Hardy Asian Alders

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The alder, whose fat shadow nourisheth—
Each plant set neere him long flourisheth.
—William Browne, 1613, Britannia's Pastorals, Book I, Song 2

The search for new and unusual plants with handsome ornamental character and reliable landscape performance is as old as horticulture itself. The peak period of plant exploration may have passed with the likes of E. H. Wilson in the earlier part of this century, but at the Arnold Arboretum new plants from around the world are still being added to the living collections and evaluated as ornamentals.

Potential new ornamentals must meet a demanding set of criteria before being declared good landscape plants. They should thrive in diverse landscapes under conditions of low maintenance, with minimal supplemental water and fertilizer. They should be reasonably drought tolerant and suffer no significant pest or disease problems. They must be easy to propagate using standard nursery techniques and grow rapidly enough to be commercially profitable. Obviously they must also possess attractive ornamental features, preferably several for multiseason interest—showy flowers, fruit, fall color, attractive winter habit or bark color, or handsome foliage with useful shade or evergreen characteristics.

The great wonder of the woody plant world is the number of new plants that are continually being found to meet these criteria—either as brand-new finds from the wild or from breeding programs, or as rediscoveries from the forgotten corners of gardens and landscapes. In the latter category, one neglected but fascinating genus holds extraordinary promise for demanding modern landscapes—the genus Alnus, or alder.

About thirty-five species of Alnus are found around the world, all of them in the northern hemisphere with the single exception of A. acuminata, which extends below the equator into Andean South America (Furlow 1979a, b). Among the alders are some of the most cold hardy of broadleaved trees, including shrubby species in subarctic regions as well as numerous species adapted to cool mountain climates. They are most often found growing on poor soils, especially in wet conditions, and will thrive where many other woody plants cannot.

The Genus Alnus

Alders are of interest biologically, botanically, and ecologically. The genus comprises an ancient group of deciduous trees and shrubs in the Betulaceae (birch family), of which the closely related Betula and Alnus may be considered the most primitive members (Furlow 1979a). The Latin name Alnus is variously believed to derive from the classical Latin verb alo (to nourish, probably referring to its usual close association with water); or from the Celtic al (near) and lan (riverbank) (Furlow 1979a). Indeed, Alnus are most often found growing in moist or wet habitats—in or near streams, rivers, ponds, lakes, swamps, wetlands, and on moist slopes—but some species inhabit moderately dry upland sites, and others can grow in a range of environments from very wet to relatively dry. They are most often found at low to middle elevations, but a few notable exceptions climb nearly to timberline.

This pair of Manchuman alders (Alnus hirsuta) along Willow Path at the Arnold Arboretum makes a handsome feature in the winter landscape
The refined silhouette of *Alnus japonica* is lovely in all four seasons of the year.

Like other members of the Betulaceae, alders are monoecious, bearing separate staminate ("male") and pistillate ("female") catkins, or aments, on the same tree. (Catkins are compact aggregates of individual flowers in a single structure, like the staminate "tassles" of oak.) Both staminate and pistillate catkins develop in the axils of the leaves or as the terminal bud. Staminate flowers mature on pendent catkins similar to those of birches, while the small pistillate catkins are for the most part relatively erect and less conspicuous at time of flowering. (An exception is *Alnus firma* var. *multinervis*, which bears nodding pistillate catkins.) One related group of alders, the subgenus *Clethropsis* (*A. maritima, A. nepalensis, A. nitida*), flowers in the fall, while all the others flower in the spring.

As seed develops, "female" catkins mature into small dry infructescences, oval in shape, with many woody scales enclosing single-seeded, narrowly winged nutlets that are later dispersed by wind and water. These infructescences resemble those of birches when young, but whereas the infructescences of *Alnus* are woody and persist after the seed matures, those of birches are papery and fall apart. Alders' pistillate catkins can develop into mature infructescences even when seed has not been fertilized; in that case, the seed develops into an empty, shrunken nutlet. There is some evidence of limited development of viable seed without fertilization through a process known as *apomixis* [Furlow 1979a, Santamour 1995].

Whether filled with viable seed or not, mature alder infructescences look very much like the diminutive true cones of a conifer. On most alders of flowering age (at least two years old), the spent "cones" are conspicuously persistent long after the seed has fallen, producing a delicate ornamental feature as well as a distinctive field-key character. These attractive infructescences are sometimes gold plated and sold as jewelry.

Perhaps the most fascinating aspect of alder biology is the ability of all species to "fix" atmospheric nitrogen in a process analogous to that of leguminous plants like beans and peas. Fixing nitrogen is the process of converting atmospheric nitrogen into a form usable by plants and other biota. This unusual ability enables alders to pioneer successfully on sites of low fertility, where over time they contribute significant nitrogen to the soil, principally as leaf litter.
As a result, *Alnus* is often one of the first species to establish itself after fire, clear cutting, volcanic activity, or other disturbances to forest environments (Furlow 1979a). Its vigorous growth can prevent or significantly inhibit colonizing by other plants, both wild and cultivated. For example, following the eruption of Mt. St. Helen's, vigorous hybrid poplars (*Populus*) were planted on mudflows caused by the eruption. *Alnus rubra* (red alder) seedlings rapidly established themselves naturally on these sites, however, outgrowing the *Populus* and other species to the extent that after six years the stands on the mudflows were 93% *Alnus* (Binkley et al. 1994). Alders' nitrogen-fixing ability has also been used to advantage for many years in mine spoil reclamation (Tarrant 1968).

Their ability to fix nitrogen combined with their rapid growth rate also permits alders to outperform other species in managed environments, sometimes in an undesirable way. For example, in the northwestern United States, native *Alnus rubra* was historically eradicated from recently harvested and disturbed sites by commercial forestry managers who considered it a weed in competition with high-value conifers. More recently, red alder's rapid growth and its ability to produce biomass on marginal sites is receiving the recognition it deserves, and its use—both as a “nurse crop” to provide nitrogen for higher value crops and as a primary crop whose wood value is itself on the increase—is now a major subject of research in United States forestry science (Hibbs et al. 1994).

**Hardy Asian Alders of Ornamental Potential**

From a horticultural standpoint, the alders' ability to fix nitrogen and to thrive in wet soils makes them a natural choice for many difficult sites with low fertility. The horticultural merit of ornamental alder species has been far more widely appreciated in Europe, Asia, and western North America than in the eastern United States.
States, possibly because the alders native to those areas include handsome, full-sized trees. In contrast, the alders native to eastern North America are generally a shrubby, disheveled lot—biologically tough and ecologically important, but less than aesthetically pleasing. This has given the entire genus an undeservedly poor reputation in the eastern half of the United States, where the vigor and attractiveness of *Alnus* could make an important contribution to gardens and other landscapes.

European species like *Alnus glutinosa* and *A. cordata* are already widely grown in Europe and the United States and each has notable cultivars. The Asian alders, on the other hand, have received little attention, although they include some of the most beautiful taxa of the genus—taxa with rapid growth rates, no significant pest or disease problems, and useful degrees of cold hardiness. Rather than attempt to treat all of the approximately thirty-five alder species in an article of this scope, I have chosen to discuss only hardy Asian alders of particular horticultural merit—plants which, unlike their European cousins, have been neglected as specimen, shade, and street trees. Herein, “Asian” refers to the regions inclusive of China, Japan, Korea, Sakhalin, the Kuriles, Kamchatka, and the eastern and central regions of the former USSR (that is, Russia’s non-European regions); while “hardy” refers to plants that will survive and grow in areas with winters at least as severe as those of USDA hardiness zone 6.

Many alders fall into that nebulous category of “large shrubs or small trees,” depending on where they are growing and on whether they have been pruned to one or a few main trunks. Many species that grow at both low and high

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**The Other Asian Alders**

Two categories of Asian alders are not included in this article: the ornamental but not hardy, and the hardy but not ornamental. Some species, like the beautiful *Alnus subcordata* of the Caucasus, which is widely grown in Europe, and the recently named white-barked *A. glutinosa* ssp. *betuloides*, fall into the former group (Ansin and Özder 1993). Also in that category are the tender but lovely *A. formosana* and *A. orientalis* and the unique but only semihardy *A. cremastogyne* of China that bears its “cones” on long pendent peduncles.

In the second group are hardy Asian alders that are of botanical, if not horticultural, interest. *Alnus trabeculosa* is a small to medium tree of southeastern China and, rarely, Japan (Ohwi 1965). Its foliage is oval and narrows abruptly to a distinctively long, pointed apex. *A. fauriei* grows as a large shrub or small tree in northern and central Japan (Ohwi 1965). The foliage of this species is its most distinctive feature. Leaves are often nearly round with a notched apex and can be 4 to 5 inches in diameter, the size of teacup saucers. Leaf size and shape are fairly variable. Its close relative, *A. matsumurae*, is a medium-sized tree (occasionally shrubby in the high mountains) that is similar to *A. fauriei*, which has an overlapping range in Japan but which grows up into higher elevations (Ohwi 1965, Sargent 1916). *A. fruticosa* is the common, widely dispersed, shrubby alder of northeast China, Mongolia, European Russia, and much of the former USSR (including Siberia). It is a plant of great tenacity that thrives in an incredible range of soils and conditions, from wet lowlands to alpine scree (Hulten and Fries 1986). Some botanists assign *A. fruticosa* to the genus *Duschekia* (noted under *A. maximowiczii*, Shemberg 1992), while others elevate the populations found on the Kamchatka peninsula to a different *Alnus* species, *A. kantschatica* (Czerpanov 1995, Voroshilov 1966, 1982).

elevations usually grow as trees but are shrubby at the highest elevations in their range (for example, *Alnus hirsuta*, *A. matsumurae*). Most of the species described below develop as trees of various heights and dimensions, an exception is the shrubby *A. maximowiczii*, which is included for its horticultural potential.

I have included the USDA hardiness zones in which the plants are likely to survive. With few exceptions, the germplasm of these species now grown in the United States originated from propagules of relatively limited geographic provenance. No doubt cold hardiness for most of these species could be improved by future collections from their coldest provenances.

The ornamental attributes of Asian alders are quiet and subtle but nonetheless effective in the landscape. None have dramatically showy flowers, but some have eye-catching and colorful catkins in spring. None have fall color, but all have persistent catkins that are delicately attractive. The arboreal alders also have very handsome winter architecture of diverse types, and some have beautiful, beech-like bark.

*Alnus firma*, native to Japan, is a deciduous, multi-trunked tree of small to medium size, or occasionally a large shrub, that can reach 40 feet in the wild but is generally seen in cultivation at heights of 15 to 25 feet, depending on habit. It has a narrow, graceful spread with somewhat pendent branches, and its foliage is among the loveliest of any deciduous tree. Its glossy, emerald green leaves, about 2 inches wide and 4 inches long, are regularly, slenderly oval and deeply veined. When emerging, the foliage appears pleated and is as attractive as when fully expanded. Hardiness of this species varies widely by provenance and is reliable through USDA zone 7, but its subspecies are generally hardy through zone 6. In the wild, *A. firma* is usually found in wet sites near water and does best with full sun or light shade in moist to wet soils that do not dry out significantly. In containers, however, it tolerates moderately uneven watering with no adverse effects in the Northeast.

*Alnus firma* var. *hirtella* is also native to Japan and resembles the typical variety except for a dense orange to light tan pubescence on the leaves and twigs. The degree of pubescence varies somewhat but where it is heavy, it is quite showy. *A. firma* var. *multinervis* (sometimes named *A. pendula*) is native to Japan, Korea, and eastern Asia. It differs from other *A. firma* taxa in bearing more numerous pairs of veins on the leaves, a trait that adds to its ornamental character. Its pistillate catkins are nodding or pendent, in contrast to the more erect catkins of other species—a characteristic that has been the basis for elevating this taxon to the species level (*A. pendula*) by some authors (Ohwi 1965).

As a small ornamental tree, *Alnus firma* var. *multinervis* offers graceful habit, exceptionally handsome foliage throughout the growing season, persistent infructescences of delicate ornamental character, and unstoppable tenacity in
The foliage of the Asian alders — from top to bottom, Alnus firma var. multinervis, A. hirsuta, and A. japonica — is diverse and beautiful.

sites of low fertility. Growth is rapid in containers and in the field. A. firma var. multinervis might make an exquisite small tree for large containers in pocket parks or urban squares, or a lovely lawn tree for small, low-fertility suburban lots where the topsoil has been stripped.

Alnus hirsuta (Manchurian alder) is a large deciduous tree reaching 50 to 80 feet in the wild and, with age, similar heights in cultivation. It has an upright, uniform, pyramidal habit similar to that of mature A. glutinosa. Its leaves are rounded to broadly ovate, about 3 inches wide and 3 to 4 inches long, variably toothed and pubescent. The foliage retains a good, grass-green color throughout the season, while the spent infructescences are prolific and persist attractively through the winter. Bark color is quite variable, ranging from a warm, light silvery gray to brown-charcoal, and it can be as ornamental as that of European and American beeches (Fagus sylvatica and F. grandifolia). A. hirsuta is hardy through at least USDA zone 4, but the provenance of wide-ranging species like this one can significantly affect cold hardiness; more collecting and testing is needed to determine whether plants from its northernmost provenance are significantly more cold hardy than Zone 4. This species and its botanical varieties are widely distributed throughout Russia (including Siberia, the Amur region, Sakhalin, Kamchatka, and the Kuriles), and in Manchuria, Japan, and parts of Korea (Kabanov 1937). In the wild, Manchurian alder is found in a diverse range of conditions from poorly drained river bottoms to dry upland. There are two botanical varieties (rarely elevated to species) distinguished chiefly by provenance, foliar morphology, and degree of pubescence. Alnus glutinosa var. manschurica, found in Manchuria, has rounded foliage and is pubescent only along the veins on the undersides of leaves, while var. sibirica is the essentially glabrous-foliaged form of wide distribution.

In cultivation, Manchurian alder is one of the most beautiful and useful of the arboreal alders, thriving in wetlands, moderately dry sites, and sites with variable moisture. Growth is rapid in the field and in containers (as much as 5 to 6 feet per year). Alnus hirsuta has been grown for
about twenty years at the Arnold Arboretum and has proven to be one of the most handsome and reliable of all the Asian alders here, with no significant pest or disease problems. In addition, it is the only one of several Asian species planted at the Harvard Forest in Petersham, Massachusetts, in the early 1980s that has remained vigorous in a plantation situation with low maintenance.

The handsome bark and foliage of the Manchurian alder, its persistent “cones,” uniform branching pattern, and stately habit make it an excellent shade tree for parks or streets. Its tolerance of low fertility and of poor drainage or fluctuating moisture enables it to tolerate low-maintenance and urban sites that defeat other shade trees. The vigor and beauty of this species suggest that its best individuals should be selected and named and that it would be profitable to collect more plants from its coldest provenances in the wild.

*Alnus japonica*, Japanese alder, is a deciduous tree of small to medium size, generally reaching 30 to 50 feet, with a narrowly oval habit and slightly pendent, fine-textured branching. Its elegant leaves of a smooth, glossy, bright green are narrowly oval, about 1.5 to 2 inches wide and 3 to 4 inches long—very finely toothed but without the prominent venation of *A. firma*. The foliage remains green and glossy very late into the fall. Its bark is a medium gray, and the spent infructescences are prolific and persist through the winter with delicate ornamental character. When the staminate catkins flower in spring, many plants develop a distinctive and attractive cherry-red hue. Japanese alder can be found growing widely in Japan as well as in Manchuria, in parts of Russia (near the shore in the maritime region, on Sakhalin, and in the Kuriles), and in Korea. It is reliably hardy through at least USDA zone 6; plants from the coldest provenances may be more hardy. Two botanical varieties are distinguished by provenance (*A. var. koreana*, found in Korea) and by foliar morphology (*A. var. minor*, with leaves much smaller than the species, about 2 to 4 inches long). *A. x mayrii*, an especially handsome tree, is a naturally occurring hybrid of *A. japonica* and *A. hirsuta* that resembles *A. japonica* but has wider leaves and a more robust habit.

The Japanese alder has a notably narrow and elegant silhouette both in summer, with its dense, glossy foliage cover, and in winter, when its persistent “cones” and appealing habit add a Japaneseque character to the landscape. It could be especially useful as a low-maintenance shade

### Propagating the Asian Alders

Alders propagate readily from seed, giving best results when the seed is fresh and has not been allowed to dry out before sowing. If the seed has dried, good results can also be obtained with relatively short periods of stratification (one to two months in a moist medium at 35 to 40 degrees F). It is useful to note that alder species that flower simultaneously may hybridize readily where they are found growing in relative proximity (Furlow 1990). Such species in the wild are generally kept separated by geography and habitat, but garden plants are freed of these natural limitations. Seed collected from cultivated alders, therefore, may well give random hybrid progeny—especially as all the Betulaceae, including *Alnus*, are wind-pollinated and the pollen can travel great distances.

This tendency to hybridize in nature and cultivation has resulted in some confusing nomenclature, as well as some attractive plants. There are some naturally occurring, distinctive, consistently named hybrids (for instance, *A. x mayrii*), as well as many names for putative hybrids that have entered the taxonomic literature. Alders can also be rooted successfully from softwood cuttings. Cuttings should be harvested when the wood has just begun to harden and rooted under relatively frequent mist with pretreatment of moderate concentrations of IBA hormone preparations. Best results have been obtained when temperatures in the propagation area stayed below 80 to 85 degrees F.
tree in narrow strips of poorly drained land, or in small courtyards or gardens with poor soil where an elegant deciduous tree is wanted.

*Alnus maximowiczii* is a deciduous shrub or occasionally a small tree that can reach surprising proportions with great age. (Richard Weaver, Jr., 1978, reported seeing trunks 3 feet in diameter from Hokkaido forests.) In the wild it generally reaches heights of 15 to 25 feet, with similar spread, but in cultivation in North America it is more often seen at heights of 8 to 15 feet, with wider spread. Leaves are about 3 inches wide and 4 inches long, heart-shaped to broadly ovate, with distinct serrations. They emerge a glossy emerald green with handsomely prominent venation and darken to a rich, matte blue-green as they mature. *A. maximowiczii* begins flowering before the leaves emerge, and both staminate and pistillate catkins are surprisingly showy. The pistillate catkins are small and erect, turning a deep cherry red at flowering time, while the staminate catkins elongate to 3 to 4 inches and turn a golden yellow. While its floral display will certainly not rival the brazen showiness of trees like the deciduous magnolias, it does offer an equally lovely, albeit quieter, spring character. *A. maximowiczii* is widely distributed in Japan (primarily in mountainous areas), in the former USSR (including Sakhalin, Kamchatka, and the Kuriles), and in parts of Korea. It grows in a wide range of elevations, climbing to alpine heights but also descending to sea level in some areas. This species has been included by Russian botanists in their split genus *Duschekia* (Czerepanov 1995), which has also included several other species of alder from time to time. The genus *Duschekia* is not widely accepted by Western botanists.

*A. maximowiczii* is a handsome shrub that will thrive in virtually any site with full sun. It is hardy through at least USDA zone 4 and grows rapidly for a large landscape shrub. With its appealing spring display and foliage that remains in good condition throughout the season, it is a good choice for embankments and other difficult sites where a tall, lush green, massing shrub is desired. It is especially useful on sites with low fertility and drastically fluctuating moisture conditions.

**Alders at the Arnold Arboretum**

For a century, alders have made an important contribution to the living collections at the Arnold Arboretum. E. H. Wilson was particularly interested in the genus and collected several Asian alders—*Alnus fauriei*, *A. firma*, *A. fruticosa*, *A. hirsuta*, *A. japonica*, and *A. maximowiczii* among them—as well as more tender species like *A. formosana* and *A. nepalensis*. Charles Sargent was also enamored of the genus and he too collected and wrote about alders. More recently, Richard Weaver, Jr., and Stephen Spongberg made significant *Alnus* collections in Japan and Korea.

Although championing Asian alders initially felt like an original effort, this is certainly not the first time their cause has been promoted at the Arboretum. Long ago Charles Sargent himself recognized the horticultural potential of the hardy Asian alders—offering his premier endorsement for this premier group of woody plants. It is especially appropriate, then, to close with words from his *Garden and Forest* article on *Alnus hirsuta* (then *A. tinctoria*) and to reiterate that “the object of this note . . . is to call attention to a promising ornamental tree” (Sargent 1897).

**Literature Cited**


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