Ericaceae—Heath family

Rhododendron L.

rhododendron and azalea

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Occurrence. The genus rhododendron—*Rhododendron* L.—is indigenous mainly to the Northern Hemisphere, with large concentrations in the mountain ranges of China, Tibet, and upper Burma, as well as to Japan and the eastern United States. Plants are found commonly in regions with highly organic soils, high rainfall, high humidity, and a temperate climate (Cox 1990). Species range from tiny, prostrate, alpine shrubs only 5 cm tall to trees with enormous leaves that reach heights of 24 m (Leach 1961). Species native to North America are listed in table 1.

Growth habit. There are over 900 species of rhododendrons and numerous cultivars (Davidian 1992). They include many of the most spectacular flowering trees and shrubs and are one of the most important and diverse groups of ornamental plants in cultivation (Dirr and Heuser 1987). The genus comprises both rhododendrons and azaleas. General characteristics are listed in table 2; however, these distinct characters are now known to be part of a continuum of gradation. Therefore, there are no clear delineations between azaleas and rhododendrons.

Uses. Besides their aesthetic appeal, rhododendrons in the wild provide erosion control for steep watersheds and protection for wildlife. In addition, some Himalayan species have been utilized for medicinal purposes, as a tea substitute, or for incense (Cox 1990). Under cultivation, the species are recognized as one of the most important plants available due to their attractive foliage and extremely showy flowers. For landscaping, rhododendrons are unsurpassed with their variations in form, flower color, texture, and leaf morphology. Those with larger leaves should be planted in a woodland or similar setting. Rosebay rhododendron is ideal as a woodland shrub or for tall evergreen backgrounds, but its texture is much too coarse and its stature entirely too large for home foundation plantings. Catawba rhododendron and its western relative, California rosebay, are also well suited for woodland plantings, although Catawba rhododendron occurs often in full sun in cooler climates. Catawba rhododendron also has been used as a parent in many breeding programs to provide cold-hardy cultivars for the northeastern United States (LHBH 1976). Piedmont rhododendron can endure temperatures to ! 32 EC and it flowers later in the year, when there is not much floral color from other shrubs (Leach 1961). It is also among the most heat tolerant of all rhododendrons. Piedmont rhododendron grows too tall for foundation plantings but is useful as a robust, evergreen background shrub that tolerates shade. Carolina rhododendron is one of most useful and adaptable of all rhododendrons, thriving on a wide variety of sites and exposures (Leach 1961). It is well suited as a foundation planting due to its moderate size and growth habit. Chapman rhododendron is suited for lowland southern gardens, probably the only evergreen rhododendron that is truly heat resistant and easy to grow in the Deep South (Leach 1961). Deciduous, dwarf, small-flowering species of azaleas should be mass planted, as no other shrubs can provide such intense color in a mass planting (Hillier Nurseries 1994).

Geographic races and hybrids. Rhododendrons in the wild are quite variable. A single species may have numerous varieties and forms, and some of the deviations are extreme (Leach 1961). In addition, natural introgression among species is common, so species tend to merge with one another. Within a species, the environmental conditions present in northern locations or at high elevations can dwarf species normally attaining much larger proportions when grown in the more favorable environmental conditions present in more-southern or lower-elevation sites. At higher altitudes, leaves of various species diminish in size, which helps them to resist the drying effects of strong winds (Leach 1961).

Cultivated rhododendrons and azaleas may be species, but frequently they are cultivars of well-known hybrids. Hybrids usually result from controlled pollinations in attempts to produce plants possessing desirable characteristics of both parents. A selected hybrid is known as a clone, or cultivar, and does not come true from seed. Thus, vegetative propagation is essential, as seed propagation results in inevitable variation among individuals. Generally, hybrids are more adaptable because they possess a combination of those genes required by their parents to withstand the environments where they originated. As a group, hybrids flower at an earlier age and more regularly year after year than their original parents (Leach 1961). However, every improvement in flower size or color is often accompanied by a loss in some other trait, such as foliage characteristics or disease resistance.

Hybrids began to appear about 1825, with most of the early ones derived from Catawba and rosebay rhododendrons, tree rhododendron (*R. arboreum* Sm.), Caucasian rhododendron (*R. caucasicum* Pall.), and *R. ponticum* L., indigenous to the United States, the Himalayas, Caucasus, and Turkey, respectively. Most of these early hybrids possessed ample foliage, firm and full flower trusses, and the ability to withstand exposure to freezing temperatures, and hence are often referred to as the "hardy hybrids." They are suited for landscape plantings in cold climates, and many are ideal as informal hedges or screens (Hillier Nurseries 1994). With the exploration of China and the eastern Himalayas during the first part of the 20th century, many new species were discovered and included in breeding programs. These newer hybrids show even greater variation in foliage, flower color, and growth habit (Hillier Nurseries 1994).

Two examples of hybrids that are planted widely throughout the southeastern United States are the Indian and Kurume azaleas. In fact, the Indian hybrid azaleas are likely the most popular of all flowering evergreen shrubs. They are derived primarily from Sims azalea *(R. simsii* Planch.) and *R. indicum* (L.) Sweet—which, despite its specific epithet, is native to southern Japan not India. These hybrids are confused often with the parent species *R. indicum,* as they are sometimes sold as varieties or cultivars of *R. indicum* (LHBH 1976). Indian hybrids are broad mounding shrubs that are 2.5 to 3.0 m tall and usually grow dense in full sunlight and open and airy in the shade. They are utilized in the landscape as accent plants, for screening, and in mass groupings. The large showy flowers are 5 to 9 cm across, blooming in May with colors ranging from white, pink, magenta, and orange-red (Odenwald and Turner 1987). Indian azaleas are grown also as large-flowered greenhouse azaleas.

Kurume azaleas are derived primarily from Hiryu azalea—*R. obtusum* (Lindl.) Planch.—also indigenous to Japan. These low-mounding, fine-textured hybrids are slow growers with relatively small single or “hose-in-hose” double flowers in a variety of colors (Odenwald and Turner 1987). Many selections are available and they are planted widely in the southern United States, even though they are very site-specific and temperamental shrubs.

Flowering and fruiting. The perfect, showy flowers appear from March to August (table 3). Flower colors vary widely, with white, pink, and purple predominating. Flowers are pollinated by bees (Gibson 1901) and to a lesser extent by birds (Cox 1990). Fruits are oblong, 5-valved, dehiscent capsules that generally ripen during autumn (figure 1). When mature, capsules turn from green to brown, at which time they split along the sides, releasing minute seeds (figures 2–4). Capsules of rosebay rhododendron contain about 400 viable seeds/capsule (Romancier 1970).

Collection of fruits, seed extraction, and cleaning. In general, capsules should be observed closely from mid-September onward and collected as they start to turn from green to brown (Bowers 1960). Fruits are dehiscent and if capsules are not collected before they open, most of the seeds will be lost. However, capsules can be picked green and then opened in gentle heat as long as their seeds are fully developed. Capsules may be air-dried at about 21 EC for 2 to 4 weeks (Blazich and others 1991; Malek and others 1989) or oven-dried for 12 to 24 hours at 35 EC (Dirr and Heuser 1987). Many capsules will split open during drying, whereas others may require crushing. Seeds should be cleaned well to remove chaff and broken pieces of capsules by shaking through various sized sieves. Seeds should then be graded further by removal of abnormal, damaged, or undersized seeds.

Rhododendrons normally produce copious amounts of seeds (Cox 1990; Romancier 1970); however, viable seeds are not always available on a yearly basis. Seeds are extremely small and size can vary greatly among species (Arocha and other 1999; Blazich and others 1991, 1993; Glenn and others 1998; Olson 1974) and among provenances within a species (Rowe and others 1994a). However, small differences in moisture content can cause wide variability in estimates of the number of seeds per given weight (table 4).

Storage. There is little information on proper storage techniques for maintaining long-term viability in the rhododendrons, but the evidence available suggests that the seeds of this genus are orthodox in storage behavior.

Seeds of rhododendrons with a moisture content of 4 to 9% will remain viable about 2 years at room temperature (Bowers 1960; Olson 1974). However, at room temperature, seeds lose their viability at a rate of 50% a year, and those that retain their ability to germinate will sprout more slowly (Leach 1961). For Catawba and rosebay rhododendrons, Glenn and others (1998) compared seed germination under storage conditions analogous to storage in a home freezer at ! 18 EC, a refrigerator at 4 EC, and at room temperature (23 EC). Seed viability remained unchanged after 5 years of storage at ! 18 EC and 4 EC, which strongly suggests that viability for even longer periods is possible. Thus, long-term seed storage of Catawba and rosebay rhododendrons is possible, provided seeds are first dried to moisture contents of 5 to 7% and then stored in sealed containers at ! 18 or 4 EC. Room temperature storage (about 23 EC) should be avoided, as viability is lost rapidly (Glenn and others 1995). In the same study, Glenn and others (1998) also included seeds of Carolina rhododendron that were stored for only 4 years. After these 4 years at ! 18 or 4 EC, viability remained unchanged. Although viability decreased with storage at 23 EC, the decrease was not as dramatic as that observed for seedlots of Catawba and rosebay rhododendrons at the same temperature.

Pretreatment and germination tests. Mature seeds of rhododendrons possess no dormancy and will germinate shortly after sowing (Fordham 1960; Romancier 1970). Official testing rules prescribe a 21-day test on the top of moist blotter paper at alternating temperatures of 20/30 EC (8/16 hours) or at a constant 25 EC with light (AOSA 1993). Germination is epigeal (figure 5). Several 30-day germination tests have been conducted for various species at a constant temperature of 25 EC or an alternating 8/16 hour thermoperiods of 25E/15EC in combination with photoperiods ranging from total darkness to 24 hours. During these tests, light was provided by cool-white fluorescent lamps that provided an approximate photosynthetic photon flux (400 to 700 nm) of 28 Fmol/m^2/sec (2.2 klux). Species tested included flame azalea (Malek and others 1989) and Carolina (Blazich and others 1993), rosebay (Blazich and others 1991), and Catawba rhododendrons (Blazich and others 1991; Rowe and others 1994a). In all species tested except one, seeds required light to germinate. In addition, an alternating thermoperiod enhanced germination when light was limiting. These results agree partially with the work of Cho and others (1981), who also reported that seeds of 5 species of rhododendron native to Korea—*R. indicum*; Japanese azalea, *R. japonicum* (Gray) Sur.; *R. mucronulatum* Turcz.; *R. schlippenbachii* Maxim.; and *R. yedoense* Maxim.—did not germinate in darkness at a constant temperature but did germinate in darkness when subjected to an alternating temperature. In addition, germination sometimes is inhibited by long photoperiods. For equivalent photoperiods, inhibition (when present) will be more pronounced at 25/15 EC than at 25 EC because an alternating temperature can substitute partially for the light requirement for some species (Toole and others 1955). However, this inhibition usually dissipates by the end of 30 days of germination (Blazich and others 1991, 1993; Rowe and others 1994a).

A test of seeds of flame azalea collected from the Blue Ridge Mountains of western North Carolina demonstrated that (at a constant temperature of 25 EC) increasing photoperiods increased germination, with maximum germination (85%) occurring by day 12 under continuous light (Malek and others 1989). An 8/16-hour thermoperiod of 25/15 °C enhanced germination when light was limiting. Maximum germination of 84 to 91% was reached by day 24 for all photoperiods $ ½ hour, although at photoperiods $4 hours, comparable germination was noted at day 18 (Malek and others 1989). Similar results were reported for seeds of Carolina rhododendron collected in Henderson County, North Carolina, except that cumulative germination was lower (Blazich and others 1993).

Seeds of rosebay rhododendron collected in Avery County, North Carolina, also required light for germination regardless of temperature. At 25 EC, increasing photoperiods increased germination, with 79 and 81% germination occurring by day 21 for the 12- and 24-hour photoperiods, respectively. The alternating temperature again enhanced germination when light was limiting. At the alternating thermoperiod, germination of 92 to 97% was reached by day 21 for photoperiods $ 4 hours (Blazich and others 1991).

Rowe and others (1994a) also found that seeds of Catawba rhododendron have an obligate light requirement for germination. In contrast, Blazich and others (1991), reported that without light, seeds of Catawba rhododendron collected in Buncombe County, North Carolina, germinated in the dark. However, germination at 25 EC was low (5%), with moderate germination (64%) occurring at 25/15 EC. At both thermoperiods, germination >95% was attained by day 15 for photoperiods of ½ to 12 hours. This suggests that the germination response of Catawba rhododendron in darkness may vary, depending on the provenance or on the environmental conditions under which the seeds developed. The work of Glenn and others (1998) has suggested that the light requirement does not disappear during dry storage.

In addition, Rowe and others (1994a) compared germination in seeds from 3 provenances of Catawba rhododendron—Johnston County, North Carolina (elevation 67 m); Cherokee County, Georgia (elevation 320 m); and Yancey County, North Carolina (elevation 1,954 m)—representing diverse geographical and altitudinal distributions. Generally, light and temperature requirements for germination of seeds from all provenances were similar. Regardless of temperature, seeds required light for germination, and daily photoperiods as short as ½ hour maximized germination. The major difference in germination response among provenances was related to seed vigor. Seeds from the Yancey County (higher-elevation) provenance germinated at a faster rate with greater cumulative germination than seeds from lower elevation provenances.

In studying effects of irradiance on seed germination of rosebay rhododendron, Romancier (1970) provided a range of irradiance levels to seeds during 16-hr photoperiods at 22 EC. He reported zero germination in total darkness but found no significant differences in germination with light intensities ranging from 1.6 Fmol/m^2/sec (0.13 klux or 12 foot-candles) to 21.9 Fmol/m^2/sec (1.72 klux or 160 foot-candles), indicating that very low levels of irradiance will stimulate germination. All seeds, including those in total darkness, had been exposed to light before the test began, so it is during the period following imbibition that light is essential. Glenn and others (1999) reported that dormancy was induced in seeds of Catawba and rosebay rhododendrons by not subjecting seeds immediately to light following inbibition. However, the degree of dormancy varied depending on (a) the length of time imbibed seeds were maintained in darkness and (b) the temperature at which the dark treatments were imposed and the seeds were germinated.

Nursery practice and seedling care. Rhododendrons may be propagated by seed, stem cuttings (Dirr and Heuser 1987; Hartmann and others 2002), layering (Wells 1985), grafting (Wells 1985), and micropropagation (tissue culture) (Anderson 1984; McCown and Lloyd 1983). Commercially, plants usually are propagated by stem cuttings, although rooting ability is genotype-specific. Procedures developed for micropropagation are currently being used with great success. Nevertheless, seed propagation is still practiced to develop new hybrids, raise understocks for grafting, and propagate wild species.

Seeds should be sown in January or as early as local conditions will allow. This is important to allow maximum growth the first year. The longer the growing period before to mid-July (when growth normally ceases), the larger the seedlings will be at the end of the first season (Leach 1961). Many materials have been used as a germination medium, including vermiculite, perlite, sawdust, peat, and various soil mixes. Flats filled with peat moss and sand or perlite mixtures topped with 6 mm (¼ in) of slightly firmed shredded sphagnum moss work well (Wells 1985). Many propagators are convinced that a medium consisting solely of shredded sphagnum moss provides the best results (Leach 1961; Wells 1985). Sphagnum moss is naturally acidic, retains water, and inhibits fungal organisms responsible for damping-off.

Seeds should be sown sparingly. Because of the need for light and their small size, seeds should not be covered with medium. Flats can then be placed in a greenhouse with moderate heat (24 EC), preferably under intermittent mist. Covering flats with glass or plastic may be advisable if mist is not available. Most seeds germinate in 1 to 3 weeks. In an additional 4 to 8 weeks, small seedlings will have 2 to 4 true leaves in addition to the cotyledons (Anderson and Anderson 1994). The time of germination and the first few weeks thereafter are critical. Seedlings must be shaded from direct sunlight, and the surface of the medium should never be allowed to become dry, not even briefly. Some growers sow about 1,000 seeds in a standard flat measuring 36 H 51 H 10 cm (14 H 20 H 4 in) and then transplant seedlings when they are still very small. Others sow them more sparsely and wait until the plants are about 2.5 cm (1 in) tall before transplanting.

In about 6 months, seedlings will be large enough to be transplanted. During the critical transplanting stage, young seedlings are carefully teased out from the sphagnum. The root system will separate easily if an underlying sand and peat mixture is used. Then, seedlings are transplanted into prepared flats containing an acidic medium (pH 4.0 to 5.5), taking care not to bury the cotyledons. Commercial growers usually put 108 seedlings into a standard flat filled with sterilized medium (Leach 1961). Flats may then be placed back in the greenhouse under shade, where they will remain for 9 months. Overwintering is seldom a problem in a greenhouse as long as plants are prevented from freezing. During seedling growth, plants may be fertilized with about 180 ppm N from a 15-45-5 ($N:P_2O_5:K_2O$) water-soluble fertilizer also containing 200 ppm $CaCl_2$ and 75 ppm $MgSO_4$. In addition, terminal growth often is pinched back to produce bushier plants. With flame azalea, Malek and others (1992a) reported that lateral shoot development in seedlings could be stimulated by either manual or chemical pinching. Generally, the number of lateral shoots increased with the leaf stage at which manual pinching was begun. The highest number of shoots resulted by removing the terminal 2 nodes at the 16-leaf stage. Both pinched and nonpinched plants treated with dikegulac—2,3:4,6 bis-0(1-methylethylidene)-(x-L-xylo-2-hexulofuranosonic acid—produced more lateral shoots than manual pinching alone. The number of shoots increased linearly with increasing concentrations of dikegulac over a range of 0 to 4,000 ppm, whereas responses to 4,000, 6,000, and 8,000 ppm were comparable. However, considerable reduction in leaf, stem, and root dry weights occurred with increasing concentration. This research also demonstrated that pinching seedlings manually prior to dikegulac treatment did not result in significantly greater numbers of lateral shoots compared to dikegulac treatment of nonpinched plants.

In spring, 1-year-old seedlings are removed from the flats, graded, and planted into pots or prepared beds to grow 1 or 2 more years before planting in permanent locations. They can be placed outdoors to harden them off when the chance of killing frost has past, but they must not be exposed to direct sunlight. When plants of Catawba rhododendron were grown in controlled-environment growth chambers under long days at 16 different day/night temperature combinations, Rowe and others (1994b) found that a day/night cycle of 22/22 EC to 26/22 EC was optimal for seedling growth, whereas cycles ranging from 30/22 EC to 26/22 EC optimized net photosynthesis (Rowe and others 1994c). Similar results were reported for flame azalea (Malek and others 1992b). Throughout propagation and subsequent culture, plants should be examined frequently for insect and disease problems. Rhododendrons can be raised successfully with proper handling of the tender and delicate young seedlings by using a porous, well-drained acidic medium high in organic matter, and by maintaining ample moisture at all times.

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Figure 1—*Rhododendron,* rhododendron: capsules with styles removed of Catawba rhododendron (*R. catawbiense*), west coast rhododendron (*R. macrophyllum),* and rosebay rhododendron (*R. maximum*).
[fig. 1 in 1974 book)]

Figure 2—*Rhododendron,* rhododendron: seeds of selected species: flame azalea *(R. calendulaceum),* Carolina rhododendron (*R. carolinianum*), Catawba rhododendron (*R. catawbiense),* Chapman rhododendron (*R. chapmanii),* and rosebay rhododendron *(R. maximum).*
[new photo]

Figure 3—*Rhododendron macrophyllum,* west coast rhododendron: seeds in external view (**A**), longitudinal section (**B**), and cross section (**C**), H20.
[Fig. 2 in 1974 book]

Figure 4—*Rhododendron maximum,* rosebay rhododendron: seed in longitudinal section , H70.
[Fig. 3 in 1974 book]

Figure 5—*Rhododendron macrophyllum,* west coast rhododendron: seedling development at 1 day (**A**) and 9 (**B**), 40 (**C**), and 60 (**D**) days after germination.
[Fig. 4 in 1974 book]

Table 1—*Rhododendron*, rhododendron and azalea: nomenclature and occurrence

Scientific name & synonym(s)	Common name	Occurrence
EVERGREEN RHODODENDRONS		
***R. carolinianum* Rehd.**	**Carolina rhododendron,** Carolina azalea	Higher slopes of Blue Ridge Mtns
***R. catawbiense* Michx.**	**Catawba rhododendron,** Catawba rosebay, mountain rosebay, purple laurel,	Mtns of West Virginia & Virginia to Georgia & Alabama
***R. chapmannii* A. Gray** *R. minus* var. *chapmanii* (A. Gray) Duncan & Pullen	**Chapman rhododendron**	Sandy coastal plain of NW Florida
***R. macrophyllum* D. Don ex G. Don** *R. californicum* Hook. *R. washintonianum* Hort. ex Zab.	**west coast rhododendron,** California rosebay, Pacific rhododendron	Pacific Coast from British Columbia to central California
***R. maximum* L.** *R. maximum* var. *roseum* Pursh, *R. ashleyi* Coker	**rosebay rhododendron,** rosebay, great laurel rhododendron	Ontario & Nova Scotia S along Appalachian Mtns to Georgia & Alabama
***R. minus* Michx.** *R. cuthbertii* Small *R. punctatum* Andr.	**Piedmont rhododendron**	Piedmont & lower mtn elevations of Tennessee & North Carolina to Alabama
DECIDUOUS RHODODENDRONS		
***R. alabamense* Rehd.** *Azalea alabamensis* (Rehd.) Small	**Alabama azalea**	Alabama
***R. albiflorum* Hook.** *Azalea albiflora* (Hook.) O. Kuntze Azaleastrum albiflorum (Hook.) Rydb.	**Cascade azalea**	Rocky Mtns of British Columbia & Alberta to Oregon & Colorado
***R. arborescens* (Pursh) Torr.** *Azalea arborescens* Pursh	**smooth azalea,** sweet azalea	Pennsylvania to Georgia & Alabama
***R. atlanticum* (Ashe) Rehd.** *Azalea atlantica* Ashe.	**coast azalea,** dwarf azalea	Delaware to South Carolina
***R. austrinum* (Small) Rehd.** *Azalea austrina* Small	**Florida flame azalea,** orange azalea	Florida to SE Mississippi
***R. calendulaceum* (Michx.) Torr.** *Azalea calendulacea* Michx. *Azalea lutea* auct. non L.	**flame azalea,** yellow azalea	SW Pennsylvania & Ohio to Georgia
***R. camtschaticum* Pallas** *Therorhodion camtschaticum* (Pall.) Small	**Kamchatka rhododendron**	NE Asia, Alaska to British Columbia
***R. canadense* (L.) Torr.** *Azalea canadensis* (L.) O. Kuntze	**rhodora**	Newfoundland to Pennsylvania

Rhodora canadensis L.		
***R. canescens* (Michx.) Sweet** *Azalea canescens* Michx. *R. candidum* (Small) Rehd.	**Florida pinxter**, hoary azalea, mountain azalea	North Carolina to Florida & Texas
***R. cumberlandense* E.L. Braun** *R. bakeri* auct. non (Lemm. & McKay) Hume	**Cumberland rhododendron**	Kentucky & West Virginia to North Carolina, Georgia, & Alabama
***R. flammeum* (Michx.) Sarg.** *R. speciosum* (Willd.) Sweet *Azalea speciosa* Willd.	**Oconee azalea,** Piedmont azalea	South Carolina & Georgia
***R. lapponicum* (L.) Wahlenb.** *Azalea lapponica L.*	**Lapland rhododendron,** Lapland rosebay	Mtns of N Europe, N Asia, & N North America
***R. oblongifolium* (Small) Millais** *Azalea oblongifolia Small*	**Texas azalea**	Arkansas, SE Texas, & E Oklahoma
***R. occidentale* (Torr. & A. Gray ex Torr.) A. Gray**	**western azalea**	S Oregon to S California
***R. periclymenoides* (Michx.) Shinners** *R. nudiflorum* (L.) Torr. *Azalea nudiflora* L. *R. periclymenoides* var. *eglandulosum* Seymour *R. nudiflorum* var. *glandiferum* (Porter) Rehd.	**pinxterbloom,** pinxter flower, honeysuckle, pink azalea	Maine to South Carolina & Tennessee
***R. prinophyllum* (Small) Millais** *R. roseum* (Loisel.) Rehd. *R. nudiflorum* var. *roseum* (Loisel.) Wieg. *Azalea prinophylla* Small	**rose-shell azalea,** early azalea, Piedmont azalea, mayflower azalea	S Quebec, through New England to Virginia & W as far as Missouri
***R. prunifolium* (Small) Millais** *Azalea prunifolia* Small	**plumleaf azalea,** plum-leaved azalea	Georgia & Alabama
***R. vaseyi* Gray** *Azalea vaseyi* (A. Gray) Rehd. *Biltia vaseyi* (A. Gray) Small	**pink-shell azalea**	North Carolina
***R. viscosum* (L.) Torr.** *Azalea viscosa L.* *R. serrulatum* (Small) Millias *Azalea serrulatum* Small *R. viscosum* var. *aemulans* Rehd. *R. viscosum* var.*glaucum* (Michx.) Gray *R. viscosum* var. *montanum* Rehd. *R. viscosum* var. *nitidum* (Pursh) Gray *R. viscosum* var. *serrulatum* (Small) Ahles	**swamp azalea,** white swamp azalea, swamp honeysuckle, clammy azalea, hammock-sweet azalea	Swamps from Maine to Florida & Louisiana

R. viscosum var. *tomentosum* Rehd.
R. coryi Shinners

Source: LHBH (1976).

Table 2—*Rhododendron*, rhododendron and azalea: general characteristics distinguishing rhododendrons from azaleas

Plant part	Rhododendrons	Azaleas
Leaves		
Duration	Evergreen	Deciduous
Texture	Coriaceous	Membranous
Abaxial surface	Scaly or punctate	Pubescent
Margin	Entire	Ciliate or ciliolate
Flowers		
Corolla	Campanulate	Funnelform
Stamens	10 or more	5
Ovary	Scaly or tomentose	Setose

Source: LHBH (1976).

Table 3—*Rhododendron*, rhododendron and azalea: growth habit and flowering

Species	Growth habit & maximum height	Flowering date	Flower color
EVERGREEN RHODODENDRONS			
R. carolinianum	Compact shrub; to 1.8 m	May	Pink, mauve, white
R. catawbiense	Spreading, rounded in the open; generally wider than tall to 3 m, sometimes small tree to 6 m	May–June	Magenta, pink, white, red
R. chapmanii	Shrub to 1.8 m	May	Rose
R. macrophyllum	Open tree-like shrub; often erect to 3–9 m	May–June	Purplish rose, white
R. maximum	Shrub in cultivation; to 4.6 m (sometimes to 12 m in the wild)	June–July	White, pink, purplish red
R. minus	2.8 m	June	Rose, white
DECIDUOUS RHODODENDRONS			
R. alabamense	Low stoloniferous shrub; to 0.6–2.4 m	Apr–May	White
R. albiflorum	Erect shrub; from 0.9–2.1 m	June–July	Creamy white, yellow
R. arborescens	From low spreading bushes in open to tall and leggy in shade; up to 6 m	June–July	White
R. atlanticum	Stoloniferous shrub, forms branching sprays when well established; 0.3–1.5 m	May	White, pink
R. austrinum	Stiff and upright; from 3.0–3.6 m	Apr	Yellow-orange
R. calendulaceum	Stiff and upright; to 3.6 m	May–June	Yellow, orange, scarlet, pink
R. camtschaticum	Very small shrub; to 0.2 m	May	Reddish purple
R. canadense	Much branched shrub; to 0.9 m	Apr	Rose-purple, white
R. canescens	Sparingly branched shrub; to 4.6 m	Apr–May	Pink, white
R. cumberlandense	Low and twiggy, often stoloniferous shrub; to 2.4 m but rarely over 1.8 m	June–July	Yellow, orange, scarlet
R. flammeum	Mounding form; to 2.5 m	May	Scarlet, orange, yellow
R. lapponicum	Dwarf, procumbent shrub; to 0.3 m	Apr	Purple
R. oblongifolium	Upright, somewhat stoloniferous shrub; to 1.8 m	June	White, pink
R. occidentale	Rounded, occasionally upright or low shrub; to 1.0–4.6 m	Apr–Aug	White, pink, pale yellow
R. periclymenoides	Usually tall, vigorous and much- branched shrub; to 2.7 m & up to 4.5 m in wild	May	Pale pink, rose, reddish, white
R. prinophyllum	Upright, well branched shrub; to 2.5 m	May	Pink, white, rosy red
R. prunifolium	Tall, rounded-topped; up to 3.6 or 5.5 m in wild	July–Aug	Yellow, orange, scarlet
R. vaseyi	Upright shrub to 3.6 m	Apr–May	White, pink, crimson
R. viscosum	Form various: large & upright to dwarf, small tree; from 3–6 m, rounded or straggly shrub, stoloniferous form to 4.6 m	July–Oct	White, pink

Sources: Davidian (1992), Leach (1961), LHBH (1976).

Table 4—*Rhododendron*, rhododendron and azalea: variation in seed size among species and seed source

Species	Seed source	Elevation (m)	Seed moisture content (%)	Cleaned seeds/wt /g	/oz
R. calendulaceum	Watauga Co., NC	1,400	6	4,350	122,000
R. carolinianum	Henderson Co., NC	720	6	29,460	825,000
R. carolinianum	Burke Co., NC	1,100	4	23,930	670,000
R. catawbiense	Buncombe Co., NC	1,860	7	6,070	170,000
R. catawbiense	Buncombe Co., NC	1,860	6	6,070	170,000
R. catawbiense	Yancey Co., NC	1954	10	6,780	190,000
R. catawbiense	Johnston Co., NC	67	9	5,700	160,000
R. catawbiense	Cherokee Co., NC	320	7	5,000	140,000
R. chapmanii	Gadsden-Liberty Cos., NC	—	5.5	29,100	815,000
R. macrophyllum	Oregon	—	—	4,460	125,000
R. maximum	Avery, Co., NC	950	6	11,790	330,000
R. maximum	Avery, Co., NC	950	5	11,430	320,000

Sources: Arocha and others (1999), Blazich and others (1991, 1993), Glenn and others (1998), Malek and others (1989, 1990), Olson (1974), Rowe and others (1994a).