

Herbaceous perennials for the Prairie Provinces



Agriculture
Canada

Publication 1769/E



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PUBLICATION 1769E, available from
Communications Branch, Agriculture Canada,
Ottawa K1A 0C7

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Cat. No. A53-1769/1984E ISBN: 0-662-13224-6
Printed 1984 8M-10:84

Également disponible en français sous le titre
*Herbacées vivaces pour les
Provinces des Prairies*

Herbaceous perennials for the Prairie Provinces

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This publication outlines the cultural practices and uses of a large collection of herbaceous perennials tested at the Research Station, Morden, Man. Most of the cultivars described are fully hardy if given ordinary care, but plants that need special requirements of soil, sun, or shade, and those that may not survive prairie winters are mentioned.

A border of herbaceous perennial plants properly planned and cared for gives pleasure in early spring and continues to bloom until long after annual flowers are cut down by frost in the late fall. Herbaceous perennials are plants that make annual top growth, flower in the summer, and store energy in underground roots, buds, bulbs, or stolons. These underground, dormant parts of the plants survive the winter and produce growth the following year.

In prairie gardens, where the renewal of plant growth is so eagerly awaited, herbaceous perennials give the first signs of spring. Some hardy bulbs push their shoots through the ground while the last of the snow lingers in shady nooks. Others show no signs of life until May is well advanced. It is not unusual to see the nodding bells of the Siberian squills opening in late April, followed in a few weeks by drifts of bloom on moss phlox. A well-planned herbaceous perennial border includes some of the earliest as well as some of the latest flowering kinds, so that there will be a long season of bloom, ending with the hardy chrysanthemums and Michaelmas daisies, which sometimes carry their bloom into November. Have the size and location of the border fit the property. A place in the sun is best, away from encroaching roots of trees or hedges. Keep the size of the border in proportion to the size of the garden. The width, however, should not be less than 1.8 m or it will be difficult to arrange the plants properly.

Preparing the soil

In prairie gardens the soil is usually fertile, and you need only work it about 15–20 cm deep. Poor soil needs enriching with rotted manure; heavy clay soils can be lightened with peat and sand. For some deep-rooted plants such as peonies, loosen the subsoil, work in a layer of rotted manure at the

*Retired.

bottom, and add a slow-release fertilizer or a handful of bone meal to the topsoil. Dig out perennial weeds before the plants are set; dandelions and quack grass, for example, can be troublesome and difficult to kill after the plants are well established. Some perennials, such as blanketflowers and bee-balms, do best in sandy soil. A few, such as peonies, bleedinghearts, and gasplants, do well in heavy clay loam. But most perennials need no special soil, only good drainage.

Planning the border

Before you plant perennials, make a plan showing where each variety is to go. You should know the height, color, and season of bloom for each variety in order to arrange the plants to the best advantage. As a general rule, place the tall plants at the back, the medium-tall ones then the shorter ones toward the front, and the prostrate plants at the front edge. To avoid a monotonous repetition put a few tall plants forward to the middle row and a few medium-tall ones toward the front. Bulbous plants, such as squills, grape-hyacinths, and many kinds of tulips, provide the earliest flowers. Bulbs are best planted in groups of a dozen or more; a few scattered specimens detract from the compact appearance of the border.

Most hardy lilies bloom in July, many with harsh orange-colored flowers that are difficult to associate with certain shades of pink. Keep these bright orange lilies away from plants that have magenta flowers, such as lythrums. You can soften and neutralize these colors by interplanting baby's-breath, sneezeworts, or other perennials that have white flowers.

A mixture of colors is generally harmonious, but there are a few basic rules for obtaining the most pleasing results. If your perennial border is at least 15 m long, start at one end with flowers of pastel shades: soft yellows, pale blues, and delicate pinks. Toward the center of the border have colors of increasing intensity so that bright scarlets, dark crimsons, rich purples, and golden yellows mix with one another; taper off to paler shades at the other end of the border. This plan should not be seriously considered for small perennial borders where the best effect is obtained with a random mixed planting. Use enough white-flowered or white- or silver-foliaged plants to separate the harsh orange-colored lilies from the shocking pinks. Set out the plants in groups of three or five if the size of the border warrants it.

The small home-garden border has room for only single plants of peony, goat's-beard, bleedingheart, coneflower, bearded iris, sea-lavender, day-lily, gasplant, and similar vigorous plants. Plants in this group need to be placed 1–1.2 m apart to show off their handsome leaves and maintain healthy growth. The bearded irises provide delicate blues, yellows, and pinks as well as reddish browns and subtle shades of apricot and buff. Tall and dwarf kinds are available; both need full sun and well-drained soil. The season of bloom is rather short, but the handsome sword-shaped leaves give character to the border all through the summer. Day-lilies bloom best in a sunny spot, but tolerate shade and provide handsome leaves over a long period. Like peonies and gasplants, day-lilies do not have to be divided and replanted for

several years. Larkspurs provide some of the bluest flowers in the border, as well as spikes of pure white, lilac pink, and dark purple. More information about the height, color, and season of bloom of perennials may be found in the recommended list published by your provincial department of agriculture. Study this list and the nurserymen's catalogs to become better acquainted with hardy perennials suitable for your region.

In spite of good planning, some plants will likely be in the wrong place, and from time to time there will be winter losses. The mistakes in arrangement are obvious when the plants reach maturity and flower. Winter losses leave gaps that should be filled in the spring. It is a good plan to have a few perennials in reserve to patch up the border. Remove all traces of the old plants and work the soil deep, adding a slow-release commercial fertilizer or a handful of bone meal.

Some kinds of annual plants do not look out of place in a perennial border; cornflowers, Marguerites, carnations, English daisies, annual chrysanthemums, and verbenas are some. Marigolds, petunias, and zinnias are not so suitable.

Planting

Most perennials are best planted in the spring. Start soon after the ground has dried up and continued for as long as the plants remain dormant. When the top growth is 15 cm or more high, transplanting is more difficult as the leaves wilt when exposed to sun and wind. Transplanted perennials recover quickly if they are shaded and sprayed with water occasionally. But the roots should not be kept too wet.

Certain kinds of perennials are planted in the fall; peonies, bleeding-hearts, bearded irises, oriental poppies, and a variety of hardy bulbs are examples. The bearded irises, bleedinghearts, and oriental poppies may be planted in August; the peonies, lilies, and other bulbs in September and October. The bearded irises must have well-drained soil and a sunny site, and should be planted with the fleshy portion of the root, or rhizome, just below the soil surface. If they are set too deep in poorly drained soil or where the sun cannot reach the base of the plants, fungus diseases are likely to attack them. Because peony roots penetrate the soil deeply, loosen the subsoil and add well-rotted manure. Set the eyes, or dormant shoots, not more than 5 cm below the soil surface. The method for dividing old peonies is described under "Propagating."

Most lilies are planted in September; a few trumpet lilies and others of borderline hardiness are available from dealers in the spring for planting in May. Different kinds of lilies are planted at different depths; the stem-rooters have annual roots on their lower stems and are planted deeper than those with basal roots only. Lilies are easier to care for when planted in separate beds or borders; however, in groups of three to five they look good among the perennials. Dig holes of a suitable size, 30 cm apart, and loosen the subsoil. Place a layer of coarse sand under each bulb to further improve drainage. Some kinds are precocious, the new shoots emerging before spring frosts

are over. The Hanson's, Martagon, and Caucasian lilies are examples of these early starters; you may retard them by placing a layer of flax straw around the old stalks in October. Remove the straw promptly at the first sign of growth in the spring, but keep it handy and be ready to replace it if frost threatens.

Summer care

A new border needs regular hoeing to kill annual weeds and keep the soil from baking. Perennial weeds, such as dandelions and quack grass, must be dug out. Chemical weed control is not practical in a perennial border; even spraying adjacent grass areas can damage certain plants. Perennials vary in their moisture requirements; deep-rooted peonies, for example, seldom suffer seriously from drought, whereas shallow-rooted chrysanthemums and similar plants are the first to need watering. Soak the whole border if it becomes dry. Frequent light sprinklings that wet only the surface soil do more harm than good. From mid-July until September the perennial border is often neglected; the first flush of bloom is over and the late-flowering plants have yet to bloom. A midsummer cleanup will stimulate the late-blooming plants; cut off spent blooms and give the border a light dose of fertilizer.

Fertilizing

If, when you first made the border, you prepared the soil by deep digging, and added well-rotted barnyard manure, the new perennial border will need no additional nutrients for several years. When the plants show signs of unthriftiness, apply a side-dressing of commercial fertilizer. Also, spread a layer of rotted barnyard manure on the border in October to give winter protection; dig the manure into the border in the spring to improve soil texture and provide a slow-release plant food.

Staking

Tall plants need to be staked; use willow or bamboo canes, or pieces of twiggy branches. As larkspur stems are hollow and fragile, tie each one to a slender stake with soft twine or plastic plant ties. A few pieces of twiggy branches will support the medium to tall plants. Place them in position before the plants get too tall so that the shoots can grow up through the twigs. Good staking gives adequate support without being conspicuous. Once the plants have been beaten down by heavy rains and wind, no amount of staking can restore their former poise.

Winter survival

Some perennials die out if they are exposed to winter wind and low temperatures without snow cover. Snow gives the best winter protection; keep it on by spreading a layer of branches or flax straw on the plants in October. Flax straw does not pack down like cereal straw to smother the crowns of the plants in the spring; a layer 10–15 cm deep is sufficient.

Perennials may survive the winter only to die in the spring. Shallow-rooted chrysanthemums and perennial asters can smother in excess water from melting snow. The old portion of the plant may die, but the basal shoots, though they may remain alive, normally have poor roots. A period of hot, dry weather in May can also kill chrysanthemums and asters; be alert to this danger and soak the plants with water. The prostrate moss phloxes, thymes, bugleweeds, and some stonecrops can be damaged by warm weather in early May. Remove the branches from these plants as soon as the snow has gone, but shade the plants lightly until they can stand full sunlight.

The hardy chrysanthemums, perennial asters, and other shallow-rooted plants benefit from a light dressing of fine soil in the spring. Work it around the base of the plants and among the basal shoots, but do not cover them. Not all perennials are truly herbaceous; some make no underground, overwintering growth buds, and the tops must be preserved through the winter. The moss phloxes, thymes, bugleweeds, and some stonecrops are examples. Other perennials have woody, basal stems; some of the beardtongues, perennial candytufts, and certain wormwoods are examples. Besides these, there are short-lived Canterbury bells, sweet Williams, hollyhocks, and pansies, usually raised from seed and lasting only a year or two. The sweet Williams, Canterbury bells, and pansies are leafy plants that must survive with top growth intact or there will be little, if any, bloom. Because snow cover is important for these plants, use a layer of evergreen boughs or flax straw, spread very thin. Heavy layers of wet leaves tend to rot off the tops.

Propagating

From seed

Some perennials may be grown from seed sown in May, either in the open ground or in a garden frame; larkspurs, columbines, and oriental poppies are some of the plants in this group. Before sowing seed make the ground fine by digging and raking, and add peat and sand if the soil is heavy. Space the rows 15 cm apart. Sow the seeds thinly and cover them with fine soil. The depth of planting depends on the size of the seed, the largest being planted not more than 1.2 cm deep. Tiny seeds, such as those of Canterbury bells, need only a very light covering.

Water carefully, using a watering can with a fine nozzle to avoid washing out the seeds. Pieces of coarse burlap, laid over the seedbed, will prevent

the seeds from being washed out by heavy rain. Remove the burlap as soon as the seeds sprout so that the seedlings will not grow up through the sacking.

Lupines have a hard seed coat that inhibits germination. To overcome this, chip the seed with a sharp knife to remove a tiny portion of seed coat. Moisture can then penetrate, and the embryo will sprout in 4 or 5 days. If you have a large quantity of lupine seeds, steep them for 20 minutes in concentrated sulfuric acid, rinse them in clear water, and sow them immediately. A third method, tested at Morden for a number of years, has been most satisfactory. Untreated seed is sown in the open ground as late in the fall as possible; sometimes it can be sown in mid-November. The action of frost on the autumn-sown seed breaks down the hard seed coat and allows a high proportion of the seed to germinate when the soil warms up in the spring.

By dividing the plants

The named cultivars of perennials do not come true from seed; new plants are obtained by dividing the old ones. As a rule, the perennials that bloom in late summer and autumn are divided and replanted in May. The hardy chrysanthemums, perennial asters, sneezeweeds, coneflowers, and phloxes are examples. Dig up the old plants when the new growth is 2–5 cm high, and pull the roots apart to make pieces with three or four shoots. The hardy chrysanthemums and perennial asters will make sturdy plants from single basal shoots, carefully detached from the mother plant and planted firmly in good soil. Water these young plants with 250 mL of starter solution made by dissolving 10 mL of 10-52-17 fertilizer in 5 L of water.

Some of the early-flowering perennials, including moss phloxes, thymes, snow-in-summer, bugleweeds, and certain stonecrops, are divided in July, or immediately after blooming. Pull small pieces from the outer edge of old plants, but avoid the center portion unless all available plants are needed. Line out the pieces in a garden frame, water them, and shade them from the hot sun for a few days. In September, when they will have become well-rooted plants, replant them in the border.

Perennials with fleshy roots are more difficult to divide than those with plenty of fibrous ones; peonies, bleedinghearts, oriental poppies, and bearded irises are examples. Divide and replant the bearded irises, bleedinghearts, and oriental poppies in August. Old peony roots are best divided and replanted in September. Expose the roots to the sun for several hours to soften them, and cut off the tops, leaving stubs 7.5 cm long. Then pierce the heart of the plant with two garden forks, set back to back. Pry the handles apart to split the roots. Trim broken roots with a sharp knife and dust the wounds with a fungicide. The ideal peony division has three to five eyes, or dormant growth buds; set the eyes not more than 5 cm deep. Deeper planting delays flowering and also increases the chance of fungus disease. After transplanting, gather up the broken roots, tops, and other pieces and burn them.

The bearded irises can be divided as soon as the flowers fade, but in prairie gardens, where July heat may be intense, it is best to postpone the operation until mid-August or early September. Pull the fleshy roots apart



Peony plant before division (*left*). Single division of peony root (*right*). The growth buds, or eyes, are just above the fleshy portion of the root (*see inset*).



Bearded iris plant before division (*left*). Single division of bearded iris root (*right*). The fan of leaves is cut to an inverted V.

to make divisions. On each division keep one or two fans of leaves. Cut the leaves to an inverted V about 15 cm long. Space the young plants 30 cm apart in groups of three or five, covering the fleshy roots with not more than 1.2 cm of soil. Avoid doubling the roots in planting. Spread them on a mound in a hole about 30 cm deep and extend the fibrous roots down the sides of the mound. Fill with pulverized soil and tramp firmly, leaving the rhizomes just below the soil surface.

Additional information about propagation can be found in *Nursery propagation of woody and herbaceous perennials for the Prairie Provinces*, Agriculture Canada publication 1733E.

Descriptions and recommendations

The following notes describe a number of herbaceous perennials tested at the Research Station, Morden, Man., and give advice on how to grow them. The list, in alphabetical order by botanical names, gives plant height, season of bloom, color, and hardiness. Both botanical and common names are given where possible. A cross index of common names appears at the back of this publication. Except where otherwise stated, all plants listed are fully hardy in southern Manitoba and are suitable for most areas in the Prairie Provinces.

Achillea (yarrow). Some yarrows have gray leaves; all need well-drained soil and prefer a sunny location. Common yarrow (*A. millefolium*) is not often cultivated, but the red-flowered cultivar Cerise Queen makes a good border plant 60 cm high. It blooms freely in July and again later. The leaves are dark green and finely divided. The Pearl, Boule de Neige, and Perry's White, double-flowered cultivars of sneezewort (*A. ptarmica*), make excellent border plants, flowering in July. The plants spread rapidly by stolons and require replanting in spring every 3 or 4 years. Silvery yarrow (*A. ageratifolia*) is good for the front of the border or rock garden. It needs a hot, dry soil to intensify the silvery, finely cut leaves. The grayish white flower heads are not particularly attractive.

Aconitum (monk's-hood). Tall, late-blooming plants with dark green, glossy leaves; most have blue flowers. They prefer a deep, moist soil and some shade. Helmetflower (*A. napellus*) blooms in July and produces purple, hooded florets on 120-cm stems. Plants of *A. × bicolor* have blue and white flowers. The late-flowering azure monk's-hood or Wilson's monk's-hood (*A. carmichaelii*) is 160 cm high, producing spikes of deep blue flowers in September and October.

Adenophora (ladybells). Ladybells need an open sunny position where the soil is well drained. The early ladybells (*A. liliifolia*) is one of the best; the leaves are gray green, and the nodding bells pale blue on 60-cm stems.

Adonis (pheasant's-eye). A pretty, early-flowering plant with yellow flowers and fernlike leaves. Both the pheasant's-eye (*A. vernalis*) and the Amur adonis (*A. amurensis*) are recommended for the front of the border; the latter has somewhat coarser leaves and larger flowers. Both species flower in May.

Aethionema (stone-cress). Two species, *A. grandiflorum* and *A. stylosum*, have done well at Morden in open, sunny spots where the soil is light. Both bloom in June and July. The flowers are pink and rose, resembling a miniature candytuft, the leaves are fine and blue gray.

Ajuga (bugleweed). Excellent plants for a perennial ground cover. The Geneva bugleweed (*A. genevensis*) has dark green leaves and blue flowers in June. The carpet bugleweed (*A. reptans*) has dark, bronzy green leaves and bluish flowers in June. *A. genevensis* is 15 cm high, *A. reptans* not much more than 7.5 cm. Both cover the ground fairly rapidly, in either sun or shade; in sun, however, there is danger of scalding in early spring unless the plants are covered in October with twiggy branches.

Allium (onion). Several kinds of ornamental onions are useful plants in the perennial border. The nodding onion (*A. cernuum*), the yellow onion (*A. flavum*), and the blue onion (*A. caeruleum*) are among the best. The nodding onion grows to 50 cm, the yellow one only 30 cm high, and the blue one about 60 cm high. All need a place in the sun where the soil is well drained.

Alcea (hollyhock). Single hollyhocks are fully hardy; double ones occasionally survive in sheltered borders but are best treated as biennials, the seed being sown outdoors in June for flowering the following July and August. Store seedling plants over winter in a cool basement and plant them out in early May.

Anchusa (bugloss). The Italian bugloss (*A. azurea*) survives in southern Manitoba, although it is not long-lived. The leaves are dark green, coarse, and hairy; the flowers, intense blue on 120-cm stems. The heavy roots penetrate the subsoil deeply and stay alive when the crown of the plant rots off. Pieces of roots may be used to start new plants.

Anemone (windflower). The native pasqueflower (*A. patens*), often erroneously called crocus, is sometimes cultivated, but under perennial-border conditions it may not thrive. The snowdrop anemone (*A. sylvestris*) makes a spreading plant 50 cm high and has dark green leaves and nodding flowers, pure white and scented. It grows well in a moist shady spot, but flowers more freely in the sun. The Chinese, or Hupeh, anemone (*A. hupehensis*) is not fully hardy all across the prairies unless under a heavy snow cover. It is similar to the Japanese anemone, which is tender in prairie gardens. The Chinese anemone has attractive leaves and lilac pink flowers on wiry stems 50 cm high.

Anthemis (chamomile). The two cultivars of the golden Marguerite (*A. tinctoria*), Kelwayi and Moonlight, are good border plants, thriving in hot, dry soil. The leaves are fine and dark green, and the yellow flowers, on 60-cm stems, resemble daisies. Moonlight is pale, lemon yellow; Kelwayi is golden.

Aquilegia (columbine). Useful border plants with decorative leaves and graceful flowers. Most are short-lived in prairie gardens unless protected from the columbine borer. The hybrid long-spurred columbines are most popular and easily raised from seed. There are also a number of species that make good border plants. A few of the best are the Colorado columbine (*A. caerulea*), which is 30 cm high and has blue and white flowers and glaucous leaves; the alpine columbine (*A. alpina*), which is about the same height and has deep blue flowers and dark green leaves; and the wild columbine (*A. canadensis*), with nodding flowers of red and yellow on stems 60 cm high. Most of the columbines flower in early summer, but the leaves are attractive until late autumn. Plant them in well-drained, moist soil in partial shade or in full sun.

Arabis (rock cress). A dwarf, early-flowering plant for edging the perennial border or for use in the rock garden. The wall rock cress (*A. caucasica*) has white flowers, either single or double; the alpine rock cress (*A. alpina*) has pink as well as white flowers. Both are almost prostrate, and unless they are under a blanket of snow they tend to winter-kill.

Artemisia (wormwood). Grown for their ornamental, sometimes aromatic leaves, either green or silver gray. The Russian wormwood (*A. gmelinii*) has woody, 120-cm stems and fernlike leaves, dark green and attractive. Hard pruning in the spring to remove dead tip-growth keeps it compact and healthy. The beach wormwood (*A. stellerana*) has silver gray, deeply lobed leaves on stems about 30 cm high. Silver Mound, a cultivar of *A. schmidtiana* with finely divided, silky foliage silver gray in color, is a good plant along with the beach wormwood for a hot, sunny spot. Both need hard pruning in April to induce young, vigorous growth. All the wormwoods do best in poor soil, low in humus and nitrogen, well-drained, and in full sun.

Aruncus (goat's-beard). The goat's-beard (*A. dioicus*) grows to 120 cm in height and is one of the most handsome perennials. The large, compound leaves are attractive all summer, turning a rich bronzy green in September. The panicles of creamy white flowers appear in July and later turn to bronze seed pods useful as decoration in the border or when cut.

Aster (aster or Michaelmas daisy). Over a hundred species and cultivars have been tested at Morden. Most of them are fully hardy, though some of the English hybrid Michaelmas daisies flower too late to be of much use in prairie gardens. The Rhone aster (*A. sedifolius*) has fine leaves and small starry

flowers in dense panicles of lavender blue. The plant is 60–90 cm high, the flowers open in September, and the bloom continues for a month. The alpine aster (*A. alpinus*) is a 15-cm dwarf and has solitary stems of lavender blue daisies in July. The various cultivars of the Italian aster (*A. amellus*) are all good border plants; Beauty of Ronsdorf is pink, King George is rich violet blue, and Perry's Favorite is lilac pink. All are about 60 cm high; they flower in August and September, and have gray green leaves.

The heart-leaved aster (*A. cordifolius*) and the heath aster (*A. ericoides*) are not fully hardy in prairie gardens. Under deep snow, however, they survive the winter but often bloom too late to make a show. The roundish leaves of the heart-leaved aster and the slender, fine leaves of the heath aster are attractive in the border. The largest group, the New York asters (*A. novi-belgii*), includes the finest in size and color; all are fully hardy provided that snow cover is early and adequate, but many flower too late. They need transplanting about every 2 years and some tall cultivars need stakes to support the flower stems. The most dependable cultivars are Plenty, a strong variety 90 cm high with large, lavender mauve, yellow-eyed flowers; Pacific Amaranth, 60 cm high with magenta flowers; Morden Lavender, 50 cm high, making a mound of lavender blue in September; and Blandie, a newer cultivar, with white daisies on 90-cm stems.

A number of dwarf asters belonging to a hybrid group with the bushy aster (*A. dumosus*) as one parent includes two Morden hybrids, Morden Fay and Morden Cupid; both are only 15 cm high; Fay is lilac mauve, Cupid is white. Other dwarf asters recommended for the front of the border are Victor, lavender blue; Marjorie, mauve; and Biobe, white.

The New England asters (*A. novae-angliae*) are tall and have coarse leaves and woody stems. The roots are compact, and the plants need less attention than the New York asters. The flowers, which are open in late September, are in dense heads, mostly rosy red or purple. Some of the best are Lil Fardell, 120 cm, rose pink; Morden Crimson, 150 cm, rosy red; and Morden Purple, a sister plant that has violet purple flowers. Harrington's Pink, a distinct salmon pink cultivar, is not early enough for the prairies. Asters grow in ordinary garden soil, and need no special attention except an occasional watering when the soil gets dry. The Michaelmas daisy group (*A. novi-belgii* and *A. novae-angliae*) requires biennial transplanting; the others can remain undisturbed for up to 5 years.

Astilbe (astilbe or perennial spiraea). The astilbes have finely divided leaves, and feathery plumes of white, red, or pink flowers on stems about 60 cm high. They do not like the usually dry summer soil of prairie gardens. The roots may be hardy, but unless the soil is kept moist and is well enriched with humus the plants soon become unthrifty. They tolerate sunny locations but prefer partly shaded sites. The most dependable cultivars are Moerheim, Magnifica, and Ceres. Moerheim has white flowers and the others are shades of pink. The plants need plenty of water around their roots and frequent

spraying of the tops with water in periods of drought; otherwise spider mites may become a serious problem.

Baptisia (wild indigo). If soil pH is high and lupines will not grow, the blue wild indigo (*B. australis*) may be substituted. The leaves and flower spikes are similar to those of lupines, but the color is restricted to deep blue. The flowers open in July on 120-cm stems; the black, ornamental seed pods soon follow.

Bergenia (bergenia or giant rockfoil). Formerly called *Megasea*, a section of the saxifrage family, bergenias are distinctive border plants. The leaves are large and handsome, turning a reddish bronze in the fall. The dense spikes of bloom on 30-cm stems are produced early in May and often get nipped by late spring frost. Of the species tested at Morden, the heart-leaved bergenia (*B. cordifolia*), which has broad, roundish leaves and rosy purple flower trusses, is one of the best. The strap-leaved bergenia or winter-begonia (*B. ciliata*) has narrower leaves; the blooms are similar. The bergenias require well-drained soil, either in sun or partial shade, and a cover of twiggy branches or flax straw to protect the crowns from winter injury by holding the snow.

Boltonia (boltonia or false starwort). These tall, asterlike perennials are not fully hardy in prairie gardens. At Morden they have usually died after one or two winters. The white boltonia (*B. asteroides*) and the violet boltonia (*B. asteroides* var. *latisquama*) have occasionally bloomed well in September with graceful, 150-cm stems of white and pale blue daisies.

Brunnera (brunnera). Once known as the forget-me-not-flowered anchusa, Siberian-bugloss (*B. macrophylla*) is not a reliable plant at Morden. The leaves are broad, dark green, and dense, and the panicles of blue flowers are not unlike forget-me-nots. The best chance of winter survival is in well-drained soil, facing east, with deep snow cover.

Campanula (bellflower). The bellflowers are a large group of herbaceous plants; many are first-class perennials, a few are rampant weeds. All need well-drained soil and most do best in full sun. They range in height from 30 cm for the Carpathian bellflower (*C. carpatica*) to almost 90 cm for the peach-leaved bellflower (*C. persicifolia*). The Carpathian species, with white, pale mauve, or deep violet blue flowers, makes a useful edging plant. It flowers from early summer until September on fine, wiry stems. The peach-leaved bellflower needs rich, moist soil and seems to do best when shaded from midday sun. There are white, pale blue, and deep purple varieties. The clustered bellflower (*C. glomerata*) and its various botanical varieties are among the hardiest and best. The Dahurian clustered bellflower (*C. glomerata* var. *dahurica*) has 60-cm stems topped with a dense cluster of purple flowers in July. The lowcluster bellflower (*C. glomerata* var. *acaulis*) is a

dwarf about 15 cm high with flowers of much the same color as the Dahurian. Harebells (*C. rotundifolia*) are native over a wide area of North America as well as Europe and Siberia. They grow about 30 cm high, bloom from June throughout the summer, and seem to tolerate alkaline soil. The spotted bellflower (*C. punctata*) is rather coarse and has large, hairy leaves, and 60-cm stems of lilac mauve flowers.

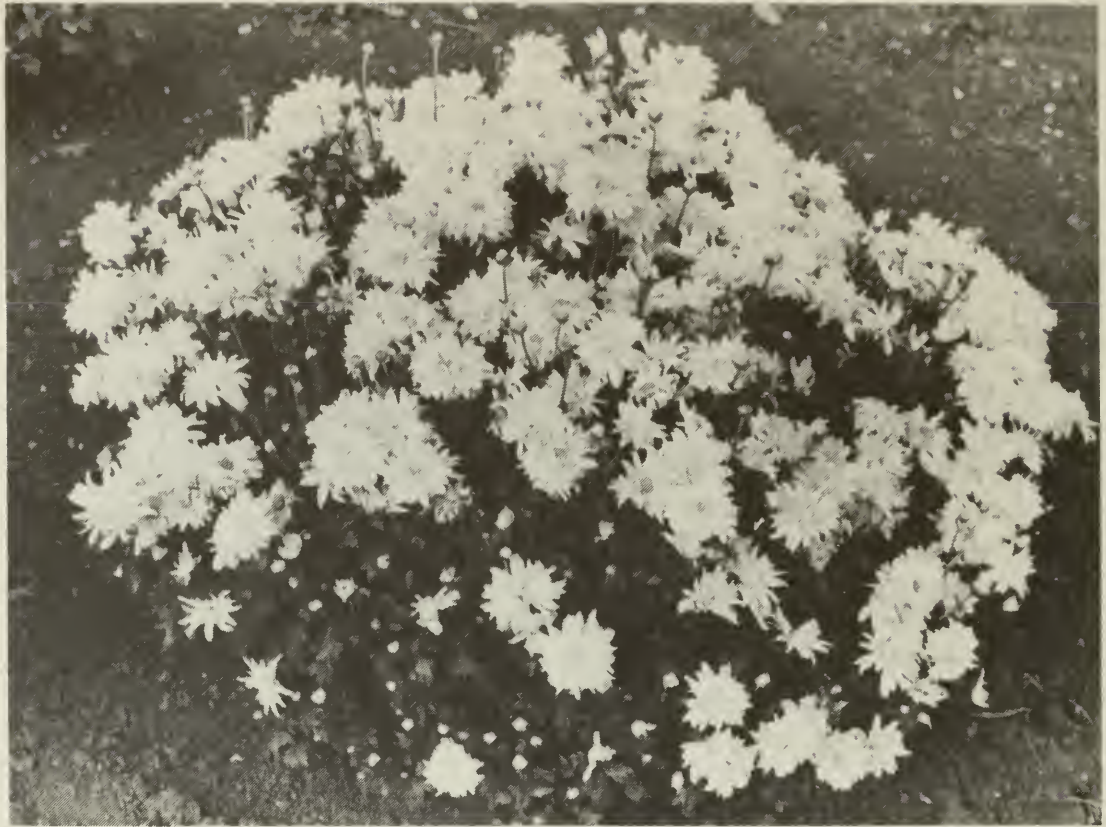
Canterbury bells (*C. medium*) are short-lived plants. When raised from seed sown in June, they flower in July of the following year. The seedlings should be transplanted into frames, and covered in October with a thin layer of dry leaves, flax straw, or evergreen boughs. These biennial bellflowers are useful for filling gaps in the border when winter damage is severe. The colors include delicate pinks and blues, as well as pure white and deep purple. The cup-and-saucer cultivars of *C. medium* are preferred to the singles.

Centaurea (knapweed). The globe knapweed (*C. macrocephala*) is a coarse, 120-cm plant that has large heads of yellow, thistlelike flowers in July. The mountain bluet (*C. montana*) is sometimes called the perennial cornflower. The flowers are similar to the annual cornflower, or bachelor's-button. Both the globe knapweed and mountain bluet grow in ordinary soil, in either full sun or partial shade.

Cephalaria (cephalaria). The giant scabious (*C. gigantea*) is a 180-cm-high spreading plant that bears pale yellow, scabiouslike flowers in July and August. The flowers have long, wiry stems and last well in water. The plant is a useful background for a wide perennial border, but it has no proper place in small gardens.

Cerastium (mouse-ear chickweed). The snow-in-summer (*C. tomentosum*) is a common gray-leaved, creeping plant used as an edging for borders, as a ground cover, and sometimes as a rock-garden plant. The flowers are white; the leaves become silvery as summer progresses. Severe pruning after the flowers fade will keep a check on its rampant spread. It survives in poor soil, but needs full sun to flower profusely.

Chrysanthemum (chrysanthemum). The group of chrysanthemums includes a number of interesting and useful perennials besides those known as the hardy mums. The pyrethrum (*C. coccineum*) has large daisies, either single or double, in shades of pink to deepest red as well as pure white. The flowers, borne on slender stems in June, last for a long time in water. Named cultivars, mostly of English origin, are available from some nurserymen; otherwise, select seedlings can be used. The ox-eye daisy (*C. leucanthemum*), condemned as a weed in Manitoba, is a useful border plant with white, yellow-centered daisies in June and July. A double cultivar called Sedgewick is not so robust as the species. The daisy chrysanthemum (*C. maximum*), often erroneously called the Shasta daisy, is not fully hardy except where early and



Canary, one of the best chrysanthemum cultivars for the prairies. It has profuse double yellow flowers and healthy foliage.

deep snow covers the plants. The cultivars Esther Read and Wirral Supreme, both choice doubles, have not survived more than one winter at Morden.

The Mediterranean chrysanthemum (*C. corymbosum*) makes a bushy, 60-cm plant with dark green leaves and composite heads of white daisies. Old plants tend to weaken and die, but new ones from voluntary seedlings soon take their place. The giant daisy (*C. serotinum*) flowers on 150-cm stems in October. The leaves are deeply lobed, dark green, and attractive; the daisies are of medium size with white petals and greenish yellow disks. The giant daisy makes a good background plant for the border or odd corner where plants that are more demanding of soil, moisture, and nutrients fail to thrive.

Cultivars of hardy garden mums, most of which have been developed by plant breeders in Western Canada, are useful perennials. They flower at a time when annuals are dead and perennials, except asters and one or two others, have finished flowering. They need regular dividing or they soon die. Over a hundred cultivars have been tested at Morden besides the named ones that have originated from the Morden chrysanthemum breeding program. The best cultivars for the prairie region include the following: Morden Canary, 50 cm tall, double, yellow; Morden Eldorado, 40 cm, double, yellow; Morden Gaiety, 50 cm, double, orange bronze; Morden Candy, 50 cm, double, pink; Morden Delight, 60 cm, double, bronze red; Morden Garnet, 50 cm, double, red; Morden Cameo, 60 cm, double, white; Morden Everest, 40 cm, double, white; Susan Brandon, 60 cm, semidouble, lavender; and Morden Fiesta, 40 cm, double, purple.

Cimicifuga (bugbane). These tall, upright plants need rich, moist soil. The leaves are deeply lobed, dark bronzy green, and handsome all through the growing season. The flowers are creamy racemes, borne on slender stems, carried well above the leaves. The cordate bugbane (*C. racemosa* var. *cordifolia*) is 90–120 cm high and flowers in July and August. Black snakeroot, or black cohosh (*C. racemosa*), is taller, sometimes over 180 cm, with 60-cm flower spikes.

Clematis (clematis or virgin's-bower). Besides the better-known woody plants, there are several herbaceous clematises that make excellent border plants. The narrow-leaved species (*C. angustifolia*) makes a bushy plant about 60 cm high and bears panicles of sweet-scented white flowers; the solitary clematis (*C. integrifolia*) has blue, nodding bells on 90-cm plants. Both are sprawling unless staked with twiggy branches. Prairie soils generally suit these herbaceous clematises if good drainage and a sunny spot are provided.

Convallaria (lily-of-the-valley). The well-known lily-of-the-valley (*C. majalis*) makes an excellent ground cover, either in shade or half sun. The delicate white bells are esteemed for their sweet scent in May and June. In the spring, clean off the top growth and spread a light topdressing of enriched soil over the crowns. Divide overgrown plants in August or early September and replant them in rich soil.

Corydalis (corydalis or fumitory). The Siberian corydalis (*C. nobilis*) is an interesting early-flowering perennial with fernlike leaves and dense heads of yellow, brown-tipped flowers in May. It should be planted adjacent to a spreading plant, such as clematis, so that its unsightly dying foliage can be hidden from view. The Siberian corydalis, which starts to grow early in spring, is prone to frost injury unless growth is retarded with a mulch of flax straw.

Delphinium (perennial larkspur). The tall perennial larkspurs are the ones seen most often in perennial borders. The dwarf butterfly delphinium (*D. grandiflorum*) has finely cut leaves and elegant sprays of blue or white flowers. The plants are compact, about 60 cm high, and need well-drained soil in full sun. The tall larkspurs, which are excellent for grouping toward the back of the border, need deep, rich soil, plenty of water as the flowers open, and support for the fragile stems. Named cultivars are not used to any extent in prairie gardens; most are raised from seed of Pacific Giant hybrids or some other notable strain. Seed may be sown indoors in February; the seedlings are transplanted to boxes like annuals, and then to the open ground in June. The following spring the young plants may be moved to a permanent place in the border. Select plants can be increased by dividing the old plants in the spring. Softwood cuttings, taken when the shoots are about 10 cm high, also provide a means of propagation. A new pink larkspur called Pink Sensation survived several winters at Morden. It grows to 90 cm with fine leaves and soft pink flowers in July, and sometimes it flowers again later.

Dianthus (pink or carnation). The pinks and carnations are a large family of plants useful for the perennial border and rock garden. Some are almost prostrate, others are 60 cm high. The sweet William (*D. barbatus*), though not long-lived and generally treated as a biennial, is a useful stop-gap in the perennial border. Seed sown in June will provide plants for next year's bloom. The maiden pink (*D. deltoides*) makes mats of dark green, covered with bright rose flowers in June and July. After the plants flower, cut off the flower stems to make the green mats more attractive. The clusterhead pink (*D. carthusianorum*) has dense heads of crimson flowers on 60-cm stems. The leaves are dark green and rather sparsely produced. Unless the plants are high and dry in the spring, and the soil not too rich but with plenty of grit, there is danger of winter-killing.

The Shadow Valley carnation (*D. caryophyllus*), of unknown origin, is a hardy, red-flowered border plant that seems to do much better in some parts of the prairies than others. At Morden the plants have been repeatedly attacked by a fungus disease. Healthy plants flower in July and continue until fall, retaining their leaves though the winter if covered with snow. Grass pinks (*D. plumarius*), in white and shades of pink, do well in sunny borders where the soil is gritty. Some have double flowers, some are single; all need snow cover to protect the tops from the searing winter winds. A number of hybrid pinks, including the well-known Mrs. Sinkins, have been tested at Morden; none are fully hardy, though the Allwood pink (*D. allwoodii*) survived several winters.

Dicentra (bleedingheart). The common bleedingheart (*D. spectabilis*) is an early-flowering, hardy plant with graceful stems of pendent, heart-shaped flowers. The roots penetrate the soil deeply, and the bushy plant has a spread of 90–120 cm and is 90 cm high when established. The tendency to precocious growth increases the danger of frost damage. Plants on the south side of buildings will suffer most unless growth is retarded by mulching with straw in October. Besides the common bleedingheart, there are the plume or wild bleedingheart (*D. eximia*) and the Western bleedingheart (*D. formosa*). These bloom in June and are about 30 cm high, but are not as showy as *D. spectabilis*.

Dictamnus (gasplant). A hardy, 90-cm, rugged, long-lived perennial that has dark green compound leaves, richly pungent when handled. The flowers are airy panicles of pink or white in June that give off a volatile gas. The seed pods are bronzy green and ornamental. Gasplants do best when left undisturbed for long periods; some 20-year-old specimens are healthy and vigorous.

Digitalis (foxglove). The common foxglove (*D. purpurea*), not fully hardy in prairie gardens, is treated as a biennial. There are improved forms and new colors, but these stand little chance of winter survival. The perennial yellow foxglove (*D. grandiflora*) is hardier. It grows to 60 cm and bears yellow, brown-spotted flowers.

Dracocephalum (dragonhead). Dragonheads have pungent gray green leaves and spikes of purplish blue flowers from July to September. They do well in light, sandy soil, in full sun, spreading fairly rapidly by underground shoots. One species (*D. rupestre*) grows 30 cm high with 5-cm blue flowers in July.

Echinacea (purple-coneflower). Purple-coneflower (*E. purpurea*) is not fully hardy at Morden, but occasionally a plant survives the winter. It bears crimson purple flowers in August. The leaves are rather coarse, dark bronzy green, and the stems are about 120 cm high. The native narrow-leaved coneflower (*E. angustifolia*) is not often cultivated; it thrives in sunny locations and seems tolerant of alkaline soil.

Echinops (globe-thistle). The blue gray thistlelike heads of the small globe-thistle (*E. ritro*) are attractive in the perennial border as well as being useful as dried material. It makes an upright, 90-cm plant densely clothed with spiny leaves. Plants thrive in sun or partial shade and are very easy to grow.

Erigeron (fleabane). A number of fleabanes have been tried at Morden but few are reliably hardy. The most satisfactory ones are the Oregon fleabane (*E. speciosus*) and its cultivars, Merstham Glory and Quakeress. The Oregon fleabane has small, lavender blue daisies on 60-cm stems. Merstham Glory has large flowers with mauve petals and golden stamens. Quakeress is similar but has pink daisies. The flowers open in July and last for almost a month.

Eryngium (eryngo or sea-holly). The sea-holly is a sturdy, deep-rooted, drought-resistant plant, and has roundish heads of steel blue flowers in July. The blue-top sea-holly (*E. alpinum*) is 90 cm high, the amethyst sea-holly (*E. amethystinum*) about half that height. The dried flower heads make attractive winter bouquets.

Erysimum (wallflower). The western wallflower, formerly called *Cheiranthus allioni*, is now officially *E. asperum*. It is not long lived, generally dying out after blooming. Plants are easy to raise from seed sown in the summer to bloom the following year. The plants are 30 cm high, bushy, and covered from June until September with bright orange, sweet-scented flowers.

Filipendula (meadowsweet). A group of plants widely different in stature, leaf shape, and flower color, some known formerly as spireas and ulmarias, and by the common names dropwort (*F. vulgaris*) and queen-of-the-prairie (*F. rubra*). The meadowsweets prefer a deep, moist soil, but are fairly tolerant of drought. The broad-leaved species often get infested with spider mites. The dropwort has large rosettes of dark green, finely cut leaves that remain attractive all summer. The slender 50-cm flower stems rise from the center

of the rosettes to bear panicles of creamy white flowers in July. The Japanese meadowsweet (*F. purpurea*) has broad leaves and 90-cm stems of pink plumes. The queen-of-the-prairie is taller, the flowers are an attractive shade of pink. The European meadowsweet (*F. ulmaria*), sometimes called queen-of-the-meadow, is a tall plant with broad leaves and rather dense panicles of creamy flowers. There are both double and single varieties. The meadowsweets are not particular in their soil requirements; ordinary garden soil, heavy or light, seems to suit them. The pink-flowered varieties, however, seem to prefer partial shade to full sunlight.

Gaillardia (blanketflower). Blanketflower (*G. × grandiflora*), growing to 50 cm, blooms throughout the summer, and requires little attention except to have the spent blooms removed. The flowers are attractive shades of yellow and red with maroon centers. They prefer a hot, dry location in full sun where the soil is sandy. Heavy soil, excess moisture, and shade causes the plants to rot at the crown, but in light soil and full sun blanketflowers remain vigorous for several years. New plants are easily raised from seed, or named cultivars can be purchased from nurserymen. The Portola hybrids are yellow and red; Burgundy is deep reddish maroon; Goblin is a dwarf, compact cultivar.

Gentiana (gentian). Gentians are usually considered rock-garden plants quite difficult to grow, but some are suitable for the border and require no special care. The Andrews gentian, or bottle gentian (*G. andrewsii*), also called the closed gentian, has handsome, dark leaves and violet blue flowers in July. It needs moist soil and partial shade. The crested gentian (*G. septemfida*) is less than 30 cm high, spreading along the ground and bearing clusters of clear blue flowers.

Geranium (crane's-bill). The true geraniums are hardy, herbaceous plants. They are easy to grow, surviving in nooks and crannies where the soil is thin and moisture scarce. They have deeply lobed leaves, dark green in summer, orange red in fall. The flowers are mostly shades of violet red, lilac pink, or mauve, opening in June and continuing for a month or more.

The lilac crane's-bill (*G. himalayense*) is a 30-cm bushy plant with lavender mauve flowers. The Caucasian crane's-bill (*G. ibericum*) is taller; the flowers are violet.

Geum (avens). The cloverroot (*G. urbanum*) is fully hardy in prairie gardens, whereas the better known cultivars *G. Mrs. Bradshaw* and *G. Lady Stratheden* are not. The cloverroot is only 30 cm high; it produces orange-colored flowers in May and June.

Gypsophila (baby's-breath). The baby's-breaths include a number of interesting plants for the perennial border from 30-cm specimens to the common baby's-breath that grows 80 cm high.

The prairie soils, being well charged with lime, suit the plants well. In some areas the baby's-breath (*G. paniculata*) has escaped from cultivation. The double-flowered baby's-breath (*G. paniculata* Flore Pleno) can be grown from seed, but only a portion of the seedlings will be double. Bristol Fairy, an improved cultivar of *G. paniculata*, is sterile; plants are increased by grafting and by cuttings. Rosea, a cultivar of creeping gypsophila (*G. repens*), commonly called rosyveil baby's-breath, is pink flowered, 15 cm high, and fully hardy; it blooms in July and August. The cultivar of creeping gypsophila Bodgeri has double pale pink flowers in July. *Gypsophila pacifica* is a spreading plant with graceful panicles of carmine pink flowers. All the baby's-breaths require well-drained soil and full sun. The roots of *G. paniculata* and its cultivars are thick and penetrate the soil deeply so that old plants cannot be successfully divided and replanted. New plants should be raised from seed or cuttings.

Helenium (sneezeweed). These late-blooming plants are not fully hardy in prairie gardens unless under a deep blanket of snow. Several named cultivars of the common sneezeweed (*H. autumnale*) have been tested at Morden. A few of the best are Chipperfield Orange; Peregrinum, with bronze flowers; Riverton Beauty, a good yellow; and Rubrum with red flowers. All are 120 cm high and need deep, moist soil.

Helianthus (sunflower). Perennial sunflowers are mostly tall, spreading plants useful for the back of the border. The willow-leaved sunflower (*H. salicifolius*) grows 150 cm high; the stems are densely clothed with pendent leaves. The small yellow flowers open in late September and, if the weather is mild, continue for a month. The plant is not fully hardy unless under a deep snow cover. Miss Mellish, a cultivar of *H. rigidus*, has coarse leaves, rampant roots, and large golden yellow flowers in September. The plants are fully hardy but need restraining to keep them from crowding out less vigorous plants.

Heliopsis (orange-sunflower or heliopsis). The rough heliopsis (*H. helianthoides* subsp. *scabra*) has coarse leaves and yellow flowers on 90-cm stems in July and August. Several improved cultivars are available. One of the best is Incomparabilis, 120 cm high and bearing bright yellow flowers in July.

Hemerocallis (day-lily). The old-fashioned species of day-lilies have yellow, orange, or tawny flowers; new hybrid cultivars are pink, apricot, or reddish brown, some with attractive throat markings. The new ones are not as robust as the old species nor are they quite as hardy. Day-lilies require no special soil, they thrive in full sun or partial shade, and have no problems with insects or diseases. The leaves are strap-shaped, bright green; the flowers are clustered on tall stems set well above the foliage. The individual flowers are rather fleeting, lasting only a few days; the buds, however, continue to open over a long period. Moreover, some bloom early, some late, and by growing a collection of different cultivars and species you can have bloom from June

until September. A few of the best selected from a test of 50 cultivars and species grown at Morden are Gaiety, Gracilis, and Ajax, yellows; Wondergold, Linda, and Apricot, orange apricot shades; and Black Prince, Minnie, and Burma, dark maroon shades.

Hesperis matronalis (dame's-rocket). An old-fashioned, 90-cm, biennial border plant that has mauve or white, sweet-scented flowers in early June. The dame's-rocket, or sweetrocket, seeds freely, the seedlings producing plants for the next year's bloom. It is partial to shade but grows well in full sun.

Heuchera (alumroot or coralbells). The coralbells have rosettes of dark green, scalloped leaves and wiry stems of elegant flowers in shades of pink or dark red. The cultivars of *H. sanguinea* have not proved hardy at Morden, but a new race of hybrids developed at the research stations at Brandon and Morden are fully hardy and are attractive perennials. Brandon Pink, Brandon Glow, and Northern Fire are about 50 cm high and have dense foliage and elegant sprays of deep pink or red flowers in June and July.

Hosta (plantain-lily). The plantain-lilies prefer shade and moist soil, but seem to adapt to full sun and drier soil remarkably well. The leaves are handsome, blue green or edged with yellow. Over a dozen species and cultivars have been tested at Morden, but not all have survived. The most reliable are the blue plantain-lily (*H. ventricosa*), which has blue green leaves and slender 30-cm stems of soft blue flowers in July, and Fortune's plantain-lily (*H. fortunei*), which has dense, bluish leaves and lilac mauve flowers.

Iberis (candytuft). This is a 30-cm evergreen plant used in rock gardens and toward the front of perennial borders. It needs well-drained soil, full sun, and some protection from drying winter winds. The flowers are dense clusters of white, opening in early June; the leaves are narrow, dark green, and attractive all through the season. Two cultivars of the edging candytuft (*I. sempervirens*), Snowflake and Purity, have thrived at Morden in full sun or in partial shade.

Incarvillea (trumpetflower). The Chinese trumpetflower (*I. delavayi*) has occasionally survived under a deep snow cover, but is not recommended for prairie gardens. The plants are 60 cm high, the compound leaves are dark green, and the flowers are trumpet-shaped, rosy purple, and produced in July. The Olga trumpetflower (*I. olgae*) is taller and hardier, but not so showy; the flower stems are 90 cm high and bear pink blooms in July.

Iris (iris). The irises form a large group of herbaceous and bulbous plants, many being fully hardy in prairie gardens. Some need full sun and well-

drained soil; the bearded irises and the dwarf, or Crimean, irises are in this group. A number of species are handsome plants with ornamental seed pods and foliage with season-long interest. The named cultivars of *I. sibirica* hybrids are among the best border plants. The colors range from pure white through shades of blue to deepest purple. These so-called beardless irises need no special soil, but thrive best in a deep loam with plenty of humus to hold moisture. Some of the best Siberian hybrids are Blue Oriole, Butterfly, and Blue King, in the blues; Mantane, White Dove, and Snow Crest, in white; Caesar, Perry's Blue, and True Blue, in the deep violet blue colors; and Pembina, purple and white.

The bearded irises or flags are a complex group of hybrids involving a number of species. The new introductions are not fully hardy in prairie gardens. The flamingo pinks, for example, have not survived more than 2 years at Morden. Since bearded irises were first grown at Morden, over 400 cultivars have been tested, some proving to be much hardier than others. The novice grower is well advised to plant those cultivars listed in local catalogs. The iris fancier may go farther afield in search of novelties.

The various species are widely different in stature and season of bloom; some flower in May, others in June and July. The first to bloom is the western blue flag (*I. missouriensis*), opening its small, lavender mauve flowers in May. The yellow flag (*I. pseudacorus*) does remarkably well in dry soil, although in its native home it thrives in moist places. The stems are 90 cm high, the heavy leaves are bright green, and the flowers open in June. The butterfly iris (*I. spuria*) is about 30 cm high with yellow and lilac blooms in June.

Japanese irises (*I. kaempferi*) are not hardy in prairie gardens. Attempts to grow them at Morden, near a pool, where soil moisture was adequate, failed. But the Manchurian iris (*I. mandschurica*) has survived and flowered well in deep, moist soil.

Lathyrus (vetchling or perennial pea). The perennial pea (*L. latifolius*) climbs to about 180 cm, bearing clusters of rosy purple flowers in July and August. The white variety is not as vigorous as the colored, otherwise it is similar. The perennial or everlasting peas need well-drained soil. The roots may be shaded, but the tops should be in full sun to bloom profusely.

Liatris (blazingstar or gayfeather). The blazingstars include a few native plants found in sunny uplands where the soil is usually dry and lean. The blazingstar (*L. scariosa*) develops 90-cm spikes of purple flowers that spring from rosettes of narrow leaves. The spike gayfeather (*L. spicata*) is only half as tall. The flowers are dense spikes of rosy purple in July. The blazingstars have the peculiarity of opening their flowers from the tip of the spike, the bottom flowers opening last.

Lilium (lily). Lilies are among the choicest hardy plants; many cultivars and colors are now available. Canadian plant breeders have developed scores of new cultivars in the past 20 years, including a number of excellent yellows,



Lilium leucanthum var. *centifolium*, one of the hardy species of this popular flower.

dark reds, and unique shades of pink and apricot. Most hardy lilies do well in prairie gardens as long as they are planted in well-drained soil.

In the perennial border, groups of up to a dozen bulbs should be planted rather than one or two. A collection of lilies shows up better and is easier to look after if given a separate border sheltered from hot sun, as some species such as *L. henryi* tend to bleach if exposed to bright sunshine. Some of the species can be easily raised from seed; the Korean lily (*L. amabile*), the star lily (*L. concolor*), the nodding lily (*L. cernuum*), and the coral lily (*L. pumilum*) are examples. Named cultivars are grown from bulbs usually planted in September or early October. A group of lilies of borderline hardiness (*L. × aurelianense*) will flower satisfactorily from dormant bulbs set out in May after being stored over winter in a root cellar. Golden Clarion, Green Dragon, and a number of others are in this group. By mounding a few centimetres of granulated peat and 30–60 cm of flax straw over the plants in October it is possible to bring the bulbs safely through the winter and have them in bloom again in July. Some hardy lilies start into new growth before danger of spring frost has passed; cover these early-starting ones in October with a layer of flax straw to retard spring growth. Japanese turk's-cap lily or Hanson's lily (*L. hansonii*) and the Martagon hybrids are in this group, and also the early-flowering Caucasian lily (*L. monadelphum*).

The following lilies are selected from many cultivars and species tested at Morden: Lemon Queen, White Princess, Edith Cecilia, Bright Cloud, Muriel Conde, Burnished Rose, Brocade, Nubian, Dunkirk, Connecticut King, Orange Light, Golden Princess, Katinka, and the species *L. amabile*,

L. martagon, and *L. henryi*. For further details on culture of lilies, read Agriculture Canada's publication 996, *Flowering bulbs for Canadian gardens*.

Limonium (sea-lavender). The common sea-lavender (*L. latifolium*) has dark green leathery leaves and deep-penetrating roots. The flowers are billowy sprays of lavender blue on 60-cm stems in July and August and may be used for making winter bouquets. The plants are attractive all through the season and once established they can be left undisturbed for 10 years or longer. They are easily raised from seed, but named cultivars must be increased by division or by root cuttings.

Linaria (toadflax). The common toadflax, or butter-and-eggs (*L. vulgaris*), has become naturalized in some parts. It is sometimes cultivated though condemned as a noxious weed. The Macedonian toadflax (*L. genistifolia* subsp. *dalmatica*) is a spreading 60-cm plant with narrow gray green leaves and spikes of yellow flowers in July resembling miniature snapdragons. It revels in hot, sandy soil and makes a good border plant in spite of its rampant habit.

Lupinus (lupine). The perennial hybrid lupines have been developed from the Washington lupine (*L. polyphyllus*) and the tree lupine (*L. arboreus*). The Russell strain is the most popular, embracing a wide range of bright colors. Where the soil is neutral or slightly acid, the plants thrive for several years, but where the soil is high in lime the plants soon sicken and die. Lupines do not transplant readily; the best chance of success is with year-old seedlings set out in the spring. Raising lupines from seed is outlined in the section headed "Propagating." The flowers are dense spikes opening in June; the leaves on healthy plants are dark green and they remain in good condition until late in the fall.

Lythrum (lythrum or loosestrife). Lythrum has gained popularity in recent years due in large measure to the introduction of Morden Pink, which arose as a bud sport of the wand lythrum (*L. virgatum*). In their natural state, lythrums are found in low-lying spots; when cultivated, however, they seem tolerant of dry soil, either in full sun or partial shade. They grow to about 90 cm in height. The plants are best set out in the spring as fall planting is sometimes risky. Some of the best cultivars are Morden Pink, Morden Gleam, Morden Rose, Dropmore Purple, and Mr. Robert. For more information, see Agriculture Canada's publication 1285, *Lythrums for home gardens*.

Macleaya (plume-poppy). The plume-poppy, formerly known as *Bocconia*, is a tall rank-growing plant and has broad scalloped leaves of gray green. The flower stems are 180–210 cm high, the flowers a creamy pink, followed by tawny seed pods. The plume-poppy does best in deep, moist soil. Because the new shoots start early and are tender, they must be protected from frost.

Mertensia (bluebells). Virginia bluebells (*M. virginica*), one of the earliest perennials, open their nodding blue bells in May. By the middle of the summer the foliage has died, leaving a gap in the border unless the plants are near a spreading, later-blooming plant. Bluebells do best in moist soil and partial shade.

Monarda (wild bergamot). Cambridge Scarlet, a cultivar of beebalm (*M. didyma*), has been tried without success at Morden. In milder parts it is a common border plant esteemed for its heads of scarlet flowers and sweet-scented leaves. The wild bergamot (*M. fistulosa*) is scattered over a wide area of the prairies in upland meadows. A white form called Minnedosa, found by Dr. Henry Marshall of the Research Station at Brandon, makes a good plant for the perennial border; the species plants are usually shades of mauve. Dr. Marshall has also introduced hybrid beebalms named Neepawa, Souris, and Wawanesa. They are 60 cm high with scented leaves and pink to purple flowers. Croftway Pink and Sunset are two more hybrid beebalms. Sunset is rose pink, Croftway Pink is paler, and both have survived for many years at Morden. The beebalms need well-drained soil, full sun, and good air circulation. Plants in half shade near buildings where the air is stagnant are liable to be infected with mildew.

Muscari (grape-hyacinth). The common grape-hyacinth is a tiny bulbous plant 15 cm high with stems of closely clustered bells of deep blue. A white form is available though less attractive. The plants bloom in May and early June; the bulbs are planted in September or early October in light soil and full sun. The flower spikes should be cut off before seeds form to exhaust the plants. The top growth, though unsightly, must be allowed to dry off naturally or the bulbs deteriorate.

Nepeta (nepeta or cat-mint). The Ukraine nepeta (*N. ucranica*) is a bushy, 30-cm plant with gray green leaves and purple flowers in July. A hybrid between *A. ucranica* and *N. mussinii* called Dropmore is a superior plant 50 cm high that bears a profusion of light purple flowers from July until September.

Oenothera (sundrops or evening-primrose). Several species have been tested at Morden, but none has proved as hardy or as satisfactory as the Ozark sundrops (*O. missouriensis*). The common sundrops (*O. tetragona* var. *youngii*) have survived under deep snow cover. The white evening-primrose (*O. speciosa*) is slightly hardier but is not reliable. Ozark sundrops have large, glossy leaves, cup-shaped, pale yellow flowers on slender stems, and interesting winged seed pods. The plants are leafy, about 50 cm high, and in bloom from July until late autumn. They prefer a sunny spot where the soil is not too rich or too heavy. They tolerate some shade though they bloom less freely.

Paeonia (peony). Peonies are the hardiest, showiest, and longest-lived perennials in prairie gardens. The leaves are dark green, deeply lobed, and handsome all through the season, some coloring well in the fall. They need no special care once the plants are established in good soil, but you should cut off the spent blooms, apply fertilizer early in the spring, and give plenty of water in periods of drought. They prefer open, sunny positions; plants in the shade of trees or buildings soon weaken. Each plant needs not less than 0.8 m² of border space and those with weak stems need support. More than 300 cultivars have been tested at Morden. A dozen of the best are listed and described below:

Festiva Maxima	White with prominent crimson flecks on some of the center petals; blooms are early, large, and fragrant, but stems are rather weak.
Enchanteresse	White with lemon tints and occasional crimson edging on the outer petals; blooms are large, well formed, and faintly scented.
Alesia	White; large, well-formed blooms of creamy white without blemish.
Sarah Bernhardt	Deep rose pink, suffused silvery pink, late, fragrant; produces a high percentage of good-quality blooms.
Livingstone	Old rose pink with crimson marking, late, fragrant.
Edulis Superba	Bright pink with lighter guard petals; very early and reliable, sweet-scented, and good for cutting.



Peonies make an impressive show, and are the hardiest perennials available for prairie gardens. Some of the most popular cultivars originated 50 to 100 years ago.

Katherine Havemeyer	Rose pink, outer petals paler, mild rose fragrance.
Mons. Jules Elie	Light rose pink, early, fragrant; blooms large, shapely, and freely produced.
Tourangelle	Creamy white, suffused flesh pink; blooms large, fragrant, and late.
Karl Rosenfield	Bright crimson, tinged magenta; blooms regularly with well-shaped, fully double blooms.
Felix Crousse	Brilliant crimson, large, early-flowering; one of the best reds for cutting.
Mary Brand	Clear crimson, large, early blooms, fragrant, and reliable.

Papaver (poppy). The oriental and Iceland poppies (*P. orientale* and *P. nudicaule*) are fairly common in prairie gardens. The oriental poppy has deep roots and is more permanent than the Iceland poppy. The flowers are mostly scarlet, on 60-cm stems, opening in June and soon shedding their petals. The plants become unattractive as the flower stems and lower leaves die. To overcome this unsightliness, plant poppies near later-flowering, spreading plants such as medium-tall perennial asters. Some oriental poppies are white and some are old rose or deep maroon.

The Iceland poppy is a dainty plant and has slender 50-cm stems bearing elegant poppies in many unusual shades. It does best in northern areas where cool nights simulate the growing conditions found in its natural home. The oriental poppies are best transplanted in August; seedling plants of the Iceland poppy may be set out in spring, or seed may be sown where the plants are required to bloom.

Paradisea (St. Bruno's-lily). The St. Bruno's-lily (*P. liliastrum*) is often included with *Anthericum*, a genus containing a similar plant, the St. Bernard's-lily (*A. liliago*). The St. Bruno's-lily has narrow leaves and open racemes of white flowers on 50-cm stems. It thrives in ordinary soil in either sun or shade.

Penstemon (penstemon or beardtongue). This group of plants has been much improved recently by prairie plant breeders. The plants do best in warm, sunny locations where the soil is well-drained. Many of them are native to North America.

The blue penstemon, or smooth beardtongue (*P. glaber*), is an attractive border plant that has blue green leaves and dense spikes of tubular flowers in shades of blue or pink. The plants are about 50 cm high; the flowers start to bloom in July and continue until September. The shell-leaved penstemon (*P. grandiflorus*) has blue gray leaves and large, soft blue flowers on 90-cm stems. It thrives in rather lean soil, in full sun, and sets enormous quantities of seed unless the flower stems are removed.

The Torrey penstemon (*P. barbatus* subsp. *torreyi*) has narrow green leaves and scarlet flowers in July and August. Two hybrid penstemons from

the Horticultural Field Station in Nebraska, called Prairie Dawn and Prairie Dusk, are excellent border plants. Prairie Dawn has scarlet flowers; Prairie Dusk is smoky purple. Both are fully hardy if grown in full sun and well-drained soil. Mr. A. Scharf of Saskatoon, Sask., introduced the hardy cultivars Debut, which has purple flowers, and Westlander, a pink-flowered penstemon.

Phlox (phlox). The summer phloxes (*P. paniculata*), the most showy of all the phloxes, are not fully hardy in prairie gardens. Of the 30-odd cultivars tested at Morden, only a few lasted more than 1 or 2 years. The most reliable are Bridesmaid, white with a pink eye; Carillon, carmine pink; and Viking, deep purple. The summer phloxes require a deep cover of snow in winter.

The moss phlox (*P. subulata*) is a green mat covered with flowers in May. The moss phloxes are good edging plants for the perennial border, are ideal for the rock garden, and may be used effectively as ground covers. There has been some hybridization with other species, for example, the lilac phlox, resulting in the well-known Wilsonii, an excellent lavender cultivar.

The arctic phlox (*P. borealis*) and Hood's phlox (*P. hoodii*) are similar to moss phlox; the arctic phlox has bright rose pink flowers and green mats that remain a lively green all through the season, whereas the moss phlox turns a bronzy green in the fall. Some of the best in the whole group of low phloxes are the cultivars Fairy, Wilsonii, and Rosea, and the species *P. borealis* and *P. hoodii*.

Another group similar to the summer phloxes but much hardier and flowering a month earlier are called the Carolina phloxes (*P. carolina*). The well-known Ada Blackjack, Moosejaw, and White Pyramid are in this group. These cultivars are fully hardy in prairie gardens and do best in deep, moist soil that drains well in the spring. A few less well known phloxes, *P. × procumbens* and the blue phlox (*P. divaricata*), grow about 30 cm high, flowering in May and early June. They are not vigorous and soon deteriorate when crowded by more vigorous plants.

Physalis (ground-cherry or Chinese lantern). The bladder-cherry (*P. alkekengi*) is grown chiefly for its ornamental seed pods. The small white flowers are buried among the coarse leaves. The plants increase by underground stolons, but are not too rampant. When the seed pods color in September, the stems bearing the pods are stripped of leaves and dried for use as winter bouquets.

Physostegia (lion's-heart). The lion's-heart, sometimes known as false dragon's-head or obedientplant (*P. virginiana*), is a valuable late-blooming perennial. The plants are 60 cm high with dark green leaves and dense spikes of tubular flowers, either pink or white. A cultivar called Vivid is superior and has reddish flowers, but at Morden it is not fully hardy. In 1975, Dr. H. Marshall of the Morden Research Station introduced a hardy pink-flowered cultivar named Morden Beauty.

Platycodon (balloonflower). The balloonflower (*P. grandiflorus*) is related to the bellflowers (*Campanula*) and needs the same general care. The plants grow to 60 cm in height. The flower buds swell up before opening, hence the common name. Most are blue, although a white variety and one with pinkish petals may be obtained. Because the plants are late in starting, there is danger of hoeing them off as they emerge. Mark the location of the balloonflowers when the previous year's tops are cut off. The soil for balloonflowers needs no special preparation, but a sunny location where the soil is well-drained is best.

Polemonium (polemonium or Jacob's-ladder). The polemoniums are hardy border plants and have attractive pinnate leaves and usually blue flowers. The Greek-valerian or Jacob's-ladder (*P. caeruleum*), is 60 cm high with dense, compound leaves and pale blue flowers in June and July. The skunk-leaf polemonium (*P. pulcherrimum*) grows only 30 cm high but is otherwise similar to *P. caeruleum*. The polemoniums need no special care but prefer moist soil and partial shade.

Polygonatum (Solomon's-seal). The Eurasian Solomon's-seal (*P. multiflorum*) is an excellent plant for the perennial border, tolerating shade or full sun and having no special soil requirements. The 60-cm stems are well clothed with dark green leaves; the flowers are pendent white bells edged with green. Solomon's-seal will grow in odd shady corners, where it provides an attractive patch of greenery as well as some useful stems for cutting.

Polygonum (knotweed). The knotweeds include a number of useful plants, mostly herbaceous, though some are rampant climbers. The dwarf Japanese knotweed (*P. cuspidatum* var. *compactum*) is 60 cm high with roundish leaves and pinkish flowers in August. The tops are tender both in the spring and in the fall. The roots are fully hardy and spread rapidly to make a good ground cover.

Primula (primrose). The primroses do best in moist, cool soil; the hardiest species is the auricula primrose (*P. auricula*), sometimes called the dusty miller because of its farinose leaves; it grows about 30 cm high and produces flowers in shades of red and yellow. The Cortusa primrose (*P. cortusoides*) makes a compact plant and has dark green leaves and pink flowers in May. The Siberian primrose (*P. sibirica*), a dwarf, 15-cm plant, has lilac pink blooms in May.

Pulmonaria (lungwort). The lungworts are old-fashioned plants once thought by apothecaries to be of value in treating lung diseases. Some have hand-some leaves heavily blotched with silver. The lungwort (*P. angustifolia*) has dark green leaves, and blue flowers in June. The Bethlehem-sage (*P. saccharata*) is 30 cm high with spotted silver leaves and violet blue flowers.

Ranunculus (buttercup). The tall buttercup (*R. acris* Flore Pleno) grows about 60 cm high, has deeply lobed leaves, and produces small, double, yellow buttercups all through the summer and early fall. The plants thrive in ordinary soil, in either sun or partial shade.

Rudbeckia (coneflower). The coneflowers include a number of herbaceous plants; some are fully hardy and long lasting, but others seem to die after a year or two. One of the most common is the golden-glow (*R. laciniata* Hortensia), a 150-cm spreading plant with attractive double yellow flowers in August and September. The black-eyed Susan (*R. hirta*) is popular as an annual plant. It survives the winter in well-drained soil that is not too rich in nutrients. The flowers are 10 cm or more across in shades of yellow and brownish red. The showy coneflower (*R. fulgida* var. *speciosa*), the sweet coneflower (*R. subtomentosa*), and the orange coneflower (*R. fulgida*) have survived several winters at Morden in a test plot but died in an adjacent perennial border.

Salvia (sage). The salvias do best in full sun where the soil is rich and well-drained. The meadow clary (*S. pratensis*) is the most reliable in prairie gardens, where it sets seed freely so that volunteer plants are produced in abundance. The leaves are dark green and coarse; the flowers on 60-cm stems are either blue or white, opening in June.

Sanguinaria (bloodroot). A choice dwarf, early-flowering native plant with bluish green scalloped leaves and cup-shaped pure white flowers in May. A double-flowered variety is available but is not as attractive as the type plant. The bloodroot does best in soil with plenty of humus and where it is shaded for most of the day.

Saponaria (soapwort). The rock soapwort (*S. ocymoides*) is more useful in the rock garden than in the perennial border; the plants are about 15 cm high and they have pink flowers in June. The double form of the bouncing Bet (*S. officinalis*) is 60 cm high and has light pink flowers that darken with age. The plant has two bad faults; it spreads rapidly and chokes less vigorous plants, and it has a tendency to revert to the single form after a year or two in the border.

Scabiosa (scabious). Several hardy scabioues are useful border plants, the best known being the Caucasian scabious or bluebonnets (*S. caucasica*). They do best in well-drained soil that is reasonably moist and fertile. The Caucasian scabious has dark green, deeply cut leaves and tall, 60-cm stems of graceful flowers in July, August, and September. The colors range from cream and pale lavender to deepest purple; the named cultivars do not come true from seed, but may be increased by dividing the old plant in the spring. The seedlings take 2 years to bloom. Fischer's scabious (*S. fischeri*) has smaller

flowers and finer leaves. The flowers are purple and open in July. The dove scabious (*S. columbaria*) and its rose-flowered cultivar *Rosea* have gray green leaves and roundish mauve or rosy flowers from July until September.

Scilla (squill). The Siberian squill (*S. siberica*) is one of the first plants to bloom, often opening its blue bells while the last of the snow lingers in shady nooks. The tiny bulbs should be planted in colonies where they can remain without disturbance. They spread by bulb increase and seedlings, and form a blue carpet. The squills do best in the shadow of medium-sized shrubs but where there is sunlight for part of the day. See Agriculture Canada's publication 996, *Flowering bulbs for Canadian gardens*.

Sedum (stonecrop). A great number of stonecrops are available but not all are fully hardy in prairie gardens. Most of them are more suitable for the rock garden than the perennial border and all must have full sun and well-drained soil. One of the most common is the orange stonecrop (*S. kamtschaticum*); it makes mats of light green leaves and masses of yellow flowers on 15-cm stems in July. A variegated-leaved cultivar named *Variegatum* exists. Ewers' stonecrop (*S. ewersii*) has bluish leaves and heads of pink flowers. The evergreen stonecrop (*S. hybridum*) has glossy leaves and yellow flowers; the October plant (*S. sieboldii*) is about 30 cm high and has blue gray leaves and soft pink flowers in July. The showy stonecrop (*S. spectabile*) has upright stems 30 cm high and flat heads of pink, white, or red flowers in August and September. The leaves are light glaucous green or variegated as in the cultivar *Variegatum*. The two-row stonecrop (*S. spurium*) is a creeping plant less than 15 cm high with roundish leaves and pink or red flowers in July.

The flower stems of all the creeping stonecrops should be cut off as the flowers fade; the green mats will continue to be attractive until the snow comes.

Solidago (goldenrod). A cultivar of the Canada goldenrod (*S. canadensis*) called *Golden Wings* makes a 150-cm plant that bears graceful heads of yellow flowers. The Missouri goldenrod (*S. missouriensis*) is about 90 cm high with deep yellow flowers; both species flower in September. The goldenrods have no special soil requirements and tolerate some shade. Two cultivars have survived well at Morden, *Cloth of Gold* and *Mimosa*.

Tanacetum (tansy). The common tansy (*T. vulgare*) is sometimes cultivated as a border plant though it is a naturalized European weed in some parts. The plants grow to 90 cm. The fernlike, dark green leaves are handsome and aromatic, but the dense clusters of yellow flowers are not particularly attractive. It spreads rapidly by underground stolons and crowds out less vigorous plants. Tansy will grow in dry corners where other plants are unthrifty.

Thalictrum (meadow-rue). A group of plants, mostly hardy, with attractive leaves and graceful stems. The meadow-rue grows in sun or partial shade and is not particular about soil. The columbine meadow-rue (*T. aquilegifolium*) has leaves that resemble the columbine and fluffy heads of mauve flowers in June; a purple variant of the same plant has dark foliage and violet purple flowers. Both plants grow to 90–120 cm.

The low meadow-rue and the maidenhair meadow-rue (*T. minus* complex) are about 30 cm high and have rounded leaves resembling the foliage of the maidenhair fern; the flowers are yellow. The Yunnan meadow-rue (*T. dipterocarpum*) is not hardy in prairie gardens. At Morden it has died out, even under deep snow cover. The Yunnan meadow-rue is 120 cm high, the tiny leaves are medium green, and the flowers are elegant sprays of lavender and pale yellow.

Thermopsis (false lupine). The Carolina-lupine (*T. caroliniana*) makes a 120-cm plant with spikes of yellow flowers resembling lupines. It is fully hardy at Morden, making a good perennial for the back of the border and requiring no special care.

Thymus (thyme). The thymes are prostrate plants suitable for rock gardens or the edge of perennial borders in full sun. The soil must be well-drained, and not too heavily charged with nitrogen. Thymes may have purple, white, pink, or reddish flowers. All have tiny leaves and spread to make mats, green or green gray throughout the whole season except when covered with blooms. Some have lemon-scented leaves, some have leaves that smell of caraway, and others have the pungency commonly associated with the plant. The woolly thyme (*T. pseudolanuginosus*) has pink flowers and hairy gray green leaves.

Trollius (globeflower). A number of globeflowers tested at Morden are not fully hardy. The most reliable is *T. chinensis*. The leaves are sharply toothed and dark green; the flower stems are about 60 cm high with double yellow flowers like buttercups. The European globeflower (*T. europaeus*) has survived for several years when under deep snow cover. The plants do best in moist soil and partial shade.

Tulipa (tulip). The tulips are a large group of hardy bulbs; some plants are very tiny, less than 30 cm high, others have large blooms on stems more than 60 cm high. The bulbs are planted in September and early October in well-drained sandy soil. In heavy clay soil the bulbs will be short-lived. The soil should be modified by adding plenty of granulated peat and coarse sand.

The species tulips are the earliest to flower, starting in early May. The Kolpak tulip (*T. kolpakowskiana*) has small, yellow or red flowers on slender stems. The tarda tulip (*T. tarda*) has starry, creamy yellow, flattish flowers in early May on slender 7.5-cm stems.

The early-flowering tulips are used as potted bulbs to some extent and sometimes they are grouped in the perennial border. The taller and later Darwin, cottage, and other types are more attractive, longer lasting, and better suited for outdoors. These later-blooming tulips are available in all shades of red, pink, and yellow as well as white; some have petals striped or picotee edged.



Darwin tulips, among the earliest blooming perennials, are available in a wide range of colors, heights, and sizes of bloom.



Tulipa tarda, a short, early-flowering tulip, is suitable for rocky shaded spots.

Tulips must have light, well-drained soil to reproduce flowering-sized bulbs. In clay soils the bulbs deteriorate rapidly. If annual flowers are to be planted after the tulips bloom, you can lift the bulbs when the flowers fade, keeping the tops intact. Replant the bulbs in a half-shaded spot where the tops will gradually brown off. Sort the ripened bulbs into sizes; replant the larger ones in the border in September, and the smaller ones in the vegetable garden to grow into flowering-sized bulbs.

Veronica (speedwell). The herbaceous speedwells are a large group of plants ranging from creeping mats to tall border plants 90–120 cm high. The creeping speedwell (*V. repens*) and the comb speedwell (*V. pectinata*) are suitable rock plants. The woolly speedwell (*V. incana*) grows 30 cm high, and has silver gray leaves in neat clusters, and spikes of violet blue flowers. *V. incana* Rosea has pink flowers but the plants are not as vigorous as the type. The woolly speedwell is useful for rock gardens as well as for the front of the border and it does best in lean soil and full sun. The taller speedwells, the spiked speedwell (*V. spicata*) and the bastard speedwell (*V. spuria*), are both excellent border plants. The spiked speedwell has blue, pink, or white flowers on 90-cm stems; the bastard speedwell is about 60 cm high and has slender spikes of deep blue flowers. The clump speedwell (*V. longifolia* var. *subsessilis*), is not fully hardy at Morden. The plants are 90 cm high and have dark green leaves and large spikes of dark blue flowers. The speedwells are easy

to grow in sun or partial shade. The plants are increased by division as seedlings give a variety of plant types and flower colors.

Vinca (periwinkle). The common periwinkle (*V. minor*) is not hardy in prairie gardens, but the herbaceous periwinkle (*V. herbacea*) has made a good ground cover at Morden. The leaves tend to brown when exposed to drying winter wind; twiggy branches placed on the plants in October will hold the snow. The herbaceous periwinkle has dark green, glossy leaves on trailing stems, and simple, violet blue flowers in July. It grows in light or heavy soil, preferably in partial shade.

Viola (violet). The violets, or perennial pansies, include a number of showy border plants as well as some more suitable for the rock garden. The bedding violas, hybrids and varieties of the horned violet (*V. cornuta*), are sometimes grown as annuals as they are not fully hardy in prairie gardens. The Altai violet (*V. altaica*) is 16–23 cm high with roundish leaves and yellow flowers in June and through the summer. The Greek violet (*V. gracilis*) has dainty flowers, either yellow or violet blue on slender stems. The Canada violet (*V. canadensis*) is sometimes cultivated; the plants are 30 cm high, compact, and have broad leaves and white, yellow-centered flowers in June. The violas do best in moist soil and all except the bedding types prefer partial shade. *V. × wittrockiana*, the garden pansy, is usually grown as an annual. Plants survive the winter under snow but are short-lived.

Yucca (yucca). The soapweed (*Y. glauca*), native of the Badlands areas of the Great Plains, is sometimes cultivated. The plants are perennial but not herbaceous; the leaves are sword-shaped and remain green all winter. The plants must have full sun and well-drained soil; in moist soil they soon rot off. The handsome spikes of creamy white flowers open in July; seed is not usually formed without the aid of a certain species of moth. Another species, the Adam's-needle (*Y. filamentosa*), has been tested and found to be tender at Morden.

Insects and diseases

In general, hardy perennials are not seriously troubled by pests or diseases. Certain plants, however, are attractive to certain insects and some plants are more susceptible to disease than others. Some of the common diseases found on herbaceous perennial plants are mildew, leaf spot, gray mold, soft rot, and viruses.

Because recommendations for pest control change rapidly, ask your agricultural adviser about the need for control and the control measures to use.

Diseases

Mildew is found on a number of plants, especially larkspurs, pansies, asters, and chrysanthemums. It appears as a grayish white growth on the leaves, young stems, and flower buds. Unless it is promptly checked, the plant becomes seriously debilitated. Because the fungus lives over winter on dead leaves and twigs, good sanitation is needed to prevent or limit the disease. Ensuring good air circulation by correctly spacing and regularly dividing plants is another important cultural method used to limit mildew.

At the first sign of active spores, spray the plants with a recommended fungicide. Dusting with sulfur is also effective.

Leaf spot, the most common disease of the bearded irises, makes its first appearance soon after the flowers fade. When the weather is warm and humid the disease spreads rapidly, the tiny spots enlarging to cover the whole leaf surface. Unless the disease is checked in its early stages, the plants become weak and winter survival is uncertain.

Soft rot of bearded irises is more prevalent in areas where humidity is high than it is in prairie gardens. The rot is caused by a bacterial organism that enters a healthy plant through wounds. The first symptom is browning of the tips of the leaves. An examination of the fleshy roots will reveal a foul mass of decay. By planting iris rhizomes shallowly in well-drained soil and by keeping the plants free from old foliage, there is little danger of serious damage from soft rot. It is best to burn infected plants and then sterilize the soil.

Botrytis sp. causes a common disease of peonies (gray mold, blight), which blackens the flower buds and sometimes destroys whole stems. The disease is carried over winter in resting spores, which are found on the leaves and stems of infected plants. Where the disease is a regular problem, cut off the tops of peonies in the fall and burn them. Spray the new growth with a fungicide, starting when the shoots are 30 cm high and continuing at 10-day intervals until the flower buds show color.

Insects

The most common insects in the garden are aphids, which feed on a wide range of plants and sometimes build up large populations. Most aphids, along with thrips and tarnished plant bugs, can be controlled with insecticides. In long periods of drought and heat, spider mites are likely to gain a foothold on garden phlox and some other plants.

Ants may be a problem in the perennial border when they make their homes in the soil where the plants are growing. Search out the anthills and apply a recommended insecticide. They are often seen on peonies, where they are in search of the sweet substance exuded by the opening buds. However, they do no harm. They are not responsible for the blackening of the buds, which is caused by *Botrytis* sp.

The columbine borer does extensive damage in some areas. The larvae bore into the main stems of all species of columbines and kill the plants. Once the borer is in the stems there is no remedy; you must pull up the plant and burn it. Good control can be had by spraying.

Sample plan of a perennial border

Plan of herbaceous border, 16 m long and 3 m wide. Arrange plants in back row singly; in center row in groups of three; and in front row in groups of five. The arrangement is in units of 1 m².

21	25	11	27	3	9	12	44	18	26	43	4	29	48	47	39
36	8	40	31	16	34	15	32	20	13	7	46	10	33	17	38
41	5	22	35	1	2	28	23	45	24	14	19	30	37	42	6

Key

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|------------------------------------|--|
| 1 <i>Achillea</i> Cerise Queen | 25 <i>Heliopsis helianthoides</i> subsp. <i>scabra</i> |
| 2 <i>Achillea</i> Boule de Neige | 26 <i>Hemerocallis</i> |
| 3 <i>Aconitum napellus</i> | 27 <i>Hemerocallis</i> (yellow) |
| 4 <i>Aconitum</i> × <i>bicolor</i> | 28 <i>Iris</i> (bearded) |
| 5 <i>Adonis vernalis</i> | 29 <i>Lythrum</i> Morden Pink |
| 6 <i>Ajuga reptans</i> | 30 <i>Oenothera missouriensis</i> |
| 7 <i>Anthemis tinctoria</i> | 31 <i>Paeonia</i> (white) |
| 8 <i>Aquilegia</i> (long-spurred) | 32 <i>Paeonia</i> (pink) |
| 9 <i>Aruncus dioicus</i> | 33 <i>Paeonia</i> (red) |
| 10 <i>Aster amellus</i> | 34 <i>Papaver orientale</i> |
| 11 <i>Aster novi-belgii</i> | 35 <i>Penstemon glaber</i> |
| 12 <i>Aster novae-angliae</i> | 36 <i>Phlox carolina</i> |
| 13 <i>Bergenia cordifolia</i> | 37 <i>Platycodon grandiflorus</i> |
| 14 <i>Campanula glomerata</i> | 38 <i>Polemonium caeruleum</i> |
| 15 <i>Campanula persicifolia</i> | 39 <i>Polygonatum multiflorum</i> |
| 16 <i>Chrysanthemum</i> (hybrids) | 40 <i>Scabiosa caucasica</i> |
| 17 <i>Chrysanthemum coccineum</i> | 41 <i>Sedum kamtschaticum</i> |
| 18 <i>Chrysanthemum serotinum</i> | 42 <i>Thalictrum minus</i> |
| 19 <i>Dianthus deltoides</i> | 43 <i>Veronica spicata</i> |
| 20 <i>Dicentra spectabilis</i> | 44 <i>Rudbeckia laciniata</i> Hortensia |
| 21 <i>Filipendula rubra</i> | 45 <i>Iris</i> (Oriental hybrids) |
| 22 <i>Gaillardia</i> (hybrids) | 46 <i>Lilium</i> (hardy species and cultivars) |
| 23 <i>Geranium himalayense</i> | 47 <i>Lupinus</i> (hybrids) |
| 24 <i>Gypsophila</i> | 48 <i>Delphinium</i> spp. |

Basic perennials

<i>Achillea</i>	<i>Dianthus</i>	<i>Paeonia</i>
<i>Aquilegia</i>	<i>Dicentra</i>	<i>Papaver</i>
<i>Aruncus</i>	<i>Gaillardia</i>	<i>Penstemon</i>
<i>Aster</i>	<i>Heliopsis</i>	<i>Phlox</i>
<i>Campanula</i>	<i>Hemerocallis</i>	<i>Rudbeckia</i>
<i>Chrysanthemum</i>	<i>Iris</i>	<i>Veronica</i>
<i>Delphinium</i>	<i>Lythrum</i>	

Plants for shady positions

<i>Aconitum</i>	<i>Dicentra</i>	<i>Mertensia</i>
<i>Aquilegia</i>	<i>Geranium</i>	<i>Thalictrum</i>
<i>Cimicifuga</i>	<i>Hemerocallis</i>	<i>Vinca</i>
<i>Convallaria</i>	<i>Hosta</i>	<i>Viola</i>

Plants for dry situations

<i>Achillea ptarmica</i>	<i>Chrysanthemum</i>	<i>Iris</i> (bearded)
<i>Anthemis tinctoria</i>	<i>leucanthemum</i>	<i>Phlox</i> (dwarf)
<i>Baptisia australis</i>	<i>Dianthus deltoides</i>	<i>Sedum</i>
<i>Campanula carpatica</i>	<i>Gaillardia</i> × <i>grandiflora</i>	<i>Thymus</i>
<i>Cerastium tomentosum</i>	<i>Gypsophila paniculata</i>	

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CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm ²)	x 0.15	square inch
square metre (m ²)	x 1.2	square yard
square kilometre (km ²)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm ³)	x 0.06	cubic inch
cubic metre (m ³)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre





