Cornus florida L. Flowering Dogwood

Cornaceae Dogwood family

B. F. McLemore

Flowering *dogwood (Cornus florida)* is one of America's most popular ornamental trees. Known to most people simply as dogwood, it has other common names, including boxwood and cornel. The species name *florida* is Latin for flowering, but the showy petal-like bracts are not in fact flowers. The bright red fruit of this fast-growing short-lived tree are poisonous to humans but provide a great variety of wildlife with food. The wood is smooth, hard and close-textured and now used for specialty products.

Habitat

Native Range

The range of flowering dogwood (figs. 1, 2) extends from extreme southwestern Maine west to New York, extreme southern Ontario, central Michigan, central Illinois, and central Missouri; south to extreme southeast Kansas, eastern Oklahoma, east Texas; and east to north Florida. A variety also grows in the mountains of Nuevo Leon and Veracruz, Mexico *(11)*.

Climate

Precipitation within the range of flowering dogwood varies from 760 mm (30 in) in the North to 2030 mm (80 in) in the southern Appalachians. Warm season precipitation varies from about 510 mm (20 in) in southern Michigan to 860 mm (34 in) in northern Florida, and annual snowfall ranges from none in Florida to more than 127 cm (50 in) in the North *(15)*. Average annual temperature is 21" C (70° F) in the South and 7" C (45" F) in the North, with temperature extremes of 46" to -34" C (115" to -30" F). Growing season ranges from 160 days in southern Michigan to more than 300 days in Florida *(12)*.

Soils and Topography

The species grows on soils varying from deep and moist along minor streams to light textured and well drained in the uplands. It is found most frequently on soils with a pH of 6 to 7 *(15)*. Dominant soil orders (with typical suborders in parentheses) in the range of flowering dogwood, in decreasing order of importance, include Ultisols (Udults and Aquults) in the South and East, Inceptisols (Ochrepts) in the Appalachians, Alfisols (Udalfs) in the Midwest, Spodosols (Orthods and Aquods) in New England and Florida, and Entisols (Psamments) in scattered areas of the Southeast *(14)*. Seedling survival is low and the species is virtually absent on poorly drained clay soils. The frequency of flowering dogwood in forest stands increases as drainage improves and soils become lighter in texture.

Flowering dogwood grows well on flats and on lower or middle slopes, but not very well on upper slopes and ridges. The inability to grow on extremely dry sites is attributed to its relatively shallow root system. It is one of the most numerous species in the understory of loblolly pine and loblolly pine-hardwood stands in the South. As these stands progress toward the hardwood climax, dogwood remains an important subordinate species.

Flowering dogwood is considered a soil improver *(7)*. Its leaf litter decomposes more rapidly than that of most other species, thus making its mineral constituents more readily available. Dogwood foliage decomposes three times faster than hickory *(Carya* spp.); four times faster than yellow-poplar *(Liriodendron tulipifera),* eastern redcedar *(Juniperus virginiana),* and white ash *(Fraxinus americana);* and 10 times faster than sycamore *(Platanus occidentalis)* and oak *(Quercus* spp.) *(15)*. In addition to its rapid decomposition, dogwood litter is an important source of calcium, containing 2.0 to 3.5 percent of this element on an oven-dry basis. The range of major mineral elements, in milligrams per kilogram of foliage (parts per million), is as follows: potassium, 4,000 to 11,000; phosphorus, 1,800 to 3,200; calcium, 27,000 to 42,000; magnesium, 3,000 to 5,000; and sulfur, 3,800 to 7,000. The range of minor elements, in mg/kg (p/m), is boron, 23; copper, 7 to 9; iron, 240 to 380; manganese, 30 to 50; and zinc, 3 to 28 *(15)*.

Dogwood leaves concentrate fluorine and may contain 40 mg/kg (p/m> compared to only 8 mg/kg (p/m) for apple *(Malus* spp.) and peach *(Prunus* spp.) leaves grown under similar conditions. In one study, fluorine increased from 72 mg/kg <p/m) in June to 103 mg/kg (p/m> in October, while that of black cherry *(Prunus serotina)* increased from 5.6 to 11.3 mg/kg (p/m) *(15)*.

The author is Principal Silviculturist (retired), Southern Forest Experiment Station, New Orleans, LA.

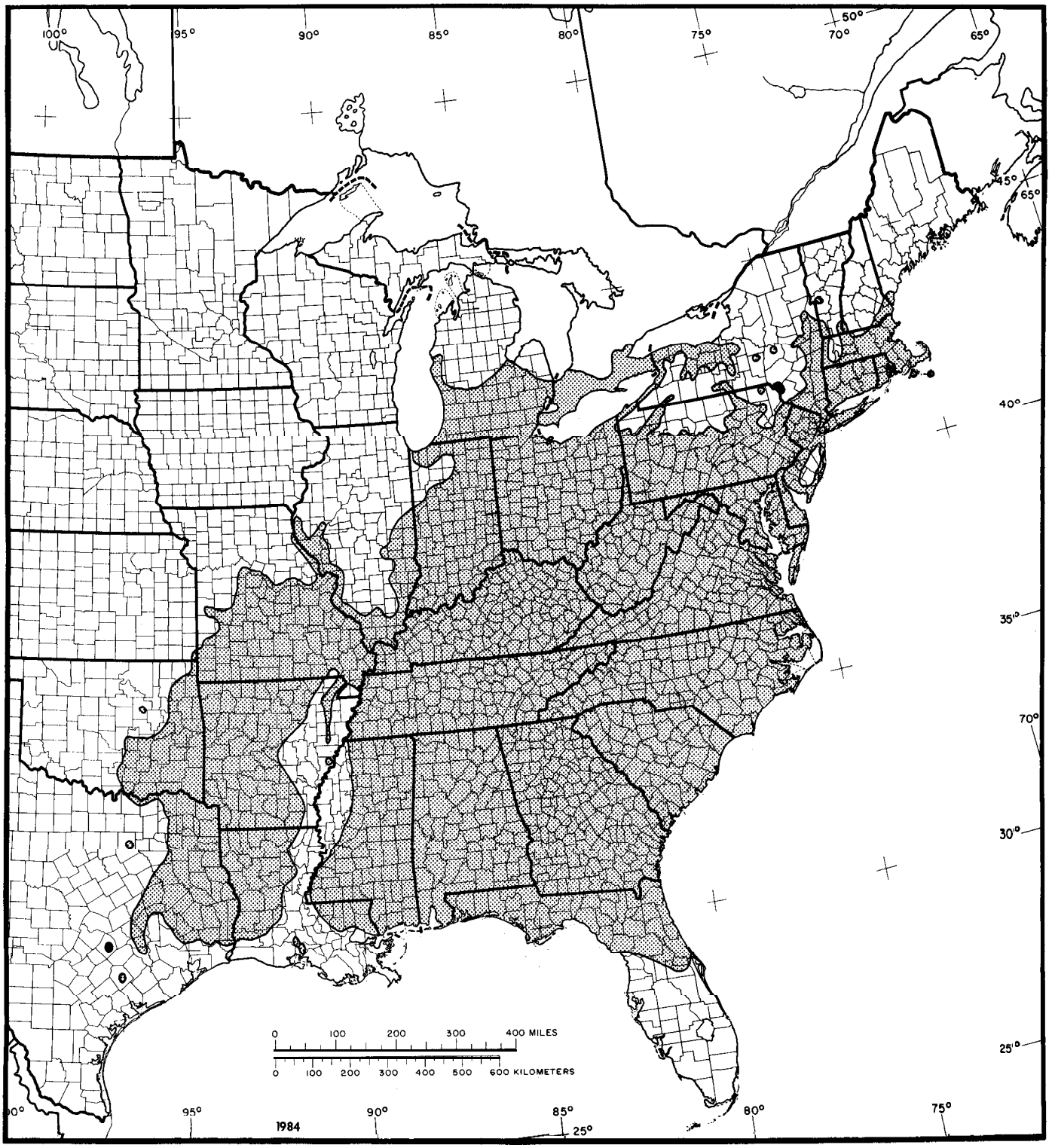

Figure *l-The native range of flowering dogwood.*

Figure 2—*Flowering dogwood.*

Associated Forest Cover

The wide geographical range of flowering dogwood, and the diverse soils on which it is found, is indicative of a large number of associated species. Dogwood is specifically mentioned in 22 of the 90 Society of American Foresters forest cover types *(3).* Cover types range from Jack Pine (Type 1) and Beech-Sugar Maple (Type 60) in the North to Longleaf Pine (Type 70) in the South. Common associates include white, red, and black oaks *(Quercus alba, Q. falcata, Q. velutina),* yellow-poplar, sassafras *(Sassafras albidum),* persimmon *(Diospyros virginiana),* sweetgum *(Liquidambar styraciflua),* and longleaf, loblolly, shortleaf, slash, and Virginia pines *(Pinus palustris, l? taeda, F! echinata, l? elliottii,* and *l? virginiana).* A complete list of species found with dogwood would include a majority of the trees growing in the Eastern United States.

Life History

Reproduction and Early Growth

Flowering and Fruiting-Flowering dogwood has many crowded, small, yellowish perfect flowers, borne in terminal clusters in the spring before the leaves appear, and surrounded by four snow-white, petal-like bracts. The bracts form "flowers" 5 to 10 cm (2 to 4 in) across and provide a spectacular display in the springtime. Occasionally, trees with salmon-colored or light-pink bracts are found in nature. Pink and red flowering dogwoods and other cultivars with special ornamental characteristics are commonly propagated from clones by commercial nurseries. Dates of flowering range from mid-March in the South to late May in the North.

The clustered fruits of flowering dogwood are bright red drupes about 13 mm (0.5 in) long and 6 mm (0.25 in) in diameter with thin, mealy flesh. Each fruit contains a two-celled, usually two-seeded, bony stone. In many stones, only one seed is fully developed. The fruits ripen from September to late October *(10).* Trees grown from seed commonly flower and produce fruits when 6 years old. Flowers also have been observed on trees of sprout origin at 6 years, when stump diameter is 19 mm (0.75 in), and height is 1.2 m (4 ft).

Seed Production and Dissemination-Dogwood usually produces a good seed crop every other year, but seeds on isolated trees are frequently empty. Thus, seed collections should be made from groups of trees. In a Texas study, 88 percent or more of trees 9 cm (3.4 in) in d.b.h. and larger bore fruit each year. Year-to-year differences were more pronounced in the smaller diameter classes. Average fruit production was 185 kg/m^2 of basal area (37.9 lb/ft^2) *(9).*

The yield of stones per kilogram of fruit ranges from 0.19 to 0.46 kg (19 to 46 lb/100 lb of fruit). The average number of cleaned stones per kilogram is 9,920 (4,500/lb). Clean, air-dried stones may be stored in sealed containers at 3" C (38" F) for 2 to 4 years (2). Birds and other animals are the primary agents of seed dissemination, although some seeds are scattered by gravity.

Seedling Development-Natural germination of flowering dogwood usually occurs in the spring following seedfall, but some seeds do not germinate until the second spring. Germination is epigeal. Stratification of freshly collected seed at 5" C (41" F) for periods up to 120 days is recommended for overcoming embryo dormancy *(2)*.

Seedlings usually show rapid root growth. In one greenhouse study, an average 6-month-old seedling had 3,000 roots with a total length of 51.2 m (168 ft), compared to 800 roots with a total length of 3.7 m (12 ft) for loblolly pine *(15)*.

This species grows nearly all summer but stops temporarily during periods of adverse conditions. In a Massachusetts nursery, flowering dogwood displayed a height growth pattern different from that of any other species studied. Seedlings grew from April 24 to September 4, and 90 percent of the growth occurred from May 15 to August 18. The most rapid growth occurred during the first week of August *(10)*.

In a North Carolina Piedmont study, flowering dogwood seedlings were planted under three situations: (1) in an open field, (2) under pine stands, and (3) on the margins of pine stands. Survival was significantly higher on the margins of pine stands than on the other two sites, but there was no significant difference in survival between the open field and the pine forest. The intermediate light intensity of the margins apparently provided some advantage. Growth of seedlings was greater in the open than on the margin of the pine forest. Seedlings in the forest were smallest *(15)*.

Transplanting flowering dogwood seedlings with a root ball is preferred over bare-root transplanting, although both methods can be successful (4). Plants entering their third year are well suited for planting in permanent locations. Plants of this age are usually 0.6 to 1 m (2 to 3 ft) tall and can be lifted easily without excessive disturbance of the root system.

Vegetative Reproduction-Flowering dogwood reproduces by sprouting and sprouts most profusely when cut in late winter. Height growth of sprouts is known to increase with increasing stump diameter. The species also reproduces extensively by layering. Other means of vegetative propagation include softwood cuttings in summer, hardwood cuttings in winter, grafting in winter or spring, suckers and divisions in spring, and budding in the summer. Vegetative reproduction is necessary to propagate plants for characteristics such as fruit retention and color of bracts and fruit.

Flowering dogwood roots readily from cuttings taken in June or immediately after the plants bloom. Cuttings from young trees usually show better growth and survival after rooting than cuttings from mature trees. Only terminal shoot tips trimmed to about 8 cm (3 in) in length and retaining two to four leaves should be used. Bases of cuttings should be dipped in a mixture of indolebutyric acid crystals and talc, one part acid crystals to 250 parts talc by weight *(10)*. Cuttings are then set about 3 cm (1.2 in) deep in the rooting medium and grown under a mist with a photoperiod of at least 18 hours.

The red form of flowering dogwood is difficult to start from cuttings and usually is propagated by budding in late summer or grafting in winter (6).

Sapling and Pole Stages to Maturity

Growth and Yield-The maximum size obtained by a flowering dogwood is 16.8 m (55 ft) in height and 48 cm (19 in) in d.b.h. as recorded in the American Forestry Association's register of champion trees. Heights on good sites of 9 to 12 m (30 to 40 ft) are common, with ranges in d.b.h. of 20 to 40 cm (8 to 16 in). On poorer sites, d.b.h. of mature trees may range from only 8 to 20 cm (3 to 8 in). Near the northern limits of its range, dogwood is a many-branched shrub *(15)*. Height growth in the southern Appalachians is reported to be fairly rapid for the first 20 to 30 years, but then it practically ceases. Individual plants may live for 125 years. Annual growth rings are usually 2 to 4 mm (0.06 to 0.15 in) wide *(12)*.

Flowering dogwood seldom if ever grows in pure stands. Thus, because it is usually a small, understory tree, little or no information is available concerning growth and yield on a per-acre basis. Moreover, it is treated as a weed tree in timber stand improvement operations more often than it is grown for its commercial value. One estimate has indicated that yields of 12.6 m^3/ha of boltwood (2 cords/acre) may be cut on good sites, but it takes 15 to 20 times the area to obtain half this amount in other locations *(15)*. *No* estimates of the volume of flowering dogwood are available for the entire range of the species. One writer noted that in six Southern States, where production is concentrated, a volume of 2.82 million m^3 (99.8 million ft^3) in trees 12.7 cm (5 in) d.b.h. and larger was shown by inventories made between 1962 and 1971 *(12)*. This indicates a supply of more than 2.55 million m^3 (1 million cords) within the six States.

Rooting Habit-The extensive root system of flowering dogwood is extremely shallow. This fact undoubtedly accounts for the susceptibility of this species to periods of drought.

Reaction to Competition-Flowering dogwood is an understory species and is classed as very tolerant of shade. Maximum photosynthesis occurs at slightly less than one-third of full sunlight *(15).* It is tolerant of high temperatures. Soil moisture usually is the limiting factor. In Southern forests, dogwood leaves are often the first to wilt in dry weather. Continuing drought may cause leaves to fall and dieback of tops to occur.

Damaging Agents-Because of its thin bark, flowering dogwood is readily injured by fire. Its profuse sprouting ability may actually increase the number of stems in fire-damaged stands, however *(12).* Flooding also is detrimental to flowering dogwood.

Little is known of the pest status of insects associated with wild flowering dogwoods, but many insects have been identified attacking cultivated ornamentals. The dogwood borer *(Synanthedon scitula)* is a noteworthy pest of cultivated flbwering dogwood. Other damaging insects include flatheaded borers *(Chrysobothris azurea* and *Agrilus cephalicus),* dogwood twig borer *(Oberea tripunctata),* the twig girdler *(Oncideres cingulata),* scurfy scale *(Chionaspis lintneri),* and dogwood scale *(C. corni) (1).* Dogwood club gall, a clublike swelling on small twigs, is caused by infestations of midge larvae *(Resseliella clavula)* and is a serious problem in some areas *(10).* The redhumped caterpillar *(Schizura concinna),* a tussock moth *(Dasychira basiflava),* io moth *(Automeris io),* and scarab beetles *(Phyllophaga* spp.) are among the numerous leaf feeders attacking dogwood *(1).* Introduced pests of flowering dogwood include the Japanese weevil *(Pseudocneorhinus bifasciatus)* and Asiatic oak weevil *(Crytepistomus castaneus) (8).*

Basal stem canker, caused by the fungus *Phytophthora cactorum,* may girdle the tree and is the most lethal disease. Target cankers *(Nectria galligena)* sometimes occur on the trunk and limbs, and *Armillaria mellea* has been found on dogwoods. Leafspot *(Cercospora cornicola)* attacks seedlings, and *Meliodogyne incognita* causes severe root galling, associated with dieback and premature leaf fall in seedlings. Twig blight, caused by the fungus *Myxosporium nitidum,* may cause dieback of small twigs. Leaf spots and dieback of flowers are caused by *Botrytis cinerea, Elsinoe corni,* and *Septoria cornicola,* while *Ascochyta cornicola* may result in shrivelling and blackening of the leaves (7). Verticillium wilt *(Verticillium albo-atrum)* attacks dogwood *(15),* and the cherry leafroll, tobacco ringspot, and tomato ringspot viruses have been isolated from dogwood leaves *(13).*

Noninfectious diseases include sunscald, mechanical and drought injury, and freezing. Dogwood reproduction is often browsed heavily by deer and rabbits.

Special Uses

Flowering dogwoods are extremely valuable for wildlife because the seed, fruit, flowers, twigs, bark, and leaves are utilized as food by various animals. The most distinguishing quality of dogwood is its high calcium and fat content (5). Fruits have been recorded as food eaten by at least 36 species of birds, including ruffed grouse, bob-white quail, and wild turkey. Chipmunks, foxes, skunks, rabbits, deer, beaver, black bears, arid squirrels, in addition to other mammals, also eat dogwood fruits. Foliage and twigs are browsed heavily by deer and rabbits. The quality of browse may be improved by controlled burns in the spring, which increase the protein and phosphoric acid content.

Flowering dogwood also is a favored ornamental species. It is highly regarded for landscaping and urban forestry purposes.

Virtually all the dogwood harvested was used in the manufacture of shuttles for textile weaving, but plastic shuttles have rapidly replaced this use. Small amounts of dogwood are used for other articles requiring a hard, close-textured, smooth wood capable of withstanding rough use. Examples are spools, small pulleys, malletheads, jewelers' blocks, and turnpins for shaping the ends of lead pipes *(12).*

Genetics

Near the northern limits of its range, flowering dogwood becomes a many-branched shrub *(15).* Other than this, little is known of population differences other than the tendency for fruit weights to decrease with decreasing latitude and increasing length of growing season *(16).*

More than 20 cultivars of flowering dogwood are sold commercially in the United States (17). Four clones of flowering dogwood most commonly propagated as drnamentals are *Cornus florida* f. *pendula* (Dipp.) Schelle, with pendulous branches, *Cornus florida* f. *rubra* (West.) Schelle, with red or pink involucral bracts, *Cornus florida* f. *pluribracteata* Rehder, with six to eight large and several small bracts on the inflorescence, and *Cornus florida* f. *xanthocarpa* Rehder, with yellow fruit. Another cultivar, called *Welchii,* has yellow and red variegated leaves and is offered commercially *(17).*

In addition to these clones, *Cornus florida* var. *urbaniana*, a variety found in the mountains of Nuevo León and Veracruz, Mexico, differs from the typical species by its grayer twigs and larger fruit *(15)*.

Flowering dogwood is not known to hybridize with other species.

Literature Cited

1. Baker, Whiteford L. 1972. Eastern forest insects. U.S. Department of Agriculture, Miscellaneous Publication 1175. Washington, DC. 642 p.
2. Brinkman, Kenneth A. 1974. *Cornus* L. Dogwood. *In* Seeds of woody plants in the United States. p. 336-342. C. S. Schopmeyer, tech. coord. U.S. Department of Agriculture, Agriculture Handbook 450. Washington, DC.
3. Eyre, F. H., ed. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, DC. 148 p.
4. Flemer, C. F., III. 1977. Dogwood liner to finished plant. Combined Proceedings of the Annual Meeting of the International Plant Propagation Society 27:240–241.
5. Halls, Lowell K. 1977. Southern fruit-producing woody plants used by wildlife. USDA Forest Service, General Technical Report SO-16. Southern Forest Experiment Station, New Orleans, LA. 235 p.
6. Hartmann, H. T., and D. E. Kester. 1968. Plant propagation: principles and practices. 2d ed. Prentice Hall, Englewood Cliffs, NJ. 702 p.
7. Hepting, George H. 1971. Diseases of forest and shade trees of the United States. U.S. Department of Agriculture, Agriculture Handbook 386. Washington, DC. 658 p.
8. Johnson, W. T., and H. H. Lyon. 1976. Insects that feed on trees and shrubs. Cornell University Press, Ithaca, NY. 464 p.
9. Lay, D. W. 1961. Fruit production of some understory hardwoods. *In* Proceedings, Fifteenth Annual Conference of the Southeastern Association of Game and Fish Commissioners, Oct. 1961, Atlanta, GA. p. 30-37. Nashville, TN.
10. Lesser, W. A., and J. D. Wistendahl. 1974. Dogwoods. p. 32-41. USDA Forest Service, General Technical Report NE–9. Northeastern Forest Experiment Station, Broomall, PA.
11. Little, Elbert L., Jr. 1979. Checklist of United States trees (native and naturalized). U.S. Department of Agriculture, Agriculture Handbook 541. Washington, DC. 375 p.
12. Mignery, Arnold L. 1973. Flowering dogwood-an American wood. U.S. Department of Agriculture, Forest Service, FS-232. Washington, DC. 5 p.
13. Reddick, B. B., 0. W. Barnett, Jr., and L. W. Baxter, Jr. 1978. Viruses infecting dogwoods in South Carolina. Proceedings of the Phytopathological Society 4:228.
14. U.S. Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Department of Agriculture, Agriculture Handbook 436. Washington, DC. 754 p.
15. Vimmerstedt, John P. 1965. Flowering dogwood (*Cornus florida* L.). *In* Silvics of forest trees of the United States. p. 162-166. H. A. Fowells, comp. U.S. Department of Agriculture, Agriculture Handbook 271. Washington, DC.
16. Winstead, J. E., B. J. Smith, and G. I. Wardell. 1977. Fruit weight clines in populations of ash, ironwood, cherry, dogwood, and maple. Castanea 42(1):56–60.
17. Wyman, Donald. 1970. The flowering dogwood—*Cornus florida*. Horticulture 48:44–45.