



Photos courtesy David Mercker

# How do acorns develop?

**By David Mercker and Jennifer Franklin**

Each year during the spring months as the days get longer and warmer, the forest comes alive with new plant growth. Conditions needed for growth (warmer temperatures, moisture, extended day length, etc.) are scarce over the winter months, but reappear and stimulate new life in spring. Plants respond at their own pace to these changes as flowers are born.

For oak trees, as leaves begin to unfurl, flower buds also expand and bloom. Ultimately, a crop of acorns will mature from these flowers and disperse into new habitats like those shown in the photo above from a swamp chestnut oak (*Quercus michauxii*).

Oaks and many other trees have both the male and female flowers on the same tree. Potentially every tree of reproductive age is capable of producing acorns, and the majority of female flowers are pollinated by the male flowers of other oak trees. In contrast, other trees, such as aspen and white ash, have the male and female flowers on separate

plants, and only those trees with female flowers produce seed.

Flowering in most oaks is triggered by rising temperatures in the spring. Red oaks tend to flower about two weeks earlier than white oaks. The male flowers of oak trees are quite noticeable. Normally by April or early May oaks have produced long, worm-like structures that droop downward off the base

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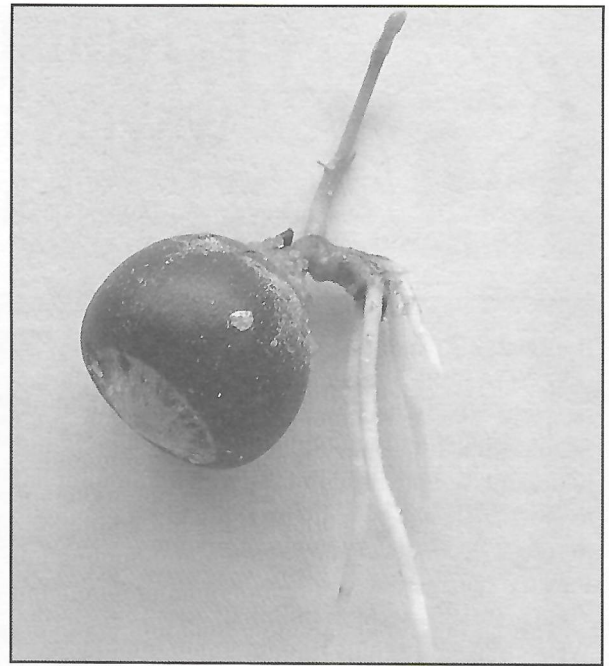
of newly forming branches. These male flowers, called catkins, have a number of small flowers arranged like beads on a string along a central stem. These male flowers produce pollen that by mid-April affect many allergy sufferers.

Pollen is shed one to two weeks after the catkins first appear over a period of three or four days. Pollen shedding is often delayed by rain and high humidity.

Pollen shedding will be greatly reduced if a prolonged period of damp weather occurs while the catkins are on the trees, resulting in a poor acorn crop.

The female flowers are much less noticeable, requiring a magnifying glass for identification. They are also located on newly forming twigs at the base of emerging leaves, and are easily overlooked because they closely resemble leaf buds. Female flowers are mainly found in the upper portion of the crown, so they are rarely seen by the casual observer. These flowers appear approximately a week later than male flowers, just as pollen begins to be shed. The female flowers have three very small, reddish stigmas that resemble small pedestals and rise up from the ovules located at the base of the female flower. These stigmas receive pollen grains from the male flowers, and an acorn is formed.





Left, male red oak flowers drooping downward. Top, a germinating acorn.

Year-to-year acorn production is very unpredictable, due mainly to external factors, and also genetic make-up of that particular oak family. Freezing temperatures during the flowering period kills the flowers, often resulting in a small acorn crop. Acorn production can also be limited by high wind and excessive rainfall (affecting pollen distribution and damage to male flowers), insects (such as weevils that feast on the contents of acorns), nutrition, humidity and soil moisture. Oak trees often abort acorns during periods of stress, thereby conserving resources such as water and nutrients. This benefits the tree by redirecting resources away from seed production and into more critical life-sustaining processes.

Most species of oaks begin producing acorns at about 20 years old. Peak production occurs from about 50 to 80 years, and then acorn production tapers off after 80 years. Certain trees typically produce more acorns than others – a phenomenon that deer hunters are keen on following. Healthy trees with dominant crowns (crowns decidedly higher and larger than those of surrounding trees) often will produce more acorns than unhealthy, suppressed trees.

Genetics of the tree also plays a large role in the quantity of acorns produced.

Trees with highly productive parents are also likely to produce good acorn crops. A year of heavy acorn production may use up much of a tree's stored nitrogen, and few acorns may be produced the following year while the tree's nutrient stores are replenished.

As a general rule, acorns from species in the white oak group tend to taste sweeter than the bitter acorns from the red oak group, which contain tannic acid. Another difference between the two groups is that the acorns from the white oak group mature in one year, whereas acorns from the red oak group mature two years after the flowers are pollinated. As a result, red oak acorn production can be affected by conditions over two years of weather events.

Very few acorns survive to sprout and produce a new oak tree; most serve as a source of food for wildlife, insects and fungi. Acorns are an important hard mast food and a source of protein for blue jays, wild turkeys, ruffed grouse, squirrels, chipmunks and other rodents, deer and black bear.

Oak trees have high aesthetic value and produce valuable forest products too. Perpetuation and sustainability of the oaks is important and begins with the flowering and germination of acorns.



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