Plant Evaluation Notes

Hardy Geraniums for Northern Gardens

Richard Hawke, Plant Evaluation Manager

Hardy geraniums are among the most fashionable garden perennials today. Their popularity is due in part to the many new and improved cultivars that have been introduced in recent years. Garden writers time and again extol the merits of hardy geraniums—their versatility, landscape adaptability and superior ornamental traits. Hardy geraniums have come a long way from the days when they were consigned to the wildflower garden.

Geranium is in the geranium family (Geraniaceae) with approximately 300 species widely distributed in temperate regions of the world. Hardy geranium is a general term that is used to distinguish *Geranium* from its tender cousin *Pelargonium*, the colorful floral or bedding geranium. Cranesbill, another common name, refers to the resemblance of the fruit to the beak of a crane.

Their saucer-shaped flowers come in shades of blue, purple, pink, magenta, violet or white, and often with darker or contrasting veins. For example, the deep magenta flowers of Armenian geranium (*Geranium psilostemon*) have prominent black veins, and the lavender-blue flowers of 'Blue Cloud' feature distinct magenta venation. Many hardy geraniums self-seed freely, but most are not weedy in the garden. Prolific seeders such as meadow cranesbill (*G. pratense*) are best cut back after flowering to prevent the spread of seed. In many cases hybrid cultivars, such as Cambridge geranium (*G. ×cantabrigiense)*, are sterile or self-seed infrequently.

Hardy geraniums can be trailing to mounding in habit, and low growing to several feet tall. Basal rosettes of leaves arise from thick rhizomes or taproots depending on the species. The leaves are typically rounded in outline and palmately lobed but exhibit a variety of shapes, sizes, textures and colors. Shapes and sizes vary from the small, deeply dissected stem leaves of bloody cranesbill (*Geranium sanguineum*) to the broad basal leaves of Armenian geranium (*G. psilostemon*); while textures range from the wrinkled Oxford cranesbill (*G. ×oxonianum*) to the felty *G. renardii*. Shades of green to gray-green predominate, but plum-purple and golden-green can be found; while some leaves are variegated, blotched or banded with cream or purple. As further ornamentation, many hardy geraniums have purple, red, orange or yellow leaves in autumn. Some species have aromatic foliage that can be described as minty, medicinal or malodorous.

Hardy geraniums are easy to grow in a variety of soils and light conditions. Most species grow in full sun to light shade in moist, well-drained soils. Many hardy geraniums prefer morning sun and afternoon shade, especially in hot climates. Plant health can suffer in hot, humid conditions or in soggy soils. There are a number of species such as bigroot geranium (*Geranium macrorrhizum*) and mourning widow (*G. phaeum*) that will grow well in dry shade. Plants grown in dense shade may have reduced flower production and leggy, open habits. Many hardy geraniums naturally grow leggy during the bloom period, especially in overly fertile or moist soils. New basal leaves develop just as the bloom period is ending, so plants can be rejuvenated and encouraged to rebloom if cut back hard.

Whether grown in formal gardens or naturalized landscapes, hardy geraniums are versatile herbaceous plants for a variety of garden settings. They can be grown as specimens or in small groups in the sunny border, or as ground covers under crab apples, large shrubs and roses with bare lower stems. Species such as *Geranium ×cantabrigiense*, *G. macrorrhizum, G. ×oxonianum* and *G. sanguineum* make exceptional ground covers because they fill in quickly and smother competitors. Many species, especially those with trailing habits, can be used on slopes, retaining walls and in containers. Several varieties can be grown together for continuous bloom from spring to autumn. Hardy geraniums have an informal quality that makes them ideal for naturalizing in meadows and woodlands. Whether grown in the sun or shade garden, they combine nicely with grasses and other herbaceous perennials like blue oat grass (*Helictotrichon*), prairie dropseed (*Sporobolus*), lamb's ears (*Stachys*), lady's mantle (*Alchemilla*), catmint (*Nepeta*), aster (*Aster*), wormwood (*Artemisia*), hosta (*Hosta*) and lungwort (*Pulmonaria*).

Jenny Lee

Geranium 'Nimbus'

The Evaluation Project

Hardy geraniums have become increasingly popular in the past decade, and each year new or improved introductions are offered in nursery catalogs and garden centers. With so many choices possible to gardeners, it can be difficult to decide which ones to grow. The Chicago Botanic Garden (USDA Hardiness Zone 5b, AHS Plant Heat-Zone 5) evaluated 111 species and cultivars of *Geranium* from 1997 to 2002. The goal of the comparative trial was to observe the ornamental traits, disease and pest resistance, cultural adaptability and winter hardiness of a wide range of hardy geraniums for sun and shade environments, and to determine the best hardy geraniums for Northern gardens. Many new cultivars from the United States and Europe were included with garden favorites like 'Johnson's Blue' and *Geranium sanguineum* var. *striatum.*

The hardy geranium trial was conducted in two distinct sites. The primary evaluation site received approximately 10 hours of full sun during the growing season and was openly exposed to wind in all directions. The well-drained, clay-loam soil was amended with

composted leaves and had a pH of 7.4 throughout the evaluation term. Turf grass pathways surrounded the beds on all sides; and 92 plots, each comprised of eight plants, were separated within the beds by mulched strips. The secondary site was located in a mixed landscape where most plants received natural, dappled shade from nearby trees throughout the day. The clay-loam soil was well-drained with an average pH of 7.5. Three plants of each taxon were grown in beds that were sheltered from wind by fences and shrubs. The 19 taxa that were grown in the partial shade site are highlighted with boldface in Tables 1, 2 and 3. Of these plants, *Geranium* 'Blue Sunrise', *G.* ×*cantabrigiense* 'St. Ola', *G. macrorrhizum* 'Variegatum', *G. sanguineum* 'Connie Hansen' and *G. sylvaticum* 'Baker's Pink' received approximately a half day of full sunlight rather than a full day of dappled shade.

Maintenance practices in both plots were kept to a minimum to simulate home garden culture. Water was provided as needed, and no fertilizer was applied. Faded flowers and lodged stems were routinely deadheaded or cut back to new basal leaves after flowering to rejuvenate plant health and habits. Mulch consisting of shredded leaves and wood chips was placed around the plants for water conservation and weed suppression. No winter protection was provided.

Observations

The hardy geraniums were observed for their cultural adaptability to the soils and conditions of the test sites, disease and pest resistance, winter hardiness and ornamental traits including floral display, plant size, habit quality and autumn foliage color. In addition, plant habits were monitored for their response to shearing after flowering. Ninety-seven of the 111 taxa completed a minimum of four years of the six-year trial. Plant traits and evaluation specifics for these taxa are shown in Table 1 and Table 2. The remaining 14 taxa in Table 3 completed less than three years of evaluation due to poor health, cultural problems and identification issues. A summary rating was assigned to each plant based on flower coverage, plant health, habit quality, disease or pest problems and winter injury.

Top-rated Hardy Geraniums

Six hardy geraniums received the highest ratings based on heavy flower production, strong plant habits and good health, cultural adaptability and winter hardiness. The top-rated plants were: *Geranium* 'Blue Cloud', *G.* 'Brookside', *G.* 'Moran', *G.* ×*cantabrigiense* 'St. Ola', *G. macrorrhizum* 'Lohfelden' and *G. macrorrhizum* 'Minor'.

The lavender-blue flowers of *Geranium* 'Blue Cloud' were etched with magenta veins and produced in profusion on robust stems. The habit remained upright throughout the bloom period, but stems began to fall in midsummer and were cut back to improve habit quality. The deeply dissected leaves turned red in autumn. The dark blue flowers of *G.* 'Brookside' were similar to 'Johnson's Blue' but the stems remained upright during the summer. The dark green, finely divided leaves turned red and burgundy in autumn. Although *G.* 'Moran' had a fairly short bloom period, its flowers opened purple and changed to iridescent blue in early May. The robust habit was retained throughout early summer but stems were cut back to the ground after flowering to rejuvenate the plants.

Table 1: Plant Characteristics and Performance Summary Ratings

Overall Rating	*Geranium*	Flower Color	Flower Size	Bloom Period[1]	Flower Coverage	Autumn Foliage Color	Plant Height	Plant Width	Cut Back Information[2]
★★★★½	'Blue Cloud'	lavender-blue	1¼ in.	early Jun-mid Jul	60-80%	red	26 in.	40 in.	Yes+
★★★★	**'Blue Sunrise' ('Verguld Saffier')**	lavender-blue	1¼ in.	late Jun-late Jul	60-80%	none observed	24 in.	36 in.	Yes+
★★★★½	'Brookside'	deep blue	1½ in.	late May-mid Aug	60-80%	red, burgundy	24 in.	38 in.	Yes+
★★★½	'Dilys'	light magenta	1 in.	late May-mid Jul+	20-40%	burgundy	14 in.	48 in.	NR
★★★½	'Johnson's Blue'	blue	1½ in.	mid May-early Jul	40-60%	red	24 in.	33 in.	Yes+
★★★★½	'Moran'	violet-blue	1¼ in.	early May-early Jun	60-80%	none observed	24 in.	26 in.	Yes+
★★★★	'Nimbus'	purplish blue	1 in.	late May-late Jul	40-60%	none observed	24 in.	36 in.	Yes+
★★	'Patricia'	magenta	1½ in.	late May-early Jul	20-40%	orange, red	18 in.	24 in.	Yes+
★★★	'Philippe Vapelle'	blue-violet	1½ in.	mid May-mid Jun	20-40%	red, golden-yellow	16 in.	18 in.	No-
★★★½	'Sirak'	deep pink	1½ in.	late May-early Jul	20-40%	yellow	12 in.	16 in.	Yes+
★★★½	'Spinners'	purple-blue	1½ in.	early Jun-late Jul	20-40%	none observed	20 in.	30 in.	Yes+
★★★★	×*cantabrigiense*	purple-pink	1 in.	mid May-late Jun	40-60%	red, burgundy	12 in.	26 in.	NR
★★★★	×*cantabrigiense* 'Biokovo'	white and pink	1 in.	mid May-late Jun	40-60%	red, burgundy, orange	9 in.	20 in.	NR
★★★★	×*cantabrigiense* 'Cambridge'	purple-pink	1 in.	mid May-late Jun	40-60%	red, burgundy	9 in.	21 in.	NR
★★★★½	×***cantabrigiense* 'St. Ola'**	white	1 in.	mid May-early Jul	60-80%	none observed	10 in.	43 in.	NR
★★★½	×*cantabrigiense* 'Vorjura'	pinkish purple	¾ in.	late May-early Jul	20-40%	red, orange, burgundy	10 in.	28 in.	NR
★★	*clarkei* 'Kashmir Purple'	purple	1¼ in.	mid May-late Jun	<20%	orange	15 in.	20 in.	Yes-
★★½	*endressii*	pink	1¼ in.	late May-early Jul	20-40%	none observed	10 in.	19 in.	No-
★★½	***gracile***	lavender-pink	1 in.	early May-early Jul	<20%	none observed	10 in.	15 in.	No-
★★★½	*himalayense*	blue	1¾ in.	mid May-late Jun	40-60%	red	15 in.	30 in.	Yes+
★★★½	*himalayense* 'Alpinum Blatow'	blue	1½ in.	mid May-late Jun	40-60%	red	12 in.	20 in.	Yes+
★★★½	*himalayense* 'Baby Blue'	lavender-blue	2¼ in.	mid May-early Jul	20-40%	red, orange, golden-yellow	13 in.	31 in.	Yes+
★★★★	*himalayense* 'Gravetye'	blue	2 in.	mid May-early Jul	40-60%	red, yellow	15 in.	30 in.	Yes+
★★★½	*himalayense* 'Irish Blue'	lavender-blue	2 in.	late May-early Jul	20-40%	none observed	15 in.	24 in.	Yes+
★★★	*himalayense* 'Plenum'	violet	1¼ in.	mid May-late Jun	20-40%	red	13 in.	18 in.	Yes+
★★★★	*ibericum* 'Rosemoor'	violet-blue	1½ in.	early Jun-early Jul	40-60%	red, orange	13 in.	18 in.	No-
★★★★	*ibericum* ssp. *jubatum* 'Vital'	purple	1½ in.	mid May-mid Jun	60-80%	red, burgundy	14 in.	22 in.	Yes+
★★★★	*macrorrhizum*	magenta	1 in.	mid May-mid Jun	40-60%	burgundy, yellow	14 in.	31 in.	NR
★★★★	*macrorrhizum* 'Czakor'	dark magenta	1 in.	mid May-mid Jun	40-60%	red, burgundy	12 in.	35 in.	NR
★★★★	*macrorrhizum* 'Ingwersen's Variety'	pale pink	1 in.	mid May-mid Jun	40-60%	purple, red, orange	14 in.	42 in.	NR
★★★★½	*macrorrhizum* 'Lohfelden'	very pale pink	1 in.	mid May-early Jul	80-100%	orange, red	8 in.	18 in.	NR
★★★★½	*macrorrhizum* 'Minor'	magenta	1 in.	mid May-early Jul	80-100%	burgundy, golden-yellow	9 in.	36 in.	NR
★★★	*macrorrhizum* 'Pindus'	magenta-pink	1 in.	late May-early Jul	20-40%	orange	10 in.	22 in.	NR
★★★★	*macrorrhizum* 'Ridsko'	magenta-pink	1 in.	mid May-early Jul	20-40%	red	14 in.	32 in.	NR
★★★½	*macrorrhizum* 'Spessart'	white and pale pink	1 in.	mid May-early Jul	20-40%	red, burgundy	12 in.	27 in.	NR
★★★★	***macrorrhizum* 'Variegatum'**	rose-pink	1 in.	late May-early Jul	40-60%	none observed	17 in.	34 in.	NR
★★★★	***maculatum* 'Beth Chatto'**	pink	1½ in.	early May-late May	40-60%	none observed	13 in.	21 in.	Yes-
★★	***maculatum* 'Hazel Gallagher'**	white	1½ in.	mid May-early Jun	<20%	none observed	12 in.	14 in.	Yes-
★★★½	***maculatum* f. *albiflorum***	white	1¼ in.	early May-early Jun	20-40%	none observed	15 in.	21 in.	Yes-
★★★	×*monacense* 'Muldoon'	maroon	1 in.	mid May-early Jul	60-80%	none observed	9 in.	18 in.	No-
★★★	*nodosum* 'Simon'	lavender	1 in.	late May-early Jul+	<20%	burgundy	9 in.	13 in.	No+
★★★	*nodosum* 'Svelte Lilac'	lilac	1 in.	late May-early Jul+	<20%	red, burgundy	14 in.	19 in.	No+

Overall Ratings: ★★★★★ excellent, ★★★★ good, ★★★ fair, ★★ poor, ★ very poor; half-star ratings included in table.
[1]Sporadic or repeat bloom into August and September designated by + following bloom period dates.
[2]Cut back information: **Yes+** plants were cut back after flowering, resulting in improved health and habit ratings within 2-3 weeks; **Yes-** plants were cut back after flowering but no improvement in plant health or vigor was noted; **No+** plants were not cut back but plant health and habit improved; **No-** plants were not cut back and did not improve in health and habit; **NR–** plants did not decline and did not require pruning to improve health or habit.
Boldface denotes taxa grown in partial shade.

The aromatic leaves of *Geranium* ×*cantabrigiense* 'St. Ola' were similar to other cultivars of this species, but the pure white flowers were uniquely its own. The low-spreading habit of 'St. Ola' made it a good ground cover and it did not require deadheading to remain healthy all season. *Geranium macrorrhizum* 'Lohfelden' and 'Minor' were both lower growing than the species and closely resembled *G.* ×*cantabrigiense* in stature and habit. The pale pink flowers of 'Lohfelden' had contrasting darker pink veins, while the magenta flowers of 'Minor' were similar in color to the species. Both cultivars had the characteristic aromatic leaves that turn colorful in autumn. These plants also did not require deadheading or pruning after flowering.

Flowers and Foliage

The ornamental traits of each hardy geranium were observed throughout the evaluation period. Each year data were collected on flower phenology, flower production, flower color, flower size and reseeding potential; foliar color in spring, summer and autumn; habit characteristics and quality; and plant height and width measurements.

Hardy geraniums are not the most floriferous of garden perennials; flower coverage of 40% to 60% was considered high and anything over 60% was exceptional. In comparison, levels under 60% are a moderate rate of. flower production for many other perennial plants such as phloxes (*Phlox*), coneflowers (*Rudbeckia*) and beebalms (*Monarda*). There were a number of cases where lower flower coverage occurred over a long bloom period. For example, most *Geranium sanguineum* cultivars bloomed 10 weeks on average, but coverage was typically below 40% at peak bloom. Twenty-two of the 34 taxa that rated good or higher had between 40% and 60% flower coverage and the remaining 12 taxa had

Table 2: Plant Characteristics and Performance Summary Ratings

Overall Rating	*Geranium*	Flower Color	Flower Size	Bloom Period[1]	Flower Coverage	Autumn Foliage Color	Plant Height	Plant Width	Cut Back Information[2]
★★★★	×*oxonianum* 'A.T. Johnson'	pink	1¼ in.	late May-late Jul	40-60%	yellow	17 in.	25 in.	Yes+
★★½	×*oxonianum* 'Claridge Druce'	violet-pink	1½ in.	late May-early Jul	<20%	none observed	16 in.	27 in.	Yes+
★★½	×*oxonianum* 'Hollywood'	pale pink	1¼ in.	late May-early Jul	<20%	yellow	12 in.	24 in.	Yes+
★★★	×*oxonianum* 'Katherine Adele'	silvery pink	¾ in.	mid May-early Aug	20-40%	none observed	14 in.	22 in.	Yes+
★★★★	×*oxonianum* 'Lady Moore'	pink	1¼ in.	late May-early Aug	40-60%	none observed	17 in.	23 in.	Yes+
★★½	×*oxonianum* 'Pearl Boland'	pink	1 in.	late May-late Jul	20-40%	none observed	14 in.	28 in.	Yes+
★★★	×*oxonianum* 'Phoebe Noble'	dark pink	1¼ in.	late May-early Jul	20-40%	yellow	16 in.	30 in.	Yes+
★★★★	×*oxonianum* 'Rebecca Moss'	silvery pink	1¼ in.	late May-late Jul	40-60%	none observed	22 in.	35 in.	Yes+
★★	×*oxonianum* 'Rose Clair'	rose-pink	1½ in.	late May-early Jul	<20%	none observed	19 in.	22 in.	Yes+
★★★½	×*oxonianum* 'Sherwood'	light pink	1¼ in.	late May-mid Jul	20-40%	none observed	13 in.	25 in.	Yes+
★★★★	×*oxonianum* 'Southcombe Star'	pale pink	1 in.	late May-late Jul	40-60%	none observed	17 in.	26 in.	Yes+
★★★½	×*oxonianum* 'Summer Surprise'	pink	1½ in.	late May-mid Jul	20-40%	none observed	17 in.	25 in.	Yes+
★★	×*oxonianum* 'Thurstonianum'	pink	¾ in.	early Jun-late Jun	<20%	red, orange	14 in.	20 in.	No-
★★	×*oxonianum* 'Walter's Gift'	light pink	1¼ in.	early Jun-early Jul	<20%	none observed	10 in.	15 in.	No-
★★★	×*oxonianum* 'Wargrave Pink'	pink	1½ in.	late May-early Jul	<20%	red	14 in.	24 in.	Yes+
★★★½	*palustre*	magenta-pink	1¼ in.	early Jun-late Jul+	20-40%	red, purple	12 in.	45 in.	Yes+
★★★	***phaeum* 'Lily Lovell'**	maroon	¾ in.	mid May-mid Jun	20-40%	none observed	14 in.	28 in.	No-
★★★	***phaeum* 'Samobor'**	maroon	¾ in.	mid May-early Jun	20-40%	none observed	15 in.	20 in.	No-
★★	***phaeum* 'Taff's Jester'**	maroon	¾ in.	early May-early Jun	20-40%	none observed	15 in.	22 in.	No-
★★	***phaeum* var. *lividum* 'Joan Baker'**			did not flower		none observed	12 in.	16 in.	No-
★★★★	*platypetalum*	violet-blue	1¾ in.	late May-early Jul	80-100%	orange, red	16 in.	25 in.	Yes+
★★★★	*pratense*	blue	1½ in.	early Jun-early Jul	60-80%	red	24 in.	38 in.	Yes+
★★★	*pratense* 'Midnight Reiter'	purple-blue	1½ in.	early Jun-early Jul	<20%	purple, red	8 in.	12 in.	NR
★★★½	*pratense* 'Mrs. Kendall Clark'	lavender-blue	1¼ in.	late May-early Jul	20-40%	none observed	24 in.	38 in.	Yes+
★★★	*pratense* 'Plenum Violaceum'	violet-blue	1 in.	late Jun-early Aug	20-40%	none observed	18 in.	30 in.	Yes+
★★★	*pratense* 'Silver Queen'	very pale violet	1¼ in.	mid Jun-early Aug	<20%	none observed	18 in.	24 in.	Yes+
★★★½	*pratense* 'Striatum'	white and violet-blue	1½ in.	late May-early Jul	20-40%	none observed	23 in.	29 in.	Yes+
★★★★	*pratense* Victor Reiter strain	purple-blue	1½ in.	early Jun-mid Jul	40-60%	purple	14 in.	21 in.	Yes+
★★★	*pratense* 'Wisley Blue'	lavender-blue	1½ in.	early Jun-late Jul	<20%	none observed	18 in.	24 in.	Yes+
★★	*pratense* var. *stewartianum*	purplish blue	1½ in.	early May-early Jun	<20%	orange, red	13 in.	17 in.	Yes+
★★	*psilostemon*	dark magenta, black	2 in.	early Jun-mid Jul	20-40%	burgundy, red	12 in.	24 in.	Yes+
★★★	*psilostemon* 'Bressingham Flair'	light magenta	2 in.	early Jun-mid Jul	20-40%	red	26 in.	30 in.	Yes+
★★	*renardii*	white and lavender	1½ in.	mid May-mid Jun	20-40%	yellow	7 in.	18 in.	No-
★★	*renardii* 'Tcschelda'	lavender-blue	1½ in.	mid May-late Jun	40-60%	orange	8 in.	15 in.	No-
★★★½	*renardii* 'Zetterlund'	lavender	1¼ in.	mid May-mid Jun	20-40%	golden-yellow	11 in.	15 in.	No-
★★★½	*sanguineum* 'Album'	white	1½ in.	late May-early Jul	20-40%	purplish	10 in.	30 in.	No+
★★★½	*sanguineum* 'Ankum's Pride'	pink	1¼ in.	early May-early Jul	20-40%	red	6 in.	18 in.	No+
★★★★	*sanguineum* 'Aviemore'	purple	1¼ in.	early Jun-mid Jul+	40-60%	red, burgundy	10 in.	26 in.	No+
★★★½	*sanguineum* 'Cedric Morris'	magenta	1¼ in.	mid May-mid Jul+	20-40%	red	21 in.	32 in.	No+
★★★★	***sanguineum* 'Connie Hansen'**	light pink	1¼ in.	mid May-late Jul	60-80%	none observed	20 in.	24 in.	No+
★★★★	*sanguineum* 'Elsbeth'	dark magenta	1½ in.	early May-early Jul+	40-60%	red	20 in.	32 in.	No+
★★★½	*sanguineum* 'Glenluce'	pink	1¼ in.	mid May-early Jul	20-40%	red	14 in.	28 in.	No+
★★★½	*sanguineum* 'John Elsley'	magenta	1¼ in.	early May-early Jul+	20-40%	red, purple	9 in.	29 in.	No+
★★★★	*sanguineum* 'Kristin Jakob'	purple-magenta	1 in.	early May-mid Jul+	40-60%	none observed	14 in.	34 in.	No+
★★★½	*sanguineum* 'Max Frei'	magenta-pink	1 in.	mid May-early Jul+	20-40%	red, purple	12 in.	29 in.	No+
★★★½	*sanguineum* 'New Hampshire Purple'	magenta	1½ in.	early May-early Jul+	20-40%	red	20 in.	31 in.	No+
★★★½	*sanguineum* 'Purple Flame'	purple	1¼ in.	mid May-early Jul+	20-40%	red, purple	23 in.	42 in.	No+
★★★½	*sanguineum* 'Shepherd's Warning'	rose-pink	1 in.	mid May-early Jul+	20-40%	purple	6 in.	17 in.	No+
★★★½	*sanguineum* var. *alpinum* 'Superbum'	bright purple	1¼ in.	early May-early Jul+	20-40%	red	7 in.	24 in.	No+
★★★½	*sanguineum* var. *striatum*	pale pink	1¼ in.	early May-early Jul+	20-40%	red	11 in.	25 in.	No+
★★★★	*sanguineum* var. *striatum* 'Splendens'	light pink	1¼ in.	early May-mid Jul+	40-60%	red, purple	16 in.	27 in.	No+
★★★½	***sylvaticum* 'Baker's Pink'**	pink	1¼ in.	mid May-late Jun	60-80%	none observed	18 in.	19 in.	No-
★★	***sylvaticum* 'Nikita'**	violet	1½ in.	early May-early Jun	<20%	none observed	10 in.	18 in.	No-
★★★★	***sylvaticum* 'Silva'**	violet	1½ in.	early May-early Jun	40-60%	none observed	15 in.	18 in.	No-
★★★★	*wlassovianum*	purple	1¼ in.	mid Jun-early Sep+	40-60%	purple, red	20 in.	35 in.	NR

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Boldface denotes taxa grown in partial shade.

coverage greater than 60%. In many cases, lower flower production was the determining factor that reduced the final rating by half a star. Among the superior hardy geraniums with low flower production were *Geranium* 'Dilys', *G.* 'Sirak', *G.* 'Spinners', *G.* ×*cantabrigiense* 'Vorjura', *G. himalayense* 'Baby Blue', *G. himalayense* 'Irish Blue', *G. maculatum* f. *albiflorum*, *G. palustre* and many of the cultivars of *G. sanguineum*.

Among the trial plants, flower colors were predominately purple to magenta and shades of pink, with the next significant group being shades of blue and lavender. The remaining plants had white or bicolored flowers. Prominent vein patterns in contrasting colors are common; for example, *Geranium* 'Blue Cloud', *G.* 'Blue Sunrise', *G. himalayense* ('Alpinum Blatow', 'Baby Blue', 'Gravetye' and 'Irish Blue') and *G. ibericum* 'Rosemoor' all had blue flowers with magenta veins. Rich purple to magenta petals with darker veins were featured on: *Geranium* 'Dilys', *G. ibericum* ssp. *jubatum* 'Vital', *G. psilostemon* and *G. psilostemon* 'Bressingham Flair'. *Geranium sanguineum* var. *striatum* had pale pink petals with darker veins, and *G. pratense* 'Mrs. Kendall Clark' had blue petals with a network of whitish veins. The flowers of all *G.* ×*oxonianum* cultivars were netted with light to dark veins.

The colors and forms of flowers were easily compared among the hardy geraniums. The blue flowers of *Geranium* 'Brookside' were reminiscent of 'Johnson's Blue' but darker with overlapping petals. The semi-double, straplike petals of *G.* ×*oxonianum* 'Sherwood' were a bit larger and lighter in color than 'Southcombe Star'. The flowers of *G. ibericum* 'Rosemoor' were similar in color to *G. ibericum* ssp. *jubatum* 'Vital' and *G. platypetalum*, and the flowers of *G. nodosum* 'Svelte Lilac' were bluer than 'Simon'. The purple-pink flowers of *G.* ×*cantabrigiense* 'Cambridge' were the same color as the species, and the deep magenta flowers of 'Czakor' were the darkest of all the *G. macrorrhizum* cultivars. 'Phoebe Noble' and 'Coronet' had the darkest pink flowers of the *G.* ×*oxonianum* group, while the silvery pink flowers of *G.* ×*oxonianum* 'Rebecca Moss' faded to white in full sun.

Jenny Lee

Geranium ×*oxonianum* 'A.T. Johnson'

Richard Hawke

Geranium 'Brookside'

The hardy geraniums were monitored for reseeding potential that might result in weediness. Plots were observed for seedlings of the resident geranium as well as seedlings of other taxa. *Geranium pratense* was the only species that demonstrated a high degree of reseeding, both in the trial plots and the adjacent turf grass paths; therefore, it was determined to be potentially weedy. The species appeared to be more prolific in seedling production than its cultivars, but seedlings were also noted in the plots of 'Mrs. Kendall Clark', 'Striatum' and Victor Reiter strain. Although the seedlings sometimes did not match the cultivar traits, a portion of the seedlings in the plot of Victor Reiter strain had purple foliage. Other taxa with seedlings observed in lesser quantities near the parent plots included: *G. palustre*, *G. platypetalum*, *G. psilostemon* and most of the *G. sanguineum* cultivars.

Foliage colors ranged from gray-green to glossy, bright green, but a number of taxa exhibited differently colored or variegated leaves. The spring leaves of 'Blue Sunrise' were golden-chartreuse before darkening as flowers developed in June. In the early season, 'Ann Folkard' and 'Anne Thomson' also had golden-yellow to chartreuse leaves. The leaves of *G. pratense* 'Midnight Reiter' remained dark purple throughout the summer, whereas the leaves of Victor Reiter strain started out deep purple but faded to mostly green by the end of summer before turning purple again in autumn. *Geranium* ×*oxonianum* 'Katherine Adele', a selection of 'Walter's Gift', had slightly darker purple markings on its leaves. The leaves of *G. phaeum* 'Samobor' were banded in maroon, while the light green leaves of *G. phaeum* 'Taff's Jester' were splashed with yellow and cream. *Geranium macrorrhizum* 'Variegatum' featured a mixture of cream, gray and green, but the variegation was not prominent until late June.

Autumn color was observed at varying levels on many of the hardy geraniums. Exceptional autumn color in shades of red, burgundy and orange was noted on most of the cultivars of *Geranium* ×*cantabrigiense* and *G. macrorrhizum*. In addition, these taxa along with *G. wlassovianum* typically had some purple or red leaves in spring and early summer. Most cultivars of *G. sanguineum* had fair to poor fall color displays, with the exception of 'John Elsley' and var. *striatum* 'Splendens', which had good color change.

Health and Maintenance

The hardy geraniums were evaluated in two different sites, although none of the taxa were grown in both. Plants that received high ratings for health and habit were generally vigorous with upright stems, healthy foliage and strong flower production. These plants also rated high for persistence and improvement in habit vigor and plant size over the course of the evaluation. Plants that received lower ratings typically exhibited a gradual decline in health and habit over successive years. The hardy geraniums in both sites were adaptable to high pH soils since no chlorosis was observed on any plants. The majority of hardy geraniums were adaptable to the variable weather conditions observed during the evaluation period. Weather information including temperature and precipitation was collected daily during the evaluation term and is summarized in Table 4.

The majority of hardy geraniums were adaptable to the growing conditions of the full sun site. These plants received a full day of sunlight and exposure to wind in all directions.

Table 3: *Geranium* Completing Less than Three Years of Evaluation

Overall Rating	*Geranium*	Reason
★	'Ann Folkard'	poor health/killed in growing season
★	'Anne Thomson'	poor health/killed over two winters
NR	×*cantabrigiense* 'Karmina'	incorrect plant
★★	*clarkei* 'Kashmir White'	poor health/killed over two winters
NR	*macrorrhizum* 'Bevan's Variety'	incorrect plant
★	×*oxonianum* 'Coronet'	poor health/killed in first winter
★★	×*oxonianum* 'Lambrook Gillian'	poor health/killed in first winter
★★	×*oxonianum* 'Old Rose'	poor health/killed in third winter
★★	×***oxonianum* 'Rosenlicht'**	competition from adjacent plants
NR	×***oxonianum* 'Wageningen'**	stolen from test garden
★★	*psilostemon* 'Bressingham Pink'	poor health/killed over three winters
★★	*soboliferum*	good health but died in third winter
★	***sylvaticum* 'Lilac Time'**	poor health/killed in first winter
★	***sylvaticum* 'Mayflower'**	poor health/dead before first winter

Overall Ratings: ★★ poor, ★ very poor, **NR**– not rated.
Boldface denotes taxa grown in partial shade.

Seventy-one of the 93 taxa grown in full sun received ratings of fair or higher based in part on good plant health and habit quality. The plants that received lower ratings due in part to inferior habits and/or poor health included: *Geranium* 'Ann Folkard', *G.* 'Anne Thomson', *G.* 'Johnson's Blue', *G.* 'Patricia', *G. clarkei* 'Kashmir Purple', *G. clarkei* 'Kashmir White', *G. himalayense*, *G. himalayense* 'Alpinum Blatow', *G. himalayense* 'Plenum', *G. nodosum* 'Simon', *G.* ×*oxonianum* 'Coronet', *G.* ×*oxonianum* 'Lambrook Gillian', *G.* ×*oxonianum* 'Old Rose', *G.* ×*oxonianum* 'Rosenlicht', *G.* ×*oxonianum* 'Thurstonianum', *G. pratense* 'Plenum Violaceum', *G. pratense* var. *stewartianum*, *G. psilostemon* 'Bressingham Flair', *G. psilostemon* 'Bressingham Pink', *G. renardii*, *G. renardii* 'Tschelda' and *G. soboliferum*. *Geranium* 'Ann Folkard' was retested three times between 1998 and 2000, because each year the plants died by midsummer and never lived through a winter. No other taxa were retested regardless in which year of the trial they were killed.

The hardy geraniums that were grown in partial shade showed variable adaptation to the growing conditions of the site, which included dappled shade throughout the day, clay-loam soil with a pH of 7.5 and competition from adjacent herbaceous and woody plants. Among the taxa that received ratings of good or higher in partial shade were: *Geranium* 'Blue Sunrise', *G.* ×*cantabrigiense* 'St. Ola', *G. macrorrhizum* 'Variegatum', *G. maculatum* 'Beth Chatto' and *G. sylvaticum* 'Silva'.

Seven taxa were less adapted to the shady test site, resulting in overall poor ratings based on health, habit and flower production. The taxa that received lower ratings due in part to poor health and/or inferior habits included: *Geranium gracile*, *G. maculatum* 'Hazel Gallagher', *G. phaeum* 'Taff's Jester', *G. phaeum* var. *lividum* 'Joan Baker', *G. sylvaticum* 'Lilac Time', *G. sylvaticum* 'Mayflower' and *G. sylvaticum* 'Nikita'. *Geranium* ×*oxonianum* 'Rosenlicht' was in poor health after planting with an inferior habit due to competition from nearby plants. The *G. phaeum* cultivars were additionally affected by rabbit damage.

Richard Hawke

Geranium ×*oxonianum* 'Rebecca Moss'

Jenny Lee

Geranium ibericum ssp. *jubutum* 'Vital'

The habits of many hardy geraniums naturally become open with relaxed to floppy stems following flowering. New foliage emerges at the crown during the bloom period; therefore, it is generally recommended to rejuvenate the plants by cutting old stems back to the new leaves. Many of the hardy geraniums were routinely cut back or sheared, resulting in an improvement in plant health and habit quality within two to three weeks (see Tables 1 and 2). The hardy geraniums that remained healthy throughout the summer and did not require shearing included: *Geranium* 'Dilys', *G. pratense* 'Midnight Reiter', *G. wlassovianum* and the cultivars of *G.* ×*cantabrigiense*, *G. macrorrhizum* and *G. sanguineum*. When grown in full sun, *G.* ×*cantabrigiense* and its cultivars may need to be cut back if inadequate moisture during hot weather results in declining foliage. *Geranium maculatum* and cultivars were not cut back because the plants went dormant in summer after flowering.

Diseases and Pests

The hardy geraniums were largely unaffected by disease or pest problems. Powdery mildew, leaf spotting, rabbits and Japanese beetles were infrequent problems observed in the trial period. No control measures were taken.

Powdery mildew was an uncommon and infrequent problem for a small group of hardy geraniums that were growing in full sun. Patches of white fungus were observed on the upper surfaces of infected leaves beginning in late July and lasting into September and October. The hardy geraniums that were infected in one or more years of the trial included: *Geranium* 'Johnson's Blue' (1998), *G. platypetalum* (1999), *G. pratense* (1998, 1999, 2000), *G. pratense* 'Mrs. Kendall Clark' (1998, 1999, 2000), *G. pratense* 'Silver Queen' (2000), *G. pratense* 'Striatum' (1999), *G. pratense* 'Wisley Blue' (2000) and *G. sanguineum* 'Album' (1999).

Leaf spotting was observed on a variety of hardy geraniums growing in full sun, but no determination was made on whether the leaf spots were fungal or bacterial in origin. In most cases, spotting was observed at 25% or less during summer months but infection levels on *Geranium renardii* and its cultivars (including 'Philippe Vapelle', a hybrid of *G. platypetalum* and *G. renardii*) were particularly high at up to 50% of leaves damaged. The hardy geraniums that were injured by leaf spotting in one or more years included: *Geranium* 'Philippe Vapelle' (2000, 2001), *G.* ×*cantabrigiense* (2000, 2002), *G.* ×*cantabrigiense* 'Cambridge' (2000, 2002), *G. endressii* (1998), *G. himalayense* 'Baby Blue' (1998, 2002), *G.* ×*oxonianum* 'Hollywood' (1998, 1999), *G. platypetalum* (1998, 2000, 2002), *G. renardii* (1998, 1999, 2000, 2001), *G. renardii* 'Tcschelda' (1998, 1999, 2000, 2001) and *G. renardii* 'Zetterlund' (2000, 2001).

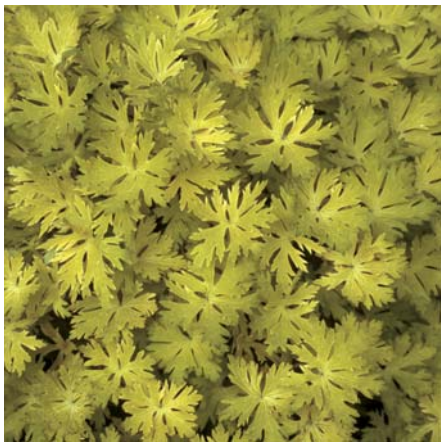
Although rabbit browsing was an infrequent occurrence, it caused significant and sometimes repeated damage to certain plants in the shady test site. Browsing was most significant in the early season between late April and early June, with repeat browsing typically noted in August. The annual and sometimes repetitive browsing adversely affected the health and habit of the plants, especially the *Geranium phaeum* cultivars, which were already weakly growing. The hardy geraniums that were damaged by rabbit browsing in one or more years included: *Geranium maculatum* 'Hazel Gallagher' (2000), *G. phaeum* 'Lily Lovell' (1998, 2000 repeated, 2001),

Table 4: Weather Summary for 1997-2002

	1997	1998	1999	2000	2001	2002
Lowest temperature °F (°C)	-9 (-23)	0 (-18)	-19 (-28)	-9 (-23)	-4 (-20)	-5 (-21)
Highest temperature °F (°C)	97 (36)	98 (37)	104 (40)	94 (34)	98 (37)	101 (38)
Number of days below 0°F (-18°C)	9	2	8	9	2	1
Number of days above 90°F (32°C)	11	19	16	8	19	30
Last frost date	5/22	4/28	4/19	4/12	4/19	5/21
First frost date	10/15	10/14	10/20	10/7	10/7	10/14
Annual rainfall in inches (cm)[a]	37.7 (95.8)	35.2 (89.4)	36.5 (92.7)	43.5 (110.5)	44.3 (112.5)	33.6 (85.3)
Annual snowfall in inches (cm)[b]	44.9 (114.0)	19.0 (48.3)	41.0 (104.1)	56.5 (143.5)	10.9 (27.7)	37.6 (95.5)
Length of growing season days[c]	146	169	175	177	171	146

[a]Average rainfall is 35.8 inches (90.9 cm).
[b]Average snowfall is 38.1 inches (96.8 cm).
[c]Average length of growing season is 158 days.

Data collected at Chicago Botanic Garden weather station. Latitude: 41°51'N. Longitude: 87°37'W. Altitude: 578.74 ft. (176.4m).


Richard Hawke

Geranium 'Blue Sunrise'


Richard Hawke

Geranium macrorrhizum 'Ingwersen's Variety'


Jen Van Wagoner

Geranium macrorrhizum 'Lohfelden'

G. phaeum 'Samobor' (1999 repeated, 2000), *G. phaeum* 'Taff's Jester' (2000), *G. phaeum* var. *lividum* 'Joan Baker' (1999, 2000) and *G. sylvaticum* 'Baker's Pink' (2000).

Foliar injury caused by Japanese beetles was only observed on cultivars of *Geranium* ×*oxonianum*. Injury was first observed in 1999 and noted between 5% and 10% foliar damage. In 2000, damage levels increased dramatically to 40% of leaves injured. The Oxford geraniums that were injured by Japanese beetles in one or more years included: 'A.T. Johnson', 'Claridge Druce', 'Hollywood', 'Phoebe Noble', 'Rebecca Moss', 'Rose Clair', 'Sherwood', 'Southcombe Star', 'Summer Surprise' and 'Walter's Gift'.

Winter Injury and Hardiness

It was generally concluded that hardy geraniums were cold tolerant and winter hardy in USDA Zone 5b. Crown injury and/or plant death were observed on a significant number of taxa, with varying degrees of damage noted each year. Plant health was a major factor in whether or not injury occurred in winter. In fact, all of the plants that were injured or killed in winter were in poor health during the previous growing season(s). Factors that contributed to poor plant health included: weak or inferior condition when planted; plants that were incorrectly sited; and repetitive pest damage. Cold temperatures may have adversely affected *Geranium gracile* and *G. soboliferum*, both referenced as hardy to USDA Zone 7. In both instances, plants lived through at least two winters but were weakened and in poor health during subsequent growing seasons.

The 34 taxa that were in poor health during the growing season and subsequently suffered crown injury or plant death during one or more winters of the trial included: *Geranium* 'Anne Thomson', *G.* 'Patricia', *G.* 'Philippe Vapelle', *G. clarkei* 'Kashmir Purple', *G. clarkei* 'Kashmir White', *G. endressii*, *G. gracile*, *G. himalayense* 'Alpinum Blatow', *G. himalayense* 'Plenum', *G. macrorrhizum* 'Pindus', *G.* ×*monacense* 'Muldoon', *G. nodosum* 'Simon', *G.* ×*oxonianum* 'Claridge Druce', *G.* ×*oxonianum* 'Coronet', *G.* ×*oxonianum* 'Hollywood', *G.* ×*oxonianum* 'Katherine Adele', *G.* ×*oxonianum* 'Lambrook Gillian', *G.* ×*oxonianum* 'Old Rose', *G.* ×*oxonianum* 'Pearl Boland', *G.* ×*oxonianum* 'Phoebe Noble', *G.* ×*oxonianum* 'Rose Clair', *G.* ×*oxonianum* 'Thurstonianum', *G.* ×*oxonianum* 'Walter's Gift', *G. phaeum* 'Lily Lovell', *G. phaeum* var. *lividum* 'Joan Baker', *G. phaeum* 'Taff's Jester', *G. pratense* 'Silver Queen', *G. pratense* var. *stewartianum*, *G. psilostemon*, *G. psilostemon* 'Bressingham Pink', *G. renardii*, *G. renardii* 'Tcschelda', *G. soboliferum* and *G. sylvaticum* 'Lilac Time'. The taxa that completed less than three years of the trial due to winter injury are noted in Table 3.

Summary

The diversity within the genus *Geranium* is evident in the many species and cultivars available to gardeners. Their increasing popularity has fueled the introduction of many new selections in the past 10 years. Hardy geraniums come in an array of flower colors, foliage colors and textures, and plant habits for full sun to shady conditions. These beautiful, low maintenance perennials are ideal for contemporary gardens.

Thirty-four hardy geraniums had overall ratings of good or higher based on heavy flower production, strong plant habits and good health. The six top-rated plants were: *Geranium* 'Blue Cloud', *G.* 'Brookside', *G.* 'Moran', *G.* ×*cantabrigiense* 'St. Ola', *G. macrorrhizum* 'Lohfelden' and *G. macrorrhizum* 'Minor'. In addition, a variety of hardy geraniums received high ratings, including: *Geranium ibericum* ssp. *jubatum* 'Vital', *G. macrorrhizum* 'Czakor', *G. maculatum* 'Beth Chatto', *G.* ×*oxonianum* 'Rebecca Moss', *G. pratense* Victor Reiter strain, *G. sanguineum* 'Elsbeth', *G. sylvaticum* 'Silva' and *G. wlassovianum*.

In many cases, lower flower production was the primary reason a plant received less than four stars. Among the superior hardy geraniums with lower flower production were: *Geranium* 'Dilys', *G.* 'Sirak', *G.* 'Spinners', *G.* ×*cantabrigiense* 'Vorjura', *G. himalayense* 'Baby Blue', *G. himalayense* 'Irish Blue', *G. maculatum* f. *albiflorum*, *G. palustre* and many cultivars of *G. sanguineum*.

Hardy geraniums have often been relegated to wildflower or naturalistic gardens because of their informality and less than showy floral display. Many superior new selections of hardy geraniums have helped change how gardeners view these valuable floral and foliage plants. Hardy geraniums are praised for their hardiness, ornamental traits and landscape versatility. Whether your interests lie with native plants or exotic cultivars, there are hardy geraniums for every garden.

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