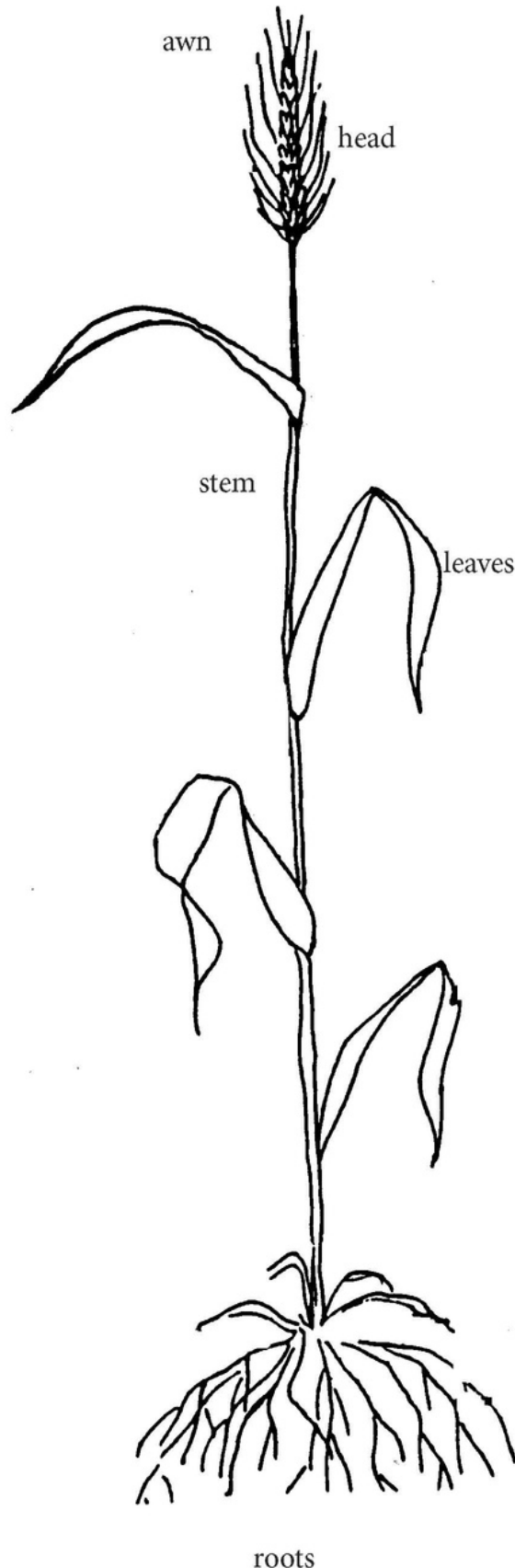
The wheat plant has four basic parts—**roots**, **stem**, **leaves**, and **head**. The **roots** anchor the plant in the soil, absorbing water and nutrients and transporting them to the stem. The **stem** supports the head and helps transport nutrients and water throughout the plant. The **leaves** are responsible for photosynthesis. The **head** of the wheat plant contains the wheat seeds, also referred to as kernels or berries.



Vertical-style grist mill located near Ruidoso, New Mexico

# Anatomy of a Wheat Plant

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The wheat plant has four basic parts: the head, stem, leaves and roots. Wheat plants grow to be about 2-4 feet tall.

The **awn** is a slender, bristle-like attachment of a wheat plant, such as those found at the tips of the spikelets in many grasses.

The **head** contains kernels or the wheat seeds.

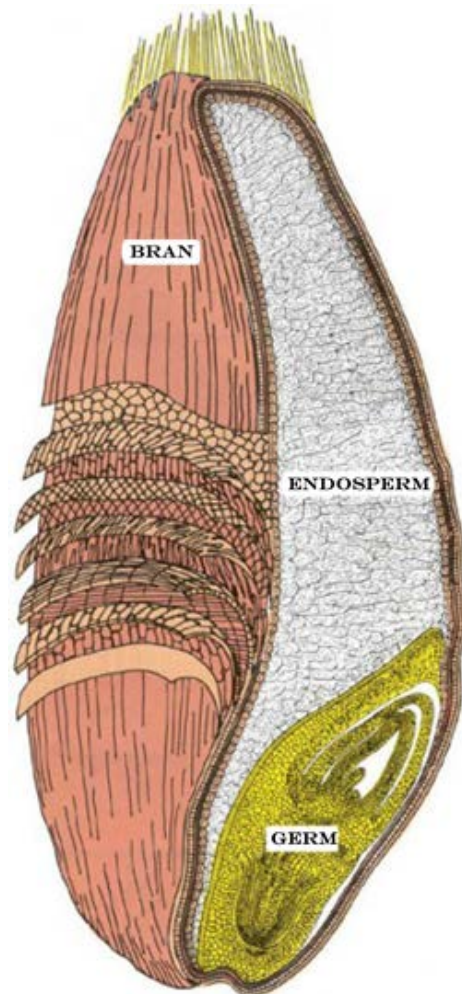
The **stem** supports the head and helps transport nutrients and water throughout the plant.

The **leaves** are responsible for photosynthesis, the process in which green plants produce simple carbohydrates by using carbon dioxide, hydrogen and a light source, usually the sun.

The **roots** anchor the plant in the soil and absorb water and nutrients from the soil and transport them to the stem.



Wheat flour is made from the kernels of the wheat plant. The kernel is the seed from which the wheat plant grows. A wheat kernel contains three distinct parts—the **bran**, **germ**, and **endosperm**. The bran is the multi-layered, hard outer covering of the kernel. **Bran** consists of important antioxidants, B vitamins, and fiber. The **germ** is the embryo or sprouting section of the kernel. It is the part of the wheat kernel that will sprout and grow into a new wheat plant. During the milling process, the germ is often separated from the flour because its fat content limits the flour's shelf-life. The germ contains B vitamins, protein, minerals, and healthy fats. The **endosperm** is the germ's food supply. In its natural state, the endosperm provides essential energy to the young wheat plant, allowing the plant to send roots down into the soil to absorb water and nutrients and shoot sprouts up for sunlight.



In Neolithic times, saddle stones (cradle-shaped pieces of hard stone) and hand stones (cylindrical-shaped stones) were used to crush grain into coarse flour. In the Stone Age, hand-powered rotary querns consisting of a rotating circular stone on top and a stationary stone on the bottom to grind grain. In the 18th century, automated stone wheels, powered by wind or water, rose in popularity as a method of flour production. The invention of the roller mill in the middle of the 19th century increased the productivity of flour mills. Commercial flour mills today still use the roller mill; however, they are utilizing the advances in modern technology to improve the efficiency, reliability, and safety of flour production.

People have used gristmills to grind grain (grist) for thousands of years. The first recorded evidence of a gristmill in New Mexico occurs in a letter written by Don Juan de Oñate in 1599. Spanish horizontal-wheel mills operated on the acequias (communal irrigation systems) that were dug throughout New Mexico. Nearly every village had a mill, and many had more than one. It took one mill to feed 30 to 40 families. At one time, there were as many as 445 gristmills in New Mexico.

When wheat arrives at the mill, it is weighed, tested, cleaned, and conditioned. To condition the wheat kernels, water is added to the grain in order to toughen the outer part of the wheat and soften the inner part. The wheat then rests for about twelve hours. Steel rollers break open the grain to release and separate the endosperm from the bran and the germ. The starchy endosperm is ground and sifted several times to make white, all-purpose flour. When making whole wheat flour, the bran and germ are put back into the white flour at the end of the milling process. The flour is then packed into bags to be transported to stores, bakeries, and food processing plants.

**Fill in the blank with the best answer:**

1. The leaves of a wheat plant are responsible for? \_\_\_\_\_
2. Which part of the wheat plant contains the seeds? \_\_\_\_\_
3. What are the three parts of a wheat kernel? \_\_\_\_\_
4. What does a miller do? \_\_\_\_\_
5. The first evidence of a gristmill in New Mexico was in the late 1500's. Almost every village had a mill, how many gristmills were there? \_\_\_\_\_
6. What is a grain? \_\_\_\_\_
7. What does the endosperm do for a wheat plant? \_\_\_\_\_
8. What is put back in to make wheat flour? \_\_\_\_\_

(Answers: 1 – photosynthesis; 2 – head; 3 - bran, germ, endosperm; 4 – grinds the flour; 5 – 445; 6 – the edible seed or seed-like fruit of grasses that are cereals; 7 - provides essential energy to the young wheat plant; 8 - bran and germ)



## Education Content Standards

### Science

#### 4. Structure, Function, and Information Processing

**4-LS1-1** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

### Literacy

**CCSS.ELA-LITERACY.CCRA.R.1** Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

**CCSS.ELA-LITERACY.CCRA.W.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.



# Tortillas in a Bag

Makes four tortillas  
(adult supervision required)

1-qt storage bag  
1 1/2 c flour  
1 t baking powder 3 T shortening  
1/2 c hot tap water  
1/4 t salt (or to taste)

1. Place flour, salt and baking powder in bag. Close and shake just a few shakes to mix.
2. Add shortening and reclose the bag. Work bag with hands until the mixture looks crumbly and there are no large pieces of shortening visible.
3. Open the bag, and add the hot tap water. Knead in the bag until the dough is one large piece and the sides of the bag come clean.
4. Take the dough out of the bag, and divide into four pieces. Put the pieces of dough on the table, and lay the bag on top of them. Let the dough rest for 15 minutes.
5. After resting time, roll or pat the dough into eight- to 10-inch circles. If dough is too sticky you may add a little more flour.
6. Place the circles on a griddle or frying pan heated to medium or medium high, and cook until dark brown spots appear. Turn and cook on the other side until brown.

