

lower frames or walls. The four-inch side of the 2" x 4"s makes the vertical side of the frame. Then 2" x 4" heavy wire mesh is nailed across the wood frame. Keep the wire mesh pulled tightly as it is nailed onto the top of the frame. Nails are driven one-half into the wood and then bent over to secure the wire in place. Any excess wire is cut off or bent over the edge of the frame.

The top frame is placed on the sub-surface frame or walls. Four-mil clear plastic is placed over the top of the frame. Allow the plastic to extend two feet on all sides of the frame. Do not nail or staple the plastic to the wood frame. Secure the plastic sheet with extra pieces of lumber or stones. Make sure that there are no holes in the plastic. Repairs can be made with pieces of ducttape. A thermometer can be placed in the south end of the "cool frame". If it is too warm, extra laths can be added for additional shade. The "cool frame" should only be opened at sunrise or when outside conditions closely match the micro-climate inside, to prevent the cuttings from drying out.

Although keeping the interior of a "cool frame" near the optimum temperature of 72°F will be difficult on hot days, the use of shade, cooling air from the sub-soil and water, and 100% humidity will modify the temperature to achieve successful propagation.

Rooted cuttings of azaleas can over-winter in the "cool frame". Cover the frame with plastic or tarps when sub-freezing temperatures are expected and remove the tarps when the weather is above freezing. Plywood can be placed on the cover for additional insulation. Remember to check for utility lines before digging, always use non-chlorinated water and look for pests that may be attracted to the cool moist environment.

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Growing Evergreen Azaleas in the Great Plains

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Obtaining good survival and dependable flowering with evergreen azaleas in the Plains States is at best difficult and thought by some to be impossible. A few limitations include among other things: (1) high soil pH, (2) low-temperature injury to flower buds, and (3) winter desiccation in the dry, continental climate. Although success with rhododendrons has been reported in Oklahoma (zone 7) in such well known areas as Honor Heights Park in Muskogee and even further north in Tulsa, very little has been reported from areas with more drastic weather fluctuations such as in Kansas. Since 1974 trials have been conducted at the Horticulture Research Center at Wichita, Kansas (zone 6) to screen evergreen azaleas for hardiness to the harsh, arid climate and soil conditions of a prairie state.

Soil preparation, best begun the previous fall, usually consists of incorporating sphagnum peat moss (about one-third by volume) plus one to two pounds of sulfur (depending on initial pH) per 100 square feet to bring the pH down near 5.5. Even so, with irrigation water containing high calcium content, the pH often returns to near neutral requiring additional sulfur top dressings. Following planting, beds are mulched with either pecan hulls, pine bark, or more recently re-cycled (ground up) Christmas trees, all very acidifying, organic materials.

Initial screening included many species and groups of azaleas such as Kurume, Gable, Girard, Glenn Dale, Kaempferi, Shammarello and Schroeder hybrids. Surprisingly, several selections proved tolerant to temperature which dropped to -18°F in December, 1989. In addition to experiments on hardiness, trials have been conducted on soil modification, propagation, nutrition, and landscape exposure. Hardest cultivars included many Gable hybrids such as 'Boudoir', 'Caroline Gable', 'Herbert', 'Karens' and 'Purple Splendor' as well as 'Pride's Pink' and other introductions by the late Orlando Pride. Moderately hardy were 'Holland', 'Girard's Roberta' and 'James Gable' (Table 1).

Winter shade has been very beneficial in protecting evergreens from the desiccating effects of sun on the foliage. The azaleas seem to cope more readily with constant cold rather than the fluctuating temperature effects of freezing and thawing which occur in winter sun which dehydrates the foliage. Consequently, the best exposure has been the north side of our office building, north side of pine trees (which also benefits azaleas by the shedding of pine needles), or for that matter the north side of anything tall enough to cast a long shadow. To demonstrate the effects of exposure on survival and flowering, 16 azalea cultivars were planted on the northeast and northwest sides of structures designed especially to represent a residential dwelling with typical landscape exposures. Soil was prepared with sphagnum peat and sulfur as indicated earlier. Plants were established between 1989 and 1991 and evaluated during 1992, 1993, and 1994. Since no previous work dealt with hot summer sun effects during mid- to late-afternoon and due to limited numbers available, a few cultivars were planted only in the northwest exposure. Low temperatures only



Left: 'Karen's' in Spring 1990 after experiencing -18°F in December 1989

Right: Azaleas on north side of Horticulture Research Center, Wichita, Kansas in Spring 1993.

TABLE 1

Performance of Hardy, Evergreen Azaleas at Wichita, KS 1987-90¹

Cultivar	Plant Condition				Flowering			
	1987	1989	1990	Avg.	1988	1989	1990	Avg.
Boudoir	8.3	7.8	8.7	8.3	9.0	8.0	6.0	7.7
Caroline Gable	8.3	6.8	8.8	8.0	6.0	5.0	4.0	5.0
Girard's Fuchsia	8.0	8.0	9.0	8.3	8.0	8.5	0.0	5.5
Girard's Roberta	9.0	8.8	8.0	8.9	6.7	8.0	0.0	4.9
Herbert	8.7	8.0	7.8	8.2	8.0	7.0	2.7	5.9
Hino Crimson	9.0	6.0	8.0	7.7	5.0	6.0	0.0	3.6
Hinodegiri	9.0	7.5	9.0	8.5	7.0	8.0	1.0	5.3
Kaempferi Holland	9.0	8.8	9.0	8.9	6.5	6.0	0.0	4.2
Karens	8.3	7.5	8.0	7.9	7.3	9.0	6.5	7.6
Louise Gable	8.0	5.5	6.0	6.5	4.0	9.0	0.0	4.3
Pride's Pink	9.0	6.5	6.5	7.3	9.0	8.0	4.0	7.0
Purple Splendor	7.5	7.5	7.8	7.6	7.0	7.0	2.0	5.3
Rosebud	8.2	7.0	7.3	7.5	6.3	9.0	0.0	5.1
Snowball	7.5	8.3	8.5	8.1	5.5	9.0	4.5	6.3
Corsage	7.5	5.0	7.0	6.5	6.7	6.0	0.0	4.2
James Gable	7.0	7.0	7.5	7.2	6.0	8.0	0.0	4.7
Louise Gable	8.0	5.0	5.0	6.0	4.0	7.0	0.0	3.7
Mary Francis Hawkins	7.0	6.0	0.0	4.3	0.0	2.0	0.0	0.7
Rose Greeley	8.0	6.0	7.0	7.0	3.0	8.0	0.0	3.7
Mildred Mae	8.0	8.0	7.0	7.7	4.0	8.0	0.0	4.0

¹ Three plants each established from one gallon containers in Spring, 1986. Ratings are based on a scale of 0 to 9 with 0 = dead or no flowers, and 9 = best condition and most flowers. Flowering in 1990 was following -18°F on December 22, 1989.

reached +5, -1 and +4°F during the winters of 1991-92, 1992-93 and 1993-94 respectively, so most cultivars flowered quite well. A few cultivars were small and not well established such as 'Bixby', 'Dorsett', 'Palestrina' and 'Viking', but nonetheless flowered quite well by the end of the experiment. Surprisingly, the azaleas tolerated the hot northwest exposure as well as, or better than the northeast corner, which is considered the most sheltered location for planted tender species. Results appear in Table 2.

The best plant condition and heaviest flowering occurred on 'Elsie Lee', 'Karen's', 'Marie's Choice', 'Herbert', 'Girard's Rose', 'Stewartstonian', 'Hardy Gardenia' and 'Viking'. Even 'Hino Crimson' flowered successfully in 1993 when temperatures dropped below 0°F, whereas most Kurumes do not survive our normal winters in Kansas. Some cultivars such as 'Girard's Fuchsia', a semi-hardy azalea, flowered better on the northwest exposure in 1993 than the northeast, a phenomenon somewhat difficult to explain. That trend occurred with several other cultivars as well including 'Herbert', 'Girard's Rose', 'Palestrina' and 'Hardy Gardenia'.

TABLE 2
Flowering and Plant Condition of Azalea Cultivars in
Various Landscape Exposures¹

Cultivar	Northeast			Northwest				
	Flowering 1992	1993	1994	Foliage Cond.	Flowering 1992	1993	1994	Foliage Cond.
Herbert	4.5	6.7	5.0	6.5	7.3	9.0	5.7	7.3
Girard's Fuchsia	0.0	1.8	4.8	6.5	1.0	7.0	4.0	7.5
Hino Crimson	2.5	9.0	6.8	5.8	0.0	9.0	5.0	7.0
Girard's Rose	2.5	5.8	4.3	5.3	3.5	6.5	6.0	6.0
Hino Red	0.0	5.0	4.3	5.8	NP	NP	NP	NP
Karens	6.0	8.3	5.7	7.0	5.7	8.7	5.3	7.7
Rene Michelle	0.0	4.5	1.8	7.3	0.0	4.7	2.0	6.7
Elsie Lee	NP	NP	NP	NP	2.7	9.0	5.0	7.3
Marie's Choice	NP	NP	NP	NP	0.0	7.0	7.0	7.0
Red Red	NP	NP	NP	NP	3.0	6.0	3.5	5.5
Stewartstonian	NP	NP	NP	NP	5.0	7.3	4.3	7.7
Bixby	0.0	6.5	4.0	6.5	0.0	6.0	4.3	7.3
Dorsett	0.0	2.0	3.0	4.0	0.0	2.0	1.5	6.0
Palestrina	0.0	3.5	0.0	5.0	2.0	5.3	3.3	6.3
Viking	0.0	4.0	7.0	7.0	1.0	4.0	7.0	6.5
Hardy Gardenia	NP	4.0	3.3	7.0	NP	8.5	5.0	7.0

¹ Rated on a scale of 0-9 with 0 = poorest and 9 = most bloom, best condition (average of three replications). NP = Not Planted.

As the experiments are concluded, these azaleas will be transplanted to The Wichita Botanical Gardens for others to enjoy in the future.

It is apparent that many, but not all, of the hardiest cultivars occur in purple colors such as 'Purple Splendor', 'Elsie Lee', and 'Herbert', all of which have some *Rhododendron yedoense* var. *poukhanense* parentage. However, several other hybrids exhibit a considerable amount of pink. Two cultivars with outstanding hardiness are 'Boudoir' and 'Karens'. The latter seems to have performed

better during the summer in our trials and has never failed to bloom under extreme weather conditions. Although not a new introduction it is just now being discovered by many and will grow as far north as Cincinnati, Ohio.

In addition to the named cultivars listed above, further evaluations are being conducted on several hardy introductions by two deceased hybridizers, Orlando Pride of Butler, Pennsylvania and Dr. Henry Schroeder from Evansville, Indiana, both of whom made great improvements in

azalea hardiness through years of breeding. These selections, some of which are not found in the trade, may prove even better than those reported above. At last there are evergreen azaleas hardy enough to grow in areas not previously considered possible, even into portions of zone 5b. Certain results on hardiness are only possible after test winters such as that which occurred in 1989-90. Perhaps when the next -20°F occurs we will have new results to report for those seeking plants for the plains.

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