



From Small Seeds 
Grow BIG Dreams

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Ready, Set, GROW

What can be smaller than a pea, but grow as big as a tree? A seed!

Seeds are small plants, wrapped up in a package with the things they need to get a good start in life. Seeds come in many shapes and sizes. Some are hard as a rock. Some are hidden in fruits. Some are smooth. Some are prickly. Some are so tiny they look like dust. In Minnesota about 1,400 native plant species produce seeds in summer or fall, as they prepare for cold weather. Safe inside a seed, a tiny new plant waits out the winter. Then it sprouts in spring when sun and rain are plentiful.



The Story of a Seed

In the fall, a ripe acorn falls from a tall white oak tree.
A squirrel might find and eat this nut, or seed.
Or the acorn might grow into a new oak tree.

The story of this seed began early in the spring when frogs were croaking in the pond and birds were building nests. At the tips of the twigs of a tall white oak tree, tiny leaves were growing. On some twigs, tiny reddish-green **pistillate** flowers formed. These flowers contained **ovules**, which are like eggs—the female flower’s contribution to the seed.

On some twigs, yellow flowers shaped like caterpillars developed. These **catkins**, or **staminate** flowers, produced dustlike particles called **pollen**, the male contribution.

The male flowers released pollen into the air. Pollen grains went everywhere! One landed on a **stigma** atop a female flower. A long tube grew from the pollen grain down into a tubelike part (**style**) of the female flower and all the way down to the **ovary**.

Next, the pollen grain released two sperm into the tube. One sperm combined with the ovule, or egg, in the ovary. The fertilized egg cell divided to make an embryo.

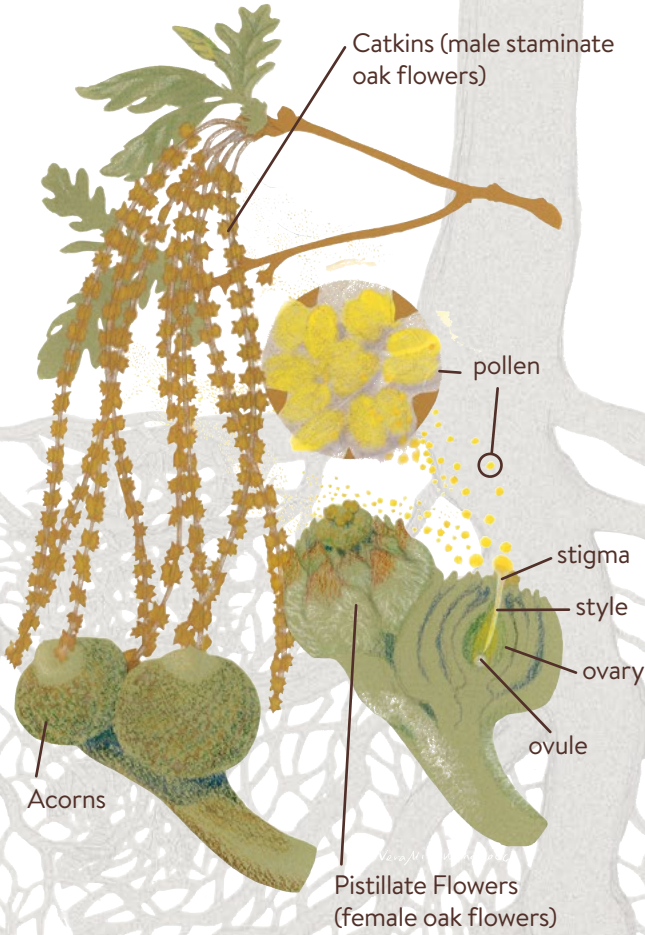
What happened to the other sperm? It combined with parts of the female flower to make **endosperm**—food for the tiny new oak.

The ovary formed the round part of the acorn. Other flower parts formed the cap. All summer the acorn grew. At first it was green, then it turned brown and tumbled from the oak.

If a squirrel doesn’t eat it, the acorn could sprout, put down roots, and grow into a new oak tree. After 50 years or so, that oak will grow acorns. Perhaps your grandchildren will see some of those new acorns.

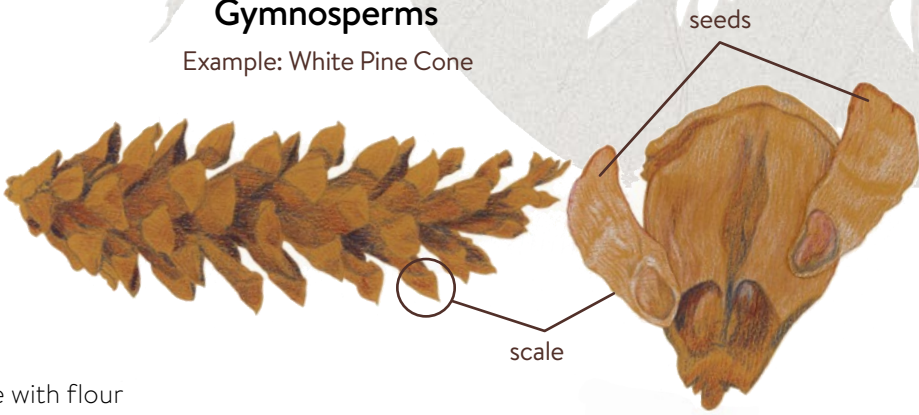
How an acorn grows

Example: White Oak Acorn



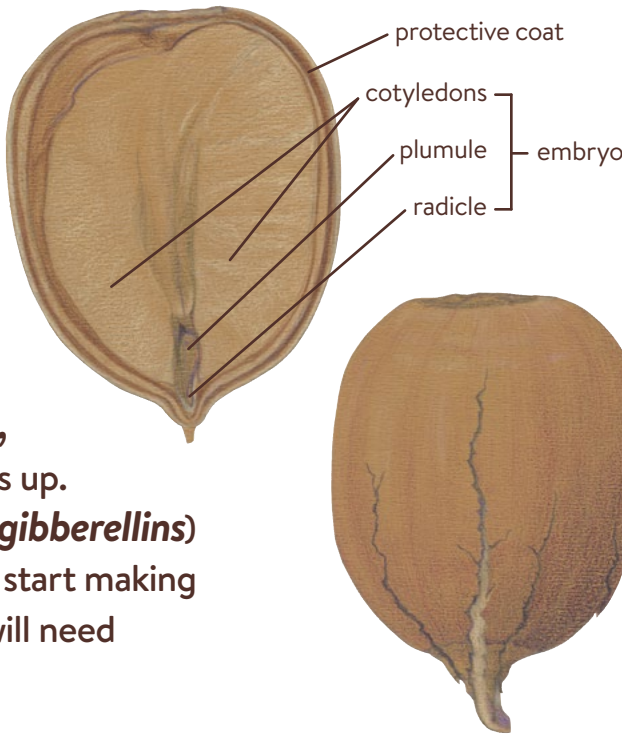
Gymnosperms

Example: White Pine Cone



Angiosperms

Example: Red Oak Acorn



What Is a Seed?

Shut your eyes and picture a seed.

What did you see? A tiny black dot?

A fat bean? A kernel of corn?

Given the right conditions, any seed can give rise to a new plant.

Seeds have some basic parts in common. Every seed has a protective coat, some stored food, and an embryo that is the beginning of a new plant. Most seed embryos have a tiny root (**radicle**), a stem (**plumule**), and one or more leaflike parts called **cotyledons**.

Energy pack

Most seed-making plants pack energy into seeds in the form of starch, sugar, and fat. When you eat bread (made with flour ground from seeds of grains such as wheat and rye), oatmeal (made from processed oat seeds), or nuts, you are using energy stored inside seeds. Many animals eat seeds and the structures such as berries that surround them. Bears, squirrels, deer, grouse, insects, and other forest animals eat nuts and berries. Ducks and geese eat seeds from **aquatic** (water) plants such as wild rice and water-lilies.

Where do seeds form?

Seed-making plants, including trees, can be divided into two groups based on where their seeds form.

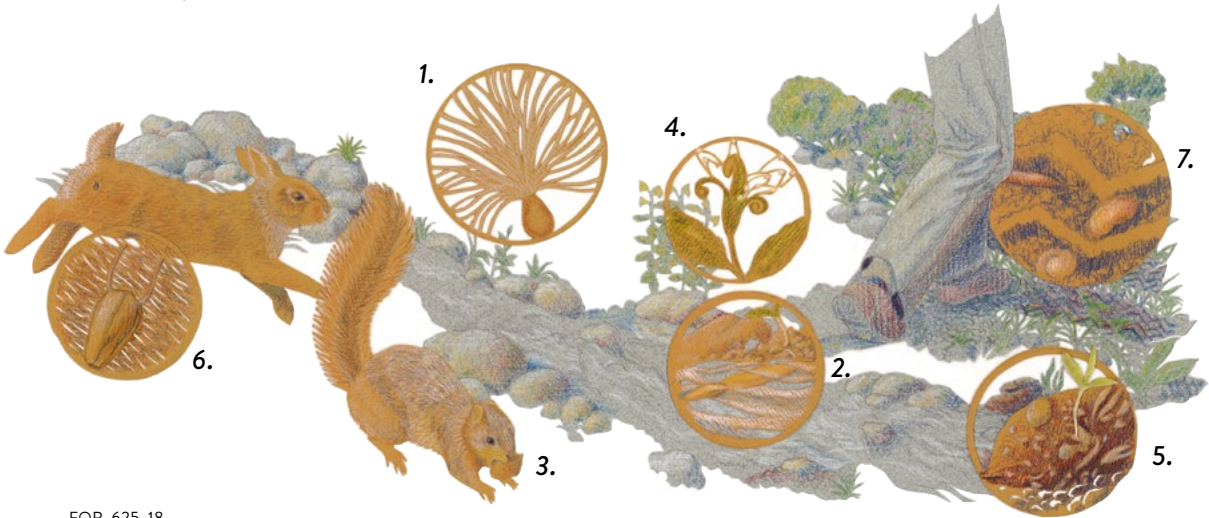
In **gymnosperms**, seeds form between the scales of a cone or in a berrylike cup. Since the seed is easily visible, gymnosperm seeds are also called “naked seeds.” **Conifers**, cone-bearing trees that keep their leaves year-round, belong to this category.

In **angiosperms**, seeds develop in sacs called **ovaries**. Ovaries then form a structure such as a fleshy fruit or nut, which encloses the seed. Trees that flower in the spring and lose their leaves in the fall, called **deciduous** trees, form seeds in this way.

Getting Around

The ground would get crowded if all of a plant’s seeds sprouted beneath it. But that rarely happens. Plants have wonderful ways of moving their seeds to new places.

1. **Wind.** Some seeds soar through the air to a new home. Maple and pine seeds have flat, winglike blades. Seeds of dandelions, milkweeds, cottonwood trees, and many other plants have white fluff that catches on the wind.
2. **Water.** American elm seeds can float for miles after falling into a stream.
3. **Carriers and buriers.** Squirrels are famous for squirreling away acorns and other nuts in the fall for food later on. The nuts that last through the winter might sprout and become trees instead.
4. **Plant power.** In warm weather the seed pods of witch hazel, a forest shrub, burst open and fling seeds far from the parent plant. Dwarf mistletoe, which grows on evergreens, can shoot its seeds 20 feet at almost 60 miles per hour.
5. **Animal insides.** When birds, bears, or other animals eat fruit, they unknowingly move the seeds inside their bodies. The seeds end up in a pile of the animal’s droppings in a new place. The droppings fertilize the new plant.
6. **Animal outsides.** Did you ever walk in a field or forest and come back with seeds stuck to your socks? Some seeds have claws, spines, hooks, or other parts that cause them to cling to animals passing by. After falling off or being pulled off the animal, the seeds can sprout in a new place.
7. **People power.** We move seeds when we buy and plant them. Sometimes seeds get stuck in mud in our shoes or in bike tires, then end up in a new spot. If these seeds are from fast-spreading plants such as dandelions or garlic mustard that aren’t native to Minnesota, they can crowd out native plants.



Sprouting Time

When ready to sprout, or **germinate**, a seed starts to absorb water. It swells up. The embryo sends hormones (called **gibberellins**) to the seed coat to signal proteins to start making other molecules that the new plant will need to live and grow.

The stored food begins to break down, providing energy to the embryo for growing. Soon a tiny root peaks through one end of the seed. A shoot rises in the opposite direction.

Just as Sleeping Beauty needed a kiss from a prince before she could wake up, some seeds need a cue from the outside world so they sprout when the world is good for growing, rather than in midwinter or during drought.

Hot and cold. Some seeds must be exposed to cold before they germinate. Wild rice seeds, for example, usually need time in cold water. Seeds of false rue anemone, a woodland wildflower, need summer’s heat to sprout.

All wet. Chemicals called **inhibitors** send the embryo of some seeds a message not to grow. When exposed to water, the inhibitors leach away (the way flavor disappears from bubble gum after you’ve been chewing it awhile) so the seed can sprout.

Right light. Some seeds need a period of darkness. Others need light to sprout.

Rough stuff. Seeds with tough coverings might need roughing up—such as tumbling downstream and bumping into rocks, or freezing and thawing, to crack.

Fungus helpers. To sprout and grow, orchid seeds need certain fungi to supply water and nutrients.

Hot stuff. Jack pine cones need heat to open. Heat of a hot summer day can cause some cones to release seeds. But others can only open when a forest fire blazes.

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