***Kalmia latifolia* L.** mountain laurel
ERICACEAE

Synonyms: *Kalmia latifolia* var. *laevipes* Fern.

General Description.—Mountain laurel, known also as calico-bush, ivy, ivybush, kalmia, laurel, and spoonwood, is a medium to large (2 to 9 m in height) evergreen shrub, often with contorted stem and branching habit. The thick, flat, leathery leaves are shiny, dark-green above and pale-green below; margins are entire. Leaf length ranges from 5 to 12 cm and width from 1.5 to 5 cm. The yellowish green petioles range from 0.7 to 3 cm long. The thin, reddish-brown bark shreds and subdivides into ridges. In the absence of disturbance (usually fire), the species is long-lived: 40 to 60 years (Chapman 1950). Botanical characteristics of the genus *Kalmia* have been studied intensively (Ebinger 1974). *Kalmia* is the state flower of Connecticut and Pennsylvania.

Range.—Mountain laurel is primarily a shrub of the Appalachian Mountain region in the eastern U.S. It also occurs in the Atlantic Coastal Plain from Maine to Virginia, throughout the Appalachian Piedmont, southwest into Mississippi, and west into much of Tennessee, Kentucky, and southern Indiana and Ohio. Reports of native mountain laurel in Canada have not been confirmed and are likely ornamentals or large-leaved specimens of sheep laurel [*Kalmia angustifolia* (Small) Fernald] (Jaynes 1997). *Kalmia* has been planted widely as an ornamental in the western United States, throughout Europe, and in New Zealand and Australia.

Ecology.—Mountain laurel occurs most commonly on dry sites of acid soils, although it occasionally occurs on well-drained floodplain soils, and it will tolerate clay soils that are not waterlogged. Mountain laurel forms dense, almost impenetrable patches known as "laurel hells" or "ivy thickets," particularly on upper slopes and ridges where the tree canopy is sparse or lacking. In the southern Appalachians, mountain laurel occurs at elevations to 1500 m and the probability of its occurrence increases on sites with a thin soil A horizon (McNab et al. 1999), and likely low available water capacity. Lipscomb and Nilsen (1990) found that mountain laurel has high water-use efficiency, which could give it a strong competitive advantage on relatively hot and dry southwest slopes. Mountain laurel adapts to a range of light regimes, from little to moderately dense shade, typically beneath an oak (*Quercus* spp.) or pine (*Pinus* spp.) canopy. The ratio of foliage chlorophylls a to b is lower (1.5) in *Kalmia* than for most understory species and may benefit this adaptation (Al-Hamdani and others 2002). Rosebay rhododendron (*Rhododendron maximum* L.) is a common associate of mountain laurel on subxeric/submesic ecotones in the southern Appalachians. A mycorrhizal association has been demonstrated for seedlings of mountain laurel (Flemer 1949). Natural stands of mountain laurel are little affected by insects, although at epidemic levels caterpillars of gypsy moths (*Lymantria dispar* L.) and elm spanworms (*Ennomos subsignaria* Hubner) will feed on the foliage. The most serious disease is phytophthora root rot (*Phytophthora cinnamomi* Rands), which can infect damaged plants (Jaynes 1997). Foliage of mountain laurel near roadsides is particularly sensitive to sodium chloride (NaCl) used for de-icing roads in New England (Bryson and Baker 2002). Although not shown in mountain laurel, other *Kalmia* species are allelopathic. Waterman and others (1995) found that *Kalmia* thickets do not exclude tree seedlings but inhibit their growth by reducing light and increasing competition for water.

Reproduction.—The showy, white to pink 2- to 3- cm saucer-shaped flowers form convex clusters at the ends of branches and appear after the foliage, from March to July, depending on latitude and altitude (Olson and Barnes 1974). Purple spots mark 10 anther pockets in the petals. The method of pollen dispersal in *Kalmia* is unusual in that the anthers are under tension as the flower matures, and they spring forward when disturbed by an insect, forcefully and effectively transferring grains of pollen to the insect (Jaynes 1997). The flowers are pollinated by more than a dozen insects, primarily bumblebees, but generally not honeybees, likely because the flowers produce little nectar (Jaynes 1997). Glandular hairs on the flower stalk, calyx, and corolla may deter nonflying insects. Flowers are most abundant on plants in full sunlight and occur rarely on plants in dense shade (Kurmes 1961). Fruit ripens in late summer and consists of a brown, erect, five-celled, globular capsule, 4 to 7 mm wide. Each capsule contains about 600 seeds, which are 0.8 to 1 mm long and average about 27 million per kilogram (Olson and Barnes 1974). The nonwinged seeds are dispersed by wind, but only for distances of less than 15 m (Robinette 1974). Seeds remain viable for more than a year under field conditions. Light, cold stratification, and moisture enhance germination (Olson and Barnes 1974). Seeds germinate on mineral soil and on moss (Robinette 1974). *Kalmia* may also regenerate by layering, sprouts, or suckers (Robinette 1974). Techniques for commercial production of mountain laurel plants have been well developed (Jaynes 1997).

Growth and Management.—Growth rate of mountain laurel is relatively slow; young plants (< 15 years) add about 12 cm in height and 9 cm in width annually, depending on site moisture relations (Monk and others 1985). Older mountain laurel stems may attain heights up to 9 m and diameter at ground level of 15 cm (Jaynes 1997). Mountain laurel stem density can range from sparse on mesic sites to over 26,000 per ha in thickets on upper, southwest slopes; basal area at 3 cm above ground level can exceed 25 m^2/ha. Herbicides may be used to control mountain laurel on sites where establishment of tree seedlings is desired (Neary and others 1984). It is sensitive to juglone, a substance produced by black walnut (*Juglans nigra* L.) trees. Mountain laurel generally does not present a problem to timber management activities on submesic to mesic sites.

Benefits and Detriments.—Mountain laurel has long been cultivated as an ornamental--since about 1740 when American naturalist John Bartram sent plants to England (Jaynes 1997). Cultivars of mountain laurel are particularly valuable as ornamentals and are propagated commercially by many nurseries. Nearly 100 horticultural varieties of have been selected for variation in flower color, leaf variegation, and growth habit (Jaynes 1997). Mountain laurel burls have been used for making pipes for smoking tobacco, and early European settlers in America used the fine-grained wood for making eating utensils and weaver's shuttles, and produced a yellow dye from its foliage. Tinctures of fresh *Kalmia* leaves have been used for home medical remedies of skin disorders. An unidentified anticancer compound has been extracted from its sap (Jaynes 1997). Mountain laurel provides cover and stability to thin soils, however its presence can reduce water yields (Johnson and Kovner 1956). Foliage of mountain laurel is toxic to domestic cattle and sheep but provides subsistence winter food for ruffed grouse (*Bonasa umbellus* L.) and white-tailed deer (*Odocoileus virginianus* Boddaert) (Robinette 1974). Foliage from new sprouts of burned mountain laurel provides greater potential benefit to wildlife diets compared to unburned foliage (Thackston and others 1982).

Fire.—Mountain laurel contributes to intensity of fires in mountainous terrain and is classified as "extreme" in rate of spread when it occurs in dense thickets beneath hardwood stands (Jemison and Keetch 1942). Flame length can exceed 30 m in fires burning in Table Mountain pine (*Pinus pungens* Lambert) stands with mountain laurel (Waldrop and Brose 1999). Moisture of *Kalmia* foliage is lower than other species and is little affected by seasonal changes of soil moisture (Reifsnyder 1961). The high flammability of Mountain laurel thickets results from low foliate moisture (Richards 1940) and a high proportion of total biomass in small (<5 mm) dead twigs. Caloric content of foliage is estimated at about 5,000 cal/g based on similar vegetation (Hough 1969). Allometric equations for estimating dry biomass of 6- to 8-year old open-grown mountain laurel stems were developed by Boring and Swank (1986), which can be used to predict fuel loadings of leaf ($\log_{10}Y = -0.754 + 1.882 \log_{10}X$), branch ($\log_{10}Y = -1.222 + 2.359 \log_{10}X$), and bole ($\log_{10}Y = -0.636 + 1.948 \log_{10}X$) components of individual plants, where Y is dry weight (g) and X is stem diameter (mm) at 3 cm from the ground. *Kalmia* is killed more readily by headfires than by backfires (Hooper 1969), but almost all topkilled stems recover by producing basal sprouts (Clinton and others 1993, Johnson and Kovner 1956). Equations for estimating stem, foliage, and total biomass of young mountain laurel sprouts on recently burned areas were developed by Elliott and Clinton (1993).

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