Rosaceae—Rose family

Spiraea L.

spirea

John C. Zasada and Peter F. Stickney

Dr. Zasada retired from the USDA Forest Service's North Central Research Station; Dr. Stickney retired from the USDA Forest Service's Rocky Mountain Forest and Range Experiment Station

Growth habit, occurrence, and uses. There are about 80 species of the genus *Spiraea* throughout the world. The genus is subdivided into subgenera and sections in several ways depending upon the author—all classifications are based primarily on the structure of the inflorescence. In the system followed here (Batta 1977), the genus has 3 sections: Chamaedryon, Calospira, and Spiraria. In the United States and Canada, the taxa listed in table 1 are fairly common (Curtis 1959; Esser 1995; Fernald 1950; Habeck 1991; MacKinnon and others 1992; Ogle 1991b; Viereck and Little 1972). Virginia spirea occurs primarily in the southeastern United States and has been listed as a threatened species (Ogle 1991a).

Spireas are important ornamental shrubs—Dirr (1990) lists 13 species used as ornamentals. Within a species, as many as 15 to 20 cultivars may have been recognized. Most of the important ornamentals have been introduced from China and Japan; many of the original introductions occurred in the early to mid-1800s (Dirr 1990). Some introduced species, for example, Japanese spirea (*Spiraea japonica* L.f.), have become naturalized and occupy habitats similar to those of native spireas (Batta 1977; Fernald 1950; Ogle 1991a).

A common habitat for the genus in general seems to be in riparian areas, bogs, or other wetland habitats (Curtis 1959; Esser 1995; Klinka and others 1985; MacKinnon and others 1992; Ogle 1991a&b; Viereck and Little 1972). However, the eastern and western forms of birchleaf spirea and the hybrid *S.* × *pyrimidata* Greene (pro sp.) occur on drier upland sites than do other species (Corns and Annas 1986; Stickney 1986). These species can be found at all stages of succession, but they seem to achieve their greatest stature and best growth following disturbances—such as fire or flooding—that remove the overtopping trees and thus

Table 1—*Spiraea,* spirea: nomenclature and occurrence

Scientific name & synonym(s)	Common name(s)	Occurrence
S. alba **Du Roi**	**meadowsweet**	Newfoundland, Quebec to Alberta S to North Carolina, Missouri, & South Dakota
S. alba **var.** ***latifolia*** **(Ait.) Dippel** *S. latifolia* (Ait.) Borkh.	**meadowsweet**	SE Canada & NE US
S. betulifolia **var.** ***corymbosum*** **(Raf.) Maxim.**	**birchleaf spirea**	Maryland, Virginia, West Virginia S to Alabama
S. betulifolia **var.** ***lucida*** **(Dougl. ex Greene) C.L. Hitchc.**	**birchleaf spirea**	South Dakota, Montana, Idaho, Washington, Oregon, Wyoming, British Columbia, Alberta, & Saskatchewan
S. douglasii **Hook.**	**Douglas spirea**	Alaska S to N California, British Columbia, Montana, Oregon
S. stevenii **(Schneid.) Rydb.** *S. beauverdiana* (Schneid.)	**Beauverd spirea,** Alaska spirea	Alaska & NW Canada
S. tomentosa **L.**	**hardhack,** steeplebush	Nova Scotia, New Brunswick, & Quebec to Minnesota & S to North Carolina, Tennessee, & Arkansas
S. virginiana **Britt.**	**Virginia spirea,** Appalachian spirea	West Virginia, Virginia, Tennessee, North Carolina, & Georgia

Sources: Curtis (1959), Habeck (1991), MacKinnon and others (1992), Ogle (1991a&b), Viereck and Little (1972).

make light and other resources more available (Ogle 1991b; Stickney 1974, 1986, 1989, 1990).

Native spireas are generally 1 to 2 m tall. Plants growing at higher elevations tend to be shorter in stature than those at low elevations. Individual plant form tends to be a multi-stemmed clump arising from basal sprouting. Many species are rhizomatous and capable of forming dense stands (clones). Beauverd spirea does not appear to be rhizomatous. Layering occurs in some species when aerial stems come in contact with a suitable substrate long enough for rooting to occur (Calmes and Zasada 1982; Esser 1995; Fowler and Tiedemann 1980; Habeck 1991; Ogle 1991b; Stickney 1974, 1986, 1990).

Planting as an ornamental seems to be the major use of plants in the genus. Native species occurring in riparian and wetland areas can be used in rehabilitation projects on these sites. Some species were used to a limited extent for medicinal purposes by Native Americans (Dirr 1990; Esser 1995; Habeck 1991; Meeker and others 1993; Ogle 1991b).

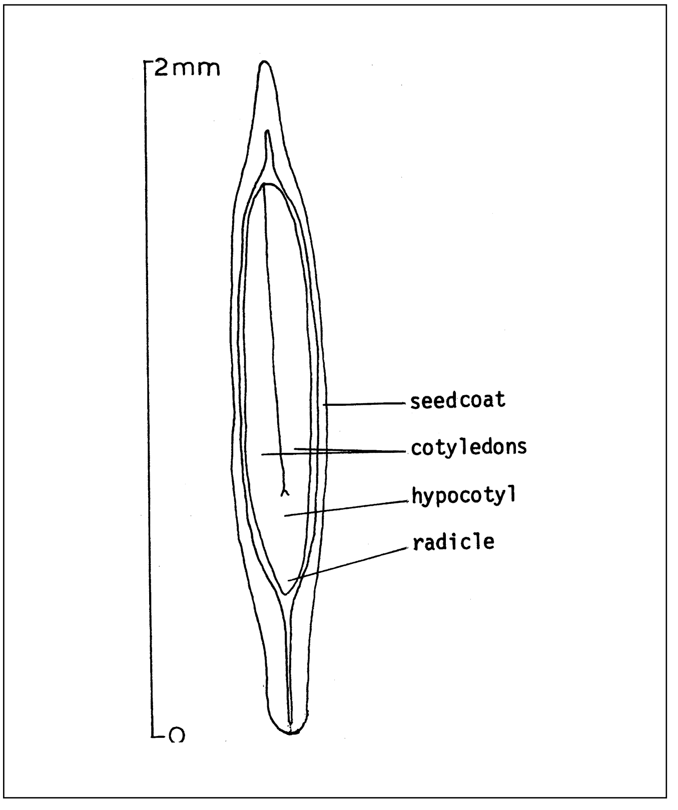
Flowering and fruiting. Batta (1977) found that the various species and varieties of spirea growing in a common garden in Norway exhibited marked differences in phenology and the timing of floral bud differentiation. Differences in timing of floral bud initiation are determined in part by the type of shoot on which the buds form. Species in section Chamaedryon form buds on the previous year's growth; species in section Spiraria, on the current year's growth; and species in Calospira, on both types of shoots (Batta 1977). Goi and others (1974, 1975) demonstrated that species differ in their temperature requirements for initiation of flower buds. In the species they studied, one initiated flower bud development at temperatures below 20 °C and the other below 25 °C.

Within a species, microclimate significantly influenced the timing of flowering and fruit maturation. Birchleaf spirea flowered at about 16,000 degree-hours (threshold temperature 0 °C) at elevations of 590, 1,105, and 1,635 m, but the heat sums were attained over a period of 30 to 40 days, with earliest flowering in mid-to late May at the lowest elevation (Fowler and Tiedeman 1980). At elevations around 985 m in the northern Rocky Mountains, flowering may occur from early June to early July (Drew 1967; Stickney 1974). Fruits ripen from mid-July to early September (Drew 1967; Stickney 1974),and seeds disseminate in October (Drew 1967). Flowering in Beauverd spirea in Alaska occurs in June–August and fruit maturation from July–September. Timing, as in birchleaf spirea varies significantly with elevation and between boreal forest and tundra populations (Viereck and Little 1972). In the southern Appalachian Mountains, follicles of Virginia spirea begin to dehisce in late August–September and the process continues through late winter (Ogle 1991a&b).

Individual flowers are very small (1.5 mm) and perfect; they are borne in terminal clusters of various sizes shapes and colors (white and pink–deep rose) (Hitchcock and others 1961; MacKinnon and others 1992; Stickney 1974). Seeds are borne in a follicle and measure 2 to 3 mm in length (figures 1 and 2). Dispersal begins when the fruit

Figure 1—*Spiraea betulifolia* var. *lucida*, birchleaf spirea: seed.

Figure 2—*Spiraea betulifolia* var. *lucida*, birchleaf spirea: longitudinal section through a seed.



becomes straw-colored or light brown and splits down one side. Although there are no estimates of the number of seeds per weight, the number is probably in the millions per kilogram (500,000+ per pound), due to the extremely small size of the seeds, usually 2 mm or less × 0.05 mm (0.8 × 0.02 in).

Annual variation in the quantity and quality of the seedcrop will depend on microclimate and its effect on pollination, flowering, seed maturation, time since disturbance, and other variables. Fowler and Tiedemann (1980) reported frost damage to birchleaf spirea flowers in early-flowering lower-elevation populations but not in later-flowering higher-elevation plants. Abortion of flowers and fruits is high in Virginia spirea growing in the southern Appalachian Mountains, particularly in years of low water availability (Ogle 1991b). Factors regulating flower bud differentiation, and thus flowering potential, vary for those species that differentiate flower buds in late summer–fall compared to those that differentiate in the spring shortly before flowering (Batta 1977).

Birchleaf spirea exhibits the phenomena of mass flowering after fire (Stickney 1986, 1989, 1990). In studies of succession following fire over a 20-year period, this species flowered profusely in the first postfire growing season, but only occasionally in scattered individuals during the subsequent 19 years. As tree canopies develop and light intensity declines, flowering is rare and the species maintains itself through vegetative reproduction.

Collection of fruits, seed extraction and storage. Seeds can be collected when the fruits turn brown. Fruits can be dried at room temperature so that they open fully; seeds are removed by tumbling or shaking the dried fruits. Seeds can be stored for several months to at least a year. In birchleaf spirea, mass flowerings in 1-year-old burns provides the best opportunity for seed collection.

Seeds have been recovered from studies of forest seedbanks in both the eastern and western United States. However, there is no good evidence that buried seeds are a significant source of regeneration after disturbance (Graber and Thompson 1978; Morgan and Neuenschwander 1988). These studies did not provide information on the length of time seeds remain viable in the forest floor or mineral soil.

Germination. Seeds germinate readily with no pretreatment, particularly if sown before there has been any significant drying (Dirr and Haeuser 1987). Birchleaf spirea seeds germinate at 0 to 2 °C when kept under such conditions for more than 120 days (McLean 1967). This suggests that seeds sown in the fall and overwintering under the snow will germinate at about the time of snowmelt to take best advantage of conditions favorable for seedling development. Unstratified seeds of Beauverd spirea germinated only at 25 °C. Germination of stratified seeds (30 days at 2 °C) was greater than 95% between 10 to 25 °C and 40% at 5 °C. Neither stratified nor unstratified seeds germinated to any degree in the dark (Calmes and Zasada 1982). Filled seeds made up 68 and 85% of seedlots of birchleaf and Beauverd spireas, respectively (Calmes and Zasada 1982; McLean 1967).

Nursery practice and natural regeneration. Natural regeneration following disturbance appears to be mostly by basal sprouting or from rhizomes. Only very severe fires or soil disturbances can eliminate vegetative reproduction (Calmes and Zasada 1982; Morgan and Neuenschwander 1988; Ogle 1991; Stickney 1986, 1989).

Seed regeneration of birchleaf spirea occurs 2 to 3 years after fire, when seeds are abundant following the mass flowering in the first post-fire growing season (Stickney 1989). This appears to be the main window for seed regeneration, as seed availability and seedbed conditions are best at this time (Stickney 1986, 1989, 1990). However, recent germinants and 1- to 2-year-old seedlings are not common (Miller 1996; Morgan and Neuenschwander 1988; Stickney 1990).

Plants can be produced from seeds or by vegetative propagation. Seeds should be sown immediately after collection for the most rapid germination. Stored seeds may require some stratification for best germination, but unstratified seeds germinate well. Softwood or hardwood cuttings of horticultural varieties can be rooted and grow fairly rapidly, filling a 3.8-liter (1-gal) container in a single growing season. Softwood cuttings appear to be used most commonly (Dirr and Heuser 1985). Shoot explants and micropropagation can be used to increase desirable clones; performance and vigor of plants produced in this way varies with season of the year and the number of times vegetative material is subcultured (Norton and Norton 1988 a&b).

References

Batta J. 1977. Studies of the genus *Spiraea*. Rep. 62. Ås, Norway: Agricultural University of Norway, Department of Dendrology and Nursery Management. 12 p.

Calmes MA, Zasada JC. 1982. Some reproductive traits of four shrub species in the black spruce forest type of Alaska. Canadian Field Naturalist 96(1): 35–40.

Corns IGW, Annas RM. 1986. Field guide to forest ecosystems of west-central Alberta. Edmonton, AB: Canadian Forest Service, Northern Forestry Centre.

Curtis JT. 1959. The vegetation of Wisconsin: an ordination of plant communities. Madison: University of Wisconsin Press. 657 p.

Dirr MA. 1990. Manual of woody landscape plants: their identification, ornamental characteristics, culture, propagation, and uses. Champaign, IL: Stipes Publishing. 1007 p.

Dirr MA, Heuser CW Jr. 1987. The reference manual of woody plant propagation: from seed to tissue culture. Athens, GA: Varsity Press. 239 p.

Drew LA. 1967. Comparative phenology of seral shrub communities in the cedar/hemlock zone [unpublished MS thesis]. Moscow, ID: University of Idaho, College of Forestry. 108 p.

Esser LL. 1995. *Spiraea douglasii*. In: Fischer WC, comp. The Fire Effects Information System [data base]. Missoula, MT: USDA Forest Service, Intermountain Research Station, Fire Science Laboratory.

Fernald ML. 1950. Gray's manual of botany. 8th ed. New York: American Book Co. 1632 p.

Fowler WB, Tiedemann AR. 1980. Phenological relationships of *Spiraea betulifolia* Pall. and *Apocynum androsaemilfolium* L. Northwest Science 54(1): 17–25.

Goi M, Kawanishi T, Ihara Y. 1975. Studies on the acceleration of flowering in woody ornamentals by low temperature treatments: 5. The flowering behavior of *Spiraea cantonensis* [abstract]. Kagawa Daigaku Nogakubu Gakujutsu Hokoku 26: 84–93.

Goi M, Hasegawa A, Kashiwaga Y. 1974. Studies on the acceleration of flowering in woody ornamentals by low temperature treatments: 4. Flowering behavior of *Spiraea thunbergii*. Kagawa Daigaku Nogakubu Gakujutsu Hokoku 25: 35–42

Graber RE, Thompson DF. 1978. Seeds in the organic layers and soil of four beech–birch–maple stands. Res. Pap. NE-401. Upper Darby, PA: USDA Forest Service, Northeastern Forest Experiment Station. 8 p.

Habeck RJ. 1991. *Spiraea betulifolia*. In: Fischer WC, comp. The Fire Effects Information System [data base]. Missoula, MT: USDA Forest Service, Intermountain Research Station, Intermountain Fire Science Laboratory.

Hitchcock CL, Cronquist A, Ownbey M, Thompson JW. 1961. Vascular plants of the Pacific Northwest. Part 3: Saxifragaceae to Ericaceae. Seattle: University of Washington Press. 614 p.

Klinka K, Scagel AM, Courtin PJ. 1985. Vegetation relationships among some seral ecosystems in southwestern British Columbia. Canadian Journal of Forest Research 15: 561–569.

MacKinnon A, Pojar J, Coupe R. 1992. Plants of northern British Columbia. Edmonton, AB: Lone Pine Publishing. 345 p.

McLean A. 1967. Germination of forest range species from southern British Columbia. Journal of Range Management 20(5): 321–322.

Meeker JE, Elias JE, Heim JA. 1993. Plants used by the Great Lakes Ojibway. Odanah, WI: Great Lakes Indian and Fish and Wildlife Commission. 440 p.

Miller M. 1996. Personal communication. Boise, ID: USDI Bureau of Land Management, Office of Fire and Aviation,

Morgan P, Neuenschwander LF. 1988. Seed-bank contributions to regeneration of shrub species after clear-cutting and burning. Canadian Journal of Botany 66: 169–172.

Norton ME, Norton CR. 1988a. The role of season in determining explant suitability for *in vitro* culture of *Prunus* and *Spiraea*. Acta Horticulturae 227: 450–452.

Norton CR, Norton ME. 1988b. Manipulation of differentiation in *Spiraea in vitro*. Acta Horticulturae 226: 191–194.

Ogle DW. 1991a. *Spiraea virginiana* Britton: 1. Delineation and distribution. Castanea 56(4): 287–296.

Ogle DW. 1991b. *Spiraea virginiana* Britton: 2. Ecology and species biology. Castanea 56(4): 297–303.

Stickney PF. 1974. *Spiraea betulifolia* var. *lucida* (Dougl.) C.L. Hitchc., birchleaf spiraea. In: Schopmeyer CS, tech. coord. Seeds of woody plants in the United States. Agric. Handbk. 450. Washington, DC: USDA Forest Service: 785–786.

Stickney PF. 1986. First decade plant succession following the Sundance forest fire, northern Idaho. Gen. Tech. Rep. INT-197. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 26 p.

Stickney PF. 1989. After forest wildfire, then what? ... masses of flowers. Words on Wilderness [newsletter of the Wilderness Studies and Information Center] April/May: 6.

Stickney PF. 1990. Personal observation. Missoula, MT: USDA Forest Service.

Viereck LA, Little EL Jr. 1972. Alaska trees and shrubs. Agric. Handbk. 410. Washington, DC: USDA Forest Service. 265 p.