# *Juglans cinerea* L. Butternut

**Juglandaceae Walnut family**

**George Rink**

Butternut ***(Juglans cinerea),*** also called white walnut or oilnut, grows rapidly on well-drained soils of hillsides and streambanks in mixed hardwood forests. This small to medium-sized tree is short lived, seldom reaching the age of 75. Butternut is more valued for its nuts than for lumber. The soft coarse-grained wood works, stains, and finishes well. Small amounts are used for cabinetwork, furniture, and novelties. The sweet nuts are prized as a food by man and animals. Butternut is easily grown but must be transplanted early because of the quickly developing root system.

## Habitat

### Native Range

Butternut (figs. 1, 2) is found froni southeastern New Brunswick throughout the New England States except for northwest Maine and Cape Cod. The range extends south to include northern New Jersey, western Maryland, Virginia, North Carolina, northwestern South Carolina, northern Georgia, northern Alabama, northern Mississippi, and Arkansas. Westward it is found to central Iowa and central Minnesota. It grows in Wisconsin, Michigan, and northeast into Ontario and Quebec. Through most of its range butternut is not a common tree, and its frequency is declining (4). The ranges of butternut and black walnut ***(Juglans nigru)*** overlap, but butternut occurs farther north and not as far south as black walnut.

### Climate

Climatic conditions within the botanical range of butternut vary widely. Mean annual temperature ranges from 16" C (60" F) in Alabama to 4" C (40" F) in New Brunswick, with an average maximum of 41" C (105" F) and minimum of -34" C (-30" F). Annual precipitation ranges from 630 mm (25 in) in southeastern Minnesota to 2030 mm (80 in) in the southern Appalachians. The frost-free period is 210 days in the southern part of the range and 105 days in the northern part (6).

Butternut is generally considered to be more winter-hardy than black walnut.

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### Soils and Topography

Butternut grows best on streambank sites and on well-drained soils; it is seldom found on dry, compact, or infertile soils. It grows better than black walnut, however, on dry, rocky soils, especially those of limestone origin.

Butternut is found most frequently in coves, on stream benches and terraces, on slopes, in the talus of rock ledges, and on other sites with good drainage, primarily on soils of the orders Alfisols and Entisols. It is found up to an elevation of 1500 m (4,900 ft) in the Virginias, at much higher altitudes than black walnut (4,181.

### Associated Forest Cover

Butternut is found with many other tree species in several hardwood types in the mixed mesophytic forest. It is an associated species in the following four northern and central forest cover types *(5)*: Sugar Maple-Basswood (Society of American Foresters Type 26); Yellow-Poplar-White Oak-Northern Red Oak (Type 59); Beech-Sugar Maple (Type 60); and River Birch-Sycamore (Type 56). Commonly associated trees include basswood *(Tilia* spp.), black cherry *(Prunus* ***serotina),*** beech *(Fagus grandifolia)*, black walnut ***(Juglans nigra),*** elm *(Ulmus* spp.), hemlock *(Tsuga* ***canadensis),*** hickory *(Carya* spp.), oak *(Quercus* spp.), red maple *(Acer rubrum)*, sugar maple ***(A. saccharum),*** yellow-poplar ***(Liriodendron tulipifera),*** white ash ***(Fraxinus americana),*** and yellow birch *(Betula alleghaniensis)*. In the northeast part of its range, it is often found with sweet birch *(Betula lenta)* and in the northern part of its range it is occasionally found with white pine *(Pinus strobus) (4,15)*. Forest stands seldom contain more than an occasional butternut tree, although in local areas it may be abundant. In the past, West Virginia, Wisconsin, Indiana, and Tennessee have been the leading producers of butternut timber.

## Life History

### Reproduction and Early Growth

**Flowering and** Fruiting-Butternut flowers from April to June, depending upon location. The species is monoecious; male flowers are slender catkins that develop from axillary buds and female flowers are short terminal spikes borne on current

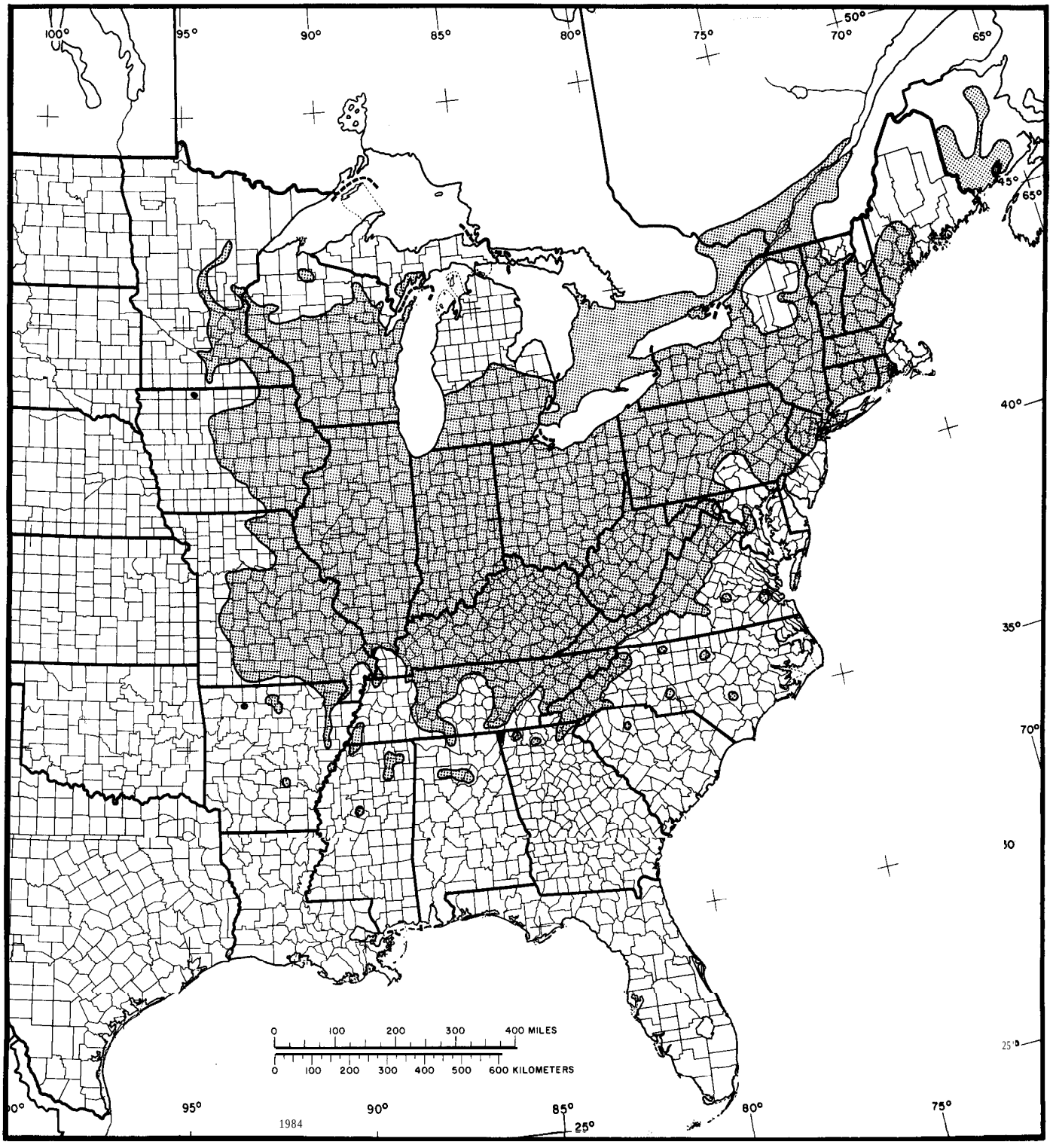


**Figure** *l-The native range of butternut.*

**Figure 2**—*Young butternut in the* White *Mountain National Forest, NH.*

year's shoots. Flowers of both sexes do not usually mature simultaneously on any individual tree *(3)*.

The fruit is an oblong-ovoid pointed nut, 3.8 to 5.5 cm (1.5 to 2.2 in) long, that matures in September and October of the year of pollination. Nuts occur singly or in clusters of from 2 to 5. The kernel or seed of the nut is sweet, oily, and edible. The nut is enclosed by an indehiscent husk that contains a glandular pubescence on the surface. The fruit usually remains on the tree until after leaf fall (3).

**Seed Production and Dissemination-Com**mercial seed-bearing age begins at about 20 years and is optimum from age 30 to 60 years. Good crops can be expected every 2 to 3 years, with light crops during intervening years. Thrifty trees may yield 9 to 35 liters (0.25 to 1 bushel) of cleaned seeds. A high percentage of mature seeds are sound, but high premature seed losses in butternut have been reported. Possible causes include consumption by insects, birds, and rodents as well as natural pollination failures due to a lack of pollinating trees in the immediate vicinity *(4,10,14,21)*.

Upon ripening, seeds are dispersed by gravity and by squirrels and other rodents. At this time, the seeds are dormant. Cold stratification for 90 to 120 days at temperatures of 20" to 30" C (68" to 86" F) overcomes dormancy (3).

**Seedling Development-Seeds** of butternut usually germinate in the spring following seedfall. Germination is hypogeal. Seedlings develop a taproot on all sites except the most shallow soils, but the taproot is much less pronounced than on black walnut. In general, butternut seedlings have more fibrous root systems than black walnut.

**Vegetative Propagation-Stumps** of young butternut trees and saplings are capable of sprouting. Also, butternut can be propagated by grafting, although the techniques have not yet been perfected. Various degrees of success have been demonstrated with intra-specific as well as inter-specific grafting in the genus *(9)*.

### Sapling and Pole Stages to Maturity

**Growth and** Yield-Butternut grows fast, especially as a seedling, although it usually does not live longer than 75 years and is short lived in relation to its common tree associates.

Mature trees rarely reach a height of more than 30 m (100 ft) and a d.b.h. of 91 cm (36 in). Average-sized trees are from 12 to 18 m (40 to 60 ft) in height and 30 to 61 cm (12 to 24 in) in d.b.h. *(4)*.

**Rooting Habit-On** favorable sites the root system is deep, but it also may be widespreading.

**Reaction to Competition-Although** young trees may withstand competition from the side, butternut does not survive under shade from above. It must be in the overstory to thrive and, therefore, is classed as intolerant of shade and competition.

Like other members of the Juglandaceae family, butternut produces a substance called juglone, a naphthoquinone that is selectively toxic to associated vegetation. Greatest concentrations of juglone are in root tissue and fruit husks with lesser amounts in leaves, catkins, buds, and inner bark *(12,13)*.

Within its optimum range and on good sites, butternut is usually considered a desirable component of forest stands; it has been classed as a "less desirable" tree in southern Appalachian coves *(4)*.

**Damaging** Agents-Insect enemies of butternut are often pests of associated trees as well. Some insects commonly found on butternut include wood borers, defoliators, nut weevils, lacebugs, husk flies, and bark beetles. The most serious insect pest at this time is the butternut curculio *(Conotrachelus juglandis)*, which injures young stems and fruit *(8,21)*.

The most serious disease of *Juglans cinerea* is butternut decline or butternut canker. In the past the causal organism of this disease was thought to be a fungus, *Melanconis juglandis;* but now this fungus

has been associated with secondary infections and the primary causal organism of the disease has been identified as another species of fungus, *Sirococcus clauigignenti-juglandacearum*. Symptoms of the disease include dying branches and stems. Initially, cankers develop on branches in the lower crown. Spores developing on these dying branches are spread by rainwater to tree stems. Stem cankers develop l-3 years after branches die. Tree tops killed by stem-girdling cankers do not resprout *(19,20)*. Diseased trees usually die within several years *(11,16)*. The disease is reported to have eliminated butternut from North and South Carolina (1). The disease is also reported to be spreading rapidly in Wisconsin; between 1978 and 1983 the incidence of butternut canker in a young, isolated plantation increased exponentially from 5 percent in 1976 to 76 percent in 1983 (20). By contrast, black walnut seems to be resistant to the disease.

Bunch disease also attacks butternut. Currently, the causal agent is thought to be a mycoplasmalike organism. Symptoms include a yellow witches' broom resulting from sprouting and growth of axillary buds that would normally remain dormant. Infected branches fail to become dormant in the fall and are killed by frost; highly susceptible trees may eventually be killed. Butternut seems to be more susceptible to this disease than black walnut *(2,17)*.

The common grackle has been reported to destroy immature fruit and may be considered a butternut pest when populations are high *(14)*.

Butternut is very susceptible to fire damage, and although the species is generally windfirm, it is subject to frequent storm damage (4).

## Special Uses

Cultivars of this species have been selected for nut size and for ease of cracking and extracting kernels. Several cultivars have been named (14). Nuts are especially popular in New England for making maple-butternut candy. Small amounts of wood are used for cabinets, toys, and novelties.

## Genetics

Butternut hybridizes with English walnut *(Juglans regia* L.) to produce *J. x quadrangulata* (Carr.) Rehd. It also crosses with Japanese walnut *J. ailantifolia* Carr. to produce *J.* x *bixbyi* Rehd. Butternut is also reported to successfully hybridize with little walnut *(J. microcarpa* Berland.) and Manchurian walnut *(J. mandshurica* Maxim.) *(6,14)*. Reports of crosses between butternut and black walnut have not been substantiated. Butternut is thought to have a haploid chromosome number of 16.

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