MINNESOTA HARDY

Showcasing New and Enduring Plants for Your Landscape

UNIVERSITY OF MINNESOTA
Driven to Discover℠

'HomeFree' viburnum, available 2015

Pink Popcorn™ blueberries, available 2015

'LaCrescent' grape at vineyard near Lake Pepin

What's New?

The increasingly popular, and environmentally wise desire for locally grown, fresh, and delicious food would resonate with the first plant breeders at the University of Minnesota. The drive for better plants in a challenging climate started soon after the Agricultural Experiment Station was created in 1887 with the quest for a hardy apple. Favorite trees from "back East" often suffered severe winter injury or failed to ripen before a killing autumn frost. Crossing them with wild Minnesota apples eventually led to the enduring favorites, 'Haralson' and 'Beacon.'

The SnowSweet® apple featured on the cover continues the legacy. It has proven to be even more resistant to apple scab fungal disease than predicted when it was released in 2006. Trees are now readily available, and it grows easily in zone 4, producing large, bronze-red blush fruit. It is a savory, sweet-tasting apple that is amazingly slow to turn brown when cut.

Good testing takes time. The University's famous apples are sometimes in development for 30 years. But when a new cultivar, such as the new 'Frontenac blanc' grape or the hardy pink blueberry Pink Popcorn™ is released, nurseries are assured that the plants have been thoroughly tested for cold hardiness.

Time and temperature are the key factors in breeding and testing plants for cold climates. Sometimes, it's just not cold enough in Minnesota, even "up north" near Grand Rapids. To accurately test plants, researchers put cuttings into the deep freeze. In a process and technology pioneered by the U of M in the 1960s, special freezers are programmed to shift down to specific temperatures for predetermined time periods.

Then the cuttings are planted in a warm greenhouse, and through that process scientists can see how quickly and completely the plants shut down for winter and whether they survive.

A Legacy of Discovery

University plant breeding encompasses apples, berries, grapes, ornamental trees and shrubs, flowers, and grasses. Breeding goals now go far beyond hardiness, and can include evaluating disease resistance, color, taste, growth habit, uses, and other differentiating features. The new 'HomeFree' viburnum was specifically selected for resistance to powdery mildew.

New and ongoing collaborations inspire and enhance plant development. Scientists collect germplasm from far-flung locales: native blueberries in the Adirondacks, wild grapes from Manitoba, wild apples from Kazakhstan, and kiwifruit from northern China.

The University began one of the earliest college horticulture programs in the United States and is nationally prominent today. More than 400 proven hardy varieties provide a foundation for Minnesota's more than $2 billion horticultural industry, spanning the borders from Roseau grass seed growers south to Lanesboro vineyards.

Throughout this book, a selective timeline highlights notable U of M plant breeding achievements.

1887: Minnesota Agricultural Experiment Station created as part of national land-grant university network

1888: U of M hires first horticulturist, Samuel Green, to improve tree fruits

1901: Vegetable breeding efforts begin

1908: St. Paul Fruit Breeding Farm established on 80 acres near Victoria

Hardy pear tree trials bear fruit at the University's Horticultural Research Center.

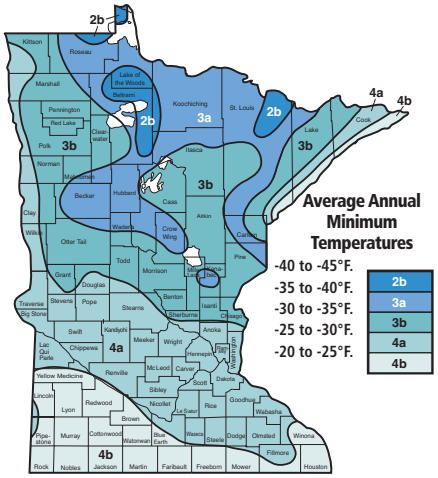
There is a large field for the plant breeder.... We need hardier cherries and better keeping varieties of plums for the market, we need long keeping varieties of apples and many other fruits. How are we going to get these? Only through the patient and hardworking plant breeder.

—CHARLES HARALSON, THE MINNESOTA HORTICULTURIST, NOVEMBER 1908

The University does not generally sell plant material directly to the public, but provides it to licensed propagators who then distribute it to growers, retailers, and landscapers. No one nursery carries all of the U of M introductions, but potted or bare root plants are sold at thousands of commercial nurseries and garden centers. "Minnesota Hardy" is meant to help you make informed choices, whether you want to create your own edible or ornamental landscape, or commercially plant and be a high quality, environmentally responsible, local resource.

The Minnesota climate presents unique challenges to gardeners, farmers, and nurseries. Temperature fluctuations rival those of any state in the nation, from hot, sometimes dry summers to extremely cold winters that sometimes leave the land bare of insulating snow. For more than a century, University of Minnesota researchers have worked to develop, grow, and evaluate the best plants for conditions ranging from USDA Plant Hardiness Zone 4B in the south to Zone 2B in certain locations in the north. The University maintains Research and Outreach Centers where breeders and field assistants conduct numerous field trials. Most plant trials are replicated at Grand Rapids, Morris, Rosemount, St. Paul, and the Horticultural Research Center or the Minnesota Landscape Arboretum near Chanhassen. Some plants are also tested nationally, in cooperation with other institutions or private companies.

USDA Plant Hardiness Zones



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On the cover: 'SnowSweet'® Apple Tree, released 2006

1909: University Extension Service begins

1926: First flower breeding efforts result in hardier roses and chrysanthemums

1954: Woody landscape breeding projects begin

1967: Fruit Breeding Farm is renamed "Horticultural Research Center" to reflect the diversity of work on 230 acres

1977: First U of M plant patent, for 'Minngopher' cushion mum

'Honeycrisp'

The Edible Landscape

The University's successful breeding of high quality hardy apples and other fruit trees, berries, currants, and grapes earns more accolades every year.

SweeTango® Apple

Frostbite™ Apple

Apples

Three apples with distinctive traits—SnowSweet®, Frostbite™, and SweeTango® apples—are the most recent introductions from the University's world-renowned apple breeding program.

SnowSweet® apple trees produce savory, sweet fruit, with a slight tart balance. An added benefit is how slowly the flesh turns brown when cut and exposed to air.

The Frostbite™ apple tree fits a special niche. It is an extremely cold-hardy tree with small fruit tasting almost like sugarcane—tangy, very sweet, and juicy.

SweeTango® has quite the "family tree" as a cross between two popular apples—'Honeycrisp' (mom) and Zestar!® (dad)—yet it delivers its own unique flavor plus the satisfying "crunch" of a 'Honeycrisp.'

The development of 'Honeycrisp' is recognized as one of the top 25 innovations of the decade by the 2006 Better World Report. This report, by the Association of University Technology Managers, recognizes significant academic research and technology transfer that has made the world a better place. Since 'Honeycrisp' trees were introduced in 1991, millions have been planted and are successfully producing excellent fruit.

Zestar!® apple trees, released in 1999, produce crunchy and juicy fruit with a sweet-tart taste and a hint of brown-sugar flavor.

Roots

In the early 1900s, U of M plant breeders collected wild trees as well as cultivars from New England and other Midwest breeders. Thousands of seedlings were grown from those parent trees, and the record-breaking cold winter of 1917–18 helped sort out the winners. Some progeny of 'Malinda'—a New England apple—survived and led to the successful apples of the 1920s, including 'Haralson' and 'Beacon.' And some of the 'Malinda' genes live on in a variety released decades later: 'Honeygold.'

"Savor the Sweet!"™ SnowSweet® Apple

"Crunch into Zestar!"™

Fruit from Zestar!® Apple Tree

www.apples.umn.edu

Apples

KNOW TO GROW

Apple trees need neighboring trees to enhance pollination. Plus, you need at least two different varieties planted no farther than 500 feet from each other.

Frostbite™ Apple

'Honeygold'

Pollinated apple blossoms are protected.

EARLY-SEASON CULTIVARS	YEAR	FEATURES
Beacon	1936	Bright red apple with soft, juicy flesh and a slightly tart flavor. Tree is hardy, vigorous, and susceptible to fire blight. Ripens mid- to late August.
Centennial Crabapple	1957	Large, red-over-orange crabapple. Excellent for fresh eating and sauce, but does not store well. Tree is very hardy, even in Zone 3. Ripens mid- to late August.
State Fair	1977	Striped red, juicy, moderately tart fruit good for eating and cooking. The fruit will store for 2 to 4 weeks. Tree is susceptible to fire blight and somewhat prone to biennial bearing. Ripens mid- to late August.
SweeTango®	2009	Blush apple with deep red coloration over yellow background. This variety is the result of 'Honeycrisp' crossed with Zestar!® and is juicy and sweet, with a crisp crunchiness and an excellent sweet-tart flavor. Ripens late August-early September. SweeTango® is a registered trademark of the University of Minnesota for the Minneiska cultivar.
Zestar!®	1999	Large, crunchy, juicy red fruit with a sprightly sweet-tart flavor. Excellent for both fresh eating and cooking. The fruit will store for 6 to 8 weeks. Tree is vigorous, upright and very susceptible to apple scab. Ripens late August to early September. Zestar!® is a registered trademark of the University of Minnesota for the Minnewashta cultivar.

'Prairie Spy'

MID-SEASON CULTIVARS	YEAR	FEATURES
Chestnut Crabapple	1949	Large, russeted crabapple with a rich, nutty flavor. Best for fresh eating or sauce. The fruit stores for 4 to 5 weeks. Ripens early September.
Red Baron	1970	Medium-size red and yellow apple with juicy flesh and a mild sweet flavor. Good for fresh eating. Storage life of 4 to 5 weeks. Tree is hardy and resistant to fire blight. Ripens mid-September.
Sweet Sixteen	1977	Crisp and juicy with an exotic yellow flesh and a very sweet, unusual sugarcane or cherry candy flavor. The fruit stores for 5 to 8 weeks. Tree is very vigorous. Fruit may be subject to premature drops. Ripens mid- to late September.
Honeycrisp	1991	Large, dappled red fruit with a well-balanced flavor, outstanding crispness and juiciness. Best for fresh eating and salads as the flesh is slow to brown. Tree has low to medium vigor and excellent scab resistance. Fruit will easily store 7 or more months, a benefit for small commercial growers. With millions of trees planted, 'Honeycrisp' is easily the most popular University of Minnesota introduction to date. Ripens late September.

1922: 'Haralson' apple released

1936: 'Beacon' apple released

1977: 'Sweet Sixteen' released

1991: 'Honeycrisp' released

1999: Zestar!® released

'State Fair'

'Regent'

LATE SEASON CULTIVARS	YEAR	FEATURES
Honeygold	1970	Golden to yellow-green fruit that is sweet, crisp, and juicy. Excellent for fresh eating and also good for cooking. The fruit will store for 2 to 3 months. Tree is easy to manage but susceptible to fire blight. Ripens late September.
Haralson	1922	Firm texture with a complex tart flavor. Good for fresh eating and cooking. Especially good pie apple. The fruit will store for 4 to 5 months. Tree is of low vigor and easily trained. Tends to be biennial bearing. Fruit may be prone to watercore and russeting. Ripens late September to early October.
Frostbite™	2008	Intensely flavored, sweet, firm, and juicy flesh. Striped maroon-red and gold-yellow, 2 1/2" diameter fruit. Fruit may be prone to russetting and cracking at the stem end. Very cold-hardy and excellent for cider. Ripens late September to mid-October.
Regent	1964	Appealing red-striped apple with well-balanced flavor that's good for eating and cooking. The fruit will store for 4 to 5 months. Tree is moderately vigorous and easily trained. Susceptible to apple scab and of moderate hardiness. Ripens early to mid-October.
SnowSweet®	2006	Savory, sweet-tasting apple, with a slight tart balance and rich overtones. Amazingly slow to turn brown when cut. Appealing, large, bronze-red blush fruit. Excellent for fresh eating, snack trays, and salads. Ripens mid-October. SnowSweet® is a registered trademark of the University of Minnesota for the Wildung cultivar.
Fireside/ Connell Red	1943	Very large fruit with sweet flavor and fine-grained flesh. Good for fresh eating, salads, and baked apples. Tree is vigorous and weeping. Ripens mid-October.
Keepsake	1978	Very hard and crisp with yellow flesh and an exotic sweet, spicy flavor. Good for fresh eating and cooking. The fruit will store for 6 months. Tree is of medium vigor and easy to manage. Ripens mid-October.
Prairie Spy	1940	Large, firm, dense fruit that is excellent for baking and long-term storage. Tree is very vigorous and productive. Ripens late October.

Finding that 'Honeycrisp' crunch

- 'Honeycrisp' apples with exceptional quality are produced in a climate with cool nights and moderate daytime temperatures leading up to the harvest season.
- Minnesota and surrounding regions of the Upper Midwest are squarely in the "'Honeycrisp' Comfort Zone," and produce some of the best quality 'Honeycrisp' in North America.
- A high quality 'Honeycrisp' apple with exceptional taste and crunch can be large or small, but should have bright red stripes or blush over a yellowish-green background color when harvested.

2006: 'Honeycrisp' voted official Minnesota State Fruit

2006: SnowSweet® apple released

2008: Frostbite™ apple released

2009: SweeTango® apple released

www.apples.umn.edu

Currants

'Ben Como'

Two blackcurrants, named 'Ben Como' and 'Ben Chaska,' were bred in Scotland and have been tested in Minnesota since 1999. They are resistant to white pine blister rust, and are productive, upright plants with excellent fruit quality for processing into juice or jelly. The names are a fusion of Scotland and Minnesota —a continuation of the renowned "Ben" series of blackcurrants from the Scottish breeding program (Ben is the word for mountain) combined with two notable Minnesota place names.

'Red Lake'

'Red Lake' has been popular in Europe and across the United States. Introduced in 1933, it is highly productive. Plants have large clusters of red, medium-size fruits, excellent for use in jellies, salads, and desserts.

Apricots

Apricots, cherries, and plums grow rapidly and often produce fruit in the first or second year—a joy for home orchards and a benefit to fruit breeders evaluating fruit for flavor, texture, and timing. University fruit breeders continue to investigate wild germplasm in breeding fruit plants that better resist cold-temperature injury. The fruit breeding program also evaluates varieties from other breeding programs around the world—apples, apricots, and pears from China; cherries and currants from Europe—looking for any fruit that may be adaptable to our region.

'Sungold'

Apricots are fine, ornamental small trees with an early spring bloom and bright orange-yellow fall color. Because two varieties of apricots are needed for cross-pollination, U of M 'Sungold' and 'Moongold' cultivars make a good planting combination. The fruit is fair for fresh eating and good for preserves and sauces.

'Summercrisp'

APRICOT CULTIVAR	YEAR	RIPENS	FEATURES
Moongold	1960	Late July	Golden yellow. Very hardy. Blooms the third week of April. 1 3/4" fruit hangs on tree until ripe. Self-unfruitful. Freestone.
Sungold	1960	Early August	Yellow with red blush. Very hardy, 1 1/4" fruit with clear flesh. Fruit hangs on the tree until ripe. Mild flavor. Upright growth habit. Blooms third week of April. Requires another apricot for cross-pollination. Freestone.

PEAR CULTIVAR	YEAR	RIPENS	FEATURES
Golden Spice	1949	Early Sept	A small, very hardy pear. The 1 3/4" fruits are a medium yellow, lightly blushed with dull red. Flesh is tart, spicy and ready for harvest in midseason. Good for canning and spicing. Fair for eating.
Parker	1934	Mid-August	Medium to large, roundish, yellow-bronze fruit. Popular for fine-grained, tender, juicy flesh. Fruit must be picked before it ripens. Upright, vigorous growing tree used as pollinator for 'Luscious.' Tree susceptible to fire blight.
Summercrisp	1985	Mid-August	Sweet flavored, crisp fruit. 2 1/2–3" in diameter and 3–4" long. Blooms early May. Fruit harvested when crisp, green with a red blush, and may be stored up to two months. Hardiest pear at University of Minnesota.

1923: 'La Crescent' plum released

1933: 'Red Lake' currant released

1985: 'Summercrisp' pear released

Pears

'Summercrisp'

'Summercrisp' pear is hardy in most of Minnesota. To improve productivity, plant another type of pear to serve as a pollinator. Researchers are testing seven selections from which several new cultivars may be introduced in the next decade.

Cherries

'Meteor'

'Meteor' tart cherry is hardy in central and southern Minnesota. Cherries bloom earlier than apples, so the flowers have a greater chance of being killed by a late spring frost. Protecting the fruit from birds is almost essential as they like them as well as people do!

TART CHERRY CULTIVAR	YEAR	RIPENS	FEATURES
Meteor	1952	Mid-July	Semidwarf (10-14'). Hardy, vigorous, pie cherry tree with large bright red fruit. No cross-pollination needed.
North Star	1950	Early July	Dwarf tree (7-10'). Pie cherry. No cross-pollination needed. Very productive. Bright red deepening to mahogany skin. Yellow, juicy, tender flesh. Tree resistant to leaf spot and brown rot.

PLUM CULTIVAR	YEAR	RIPENS	FEATURES
Alderman	1986	Late August	Fruit is burgundy red with golden yellow, sweet, juicy flesh. Eat fresh or use for preserves. Tree is valued as an ornamental and fruits consistently. Clingstone.
La Crescent	1923	Early August	High-quality yellow plum. Fruit is small to medium, sometimes with a light blush skin. Flesh is sweet, juicy. Freestone. Somewhat suggestive of apricots. Vigorous grower but often a shy bearer.
Pipestone	1942	Late August	Large, attractive red fruits for drier areas. Sweet, juicy yellow fruit. Excellent quality for jam, jellies, and fresh use. Very hardy. Tree is productive. Clingstone.
Superior	1933	Mid-August	Hybrid with large fruit with dark red, russet-dotted skin. Flesh is yellow, juicy, and sweet. Heavy bearing tree may lack hardiness in north. Often sets fruit the first year. Clingstone.
Underwood	1920	Late July	Medium-large, red fruit with golden yellow flesh. Juicy and sweet flavor. High quality for fresh use and jam. Clingstone. Hardy, vigorous grower with horizontal spread.

'Superior'

Plums

'Alderman'

'Alderman' plums are large, with golden flesh and burgundy skin. Horizontal branches make it an attractive small tree in the landscape. Plant 'Superior,' 'Toka,' or 'Compass' as pollinators for best fruit set.

Choices, choices

The selections that perform well in regional trials are the plants that will become future cultivars. Stock plants of these new cultivars are provided to commercial nurseries, who spend the next few years propagating the large quantities of plants needed for retail sales.

Cultivars developed by University of Minnesota plant breeders are released through the Minnesota Nursery Research Corporation or through the University of Minnesota's Office for Technology Commercialization.

In either case, royalties collected from cultivar releases play a vital part in providing financial support for future research.

KNOW TO GROW

Hybrid plums are not self-fruitful; therefore, at least two varieties must be planted. Tart cherries are self-fruitful, so a single-variety orchard could be planted.

Berries

Strawberries

Planting several different varieties of strawberries in the field offers growers extended ripening times, and curtails the spread of diseases. University fruit breeders continue research for more cold-hardy, productive plants.

It is not a fast process. Strawberries undergo years of scrutiny and propagation tests before being released. After a year in the greenhouse, the most disease-resistant seedlings are tested at the nation's coldest agricultural research center, the North Central Research and Outreach Center at Grand Rapids, and at the Horticultural Research Center near the Twin Cities. In the second summer, the fruit is evaluated: some may be small, tasteless, or too acid or tannic tasting. The best berries are notable for their creamy, juicy texture and flavor. Plants that don't survive the winter or show signs of disease or mold are eliminated. Only a small percentage is good enough to save, and the best plants are set out in rows and monitored for two more years.

In the final stage, test plots are added at the West Central Research and Outreach Center at Morris. The harvests are evaluated—berries are measured and the yield is weighed—for two more years. If the variety is a winner, it is sent to nurseries where it will be propagated for two more years. That may seem like a long process, but strawberries yield fruit in their second year, while grapes and apples keep breeders in suspense until fruit appears four or five years after planting. After years of trials, the new cultivars are proven hardy, high-quality, and disease-resistant.

CULTIVAR	YEAR	RIPENS	FEATURES
Itasca™	2006	Late June-early July	Hardy through Zone 3B. Productive plant with richly colored tart berries.
Mesabi™	1999	Mid-late June	Large, bright red glossy fruit with melting texture. Fine flavor. Winter hardy. Impressive disease resistance. Ideal for gardens with reduced pesticide use.
Winona™	1997	Late June-early July	Large fruit with excellent texture and hints of peach flavor. Hardy and disease resistant.

Itasca™

Mesabi™

KNOW TO GROW

Grow strawberries in moist, well-drained soil of good fertility. Plant several varieties to extend the season and curb the spread of disease. Apply a winter mulch of clean, weed-free straw to help protect the crowns and flower buds.

1997: Winona™ released

2006: Itasca™ released

Pink Popcorn™

'Chippewa'

Blueberries

Pink Popcorn™ (MNPink1 cultivar) is the first hardy pink blueberry introduced from the University. It has the showy white flowers and crimson fall foliage that make blueberry a landscape favorite but features blush-colored berries that have the flavor essence and crisp texture of the best of the blues.

Blueberries have been grown at research stations in Minnesota for nearly a century. In 1967, a blueberry breeding program was initiated to develop cold-hardy, low-stature ("half-high"), high quality, large-fruited cultivars.

KNOW TO GROW

Blueberry plants require acidic, well-drained soil. Most soils— where the native pH of the soil is less than 7.0— can be amended to make them suitable (4.0-5.0). Plant more than one variety for effective pollination leading to better yield and berry size.

The first varieties released from this effort, 'Northblue,' 'Northsky,' and 'Northcountry' avoid low-temperature injury by their cold-tolerant buds and a low stature that allows part of the bearing surface to be covered by protective snow. In the '90s, 'St. Cloud,' 'Chippewa,' and 'Polaris' were bred to be chest-high for easier picking. A later introduction, 'Superior,' matches them for height, and is highly productive.

Blueberry plants can be decorative, with profuse miniature white blossoms in late spring, glossy green leaves in summer and colorful maroon or orange foliage in autumn.

CULTIVAR	YEAR	FEATURES	PLANT HEIGHT	PLANT SPREAD	YIELD
Chippewa	1996	Most productive U of M variety.	30–40"	30–60"	3–8 lbs / bush
Northblue	1983	Large fruit. Tart flavor. Productive. Half-high habit.	24–36"	30–40"	3–9 lbs / bush
Northcountry	1986	Half-high habit. Wild blueberry flavor.	18–24"	24–36"	3–5 lbs / bush
Northsky	1981 or 1983	Half-high habit. Compact.	12–18"	24–30"	1–3 lbs / bush
Pink Popcorn™	2014	Pale pink blush color with aroma, taste and texture of blueberry.	30–48"	30–50"	3–5 lbs / bush
Polaris	1996	Aromatic flavor and firm texture. Early maturing.	30–40"	30–60"	3–8 lbs / bush
St. Cloud	1990	Sweet flavor. Early maturing.	30–48"	30–40"	2–7 lbs / bush
Superior	2009	Highly productive. Late-season variety.	30–48"	30–40"	3–8 lbs / bush

Raspberries

'Latham'

'Latham' was the most widely planted raspberry in the United States during the 1930s and '40s. It remains popular today, due to its large and beautiful fruits and disease resistance.

KNOW TO GROW

Raspberries grow in a wide range of soil types, but the ideal environment is well-drained subsoil, with full sunlight and good air circulation.

1920: 'Latham' raspberry released

1981-83: First U of M blueberry releases

1988: Blueberry muffin named Minnesota State Muffin

2014: Pink Popcorn™ hardy pink blueberry released

'Frontenac'


'Marquette'


'La Crescent'


'Frontenac gris'


'Frontenac blanc'

Wine Grapes

The University of Minnesota is recognized as one of the top wine grape research programs in the country, with the goal of developing high-quality, cold-hardy, and disease-resistant wine grape cultivars. The wine grape breeding program began in the mid-'70s, and in 2000 an enology lab and research winery opened at the Horticultural Research Center.

Today more than 12,000 experimental vines are cultivated on 12 acres. Thousands of seedlings are produced each year using a diverse genetic base that includes classic *Vitis vinifera* cultivars, quality French hybrids, and hardy, disease-resistant selections based on *V. riparia,* Minnesota's native grape.

Currently, more than 100 U of M selections are in advanced tests, as well as more than 400 named varieties and selections from other breeding programs around the world. In addition to cold hardiness and disease resistance, viticultural traits such as productivity, cluster size, growth habit, bud break, and ripening times are evaluated.

When a new grape is released, nurseries get a well-tested selection that has been evaluated for 15 years or more. The cross for 'Marquette' was made in 1989, and it was introduced as a new variety in 2006. It is now extensively planted throughout the Midwest and New England.

Several white-fruited mutations of 'Frontenac' and 'Frontenac gris,' sold as 'Frontenac blanc,' are the newest wine grapes derived from the University of Minnesota "Frontenac family." Several versions of 'Frontenac blanc' have been discovered independently by grape growers and nurseries. Trials so far indicate they have the same outstanding vine traits of 'Frontenac' and are ready for harvest several days earlier. Various mutations are being evaluated by the enology program to determine whether they differ in winemaking character.

The enology project works closely with the breeders by producing numerous experimental wines from test cultivars each year. The project helps wineries by determining optimum processing methods for both new and existing cultivars, and provides local support for the technical needs of the developing Minnesota wine industry. Researchers also work to characterize the components of new grapes.

WINE GRAPE CULTIVARS	YEAR	TYPE	FEATURES
Frontenac	1996	Red and rose' wine, port	Vigorous and very disease resistant. Wine has flavors of cherry and plum. Can be high in acidity.
Frontenac blanc	2012	White wine	White-fruited sports of Frontenac and Frontenac gris with earlier harvest date.
Frontenac gris	2003	White wine	Vigorous and very disease resistant. Wine has a characteristic peach flavor. Can be high in acidity.
La Crescent	2002	White wine	Very cold hardy. Wine has flavors of apricot, citrus, and tropical fruit. Moderately disease resistant.
Marquette	2006	Red wine	Resists downy and powdery mildew, and black rot, with open, orderly growth habit. Wine has complex notes of cherry, berry, black pepper, and spice on both nose and palate.

1989: Cross made for 'Marquette'
1996: 'Frontenac' released
2000: Enology lab and research winery opens
2002: 'La Crescent' released
2003: 'Frontenac gris' released
2006: 'Marquette' released

www.grapes.umn.edu

About Enology

At the Horticultural Research Center enology lab, spectrometric tests are run on all University cultivars, especially highly colored reds. This analysis enables researchers to quantify and compare the amounts of red pigment (anthyocyanins), tannins, and total phenolic compounds in new hybrids to those of native American and European grape varieties, and other hybrids.

Flavor compounds in key wine grape cultivars—'Frontenac,' 'La Crescent,' 'Frontenac gris,' 'Frontenac blanc,' and

'Marquette'—are analyzed with a combination of instrumental and sensory methods.

Determining key wine components will ultimately allow producers to make educated choices about processing methods that best fit their stylistic goals.

In the state-of-the-art facility, an expert staff works to evaluate all aspects of the experimental wines. Polyphenols (pigment and tannins), acidity, and sugar, as well as aroma and flavor can be objectively measured.

A trained taste panel evaluates various sensory aspects, including visual appeal, bouquet, flavor, balance, and body.

The latest advances in propagation, hybridization, cultivation, and winemaking ensure the introduction of vines with superior performance in both vineyard and winery.

Table Grapes

Since the introduction of 'Bluebell' in 1944, the University of Minnesota has offered grapes that withstand cold winters, are disease resistant, and taste delicious fresh, or as juice or jelly. In past years, the University released 'Swenson Red' and 'Edelweiss' grapes in collaboration with the legendary Elmer Swenson, a pioneering Wisconsin grape breeder who also worked at the Horticultural Research Center for a number of years. Several varieties of table grapes developed at the University in the last century are no longer commercially available. Researchers today continue work toward new seedless varieties suited to cold climates.

'Edelweiss'

'Swenson Red'

TABLE GRAPE CULTIVARS	YEAR	TYPE	FEATURES
Bluebell	1944	Table, juice, jelly	Early ripening. Blue-seeded table grape with a mild Concord-like flavor. Disease resistant.
Edelweiss*	1977	Table, wine	Large-clustered, white-seeded table grape with a Concord-like flavor. May need winter protection.
Swenson Red*	1977	Table	Red-seeded table grape with refreshing flavor and crisp texture. Needs winter protection and a thorough spray program.

*Joint release with Elmer Swenson.

1870: Louis Suelter, a German immigrant in Carver County, introduced 'Beta' grape

1944: 'Bluebell' released

1977: 'Edelweiss' and 'Swenson Red' released

The vines reach 25 feet in length and typically require 20-foot tall trellises for support.

New Focus on Hops

Often referred to as the spice of beer, hops have the distinction of having nearly 100% of the U.S. grown crop originate in three states—Washington, Oregon, and Idaho. But in the 1860s and 1870s Wisconsin grew one third of the hops produced in the U.S. Since then many new varieties were developed that offer a plethora of upgrades such as providing higher yields or distinct flavors and aromas. However, those improved varieties were not bred with the Midwest in mind and in many cases are proprietary.

Over the last decade there has been a dramatic revival in beer brewing throughout the eastern U.S. Minnesota has the distinction of being on the western edge of that revival. Local craft and microbrewers are in need of new hops varieties. Beer lovers are increasingly seeking out unique brews or even trying their hand at homebrewing.

The University's hops research program officially began in 2010 and in 2012 added breeding to the mix. The program has several goals: 1) sharing research findings with local growers and other Great Lakes region programs; 2) exploring production practices suited for Minnesota conditions; 3) discovering what existing varieties work well here and under what conditions; and 4) developing new varieties that meet the demands of the growing brewing industry in Minnesota.

More than 16 existing varieties have been tested on Research and Outreach Center sites in Waseca, Rosemount, and Grand Rapids. In total, two-thirds of an acre is being used for hops research. Of that, half is used for disease studies and the other half is solely in Waseca and used for production research and breeding. In addition, hops are being monitored in the Saint Paul Campus greenhouses where they are tested for downy mildew and disease resistance.

Roots in barley

Another key ingredient for beer making, barley, has been grown at research stations in Minnesota since 1900. Breeding focuses on developing varieties that increase yields, offer disease resistance, and are suitable for malting and brewing. The U's Agricultural Experiment Station has developed 20 varieties; the most recent is 'Quest', released in 2010. In the heyday of large national brewers, two-thirds of all beer brewed in the U.S. contained barley from U of M varieties. The current breeding program includes two-row varieties, preferred by craft brewers, versus six-row types used by large scale breweries.

KNOW TO GROW

Although a perennial plant, hop vines die back to the ground every year and start fresh with new vines in early spring after the last frost. The vines reach 25 feet in length and typically require 20-foot tall trellises for support. At harvest time, the cones are around 80% water and either need to be dried or used immediately to avoid composting.

http://z.umn.edu/hops

Mammoth™ 'Red Daisy'

The Ornamental Landscape

The University's success in developing hardy azaleas and large cushion chrysanthemums of every hue is unparalleled. Shrub roses, wisteria, and ornamental grasses promise varied color and texture—and easy maintenance—for years to come. Trees and shrubs for northern landscapes are bred for blossom display, plant size, and early fall color, in addition to proven hardiness.

Chrysanthemums

The University's mum breeding program is one of the oldest public sector breeding programs in the world and the only one in North America. Trend-setting breeding endeavors, coupled with the program's germplasm base and genetic resources, continue to bring a wide range of colors and shapes of proven hardy mums to northern gardens.

Beginning in the 1920s, U of M researchers were selecting and breeding mums for early flowering; none bloomed before Minnesota's killing frosts.

The cushion habit of mums, a genetic discovery of Experiment Station mum breeders, was the basis for the U of M's first plant patent, in 1977, for 'Minngopher.' Plants are dome-shaped, with flowers almost completely covering the outside surfaces of each plant. Previous mums bloomed only at the top of long stems (upright habit). Within a decade, the cushion type became the dominant chrysanthemum plant habit worldwide.

In 1990, breeders inspecting field plantings found seedlings of unprecedented size. Now marketed worldwide as Mammoth™ mums, the plants produce several thousand flowers and grow to three to four feet across in the second season and thereafter.

The University's floral research garners international respect and collaboration. Scientists collected wild mum species in western China, near Tibet, to add to the germplasm collection. Scientists from Asia study here and bring new breeding techniques back to the place where many of our exotics originated.

Even more colors and shapes are on the way. "Wave" types—which spread up to three feet across and remain low to the ground, and are ideal for hanging baskets—will soon be released in a range of colors with daisy or double blossoms.

Mammoth™ 'Dark Pink Daisy'

Mammoth™ 'Lavender'

Mammoth™ 'Dark Bronze Daisy'

1926-1939: Breeding and release of greenhouse mums

1939: 'Duluth' — the first winter-hardy mum released

1977: First U of M plant patent, for 'Minngopher' cushion mum

1990s: Extraordinarily large cushion mums lead to 'Mammoth' series

Chrysanthemums

Tests show that garden mums survive the winter better when the above-ground dead plant stems are not removed in the fall. This is also a beneficial technique to use with other herbaceous perennials.

Cushion growth habit

Upright growth habit

Shrub Cushion growth habit

Wave growth habit

CULTIVAR	YEAR	GROWTH HABIT	FLOWER COLOR, SIZE, TYPE	BLOOM PERIOD
Inca™	1996	cushion	Light bronze, 2" double button.	early
Lemonsota	1988	low cushion	Lemon yellow, 1" pompon.	early
Minngopher	1977	cushion	Ruby-red 2–2 1/2" decorative.	early
Minnqueen	1979	cushion	Rose-pink 3" decorative.	early
Minnrose	1966	cushion	Rose-pink 1 1/2" pompon.	early
Minnruby	1974	cushion	Ruby-red 2 1/4" decorative.	early
Minnwhite	1968	cushion	White 2" decorative.	early
Minnyellow	1972	cushion	Lemon-yellow 2" decorative.	early
Sesquicentennial Sun	2001	cushion	Gold, fully double 1-2" pompon. Frost-tolerant.	midseason
Snowsota	1989	cushion	White with cream centers, 1 1/2" pompon.	early
Burnt Copper	1988	tall upright	Orange bronze, 3" double pompon.	midseason
Centerpiece	1982	tall upright	Rose-lavender with gold center, 4" quill/spoon.	midseason
Gold Country	1983	upright	Peachy yellow, 4" fully double, incurved football.	midseason
Grape Glow	1988	upright	Bright rosy purple, 3 1/2" flat decorative.	midseason
Lindy	1974	tall upright	Lavender-pink, 4 1/2" quilled incurve.	midseason
Maroon Pride	1989	upright	Dark red, 3 1/2" flat, decorative.	early
Mellow Moon	1983	upright	Cream, 4 1/2" semi-incurved, fully double, football.	midseason
Peach Centerpiece	2000	tall upright	Peach colored with gold center, 2-4" flowers, quill/spoon.	midseason
Rose Blush	1993	upright	Mauve, 2-3" decorative.	early
Mammoth™ * Coral Daisy	2002	shrub cushion	Coral with a gold center, single. Frost tolerant.	early
Mammoth™ * Dark Bronze Daisy	2006	shrub cushion	Bronze with a gold center, single. Frost tolerant.	early
Mammoth™ * Dark Pink Daisy	2006	shrub cushion	Deep pink, large daisies with a gold center, single. Frost tolerant.	early
Mammoth™ * Lavender Daisy	2006	shrub cushion	Lavender with a gold center, single. Frost tolerant.	early
Mammoth™ * Red Daisy	2007	shrub cushion	Red petals with a gold center, daisy. Frost tolerant.	early
Mammoth™ * Twilight Pink	2002	shrub cushion	Pink with a gold center and a purple eye, single daisy. Frost tolerant.	early
Mammoth™ * White Daisy	2002	shrub cushion	White, gold center, semi-double, daisy. Frost tolerant.	early
Mammoth™ * Yellow Quill	2002	shrub cushion	Yellow with a gold center, single daisy, quilled petals.	midseason
Snowscape	1996	semi-wave	White with purple tips, 3" semi-double flowers.	early

** Mammoth™ mums were previously marketed as Maxi-Mums and My Favorite™.*

Mammoth™ 'Red Daisy'

'Snowscape'

Mammoth™ 'Coral Daisy'

'Gold Country'

Inca™

Mammoth™ 'White Daisy'

Mammoth™ 'Twilight Pink'

'Mellow Moon'

'Minngopher'

'Peach Centerpiece'

'Sesquicentennial Sun'

Mammoth™ 'Yellow Quill'

Candy Lights™

'Golden Lights'

'Mandarin Lights'

'Northern Hi-Lights'

Tri Lights™

'White Lights'

'Orchid Lights'

'Lemon Lights'

Azaleas

'Spicy Lights'

The 'Lights' series of azaleas brings the colors of the tropics to Minnesota's early spring landscape. The plants are world-renowned for varied colors and incredible flower bud hardiness—an achievement that initially took two decades. The first crosses were made in 1957; 'Northern Lights'—with various shades of fragrant pink flowers on a 4- to 6-foot bush—was the first introduction, in 1978. Since then, 12 new 'Lights' have been released.

Although nearly commonplace in Zone 4 landscapes today, the range of colors and flower forms in the 'Lights' azaleas were unknown even as recently as the mid-'80s when some of the richer yellow, orange, and multihued cultivars began to find their way into the landscape.

University azalea breeders continue to improve foliage quality and powdery mildew resistance. Researchers are screening 41 deciduous azalea varieties in replicated field plots in Minnesota and Ohio to identify mildew tolerant or resistant cultivars for use in future breeding. Most of the varieties in the field are also screened in growth chamber experiments to determine whether the same resistance/susceptibility reactions occur. If so, the powdery mildew screening can occur more quickly—on a smaller scale, in the off-season, and with less expense.

Breeders now select for attractive fall foliage color, flower fragrance, and significantly extended bloom periods—cultivars that flower later into June and possibly even July.

Lilac Lights™

CULTIVAR	YEAR	COLOR	FEATURES
Apricot Surprise	1987	Light orange	Fragrant flowers. Latest flowering. 3–4'
Candy Lights™	2001	Light pink	Pale yellow streaks, very fragrant. 5–6'
Golden Lights	1986	Golden	Fragrant. Greater mildew resistance. 4–6'
Lemon Lights	1996	Lemon yellow	More narrow, upright plant. 4–5'
Lilac Lights™	2001	Pinkish purple	Darker speckles on upper lobes. 3.5–5'
Mandarin Lights	1992	Orange	Extremely hardy. 5–6.5'
Northern Hi-Lights	1994	Creamy white	Bright yellow upper petal. 5–6'
Northern Lights	1978	Pink	Fragrant flowers,various shades of pink. 4–7'
Orchid Lights	1986	Orchid	Earliest flowering of the 'Lights.' Extremely hardy, compact plant. 2–3'
Rosy Lights	1984	Deep rosy pink	Abundant blossoms, buds hardy to –45°F. 4–5'
Spicy Lights	1987	Salmon orange	Large flowers. Early flowering. 5–6.5'
Tri Lights™	2000	Soft pink	Deep rose buds. Yellow upper petal highlight. 5'
White Lights	1984	White	Abundant blossoms, with slight yellow highlight. 5–6'

Rhododendron is the genus name for both rhododendrons and azaleas. In the Upper Midwest, azalea refers to the deciduous members of the genus Rhododendron and rhododendron refers to those that hold their leaves through the winter.

1957: First azalea crosses begin the project leading to 'Lights' azaleas

1978: 'Northern Lights' released

1991: Promising azalea selections made toward true red flowers

'Summer Waltz' during a midsummer rain

Northern Accents™ 'Sven'

Northern Accents™ 'Lena'

Northern Accents™ 'Ole'

Northern Accents™ 'Sigrid'

Roses

The showy 'Summer Waltz' rose, released in 2012, is covered with double-cupped frilly pink flowers, blooming throughout the season until frost. The lightly fragrant flowers fade to light pink as they age. As with most repeat blooming roses, there is partial die back of the crown to winter injury. It is tolerant of black spot fungus—plants may get a little, but it doesn't impact plant appearance or performance. 'Summer Waltz' is available only at the Minnesota Landscape Arboretum Auxilary Plant Sale each May.

Four super-hardy shrub roses—known as Northern Accents™ 'Sven,' 'Ole,' 'Lena' and 'Sigrid'—grow to more than three feet tall, covered in a profusion of clustered blooms all season. In Grand Rapids they survived a winter with a low temperature of -47ºF. With consistent snow cover, they need no special winter care. They are resilient and environmentally gentle as well. At trials near Dallas, Texas, the U of M polyanthas grow to eight-foot shrubs with no special inputs other than water and mulch at planting.

CULTIVAR	YEAR	FEATURES
Prairie Fire	1959	Shrub. Bright red, single blooms, 4–6'
Viking Queen	1963	Large, fragrant climber with pink double blooms. Glossy foliage, 8–10'
Northern Accents™ Lena	2008	Hardy shrub with frilly pink and white single, five-petal flowers, 3–4'
Northern Accents™ Ole	2008	Hardy shrub with ivory to pale pink double petals, 3–4'
Northern Accents™ Sven	2008	Hardy shrub with fragrant, pink-to-violet double flowers, 3–4'
Northern Accents™ Sigrid	2012	Hardy shrub with fragrant, deep pink-to-red flowers, 3–4'
Summer Waltz	2012	Double-cupped frilly 3.5" medium pink blooms with light fragrance, 4 x 4.5'

Research

Black spot fungus has challenged rose gardeners for centuries. Using black spot isolates collected from across eastern North America, University scientists can characterize the molecular diversity of the fungus. Rose genotypes are inoculated with black spot isolates to determine the race diversity of the isolates. Breeders then identify black spot resistance genes in rose germplasm and begin the process of incorporating those genes into cold-hardy shrub roses.

Roots

Roses were some of the earliest woody landscape plant cultivars released from the University, as a sideline of the chrysanthemum breeding project in the 1940s. The first directed breeding work on woody landscape plants can be dated to 1942 when Dr. Louis E. Longley, who started the chrysanthemum breeding project, began making some crabapple and rose crosses.

Longley is credited with releasing four roses, 'Pink Rocket,' 'Red Rocket,' 'L.E. Longley,' and 'White Dawn,' in 1949, and with developing the 'Radiant' crabapple. His assistant, Robert A. Phillips, continued to make rose hybridizations after Longley's retirement in 1949. Two additional rose cultivars, 'Prairie Fire' and 'Viking Queen,' are attributed to Phillips and are still available.

1949: first four rose releases · 1959: 'Prairie Fire' shrub released · 1963: 'Viking Queen' climber released · 2008: 'Sven,' 'Ole,' and 'Lena' shrub roses released · 2012: 'Sigrid' shrub rose released · 2012: 'Summer Waltz' rose released

Wisteria

The hardy 'Summer Cascade' wisteria features spectacular blooms in long showy clusters 10 to 12 inches long. It was bred from a hardy strain of Kentucky wisteria and first known as 'Betty Matthews,' after a White Bear Lake resident in whose yard it grew.

'Summer Cascade' is proven hardy to Zone 3. The vine can grow to 20 feet with sturdy, twining stems. Pruning two or three times throughout the summer helps keep a wisteria under control and prompts blooms.

It blooms on new growth in June. Individual flowers are borne on long showy racemes and open as a lovely shade of dark lavender before fading. This beautiful flowering vine thrives in full sun, and can easily cover an arbor or pergola to create a shady retreat. An interesting seed pod in late summer provides multi-season interest.

'Summer Cascade'

KNOW TO GROW

'Summer Cascade' blooms on new growth in June and can grow to 20 feet with sturdy, twining stems. Plant in full sun and prune two or three times throughout the summer to prompt blooms. It is proven hardy to Zone 3.

Gaura

'Snowstorm' is a vigorous gaura for Minnesota, with abundant, continuous pink and white flowers. It flourishes in both cool and warm locations, even in extreme heat and drought. A hardy seedling was selected in 2000, and was crossed with plants gathered on collection trips to Texas, Mexico, California, and the Dakotas, resulting in a fragrant, prolific plant. Tough though it may be, 'Snowstorm' is now marketed as an annual, and will be used in future breeding efforts toward a truly winter-hardy gaura.

'Snowstorm'

Horticulture is an art of endless possibilities and changes, and no person of experience in such matters ever feels that he knows it all.

—PROF. SAMUEL B. GREEN, PRESIDENT'S ADDRESS TO THE MINNESOTA STATE HORTICULTURAL SOCIETY, THE MINNESOTA HORTICULTURIST, 1908

2000: Gaura seedling crossed with selections

2008: 'Snowstorm' guara released

2013: 'Summer Cascade' wisteria released

Shrubs

Dogwood

The underlying rosy hue of dogwood branches provides bright landscape color through even the most severe Minnesota winter. The extensive root system tolerates poorly drained soil, and can be useful for erosion control. Small white flowers appear in June, followed by white berries that many birds and other wildlife find appealing.

The latest variety, Garden Glow™, adds chartreuse foliage and a luminous glow to a shady landscape. 'Cardinal' was introduced for its vivid red winter twig color. 'Isanti' is a slower-growing selection of native dogwood. Garden Glow™ performs best in filtered sunlight or where it receives protection from the afternoon sun. 'Cardinal' and 'Isanti' grow well in full sun or partial shade.

KNOW TO GROW

Garden Glow™ is adaptable to a range of soil conditions and is proven cold hardy for Zone 4A. It is not recommended for full or afternoon sun because the golden leaves tend to burn or bleach in high light conditions. Dappled, light shade, or full morning sun followed by afternoon shade produces the brightest, glowing, yellow-green foliage. This dogwood tolerates heavy shade, but foliage turns a darker green.

Garden Glow™

'Isanti'

Research

Pagoda or alternate leaf dogwood is a Minnesota native. Creamy white blossoms on horizontal branches light up the woods in May, and lead to attractive blue fruits in the fall. Unfortunately, the trees are highly susceptible to *Cryptodiaporthe* canker, a problem identified more than a century ago. Trees rarely attain a trunk diameter greater than four inches before the tree succumbs. U of M researchers collected canker samples from around the state in order to isolate and culture the fungus. New seedlings, grown from seeds from hardy trees across Minnesota, are systematically infected with the cultured pathogen in the first step to develop a canker-resistant cultivar. In the process, breeders will select for improved fall color, richer and varied flower color, and larger flower size.

DOGWOOD CULTIVARS	YEAR	FEATURES
Cardinal	1986	Young growth has bright red winter color.
Garden Glow™	2001	Brilliant yellow-green foliage. Thrives in shade.
Isanti	1971	Mound-shaped. Fine-twigged with red bark.

Native Pagoda

1971: 'Isanti' released

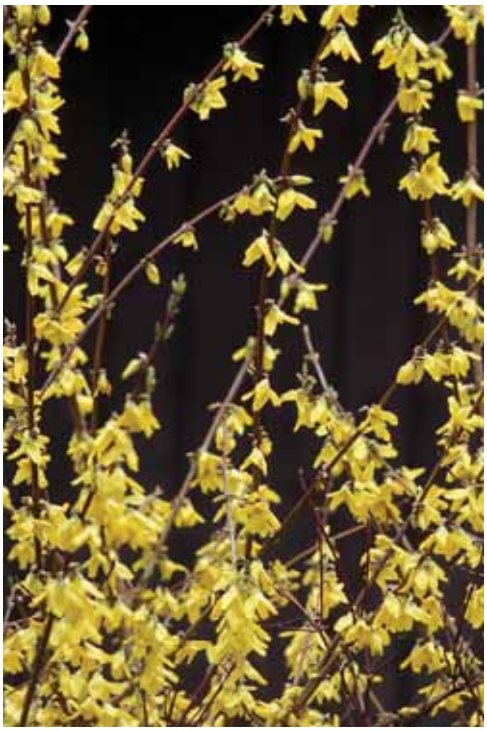
1986: 'Cardinal' released

2001: Garden Glow™ released

'Northern Pearls' pearlbush

'HomeFree' viburnum

'Emerald Triumph' viburnum



'Northern Sun' forsythia

Forsythia

The bright yellow flowers of forsythia appear before the leaves, signaling the arrival of spring. 'Northern Sun' was bred to flower in early spring despite cold temperatures. A forsythia's vigorous growth makes it suitable for screens and bank plantings. 'Northern Sun' thrives in full sun, and tolerates poor soil.

Pearlbush

'Northern Pearls' is the only selection of pearlbush hardy for Minnesota. Its name comes from its flower buds, arrayed like pearls along a stem. In early May, each bud opens into a showy white flower, two inches across. It can be pruned to a single trunk for a small tree, or grown as a five- to eight-foot shrub.

'Emerald Triumph'

Viburnum

Two hardy viburnum varieties, 'HomeFree' and 'Emerald Triumph', have great potential as buckthorn replacements in midwestern landscapes. Commonly known as nannyberry, the bushes feature dark green, glossy foliage and creamy white flowers in late spring. The compact shrub grows 6 to 10 feet wide and high, with dense foliage making it an ideal choice for screen hedges. 'HomeFree' is extremely resistant to powdery mildew and will do better in shade than other varieties. Fruit turns bright red in August and changes to bluish-black by mid-autumn. Fall color may not develop completely before a hard freeze, but in the South, the foliage turns bronze to dark red.

TYPE	CULTIVAR	YEAR	FEATURES
Forsythia	Northern Sun	1982	Hardy to -30°F. Fast-growing. 8–10'. Tolerates a wide range of soils.
Pearlbush	Northern Pearls	1995	Attractive flowers. Showy exfoliating bark.
Viburnum	Emerald Triumph	1994	Showy, white, nearly flat flower clusters in mid-May. Hardy to -30°F. Best in full sun to part shade and in well-drained soil.
Viburnum	HomeFree	2015	Attributes like 'Emerald Triumph' but especially resistant to powdery mildew, even when grown in shade.

1982: 'Northern Sun' forsythia released

1994: 'Emerald Triumph' viburnum released

1995: 'Northern Pearls' pearlbush released

2015: 'HomeFree' viburnum released

Firefall™

Firefall™

'Northwood'

'Autumn Spire'

Trees

Maples

Brilliant early fall color distinguishes the Firefall™ Freeman maple. It is the result of a cross between 'Beebe,' a cut-leaf silver maple, and an earlier University red maple introduction, 'Autumn Spire.' This male selection produces no messy seed.

Field trials began in 1992, with young trees evaluated for form, cold tolerance, and quality and timing of autumn leaf color. The initial selections were propagated by softwood cuttings in 1994 and sent to cooperators in Iowa, Oregon, Manitoba, and outstate Minnesota before introduction in 2005.

Research

Mass screening of various non-hardy species for cold hardy variants is ongoing at the Horticultural Research Center and at the North Central Research and Outreach Center in Grand Rapids (Zone 3). Individual seedlings that exhibit exceptional hardiness are propagated and evaluated in additional trials.

'St. Croix' American Elm parent tree

Elm

Selected from a massive parent tree in Afton, Minn., the 'St. Croix' American elm joins the ranks of Dutch elm disease-tolerant elms with a Minnesota twist. Since its discovery by U of M alumnus Mark Stennes, researchers in the Departments of Plant Pathology and Forest Resources have cloned and screened the tree for Dutch elm disease tolerance. Young specimens grow at an incredible pace and have gracefully arching branches and dark green leaves. Like all American elms, 'St. Croix' can thrive in tough environmental conditions.

The focus is on overall environmental adaptability—improved cold hardiness, drought tolerance, heat tolerance, and disease and insect resistance.

White Pine

White pine blister rust threatens to destroy native white pines, but some trees are more resistant than others. 'Patton's Silver Splendor' white pine was selected after a decade of screening by U of M researchers following propagation by Robert F. Patton at the University of Wisconsin-Madison. Patton initially discovered and investigated the waxy deposits that make the tree exceptionally resistant to blister rust. Thicker than usual waxy deposits inhibit the disease and give the blue-green needles a distinctive silvery look. Cones develop with age and enhance the tree's ornamental and wildlife value.

'Patton's Silver Splendor'

CULTIVAR TYPE & NAME	YEAR	SIZE	FEATURES
AMERICAN ELM, *Ulmus americana*			
St. Croix	2015	60-75'	Broadly vase-shaped. Dark green foliage, turns yellow in fall.
RED MAPLE, *Acer rubrum*			
Autumn Spire	1992	40'	Upright form. Good red fall color.
Firefall™ Freeman	2005	50'	Early fall color, orange to scarlet.
Northwood	1980	50'	Bright orange fall color.
WHITE PINE, *Pinus strobus*			
Patton's Silver Splendor	2011	100'	Fast-growing white pine that is resistant to blister rust disease, due to waxy needles.

1923: 'Newport' flowering plum released

1992: 'Autumn Spire' maple released

1992: 'Minnesota Strain' redbud released

2002: 'Stately Manor' Kentucky coffeetree released

2005: Firefall™ Freeman maple, a cross of 'Autumn Spire,' released

2015: 'St. Croix' American Elm released

Trees

Redbud

'Minnesota Strain'

A hardy variant of redbud appeared in a mass screening of seedlings planted at the Horticultural Research Center many years ago. Before the 'Minnesota Strain' was developed in 1992, few large specimens survived as far north as Minnesota. Flowers are rosy pink and open before leaves appear.

Buckeye

'Autumn Splendor'

silvery spring foliage and unusual creamy white flowers in July and August.

The 'Autumn Splendor' buckeye is popular for its stunning maroon fall color, and its tolerance of de-icing salts makes it a good boulevard tree. It has showy flowers in late spring and shiny nutlike buckeyes in fall.

The 'Stately Manor' Kentucky coffeetree is a male selection, with no pods, that offers interesting gray bark and yellow fall color. A good shade tree with a narrow, upright form and large leaves, it could be a suitable replacement for ash in Minnesota.

Flowering Plum

'Princess Kay'

'Newport' and 'Princess Kay' flowering plums are fragrant ornamental trees in the spring. Plums can produce fruit that is attractive to wildlife and useful for making jelly.

Amur Maackia

Summertime™

The little-known Summertime™ Amur maackia is a small, tough tree that glows with

CULTIVAR TYPE & NAME	SIZE	FEATURES	YEAR
BUCKEYE, *Aesculus* **Autumn Splendor**	35'	Clusters of large yellow flowers followed by shiny, nut-like fruits and brilliant maroon fall color. Resists leaf scorch diseases.	1980
KENTUCKY COFFEETREE, *Gymnocladus dioicus* **Stately Manor**	50' x 40'	Male selection; no seed pods. Tolerates a wide variety of soil conditions. Unusual, deeply furrowed bark adds winter interest.	2002
CORKTREE, *Phellodendron amurense* **His Majesty**	40' x 35'	Fast-growing, open-spreading, male selection producing no fruit, has interesting corky bark. Tolerates alkaline soils. Resistant to insects and diseases.	1996
AMUR MAACKIA, *Maackia amurensis* **Summertime™**	18'	Silvery leaves in spring turn deep green until leaf fall. Blooms late July-early August with small bottlebrush-like cream-colored flowers. Mottled bark provides winter interest.	2001

Kentucky Coffeetree

'Stately Manor'

Crabapples bloom abundantly in spring and have attractive displays of fruit. The ornamental U of M cultivars get no taller than 20 feet, with foliage colors that vary from light, bright green to deep maroon or silvery red. Forms may be horizontal, oval, rounded, or vase-shaped.

Flowering Crab

'Sparkler'

Sometimes thought of as a novelty tree due to its irregular growth habit, fast-growing jack pines can grow well on impoverished, sandy sites with acidic soil. 'Uncle Fogey' is an exceptionally hardy, prostrate, drooping tree that does well in urban settings.

The 'Wissota' red pine is a dwarf version of a tall native tree, and is a hardy, diminuitive landscape tree.

Corktrees get their name from the deeply furrowed and soft corky bark. The fast-growing 'His Majesty' develops an open, spreading crown with coarse branches and dark green foliage. This male selection produces no seeds or fruit and so is not spread by birds.

Jack Pine

'Uncle Fogey'

Corktree

'His Majesty'

CULTIVAR TYPE & NAME	SIZE	FEATURES	YEAR
FLOWERING PLUM, *Prunus*			
Princess Kay	**20' x 15'**	**White double blossom. Smooth trunk and branches. Red fall foliage.**	**1986**
Newport	**20' x 20'**	**Pink flowers followed by purple fruit. Dark purple foliage.**	**1923**
REDBUD, *Cercis canadensis*			
Minnesota Strain	**12' x 12'**	**Dark pink to purple flowers open in early May before leaves appear.**	**1992**
CRABAPPLE, *Malus*			
Flame	**20' x 15'**	**White double flowers. Red fruits. Green foliage.**	**1934**
Radiant	**20' x 20'**	**Red flowers. Red fruits. Purple/green foliage. Oval shape.**	**1958**
Sparkler	**15' x 15'**	**Pink flowers. Deep red fruits. Red/green foliage. Flat-topped tree.**	**1969**
Vanguard	**18' x 12'**	**Red flowers. Red fruits. Green foliage. Vase-shaped tree.**	**1963**
JACK PINE, *Pinus Banksiana*			
Uncle Fogey	**6'**	**Prostrate, drooping habit. Hardy to Zone 2.**	**1971**
RED PINE, *Pinus resinosa*			
Wissota	**6'**	**A landscape-friendly dwarf form of a tree that otherwise reaches 100'.**	**1998**

Environmental Stewardship

"Driven to Discover℠" encompasses the University's mission and communicates the search for knowledge and the drive to share information with students and the larger community. Improving soil and water quality while at the same time improving plant quality is vital to the state's health, well-being, and economy. Ongoing research is accessible online and in person at the statewide U of M Research and Outreach Centers.

Rain gardens on the St. Paul campus thrive in low spots where water is purposely channeled.

Seeking Solutions

University horticultural scientists research ways to restore and preserve water quality through strategic plantings to restore wetlands, preserve lakeshore, and curb runoff through rainwater gardens. Researchers analyze the most beneficial plants for various conditions and provide information to the public on plant selection.

In wetland demonstration sites, researchers are investigating whether short-lived perennials can be used to suppress reed canary grass that invades damaged wetlands, and whether adding nutrients increases the likelihood of weedy plant invasion.

Natural landscaping along lakeshores enhances lake quality by restoring fish and wildlife habitat and protecting water quality by reducing runoff. The vegetation protects the land from erosion and reduces yard maintenance. Waterfront sites, such as lakeshore, river banks, and public access boat launch areas, are prone to erosion and require durable and adaptable plants. Sites are often characterized by poor soil, high shade, and seasonal flooding.

Rainwater gardens of hardy plants sited in low-lying areas trap and absorb runoff from parking lots, streets, and roofs. Parking lot runoff at the University's Minnesota Landscape Arboretum and the St. Paul campus is channeled into planting beds and supports a wide variety of plants for public view. The gardens filter storm water close to where it falls and prevent additional runoff and pollution.

Researchers put green roof plant materials on trial on the Williamson Hall roof on campus.

Native prairie and wetlands research focuses on restoration and preventing invasive species.

Shoreland management research aims to prevent erosion and protect water quality.

Grass cultivars are tested at the St. Paul campus, where this sliding cover is placed over grass plots whenever it rains. Unprotected plots outside the cover provide comparison. Successful drought-tolerant varieties will save water and lower irrigation costs for golf courses, athletic fields, cemeteries, and lawns.

Grasses

'Arctic Green'

Selection for improved winter hardiness is complicated by unpredictable and unrepeatable winters. University of Minnesota researchers exchange plant materials and conduct multiple trials in cooperation with researchers nationwide.

Turfgrass

Most Americans value lush green lawns, parks, school playgrounds, and athletic fields for aesthetic reasons. But there are other benefits. Grass absorbs water, which helps reduce storm runoff and improve water quality. Lawns also have a significant cooling effect, provide oxygen, can trap dust and dirt, promote healthful micro-organisms, prevent erosion, and filter rainwater contaminants.

In Minnesota, producing grass seed and sod suitable for northern climes is a growing industry. University of Minnesota developments of sustainable, environmentally friendly alternatives to intensive, high-maintenance turfgrass are in high demand. Many grass species popular in other states, such as perennial ryegrass, lack the hardiness to survive a winter of harsh temperatures or little insulating snow. University grass breeders use genetic material from old turf areas in Minnesota, collections from other parts of the world, and materials from research institutions in other states to develop improved hardy turfgrass varieties.

Current efforts in perennial ryegrass breeding focus on improved winter hardiness, and researchers have recently made significant advances, especially for resistance to snow mold disease. Researchers continue to test several species that include Kentucky bluegrass, perennial ryegrass, tall fescue, fine fescue, and a few native grass species. In addition to winter hardiness, they evaluate quality of color, density, texture, mowability, growth habit, seed production, multiple pest resistance, efficient water and nutrient use, and drought tolerance.

Genetic improvement of native grasses such as prairie junegrass into top-performing turfgrass varieties should reduce water, fertilizer, and pesticide inputs, resulting in environmental benefits and reduced costs.

Learn more about research on low-maintenance plant materials and best management practices for lawns and turf with a visit to the research plots on the St. Paul campus and the Minnesota Landscape Arboretum.

CULTIVAR	YEAR	SPECIES	USES
Arctic Green	2007	Perennial ryegrass	Lawns/golf courses
Green Emperor	2013	Perennial ryegrass	Lawns/golf courses athletic fields
Polar Green	2006	Perennial ryegrass	Lawns/athletic fields
Ragnar	2001	Perennial ryegrass	Lawns/athletic fields
Ragnar II	2005	Perennial ryegrass	Lawns/athletic fields
Royal Green	2013	Perennial ryegrass	Lawns/golf courses athletic fields
Park	1957	Kentucky bluegrass	Lawns
TruePutt™	1998	Creeping bluegrass	Golf courses

1957: 'Park' released

2013: 'Royal Green' & 'Green Emperor' released

Blue Heaven™

Ornamental Grass

The University's first release of an ornamental grass, Blue Heaven™, is a unique form of little bluestem, a native prairie grass known for its tolerance of sites with dry soil and full sun. It is a great plant for low maintenance sustainable landscapes. The selection process began in 1995, with seed from Benton County and 30 other locations statewide.

Several characteristics make this carefully selected variety attractive through all seasons. It has a taller, more upright form (40–48 inches tall and 25–30 inches wide) than is typical of little bluestem. The colors of dark blue to burgundy summer foliage turning red to purple and violet in the fall are unique on a tall columnar plant. It flowers in September, and showy fall color extends into winter.

Research

The Ornamental Grass Collection at the University's Minnesota Landscape Arboretum includes more than 200 different ornamental and native grasses and is one of the largest in the United States. Plants are evaluated for winter survival, flowering time, self-seeding, invasiveness, and winter interest. Since the initial planting in 1987, about half of the original grasses, sedges, and rushes have proven hardy.

Working for Bees

Since 1918, the University's Department of Entomology has maintained an internationlly recognized research, teaching, and outreach program on bees. Known today as the "Bee Lab," the goal of the research is to promote the health of bee pollinators.

Researchers have found several ways to reach this goal: 1) breeding better bees like the "Minnesota Hygienic Bees;" 2) discovering and studying natural bee defenses like propolis; 3) reducing pesticide usage; 4) providing research discoveries to beekeepers; and 5) improving conservation and management of other pollinators to reduce the stress on bees.

In the winter of 2006, the honey bee population began to suffer steep declines. Since then, an average of 30% of all honey bee colonies die every winter. Beekeepers struggle to replace losses. U of M researchers are hard at work studying the causes and looking for solutions that will save the honey bee.

KNOW TO GROW

Bee Friendly Tips: For a bee-friendly garden, focus on a diversity of flowering plants. Colorful nectar-producing plants are ideal, such as asters, goldenrod, and sunflowers. Flowering fruits, vegetables, and herbs are also great choices. Bees need food throughout the season so look for long blooming varieties that will bloom at different times of the season (ideally April–September). Avoid pesticides and fungicides and let a few dandelions slip by—they are one of the earliest food sources for bees in April.

1987: 200 kinds of grasses form U of M grass collection

2008: Blue Heaven™ little bluestem released

www.beelab@umn.edu

Coming Up!

What's in a name? As Shakespeare famously said, a rose by any other name would smell as sweet, but new releases need names that are unique, memorable, and somewhat descriptive. On this page we highlight a few varieties that have passed rigorous tests, are now in commercial trials or propagation, but are as yet unnamed.

After new selections are tested in multiple sites in Minnesota and elsewhere, the best ones are sent to commericial trials for propagation tests and grower production to meet market standards. Finally, commercial propagation begins, but it may take several years to develop sufficient plant stock for retail nurseries and garden centers. Watch the website for updates.

Hardy magnolia.

True red azalea.

Hardy 'Iris domestica' (commonly called blackberry lily and leopard lily).

A hardy paper birch.

Double-flowering pink azalea.

Several varieties of hardy pears are in trials.

Science may accelerate natural cycles to some extent, but breeding, selecting, and testing new fruits is not a job for the impatient.

—W.H. ALDERMAN, 1957, IN *FRUIT VARIETIES DEVELOPED AT THE UNIVERSITY OF MINNESOTA FRUIT BREEDING FARM*

http://z.umn.edu/hortnew

Research across all of Minnesota

Visitors are welcome at the University of Minnesota's research sites. Public gardens and fields enable visitors to see a variety of U of M cultivars in different settings and to learn how to grow them. Located throughout the state at Becker, Cloquet, Crookston, Grand Rapids, Lamberton, Morris, Rosemount, and Waseca, the eight Research and Outreach Centers (ROCs) vary in climate and soil conditions. Other facilities that conduct research and outreach include the St. Paul campus, the Horticultural Research Center, and Minnesota Landscape Arboretum.

Lamberton

The Southwest Research and Outreach Center at Lamberton is well known for its organic research with more than 40 years of organic crop and vegetable production. High tunnel greenhouses demonstrate extending the growing season for research and production. A 30-acre remnant prairie features ponds, a side slope, marshy fen, and access to the Cottonwood River. Ten new acres of native prairie were established in 1990.

St. Paul

On the northeast corner of the University's St. Paul campus, a vibrant, welcoming garden is a landscape laboratory for College of Food, Agricultural, and Natural Resource Sciences students majoring in environmental horticulture and a popular site for seminars, tours, and casual visitors. The campus has many acres devoted to research and display, including turf and ornamental grasses, a tree and shrub nursery, a native prairie, and attractive edible gardens.

Morris

At the West Central Research and Outreach Center in Morris, diverse research programs range from swine production to organic dairy to renewable energy. Large horticultural display gardens mix research and education in a showcase that entices visitors to enjoy a scenic overlook, trellises, gazebo, water garden, and an interactive, informative children's area. Eighty percent of the plants on display are in research trials, yet presented in an aesthetically pleasing way. Cold, dry, windswept winters and soil differences are factors in testing new flower and fruit varieties.

1896: Research projects begin at Grand Rapids

1909: Cloquet Forestry Center opens

1913: Waseca site research begins

http://z.umn.edu/rocs

Grand Rapids

Much of the University's outdoor cold hardiness research takes place at the North Central Research and Outreach Center, where research has been ongoing since 1896. Most notably, apples, strawberries, and blueberries are tested here, along with other fruits, vegetables, trees, shrubs, and flowers. Extremes of cold winters and short, humid summers present natural challenges at this northernmost—and coldest— horticultural research center in the continental United States. High tunnel greenhouses protect plants from snow and extend the growing season.

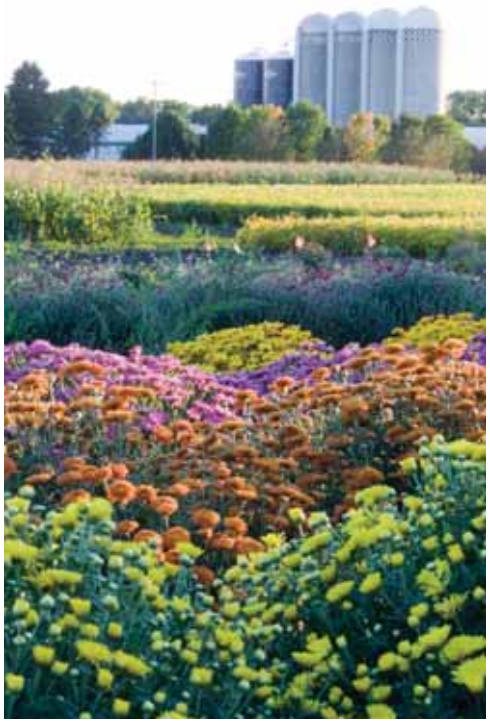
Rosemount

The 3,500 acres at the Rosemount Research and Outreach Center are dedicated to research in a wide range of agricultural crops and animals, as well as turfgrass, ornamental plants, and trees. This extensive site, where rural meets urban, invites the public to learn about food production.

Horticultural Research Center and Minnesota Landscape Arboretum

The Minnesota Landscape Arboretum's famous display gardens and natural woodlands are a year-round destination. Science and research underly the beauty there, but at the adjacent Horticultural Research Center, research is foremost. University horticulturists develop and study hardy landscape plants, high quality grapes, berries and tree fruits, ornamental grasses, and investigate methods for restoring wetland and prairie ecosystems. The Arboretum's Spring Peeper Meadow is a major wetland restoration demonstration site.

Waseca



At the Southern Research and Outreach Center, agricultural research including drainage and water management, dairy calf production, alternative crops, and biomass renewable energy provides ongoing demonstrations of new cultivars and farming techniques. Research on vegetables with cancer preventive nutrients has been ongoing since the 1980s.

1947: Rosemount site acquired

1958: Minnesota Landscape Arboretum opens

1959: Lamberton site acquired

1976: Sand Plain research at Becker begins

www.arboretum.umn.edu

'Summer Cascade' wisteria

Discover more about edible and ornamental plants for your landscape at www.maes.umn.edu

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