

## ***Fagus grandifolia***

## **Fagaceae family**

American beech, beech, beechnut, Carolina beech, gray beech, red beech, ridge beech, stone beech, white beech, winter beech

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**Description:** *Fagus grandifolia* is a large, slow-growing, long-lived, monoecious, deciduous tree. Flowering occurs as leaves are approximately one-third expanded. Fruits are produced when the plant is about 40 years old. Roots can produce suckers/sprouts forming thickets; stumps can sprout when damaged or injured, although those stumps larger than 4 in. (10 cm) in diameter are less likely to sprout, or have those sprouts survive.

Variation: There are several varieties of this species, not all being currently recognized taxonomically. Some botanists believe the Northern and Southern plants vary.

Size: 65-130 ft. (20-40 m) tall. Trunk up to 2.5 ft (0.8 m) in diameter.

Leaves: Leaves alternate; stipules present. Leaf blade/lamina simple; stiff, leathery; ovate to oblong ovate, rarely obovate; apex acuminate; 2-7 in. (5-18 cm) long; 1-3.5 in. (2.5-9 cm) wide; margins serrate or serrulate; upper surface shiny green to blue-green; lower surface green to yellow-green, glabrate or pubescent, or having tufts of hairs in vein axils; each vein ending in a sharp distinct tooth on the margin. Petiole 0.2-0.6 in. (0.4-1.6 cm) long.

Inflorescence: Terminal or axillary.

Male: 7-25 male flowers borne on globose heads hanging from a slender 1 in. (2.5 cm) peduncle/stalk.

Female: flowers borne in a bur/cupule on shorter peduncle/stalk, each bur/cupule with 2 flowers, appearing just after leaves emerge in the spring.

Flowers:

Staminate (male) flowers: Sepals 4-8; no corolla/petals. Stamens 6-16.

Pistillate (female) flowers: Fused sepals urn-shaped (urceolate); no corolla/petals. 1 pistil, 3 carpels; 3 styles.

Fruit: A 4-valved bur/cupule (woody husk covered with spines); 0.6-1 in. (1.5-2.5 cm) long; 0.6-0.8 in. (1.5-2 cm) wide; oval; holding 2-4 nuts. Nuts/seeds irregularly

triangular; 0.5-0.9 in. (1.2-2.2 cm) long; 0.4-0.7 in. (1-1.8 cm) wide; shiny brown to reddish brown; glabrous or puberulent. Edible.

Bark: Blue-gray, smooth; becoming rougher and darker in maturity. Twigs very slender; having scattered silky hairs, becoming glabrous with maturity. Terminal buds very long; 0.8 in. (1.9 cm) long.

Roots: Shallow and spreading, occasionally reaching 5 ft. (1.5 m) deep in deeper soils.

Habitat: Found in mesic deciduous forests, with deep, rich, well-drained soils. *Fagus grandifolia* grows at lower elevations in the southern U.S., and grows at higher elevations in the northern U.S. On coarser soils, it grows at higher elevations. Common in ravines, slopes, small valleys, bordering streams/springs. It grows poorly on poorly drained soils. It is very tolerant of shade.

**Species distribution in US states:** AL, AR, CT, DC, DE, FL, GA, IL, IN, KY, LA, MA, ME, MI, MO, MS, NC, NH, NJ, NY, OH, PA, RI, SC, TN, TX, VA, VT, WI, WV

#### Species images:

Whole plant:

<http://www.cas.vanderbilt.edu/bioimages/species/frame/fagr.htm>  
<http://www.forestryimages.org/images/768x512/5042091.jpg>

Bark:

<http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/faggra01.htm>  
<http://www.forestryimages.org/browse/detail.cfm?imgnum=1380006>

Leaf:

[http://calphotos.berkeley.edu/cgi/img\\_query?query\\_src=photos\\_index&enlarge=0000+0000+0506+1937](http://calphotos.berkeley.edu/cgi/img_query?query_src=photos_index&enlarge=0000+0000+0506+1937)  
[http://www.ibiblio.org/openkey/intkey/images/Fagus\\_grandifolia\\_leaves01.jpg](http://www.ibiblio.org/openkey/intkey/images/Fagus_grandifolia_leaves01.jpg)

Colored leaves:

[http://calphotos.berkeley.edu/cgi/img\\_query?query\\_src=photos\\_index&enlarge=0000+0000+0506+1939](http://calphotos.berkeley.edu/cgi/img_query?query_src=photos_index&enlarge=0000+0000+0506+1939)  
[http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/trees-new/fagus\\_grandifolia.html](http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/trees-new/fagus_grandifolia.html)

Buds:

[http://www.ibiblio.org/openkey/intkey/images/Fagus\\_grandifolia\\_buds03.jpg](http://www.ibiblio.org/openkey/intkey/images/Fagus_grandifolia_buds03.jpg)  
<http://www.forestryimages.org/browse/detail.cfm?imgnum=1219105>  
<http://www.forestryimages.org/images/768x512/1342006.jpg>

Staminate (male) flowers:

<http://www.cas.vanderbilt.edu/bioimages/biohires/f/hfagr--flmale39273.JPG>

<http://www.cas.vanderbilt.edu/bioimages/biohires/f/hfagr--flmature-male10504.JPG>

Pistillate (female) flowers:

<http://www.cas.vanderbilt.edu/bioimages/biohires/f/hfagr--flfemale39282.JPG>

Fruit:

<http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/faggra01.htm>

<http://www.cas.vanderbilt.edu/bioimages/biohires/f/hfagr--fr52470.jpg>

Seeds:

[http://plants.usda.gov/java/largeImage?imageID=fagr\\_005\\_ahp.tif](http://plants.usda.gov/java/largeImage?imageID=fagr_005_ahp.tif)

<http://www.uwgb.edu/BIODIVERSITY/herbarium/trees/faggra01.htm>

### **Expected timing of growth stages:**

Germination: Early spring-early summer.

Flowering: February-June, depending on location.

Bud break/Leaf out: Leaves emerge and are about one-third expanded as flowering initiates.

Leaf/canopy development: \*Need info.

Fruit ripening: September-October.

Seed dispersion: Begins following the first heavy frost, causing the burs to open. Seed dispersion lasts a few weeks.

Leaf coloration: \*Need info.

Leaf fall: October-November.

### **Phenophases to be monitored for NPN:**

#### **Leaf out**

- *First leaf*  
In at least 3 locations on the plant, the very first green tip of a young leaf has visibly moved out of the leaf bud.

## Flowering

*Note: Where possible, observe both male and female flowers and evaluate them separately.*

- *First flower*  
In at least 3 locations on the plant, a flower has opened completely. Flowers are considered 'opened' when the reproductive parts are visible between unfolded or opened flower parts. For *Fagus grandifolia*, the small petal-less flowers appear from the bud just after the newly emerging leaves, and the stamens or pistil becomes clearly visible once the flower 'opens'. If you know whether the flowers you are observing are male or female, please report this information as well.
- *Full flower [Intensive only]*  
The plant has reached its peak floral display. This occurs when half (50%) of the flowers on the whole plant have opened completely.
- *Last flower*  
The last visible flower has opened completely and is still fresh.

## Leaf elongation

*Note: These measures can be difficult to estimate without a few seasons of practice.*

- *25% leaf elongation [Intensive only]*  
The majority of young leaves have unfolded completely and have expanded to one-quarter (25%) of their mature size. Leaf elongation may also be estimated by viewing the canopy as a whole. At 25% leaf elongation, the canopy appears to be approximately one-quarter (25%) full.
- *50% leaf elongation [Intensive only]*  
The majority of young leaves have unfolded completely and have expanded to half (50%) of their mature size. Leaf elongation may also be estimated by viewing the canopy as a whole. At 50% leaf elongation, the canopy appears to be approximately half (50%) full.
- *75% leaf elongation*  
The majority of young leaves have unfolded completely and have expanded to three-quarters (75%) of their mature size. Leaf elongation may also be estimated by viewing the canopy as a whole. At 75% leaf elongation, the canopy appears to be approximately three-quarters (75%) full.
- *Full leaf elongation [Intensive only]*

The majority of young leaves have unfolded completely and have expanded to 95-100% of their mature size. At full leaf elongation, the canopy appears to have reached its full density.

### **Fruit ripening**

- *First fruit ripe*  
In at least 3 locations on the plant, a fruit has become ripe. In *Fagus grandifolia*, a fruit is considered ripe when the bur splits open and the beechnuts have been dropped.. Ripeness may also be indicated by the presence of at least 3 fresh beechnuts on the ground below the plant (that are not apparently from a nearby tree).
- *50% of fruit ripe [Intensive only]*  
For the whole plant, half (50%) of the fruits are ripe. In *Fagus grandifolia*, this occurs when half (50%) of the burs have dropped their beechnuts.
- *All fruit ripe [Intensive only]*  
For the whole plant, virtually all (95-100%) of the fruits are ripe. In *Fagus grandifolia*, this occurs when all (95-100%) of the burs have dropped their beechnuts.

### **Leaf color change**

**Note: If drought seems to be the cause of leaf color change for a plant, please make a comment about it for that plant.**

- *First leaf colored [Intensive only]*  
In at least 3 locations on the plant, the green leaves have begun to change to their late season colors.
- *25% of leaves colored [Intensive only]*  
For the whole plant, one-quarter (25%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.
- *50% of leaves colored*  
For the whole plant, half (50%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.
- *75% of leaves colored [Intensive only]*  
For the whole plant, three-quarters (75%) of the leaves (including any that have fallen to the ground) have changed to their late season colors.

- *All leaves colored*  
For the whole plant, virtually all (95-100%) of the leaves (including any that have fallen to the ground) have changed to their late season colors and there is virtually no green left in the leaves.

## Leaf fall

**Note:** *If drought seems to be the cause of leaf fall for a plant, please make a comment about it for that plant.*

- *First leaf fallen* [**Intensive only**]  
In at least 3 locations on the plant, a leaf easily falls off into your hand when touched or gently handled. First leaf fallen may also be indicated by the presence of at least 3 leaves on the ground below the plant (that are not apparently from another individual nearby).
- *25% of leaves fallen* [**Intensive only**]  
For the whole plant, one-quarter (25%) of the leaves have fallen.
- *50% of leaves fallen*  
For the whole plant, half (50%) of the leaves have fallen.
- *75% of leaves fallen* [**Intensive only**]  
For the whole plant, three-quarters (75%) of the leaves have fallen. For *Fagus grandifolia*, this includes any leaves that have dried and remain dead on the plant.
- *All leaves fallen*  
For the whole plant, virtually all (95-100%) of the leaves have fallen. For *Fagus grandifolia*, this includes any leaves that have dried and remain dead on the plant.

**Did you know?** Native Americans used this plant medicinal for many ailments. It also was used to make water wheels in colonial times, due to its resistance to decay under water. It is currently used for construction, furniture, toys, cookware, barrels, fuel, dyes, and railroad ties. Coal tar and creosote is made from this tree. The nuts are eaten by humans and these fruits are used as a coffee substitute. Many wild animals utilize this tree for food.

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## Notes

The USDA PLANTS symbol for this plant is FAGR.

The ITIS Taxonomic Serial No. for this species is 19462.

BBCH codes for phenophases used for this plant are available from the USA-NPN office upon request.

Proposed modifications, updates or corrections to this protocol are welcome; please direct correspondence to the USA-NPN National Coordinating Office.

Prior versions of this species protocol will be made available in a documents library on USA-NPN webpage.

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