

Cercis canadensis L. Eastern Redbud

Leguminosae Legume family

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Eastern redbud (*Cercis canadensis*) is a small, short-lived deciduous tree found throughout the eastern United States. Redbud is also known as Judas-tree. According to legend, Judas Iscariot hanged himself from a branch of the European species *Cercis siliquastrum* (13). Eastern redbud is a strikingly conspicuous tree in the spring because it flowers before other tree leaves form. The wood is heavy, hard, and close-grained, but because of the small size and irregular shape of the tree it is of no commercial value as a source of lumber. This tree is most valued as an ornamental and is extensively planted.

Habitat

Native Range

The range of eastern redbud (figs. 1, 2) is from New Jersey and southern Pennsylvania northwest to southern Michigan, southwest into southeastern Nebraska, south to central Texas, and east to central Florida (8). A disjunct population of redbud extends from the Trans-Pecos and south Texas into Mexico.

Climate

A wide range of climatic conditions are present in the large geographical range of redbud. Mean annual precipitation is less than 510 mm (20 in) in dry south Texas and approximately 1270 mm (50 in) in moist central Florida. Mean annual snowfall in the northern perimeter of redbud is about 90 cm (35 in). Mean January temperatures vary from -8°C (18°F) to 16°C (61°F) within the native range of redbud. Mean July temperatures vary from about 21°C (70°F) in southern Pennsylvania to 26°C (79°F) in central Florida. Frost-free days can vary from 160 to 300 days.

Soils and Topography

Redbud is found on a variety of sites ranging from xeric to mesic but grows better on moist, well-drained sites. It is normally more abundant on south-facing slopes where sunlight is more intense and there is less plant competition (11). This species does not usually grow on flooded sites because it

cannot endure inundation or survive in poorly aerated soils.

The tree grows well in a variety of soil textures but is not found in coarse sands (11). It requires some fine or colloidal material. Redbud is tolerant of a wide pH range but grows best where the pH is above 7.5. It is prevalent on limestone outcrops and on alkaline soils derived from them (11,12). Redbud is tolerant of nutrient deficiencies. Therefore, less competition can occur from associated trees that are less vigorous on the nutrient deficient sites. In Indiana no relationship was noted between distribution of redbud and soil calcium or magnesium. Redbud is found on soils of most soil orders, but most commonly on those of the orders Alfisols and Mollisols.

Associated Forest Cover

Redbud is a regular but usually not a common understory component of many forest types throughout the Eastern United States. It is not a commercial timber species, and although it grows in many forest cover types, it is not listed in all of them by the Society of American Foresters (4).

Life History

Reproduction and Early Growth

Flowering and Fruiting—Redbud flowers are pink to reddish purple, and rarely white. They are borne on pedicels in clusters of two to eight. Flowers are produced from small buds on old twigs, branches, and trunks. Flowers are bisexual and the tree is self-pollinating. Flowering usually occurs sometime from March to May and precedes leafing. In Indiana, the tree requires 30 days of temperatures averaging more than 10°C (50°F). Previous winter chilling also enhances flowering (11). Pollination is usually accomplished by bees. After 2 or 3 weeks leaves appear and the flowers drop. The ovaries of one to several flowers in most flower clusters enlarge and develop into fruits that reach their full size by mid-summer (13). Fruits are flat reddish-brown pods about 1.3 cm (0.5 in) wide and 5 to 10 cm (2 to 4 in) long (16). Each fruit contains 4 to 10 brown, hard, compressed beanlike seeds, each about 6mm (0.25 in) long. The fruits remain on the tree until after leaf fall; some persist throughout winter (15).

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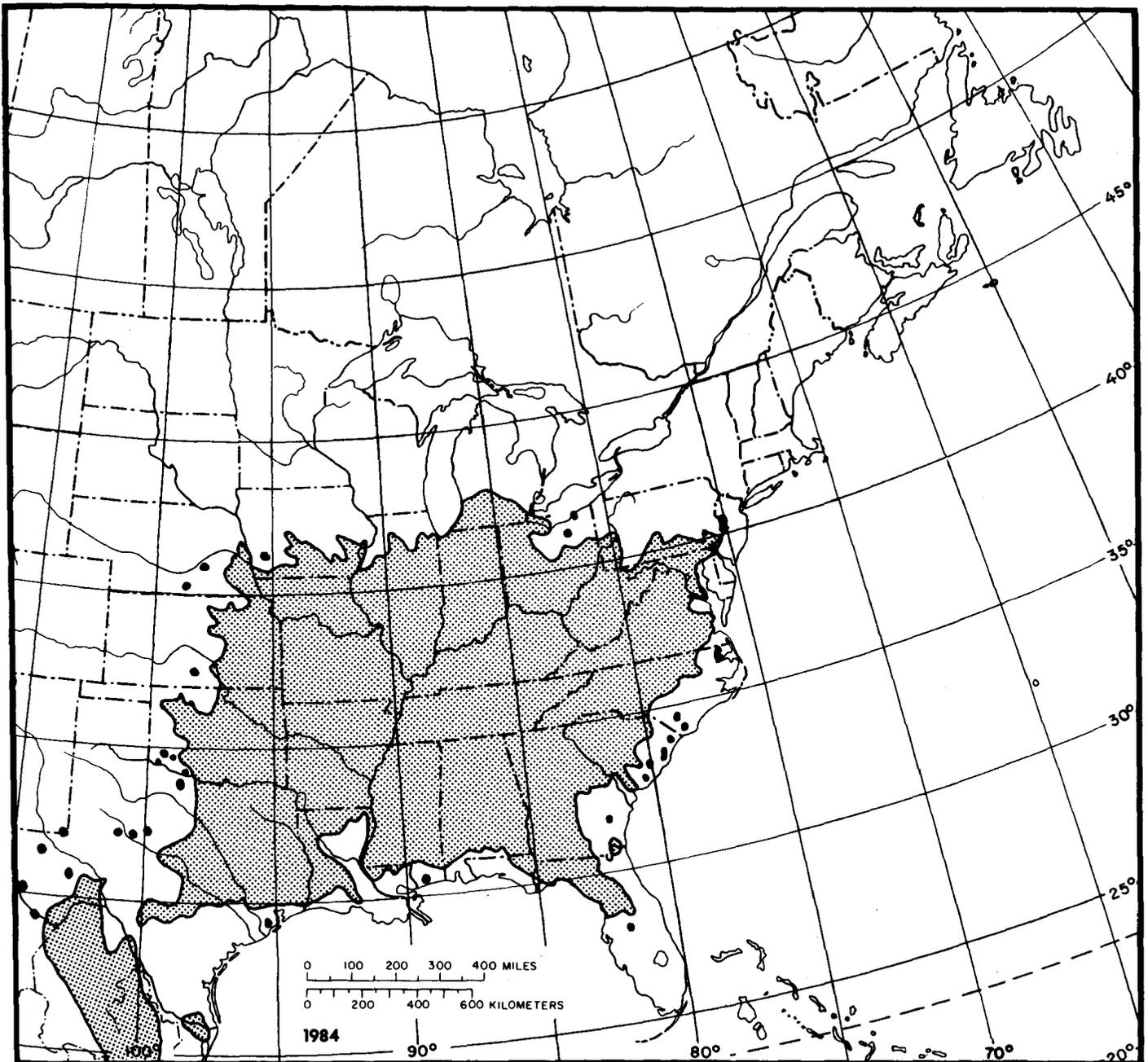


Figure 1—The native range of eastern redbud.

Seed Production and Dissemination—Seeds are released by the opening of fruit sutures or decay of the fruit wall. Most seeds are dispersed during fall and winter by wind and animals. Many seeds are injured by insects. Those that fall to the ground usually remain dormant for several years (1).

For artificial propagation, seeds should be collected, cleaned, and dried when ripe to avoid insect

damage. Dried seeds can be stored in sealed glass or metal containers at 2° to 5° C (35° to 41° F). Seed treatment is necessary for propagation because redbud shows delayed germination due to impermeability of the seed coat to water and dormancy of the embryo (1). The seed coat can be made permeable to water by mechanical scarification or by immersion in boiling water or in concentrated sulfuric acid for



Figure 2—Eastern redbud makes a handsome ornamental year-round.

about 30 minutes. After scarifying, seeds should be stratified in moist sand at about 5° C (41° F) for 5 to 8 weeks (14).

Prepared seeds should be sown in well-prepared seedbeds in late April or early May (14). Moist soil should cover seeds at a maximum depth of 0.5 cm (0.2 in). Propagation can also be accomplished by layering or cuttings.

Seedling Development—Approximate site characteristics and seedling vigor determine seedling establishment. Germination is epigeal (14). Under optimum conditions seedlings can grow 0.3 m (1 ft) in height the first growing season. Continuous terminal growth is related to light intensity, photoperiod, and temperature (11). Once established, seedlings can endure much shading.

Vegetative Reproduction—No information available.

Sapling and Pole Stages to Maturity

Growth and Yield—Development of young redbud to the flowering stage is rapid. Young redbuds have been observed first flowering when less than 7 years old but do not fruit the first year of blossoming. Annual cambial growth begins just before flowering

and shoot growth usually begins during flowering (11). In Indiana terminal growth of saplings started when the weekly mean of the daily mean temperature reached 13° C (55° F). Maximum growth was reached the fourth week and growth ceased after 6 to 10 weeks under low soil moisture conditions. With adequate soil moisture, terminal growth continued until frost. More than 1076 lux (100 lumens/ft²) of light and more than 13 hours of daylight daily are needed to maintain terminal growth of saplings.

Rooting Habit—Redbud develops a deep taproot that descends rapidly the first few years if the soil permits. Initial growth depends on soil moisture and the absence of a tight clay subsoil. If impenetrable subsoils are present the taproot grows horizontally. Secondary roots appear when the taproot is 5 to 8 cm (2 to 3 in) long and grow rapidly.

Reaction to Competition—As redbuds grow and mature they become less shade tolerant. Old trees usually suffer from heart rot and cannot normally tolerate severe competition and shade. Redbud is most accurately classed as tolerant of shade.

Damaging Agents—Redbud is a host to a variety of insects, but damage is not normally severe. Bark and phloem borers include three species of *Hypothenemus*, and *Pityophthorus lautus* (2). A seed beetle, *Gibbobruchus mimus*, breeds in the seed of redbud.

Numerous wood borers have been found in redbud. *Agrilus otiosus*, three species of *Hypothenemus*, three species of *Micracis*, two species of *Microcisella*, *Pityophthorus lautus*, *Ptosima gibbicollis*, and *Thysanoes fimbriicornis* all inhabit portions of the wood of redbud.

Other insects feed on the leaves of redbud. The redbud leaffolder, *Fascista cercerisella*, feeds on leaves which the larvae web together. The grape leaffolder, *Desmia funeralis*, an important pest of grape, also feeds on redbud. The Japanese weevil, *Callirhopalus bifasciatus*, and *Norape ovina* both consume redbud leaves.

Other insects feed on redbud by extracting juices from the plant. The twolined spittlebug, *Prosapia bicincta*, has been recorded feeding on redbud. The terrapin scale, *Mesolecanium nigrofasciatum*, and San Jose scale, *Quadraspidiotus perniciosus*, like most of the other redbud parasites, inhabit a variety of hosts including redbud. The periodical cicada, *Magicicada septendecim*, lays its eggs in more than 70 species of trees and other plants, including redbud.

There are three main diseases of redbud: leaf anthracnose, *Mycosphaerella cercidicola*, Botryosphaeria canker, and Verticillium wilt (6). The most serious is the canker *Botryosphaeria ribis* or its variety *chromogena*. The species is mainly a saprobe; the variety is a parasite. This variety produces stem and twig lesions and entire groves of redbuds have been killed by this disease. Verticillium wilt (*Verticillium albo-atrum*) sometimes kills redbuds, especially in the Midwestern United States. Redbud is vulnerable to Texas root rot (*Phymatotrichum omnivorum*), but redbud is not commonly grown in its range. A variety of sap and heart rots also infect eastern redbud.

Special Uses

The eastern redbud is extensively planted as an ornamental throughout the Eastern United States. It is tolerant of a wide range of site conditions, is not especially vulnerable to insects or diseases, is relatively easy to maintain, and makes a beautiful shrub or small tree, especially when flowering.

Bark of redbud has been used as an astringent in the treatment of dysentery. Flowers of the tree can be put into salads or fried and eaten (16). There is some documented wildlife use of redbud fruit. Cardinals have been observed feeding on the seeds, and seeds have been consumed by ring-necked pheasants, rose-breasted grosbeaks (5), and bobwhites (7). White-tailed deer and gray squirrels have also been observed feeding on the seeds (5). Flowers of the tree are regarded as important in the production of honey by bees (10).

Genetics

Donselman (3) investigated morphological variation in trees grown from seed collected from 13 diverse locations in the range of redbud. He concluded that trees from more xeric locations in the southwestern and western portions of the range exhibited adaptations to high solar radiation, drying winds, low humidity, low soil moisture, and other environmental factors associated with high evapotranspiration. Leaves from those plants were thicker and smaller, had increased pubescence, and showed more efficient stomatal geometry than trees from mesic locations.

Two subspecies of redbud have been identified: Texas redbud (*Cercis canadensis* var. *texensis*) found in southern Oklahoma, Trans-Pecos Texas, and

southeastern New Mexico; and eastern redbud (*C. canadensis* var. *canadensis*) found in the remainder of the range of redbud (9). Another native *Cercis* species, California redbud (*C. occidentalis*), is found in Utah, Nevada, California and Arizona.

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