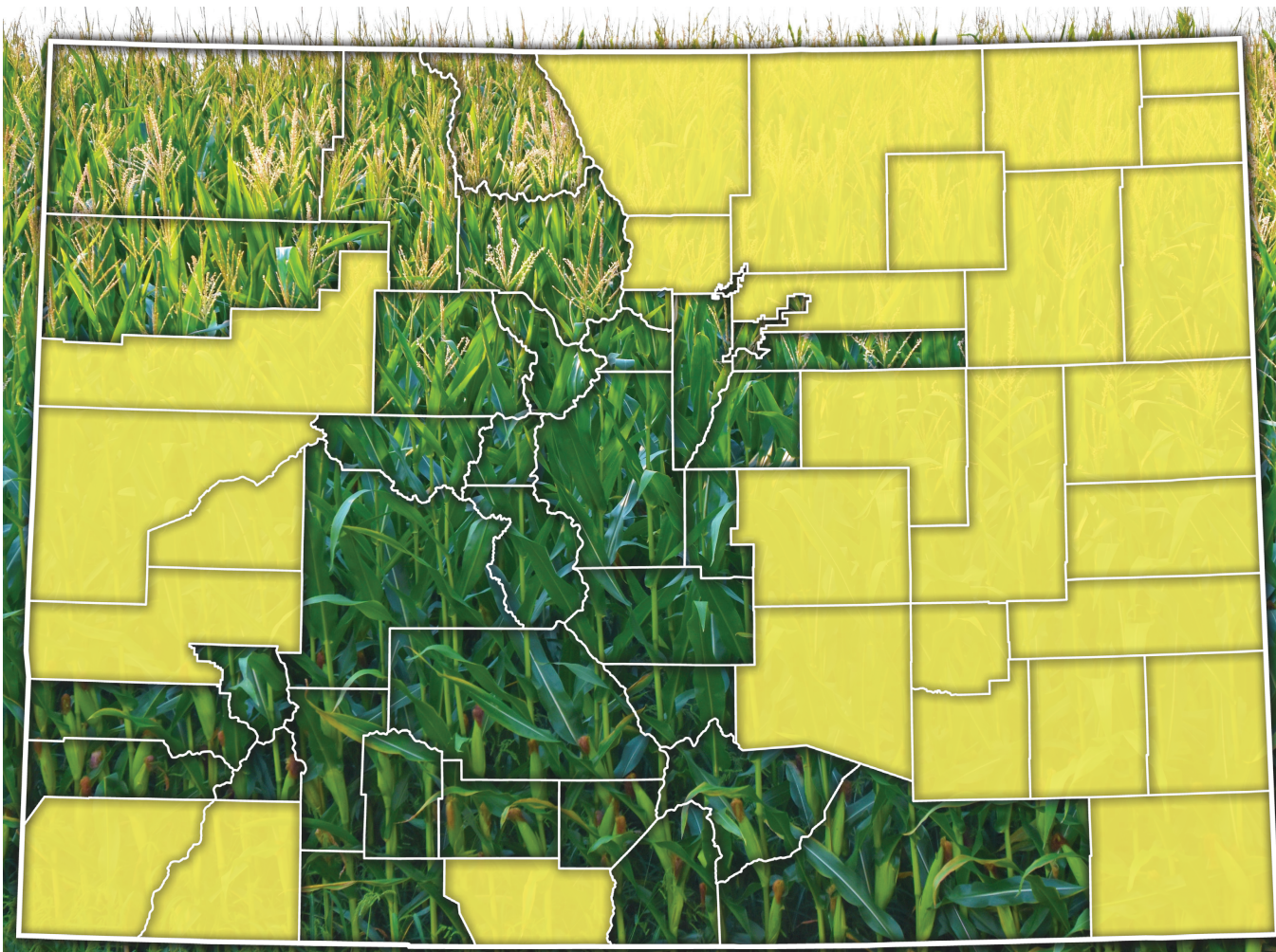




# CORN: IT'S FEED. IT'S FUEL. IT'S FOOD. IT'S EVERYTHING!

Of all the crops grown in Colorado, corn is king! Colorado farmers, by far, grow more **dent or field corn** than any other crop. Did you know that most of the corn you see when driving across Colorado is dent corn and not for you and me to eat? The map below and the chart to the left represent the top Colorado counties that harvested the greatest number of bushels of dent corn, according to 2017 USDA National Agricultural Statistics Service data. **Complete this activity by writing the rank number on the map for each of the counties colored in yellow.**

Rank	County	Bushels of Corn Harvested/Year
1	Yuma	44,878,000
2	Kit Carson	28,955,000
3	Phillips	18,885,000
4	Logan	14,062,142
5	Weld	10,595,000
6	Washington	10,385,000
7	Morgan	9,959,000
8	Sedgwick	9,245,000
9	Cheyenne	6,960,000
10	Baca	5,660,274
11	Prowers	4,283,514
12	Adams	2,395,000
13	Kiowa	2,261,313
14	Otero	2,180,000
15	Bent	2,103,000
16	Lincoln	1,873,924
17	Larimer	1,383,435
18	Pueblo	1,094,000
19	Mesa	1,006,529
20	Montrose	968,698
21	Delta	672,246
22	Elbert	464,000
23	Montezuma	397,452
24	Boulder	256,000
25	La Plata	77,804
26	Garfield	62,196
27	Crowley	25,090
28	Conejos	3,900
29	El Paso	500

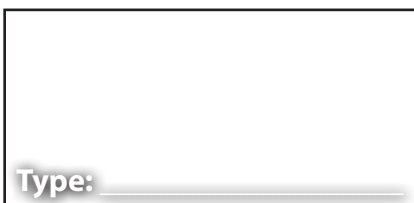


# TYPES OF CORN

Along with wheat and rice, corn is one of the world's major grain crops. First domesticated in Mexico, corn is now grown on every continent of the world except Antarctica. It is the largest grain crop grown in the United States today, and the United States is the largest producer of corn in the world. Corn is in the grass family and the scientific name for corn is *Zea mays*. All types of corn belong to this species, including dent (field) corn, sweet corn, popcorn, flour corn, and flint corn.



**DENT CORN:** The most abundant type of corn grown in the United States is actually dent corn, also called field corn. Almost all the corn you see in fields is dent corn. Unlike sweet corn, dent corn has a hard outer portion about the thickness of your fingernail. The inner portion of the corn kernel is soft and floury. It is referred to as dent corn because of the indentations or “dents” on the top of each kernel.



**SWEET CORN:** Sweet corn is the kind of corn you buy at the grocery store to eat. You can eat it off the ear as corn-on-the-cob. You can also buy it in cans or in the frozen food aisle. Fresh sweet corn is found most often during the summer and is extra sweet because it contains more natural sugars than other types of corn. We grow excellent sweet corn in Colorado. But, less than 1 percent of corn grown in the U.S. is sweet corn.



**POPCORN:** The composition of the kernel distinguishes popcorn from other varieties. Corn in general is made of starch, protein, fat, and water. Water is stored in a small circle of soft starch in each kernel. As the popcorn kernel is heated, the water heats, builds up pressure, and takes up any available room until the outer surface gives way and the kernel explodes into the fluffy white snack we all love. There are some farmers in Colorado that do grow popcorn, although it represents very little of all of the corn grown.



**FLOUR CORN:** Flour corn is used in baked goods because it has a soft, starch-filled, kernel that is easy to grind. Flour corn is primarily white, although it can be grown in other colors, for example, blue corn. One of the oldest types of corn, flour corn was a chief type grown by Native Americans.



**FLINT CORN:** Flint corn, also known as Indian corn, is used for similar purposes as dent corn. Flint corn is distinguished by a hard outer shell and kernels with a range of colors from white to red. Today, most flint corn is grown in Central and South America.

**INVESTIGATE:** Using the descriptions and photos above, label each photo with the correct name of each type of corn seed. Then, looking at the photos, describe some the differences (color, size, shape, etc.) you notice using complete sentences.

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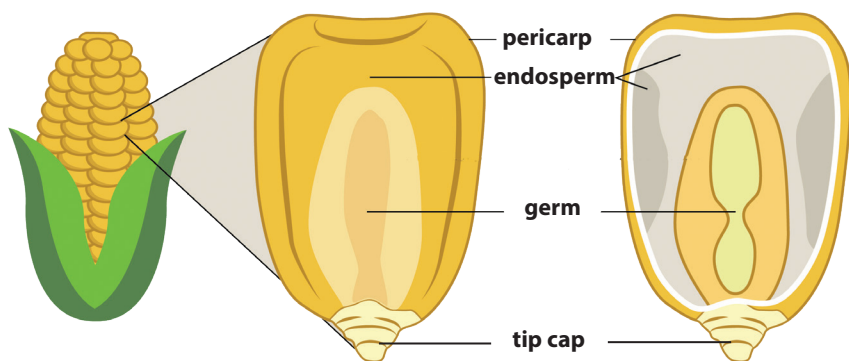
# CORN FACTS



An ear of corn has an average of sixteen rows with 800 kernels. There are approximately 1300 kernels in one pound of corn. An acre (about the size of a football field) of corn can yield more than 13 million kernels. In the United States, corn production is commonly measured in **bushels**. This measurement originated as a unit of volume but has been standardized

to units of weight for different commodities. One bushel of shelled corn is equivalent to 56 pounds (25 kg).

The corn seed (kernel) is composed of four main parts: the **endosperm**, the **pericarp**, the **germ**, and the **tip cap**. The endosperm makes up most of the dry weight of the kernel and provides the source of energy for the seed. The pericarp is the hard, outer coat that protects the kernel both before and after planting. The germ is the living embryo of the corn kernel. It contains genetic information, vitamins, and minerals that the kernel needs to grow. The tip cap is where the kernel is attached to the cob and is the major entry path into the kernel for water and nutrients.



**Hybrids** of corn, produced by crossbreeding different varieties, have been developed to grow well in varying conditions and locations worldwide. The development of hybrid varieties, along with synthetic fertilizers and new farm machinery, has facilitated huge increases in corn productivity. Today, more corn can be grown on less land than ever before.

# RENEW WITH CORN

**Renewable resources** are either naturally reproduced at a sustainable rate or they can be produced in agriculture at a rate equivalent to the demand or need. **Nonrenewable resources** are made naturally by the Earth but do not renew themselves fast enough for people to count on having the resource for an indefinite period of time.

Corn can be used to make a type of plastic known as **bioplastic**. Commonly, plastic is made from by-products of petroleum used to refine crude oil for fuel and is a nonrenewable resource. In contrast, bioplastic is made from biological materials—plant starches, cellulose, oils, or proteins. Unlike petroleum-based plastics, bioplastics are made from renewable resources such as corn, potatoes, tapioca, and casein (milk protein).

**Biofuel** is any fuel made from biological plant matter rather than fossil fuels. **Ethanol** is a form of biofuel. It can be made by fermenting sources of starch such as corn, wheat, grain sorghum, barley, potatoes, and sugar crops. Corn is the most common ethanol source due to its abundance in the United States. Biofuels are a product of agriculture and are considered a renewable resource because they can be produced repeatedly, year after year.

## STUDENT ACTIVITY - MAKING BIOPLASTIC

Make your own bioplastic using cornstarch, corn oil, and water. Ask your teacher for the instruction page included with this packet of *Colorado Readers* or find the instructions and demonstration video online at: <http://bit.ly/Reader-Corn>



## Corn Revolution Video

<http://bit.ly/PetersonBrosCorn>

The **#CornRevolution** is here! An original song and music video dedicated to the research and development behind today's corn plants, from the Peterson Farm Brothers. YouTube link safe for kids!

# THE CORN CONTINUOUS LIFE CYCLE

The corn life cycle is a process that begins in the early spring around mid-April to mid-May across the U.S. Corn is planted in rows that are spaced 2.5 to 3 feet apart. The seeds are also planted 1.5 to 2 inches deep and 4 to 6 inches apart to ensure that the plant has enough room to grow and can stay warm and protected from the weather and birds.

The growth stages of a corn plant are divided into two categories: vegetative stages (v) and reproductive stages (r). **Vegetative stages** involve the growth of the plant itself and are counted by the number of leaves (called **leaf collars**) present. The **reproductive stages** involve the development of the seeds or kernels inside the ear of corn. The silks of an ear of corn are pollinated by pollen that falls from the **tassel** of the surrounding corn plants.

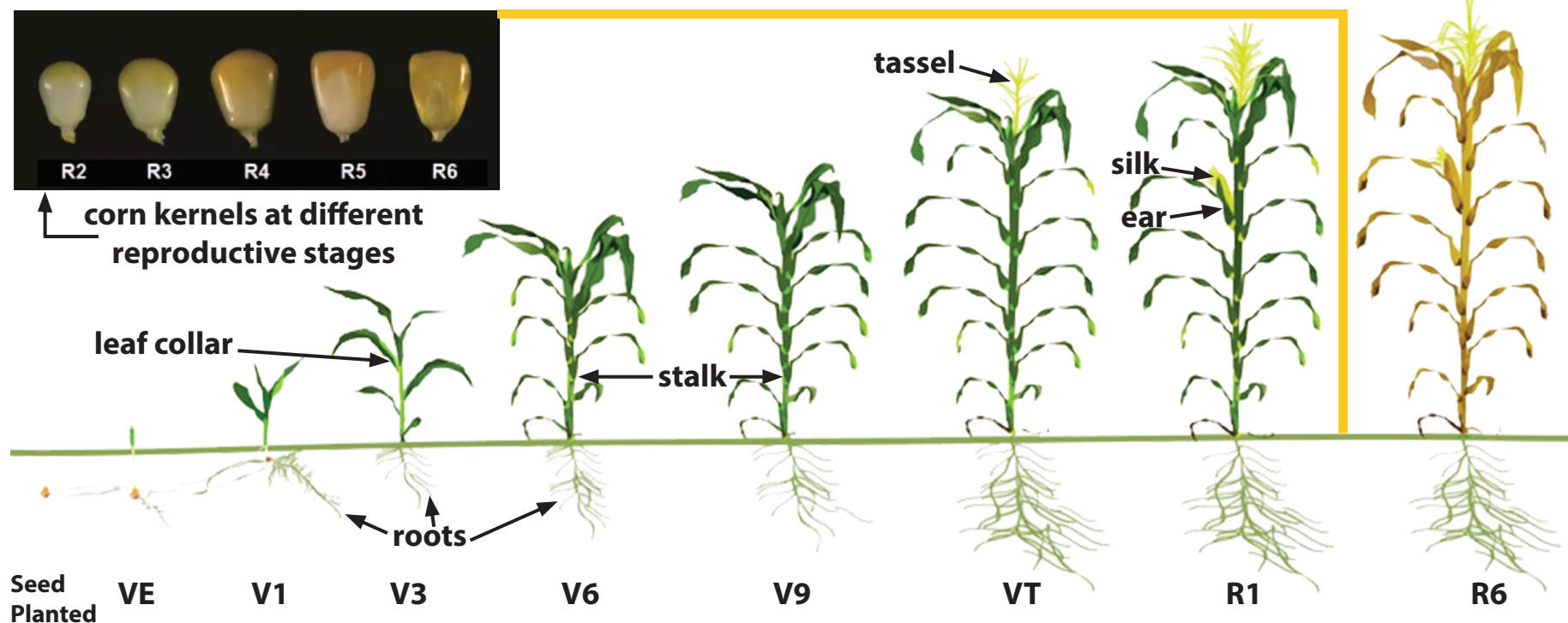
Once planted, the corn seed will **germinate** in the soil. A seed needs three things to germinate: warmth, moisture, and air. The seed will begin to absorb water and swell. Air

around the seed in the soil keeps it from growing mold. Water, temperature, and weather conditions (hail, wind) during each stage can affect the final yield of the corn crop.

In Colorado, farmers grow either dry ground corn or irrigated corn. **Dry ground** corn simply means the corn plant gets all of its moisture to grow from rain or snow, no additional water is applied to the field. **Irrigated** corn means additional water is applied to the field using either a ditch or center pivot system. Ditch irrigation involves delivery of water to the field through a network of tubes and ditches, with the water being siphoned off a main waterway. Center pivots apply water in a circular pattern around a central pivot point in the field. The corn is watered with sprinklers and water is sourced from a well or underground aquifer.

Farmers will also apply **fertilizer** to their crops to help aid in the growing process. Corn has three main **macronutrients** (nutrients needed in the highest quantity) that it needs to grow. These nutrients are nitrogen (N), phosphorus (P), and

**Farmer Rule of Thumb:  
Corn planted on May 1 will  
be harvested on October 5.**



Graphics courtesy of Pioneer.com - Staging Corn Growth

potassium (K). Farmers apply fertilizer using the **4R method**: right source, right rate, right timing, and right placement. Farmers never want to apply more fertilizer than what is needed because of environmental factors and the cost associated to apply additional fertilizer. They only apply fertilizer where the plants are not getting sufficient nutrients. Fertilizer can come in many forms. Some forms, like anhydrous ammonia (for nitrogen) are purchased from a cooperative. Other forms, like manure from livestock, may be something the

farmer already has on hand. Manure is very high in nitrogen, and contains high levels of phosphorus and potassium.

**Insects** are another factor that farmers must deal with. There are a variety of insects that feed on corn plants. There are insects that feed on the roots, the stalk, the leaves, or elsewhere on the plant. A precaution a farmer can take prior to planting is selecting a certain type of seed that is resistant to insects. This is known as a **genetically modified organism**

(GMO). Another way to deal with pests like insects is to apply an insecticide. A farmer will only apply an insecticide if he/she notices a pest/ insect in the corn field that is destructing the crop.

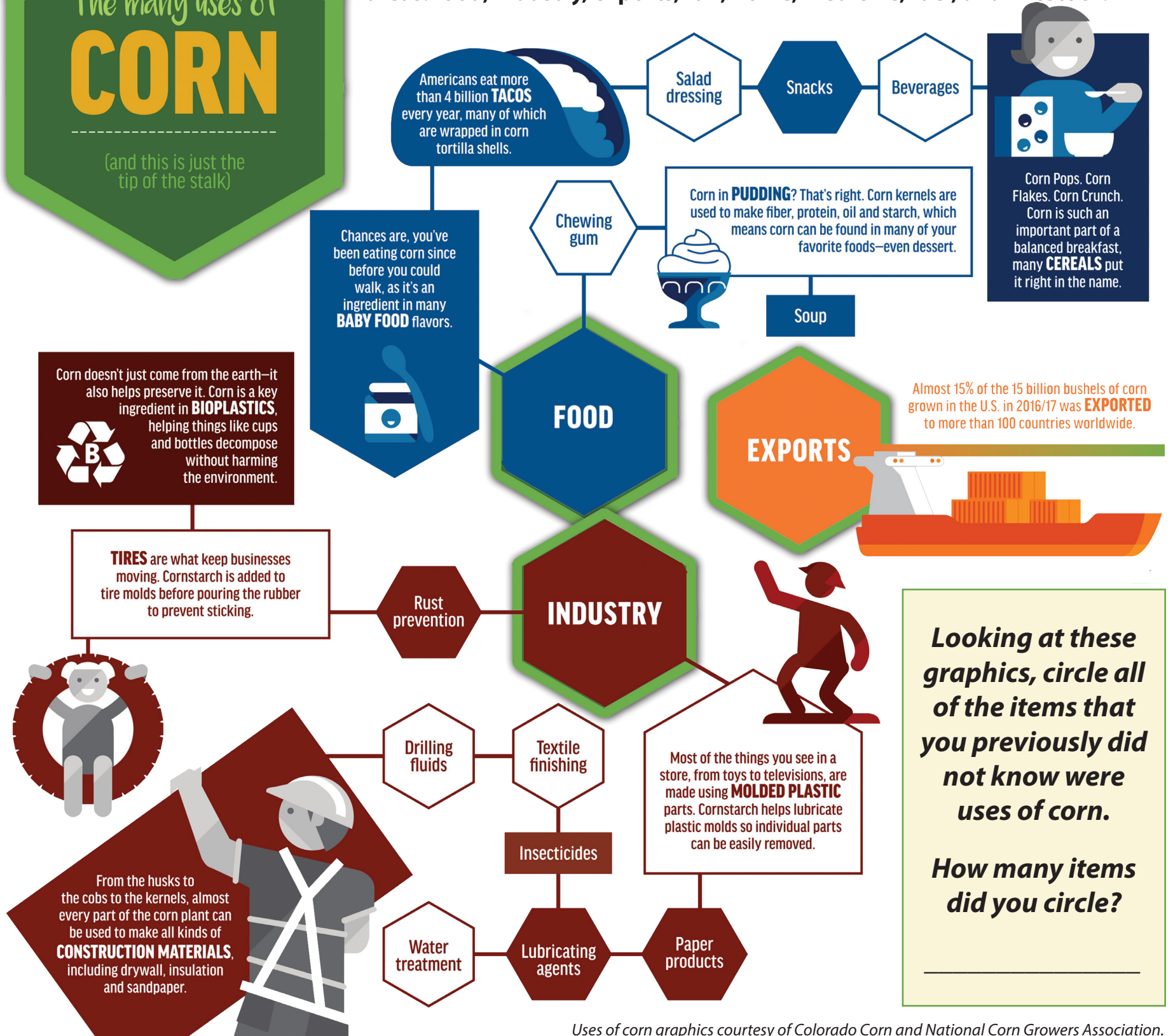
As the growing season comes to an end, corn begins to dry and hold less moisture. A farmer knows that the corn is ready when the plant stops filling the kernel with starch, and the tip cap of the kernel is closed off from the cob. This can be seen when the tip is broken off the kernel, and is called the **black layer**. The kernel is about 30 percent moisture at this time, and the corn is dead and continues to dry in the field. This is when the corn plant turns brown. By using a **moisture tester**, farmers determine when the corn is ready to **harvest**. Corn can be harvested at moisture levels between 15 and 30 percent.

Vegetative Stages (growth of the plant)	Days After Emergence	Calendar Day	Concerns
VE = emergence	Can take 5 to 14 days	May 1 to 14	Seed needs proper moisture and warmth to germinate and emerge
V1 = first leaf collar	1	May 15	Moisture and weather conditions are critical for continued growth
V2 = second leaf collar	4-6	May 19-21	Moisture and weather conditions are critical for continued growth
V3 = third leaf collar	9-12	May 24-27	Late frost will not damage plant potential yield
V5 = fifth leaf collar	14-21	May 29-June 5	Cooler soil temperatures will slow growth and cause a later harvest
V9 = ninth leaf collar	28-35	June 12-June 19	Flooding up until this stage can kill a plant in a few days
V15 = 15th leaf collar	56-63	July 10-17	Drought conditions from V6-V15 can reduce yields up to 25%
VT = Tasseling	60-67	July 14-21	Water is still critical and hail can lead to pollen damage
Reproductive Stages (development of the kernels on the ear)	Days After Emergence	Calendar Day	Concerns
R1 = silking	63-68 days	July 17-22	Water is critical
R2 = blister	73-78 days	July 27-Aug. 1	Drought conditions from V15 to R2 can reduce yields up to 50%
R3 = milk	83-88 days	Aug. 6-10	Water is critical
R4 = dough	89-94	Aug. 11-16	Frost can reduce yields by 35-50%
R5 = dent	99-104	Aug. 21-26	Drought and frost conditions from R2 to R5 can reduce yield up to 25%
R6 = maturity	118-123	Sept. 9-14	
After maturity, the corn (plant and kernels) begins to dry before it is harvested.			

# The many uses of CORN

(and this is just the tip of the stalk)

What happens to all that corn grown by Colorado farmers? Much of it becomes livestock feed and ethanol fuel, or is exported. But that's not all. Corn is in almost everything! The many uses of corn include eight main areas: food, industry, exports, fun, home, medicine, fuel, and livestock.



Uses of corn graphics courtesy of Colorado Corn and National Corn Growers Association.



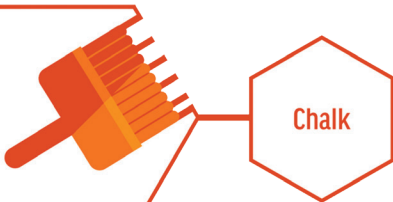
Corn is commonly used to make dextrin, a binding compound used to help **FIREWORKS** burn properly. Now that adds a whole new meaning to the word "pop"corn.

From the molding process to helping keep the paper labels in place, corn products are involved in almost every step of making **CRAYONS**. Color us impressed.

It takes more than a gripping plot to hold a book together. Corn-produced dextrin is used to make the adhesives found in **BOOK BINDINGS**.



Time to brush up on your corn knowledge. Corn products are used as solvents for **PAINTS, DYES, RESINS** and **LACQUERS**.



# FUN



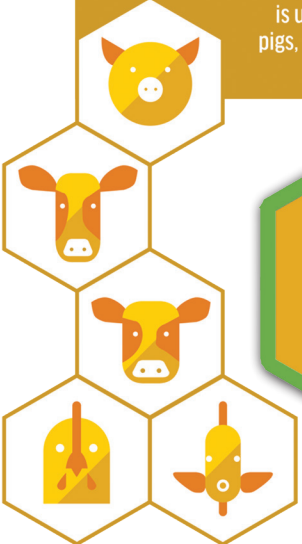
Everything from the color and smell to the cleaning ability of **HAND SOAP** is thanks to corn, which accounts for about 1/4 of its ingredients.

Everything from corn oil to corn meal is used to make **COSMETICS**. So the next time mom puts on a little makeup, you can tell her how corny she looks (ok, maybe not).

Corn is incredibly absorbent, making it the perfect ingredient to help **DIAPERS** hold in what baby boys and girls can't.

# Corn is used in over 4,000 edible and non-edible products!

More than 1/3 of all corn grown in the U.S. is used to **FEED** farm animals such as pigs, beef cows, dairy cows and chickens.

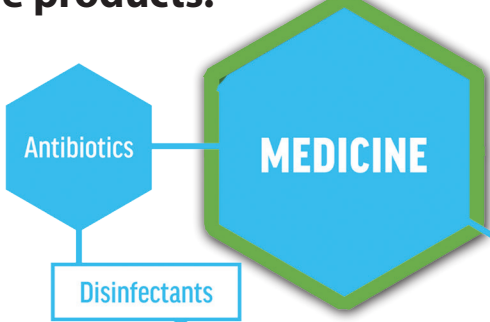


# LIVESTOCK



# FUEL

Getting from point A to point B sometimes takes a little C (Corn, that is). **ETHANOL** is a high-octane, low-carbon, corn-based fuel that is often blended with gasoline for use in a variety of vehicles.



# MEDICINE

A spoonful of corn helps the medicine go down. Corn is added to many **COUGH SYRUPS** for flavor, giving some relief to your taste buds as well as your throat.

When corn starch is combined with certain polymers, it creates a protective compound that works perfectly in medical **BANDAGES** and wraps.

Want to feel even better about corn? Corn starch is used as a bonding agent in **ASPIRIN** tablets, helping to hold together all the other ingredients.

Vitamin carriers

**What is your favorite product made from corn?**

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## CORN FARMER SPOTLIGHT



**Sondra Peirce**

Sondra Peirce is a corn farmer in Boulder County, north of Longmont. She and her husband

are first generation farmers and bought their own farm and equipment 21 years ago. They continue to farm with the help of their three children. Sondra and her family are the only ones that work on the farm, but they do have relatives that assist with harvest every once in a while.

Sondra and her husband grow field corn, both organically and traditionally. In order to keep weeds, pests, and diseases under control, they till (or disturb) the top two to three inches of the soil about four times per season. The USDA has specific requirements for organically grown crops, so Sondra doesn't

use any pesticides. She uses manure to fertilize her fields. Even though Sondra fully supports GMO crops, she uses non-GMO and organic corn seed.

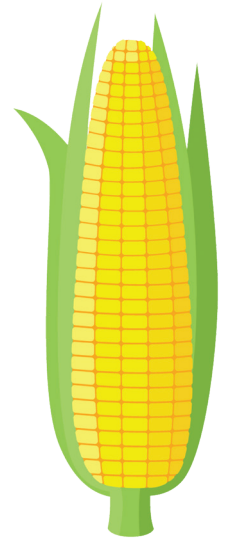
"Through biotechnology, scientists have bred better and stronger corn varieties that can be used with both traditional and organic growing methods. These genetics help to create corn that produces more yield while using less resources," Sondra adds.

Sondra and her husband love what they do. They believe it is more of a lifestyle than a business. When asked about her favorite part of growing corn, Sondra says, "There is about one week during the growing season when the corn tassels bloom and are in milk stage. There is a sweet smell all around the field. The tall corn, which usually grows symmetrical and at the same height, creates its own little tunnel when you walk in between the rows."

## CORN CAREERS

There are many fun and fascinating careers involving corn - from the development of the seeds all the way to the many uses of corn. Check out this list of some of the careers!

- Agronomist
- Animal Nutritionist
- Cosmetic Researcher
- Ethanol Plant Manager
- Farmer
- Food Scientist
- Geneticist/Seed Breeder
- Grain Buyer/Merchandiser
- Grain Mill Technician
- Import/Export Specialist
- Mechanical Engineer
- Pharmaceutical Technician
- Quality Assurance Analyst
- Robotic Engineer
- Safety Assurance Analyst
- Truck Driver



**Explore Further:** *Select one corn career, from the list above or from your own research, and write a short essay about that career. Investigate what that career is about, what classes and education you may need, and where you might work. Find career resources at <http://bit.ly/Reader-Corn>*



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