# Ornamental Grasses For Minnesota[1]

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## Abstract

One hundred and sixty-five (165) species and cultivars of ornamental grasses and grass-like plants were investigated to determine winter survival in USDA Zone 4a from 1987 to 1993 at the Minnesota Landscape Arboretum, Chanhassen, MN. Eighty-five (85) entries survived and performed well all six years and are considered hardy under the conditions of the experiment. Additionally, 35 entries survived four or five of the six years and are considered marginally hardy. The remaining 45 entries survived no more than two winters and are not hardy in zone 4a. Hardiness varied within species of *Miscanthus sinensis* Anderss. and *Pennisetum alopecuroides* (L.) Spreng.. *Saccharum ravennae* (L.) Murray, synonym (*Erianthus ravennae*); *Imperata cylindrica* L. 'Red Baron'; and *Chasmanthium latifolium* (Mic.) Yat. were not considered hardy. Some popular genera such as *Calamagrostis*, *Deschampsia*, *Molinia*, and *Spodiopogon* were reliably hardy throughout the years of the investigation.

**Index words:** winter hardiness; *Miscanthus*, *Pennisetum*.

## Significance to the Nursery Industry

Research on winter survival of ornamental grasses is limited. This is the first work to be published on hardiness in USDA Zone 4a and it provides a basis for nursery and landscape personnel to select and use these plants. Many grasses are hardy and can be grown successfully as far north as the 45° parallel, however further work needs to be conducted with the newer cultivars of *Miscanthus*.

## Introduction

Ornamental grasses have been recognized as valuable landscape plants for many years (1, 6). They have received increased attention due to use in public parks and gardens and are now available from many nurseries and garden centers. However little information is available on winter hardiness or survival (7, 8, 9) and cultural recommendations, particularly for USDA Zone 4a, where the average annual minimum temperatures range from –31.7 to –34.4°C (–25 to –30°F) (10).

The objective of this study was to determine the landscape hardiness of 165 species and cultivars of grasses and grass-like plants in USDA Zone 4a.

## Methods and Materials

In early July 1987, 159 ornamental grasses or grass-like plants were obtained from commercial sources in California and Maryland. Plants were received either in containers or as bare root stock. Four replicates of each type were planted in a Hayden loam soil on a level but elevated site at the Minnesota Landscape Arboretum, Chanhassen, MN. Thirty (30) of the most popular entries were also planted in a Waukegan, or fine-silty mixed mesic Type Hapludolls soil in an open level site at the University of Minnesota Turf Field Research Area in St Paul. Plants were spaced a distance equal to their mature height.

In addition, seed from four cultivars each of *Schizachyrium scoparium* (Michx.) Nash, little bluestem, and *Sorghastrum nutans* (L.) Nash, Indian grass, from local sources, was germinated in May 1988 in the greenhouse and transplanted at the Arboretum in July.

Plants at the Arboretum were mulched with wood chips over a geofabric landscape mat to control weeds. No mulch was used at St. Paul, however, straw bales were placed over the crowns the first winter (1987–88). Supplemental irrigation was applied as necessary to equal approximately 2.5 cm (1 in) per week during the summer. A natural organic fertilizer was applied in mid-summer at approximately .45 kg per 182 $m^2$ (1 lb N per 600 $ft^2$). In early April of each year, plants were cut back manually or burned to remove the previous years' growth.

Hardiness was evaluated by visual observations each spring in early June. Plants were classified into one of three catagories: 1) good survival, no injury; 2) visible injury, no survival some years; and 3) died more than one year.

Some of the more popular grasses that did not survive the winter of 1989-90 were replanted in the spring of 1990.

## Results and Discussion

The winter of 1989–90 resulted in damage to many ornamentals, due to little snow cover, and December temperatures of –25°C (–13°F), (Fig. 1). Root zone temperature at a depth of 5 cm (2 in) reached –10°C (14°F) during this time (Fig. 1).

During the winter of 1992–93 there was also little or no snow cover in December; this combined with low air temperatures resulted in injury to some grasses. The other four winters in this study consisted of average air temperatures with adequate snow cover on the test sites.

Eighty-five (85) grasses, survived the six winters, and are considered hardy in USDA Zone 4a, Table 1. Future research may modify this list, but to date, these entries appear to be appropriate for landscape and nursery use this far north. Thirty-five, classified as marginally hardy, were rated as 1) showed injury; or 2) did not survive at least one of the years of the test. Finally, 44 entries did not survive beyond two years, are not considered to be sufficiently hardy and were classified as poor for Zone 4a.

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**Table 1. Ornamental Grasses, sedges and rushes grown at the Minnesota Landscape Arboretum, 1987-1992.**

| Botanical name[z] | Common name | Survival | | |
|---|---|---|---|---|
| | | good | injury | poor |
| *Acorus calamus* L. | sweet flag | x | | |
| *A. calamus* 'Variegatus' | variegated sweet flag | x | | |
| *Alopecurus pratensis* L. 'Aureus' | yellow foxtail | x | | |
| *Arrhenatherum elatius* L. 'Variegatum' | bulbous oatgrass | x | | |
| *Arundo donax* L. | giant reed | | | x |
| *A. donax* 'Variegata' | variegated giant reed | | | x |
| *Arundo plinii* Turra. | dwarf reed | | | x |
| *Bouteloua curtipendula* (Michx.)Torr. | side oats grama | x | | |
| *Briza media* L. | quaking grass | | | x |
| *Calamagrostis* x *acutiflora* (Schrad.)DC. 'Karl Foerster' | feather reedgrass | x | | |
| (synonym *Calamagrostis* x *acutiflora* 'Stricta') | | | | |
| *Calamagrostis brachytricha* (Steud.) Hack. | fall blooming reedgrass | x | | |
| *Carex buchananii* Berggr. | leatherleaf sedge | | | x |
| *C. comans* Berggr. | New Zealand sedge | | | x |
| *C. digitata* L. | finger sedge | x | | |
| *C. flacca* Schreb. | blue sedge | x | | |
| *C. flagelifera* Colenso | weeping brown New Zealand sedge | | | x |
| *C. flava* L. | yellow sedge | x | | |
| *C. grayi* Carey | Gray's sedge | x | | |
| *C. montana* L. | mountain sedge | x | | |
| *C. morrowi* Boot. 'Old Gold' | yellow variegated sedge | | | x |
| *C. morrowi* Boot. 'Variegata' | variegated sedge | | | x |
| *C. muskingumensis* Schweinf. | palm sedge | x | | |
| *C. nigra* L. Reichard | black flowering sedge | x | | |
| *C. ornithopoda* Willd. | birdsfoot sedge | | | x |
| *C. ornithopoda* 'Variegata' | variegated birdsfoot | | | x |
| *C. pendula* Huds. | drooping sedge | | | x |
| *C. pilulifera* L.'Tinney's Princess' | silver striped sedge | | | x |
| *C. plantaginea* Lam. | plantain leaved sedge | | | x |
| *C. speciosa*[y] 'Velebit Humilis' | velvet sedge | x | | |
| *C. sylvatica* Huds. | forest sedge | | x | |
| *C.* x 'The Beatles' | mop-head sedge | | x | |
| *C. umbrosa* Host. | umbrosa sedge | x | | |
| *Chasmanthium latifolium* (Mic.)Yat. | northern seaoats | | | x |
| *Dactylis glomerata* L. 'Variegata' | variegated orchardgrass | | | x |
| *Deschampsia caespitosa* L. Beauv. | tufted hairgrass | x | | |
| *D. caespitosa* 'Bronzeschleier' | bronze veil hairgrass | x | | |
| *D. caespitosa* 'Fairy's Joke' | fairy's joke hairgrass | x | | |
| *D. caespitosa* 'Goldgehaenge' | gold pendant hairgrass | x | | |
| *D. caespitosa* 'Scottland' | Scotland hairgrass | x | | |
| *Eragrostis trichodes* (Nutt.)Wood. | lovegrass | | | x |
| (*Erianthus ravennae* L.) see *Saccharum*,below | | | | |
| *Erianthus contortus* Baldw. ex Ell.1 | bent awn plumegrass | | | x |
| *Festuca alpestris* Roe.& Schul. 'Aureola' | alpine fescue | | | x |
| *Festuca amethystina* L. 'April Green' | april green fescue | | x | |
| *F. amethystina* 'Bronzeglanz' | bronzeluster fescue | x | | |
| *F. amethystina* 'Klose' | klose fescue | x | | |
| *F. amethystina* 'Superba' | supurba fescue | x | | |
| *Festuca cinerea* Vill. 'Blaufink' | blue finch fescue | x | | |
| *F. cinerea* 'Blauglut' | blue ember fescue | x | | |
| *F. cinerea* 'Blausilber' | blue silver fescue | x | | |
| *F. cinerea* 'Daeumling' | tom thumb fescue | x | | |
| *F. cinerea* 'Fruehlingsblau' | spring blue fescue | x | | |
| *F. cinerea* 'Harz' | harz blue fescue | x | | |
| *F. cinerea* 'Meerblau' | ocean blue fescue | x | | |
| *F. cinerea* 'Pallens' | pallens fescue | | x | |
| *F. cinerea* 'Sea Urchin' | sea urchin blue fescue | x | | |
| *F. cinerea* 'Solling' | solling blue fescue | x | | |
| *F. cinerea* 'Silberreiher' | silver heron fescue | | x | |
| *F. cinerea* 'Superba' | supurba blue fescue | x | | |
| *Festuca elegans*[y] | elegans fescue | | | x |
| *Festuca gautieri* (Hackel) K.Rechter | bearskin fescue | | | x |
| (synonym *Festuca scoparia* Kerner et Hack.) | | | | |
| *Festuca gautieri* 'Pic Carlit' | dwarf bearskin fescue | | | x |
| *Festuca gigantea* (L.) Vill. | giant fescue | | | x |
| *Festuca glacialis* Miegev. | glacier fescue | | | x |
| *Festuca mairei* St Yves | atlas fescue | | x | |
| *Festuca muelleri*[y] | mueller's fescue | x | | |
| *Festuca pseudeskia* Boiss. | Sierra Nevada fescue | | x | |
| *Festuca rupicaprina*[y] | fescue | | | x |
| *Festuca tenuifolia* Sibth. | fine leaved fescue | x | | |
| *Festuca vallesiaca* 'Glaucantha' | wallis fescue | | x | |

**Table 1. Ornamental Grasses, sedges and rushes grown at the Minnesota Landscape Arboretum, 1987-1992. (continued)**

| Botanical name[z] | Common name | Survival | | |
|---|---|---|---|---|
| | | good | injury | poor |
| *Hakonechloa macra* (Munro)Makino. | hakone grass | x | | |
| *H. macra* var. *aurea* | golden hakonechloa | | | x |
| *Helictotrichon sempervirens* (Ville.) Pilger. | blue oatgrass | x | | |
| *Holcus lanatus* L. | velvetgrass | | | x |
| *H. lanatus* 'Variegatus' | variegated velvetgrass | | | x |
| *Hystrix patula* Moench. | bottlebrush | x | | |
| *Imperata cylindrica* L. 'Red Baron' | Japanese bloodgrass | | | x |
| *Juncus effusus* L. | common rush | x | | |
| *Koeleria brevis* Steven | blue hairgrass | x | | |
| *Koeleria glauca* (Schkuhr) DC. | blue junegrass | | x | |
| *Leymus racemosus* (Lam.) Tzvelev. | giant blue rye | x | | |
| (synonym *Elymus giganteus* Vahl.) | | x | | |
| *Leymus arenarius* (L.) Hochst. | blue lymegrass | x | | |
| (synonym *Elymus arenarius* L.) | | | | |
| *Luzula nivea* (L.) DC. | snowy woodrush | | | x |
| *Luzula purpurea* (Mas.& Buch.)Link | purple woodrush | | x | |
| *Luzula sylvatica* (Huds.) Gaudin | greater woodrush | x | | |
| *L. sylvatica* (Huds.)Gaudin 'Hohe Tatra' | high tatra mt. rush | | x | |
| *Melica ciliata* L. | hairy mellic | | | x |
| *Millium effusum* L. | wood millet | | | x |
| *M. effusum* 'Aureum' | golden wood millet | | | x |
| *Miscanthus floridulus* (Labill.) Ward. | giant miscanthus | x | | |
| *Miscanthus oligostaschyus* Stapf. | small Japanese silvergrass | x | | |
| *Miscanthus sacchariflorus* (Maxim.)Hack | Chinese silvergrass | x | | |
| *Miscanthus sinensis* Anderss. | Japanese silvergrass | | x | |
| *M. sinensis* 'Autumn Light' | autumn light miscanthus | | x | |
| *M. sinensis* 'Condensatus' | purple-blooming miscanthus | | x | |
| *M. sinensis* 'Gracillimus' | maidengrass | | x | |
| *M. sinensis* 'Graziella'[x] | graziella miscanthus | x | | |
| *M. sinensis* 'Malepartus'[x] | malepartus miscanthus | x | | |
| *M. sinensis* 'Morning Light' | morning light miscanthus | | x | |
| *M. sinensis* 'November Sunset' | november sunset | | x | |
| *M. sinensis* 'Purpurascens' | red flame miscanthus | x | | |
| *M. sinensis* 'Sarabande'[x] | sarabande | | x | |
| *M. sinensis* 'Siberfedher' | silverfeather | x | | |
| *M. sinensis* 'Silberpfeil' | silverarrow miscanthus | | x | |
| *M. sinensis* 'Strictus' | porcupinegrass | | x | |
| *M. sinensis* 'Variegatus' | variegated miscanthus | | x | |
| *M. sinensis* 'Zebrinus' | zebragrass | | x | |
| *M. sinensis* 'Yaku Jima' | Yaku Jima miscanthus | | | x |
| *Miscanthus transmorrisonensis* Hayata. | evergreen miscanthus | | | x |
| *Molinia caerulea* (L.) Moench. | moorgrass | x | | |
| *M. caerulea* 'Heidebraut' | heather bride moorgrass | x | | |
| *M. caerulea* 'Moorhexe' | moorwitch moorgrass | x | | |
| *M. caerulea* 'Strahlenquelle' | fountain spray moorgrass | | x | |
| *M. caerulea* 'Variegata' | variegated moorgrass | | | x |
| *M. caerulea* ssp. arundinacea | tall moorgrass | x | | |
| *M. caerulea* 'Bergfreund' | mountain friend tall moorgrass | x | | |
| *M. caerulea* 'Skyracer' | skyracer tall moorgrass | x | | |
| *M. caerulea* 'Staefa' | stafa tall moorgrass | x | | |
| *M. caerulea* 'Transparent' | transparent tall moorgrass | x | | |
| *M. caerulea* 'Windspiel' | windplay tall moorgrass | x | | |
| *Panicum clandestinum* L. | deerstongue grass | x | | |
| *Panicum virgatum* L. | switchgrass | x | | |
| *P. virgatum* 'Haense Herms' | red switchgrass | x | | |
| *P. virgatum* 'Rehbraun' | red-brown switchgrass | x | | |
| *P. virgatum* 'Rotstrahlbusch' | red-rays switchgrass | x | | |
| *P. virgatum* 'Strictum' | tall switchgrass | x | | |
| *P. virgatum* 'Warrior'[w] | warrior switchgrass | x | | |
| *P. virgatum* 'Squaw'[w] | squaw switchgrass | x | | |
| *Pennisetum alopecuroides* (L.) Spreng. | fountain grass | | x | |
| (synonym *Pennisetum caudatum*) | | | | |
| *P. alopecuroides* 'Hameln' | dwarf fountain grass | | x | |
| *P. alopecuroides* 'Moudry' | black flowering fountain grass | | | x |
| (synonym *P. alopecuroides* 'Viridescens') | | | | |
| *P. alopecuroides* 'Weserbergland' | dwarf fountain grass | | x | |
| *Pennisetum flaccidum* Griseb. | meadow pennisetum | x | | |
| (synonym *Pennisetum incomptum*) | | | | |
| *Pennisetum orientale* Rich. | oriental fountain grass | | | x |
| *Phalarius arundinacea* L.'Picta' | ribbongrass | x | | |
| *P. arundinacea* var. *luteo-picta* | yellow ribbongrass | x | | |
| *P. arundinacea* 'Feesey's Form' | Feesey's form ribbongrass | x | | |

Table 1. Ornamental Grasses, sedges and rushes grown at the Minnesota Landscape Arboretum, 1987-1992. (continued)

| Botanical name[z] | Common name | Survival | | |
|---|---|---|---|---|
| | | good | injury | poor |
| *Poa alpina* L.'Vivipara' | alpine bluegrass | | | x |
| *Poa caesia* Sm. | alpine bluegrass | | x | |
| *Poa chaixii* Vill. | forest bluegrass | | x | |
| *Poa glauca* Vahl. | greenland bluegrass | | | x |
| *Saccharum ravennae* (L.) Murray | plumegrass | | | x |
| *Schizachyrium scoparium* (Michx.) Nash[v] (synonym *Andropogon scoparius* Michx.) Aldos; Little Camper; Blaze | little bluestem | x | | |
| *S. scoparium* (Michx.) Nash[v] (synonym *Andropogon scoparius*) Cimarron | little bluestem | | | x |
| *Sesleria autumnalis* (Scop.)Schulz. | autumn moorgrass | | x | |
| *Sesleria caerulea* (L.) Ard. | blue moorgrass | x | | |
| *Sesleria heufeliana* Schur. | green moorgrass | x | | |
| *Sesleria nitida* Ten. | grey moorgrass | x | | |
| *Spartina pectinata* Link. | cordgrass | x | | |
| *S. pectinata* 'Aureo-Marginata' | variegated cordgrass | x | | |
| *Spodiopogon sibericus* Trin. | spodiopogon | x | | |
| *Sporobolus heterolepsis* (A.Gray)A.Gray | prairie dropseed | x | | |
| *Sorghastrum nutans* (L.) Nash.[v] Holt; Osage; Oto; Rumsey | Indian grass | x | | |
| *Stipa barbata* Desf. | feathergrass | | | x |
| *Stipa capillata* L. | feathergrass | | | x |
| *Stipa extremorientalis* Hara. | eastern feathergrass | x | | |
| *Stipa gigantea* Lag. | giant feathergrass | | x | |
| *Stipa pennata* L. | feathergrass | | x | |
| *Stipa rubens*[y] | feathergrass | | | x |
| *Themeda triandra* Forssk. 'Japonica' | Japanese themeda | x | | |

[z]Plants are listed with names as received, except where synonyms apply. References for nomenclature are 2, 3, 4 and 5.

[y]No reference can be found for species name.

[x]Planted in 1990.

[w]Planted in 1989.

[v]Planted in 1988.

Popular genera such as *Calamagrostis*, *Festuca*, *Molinia*, *Spodiopogon*, and *Deschampsia* appear to be reliably hardy in Zone 4a. *Deschampsia* may be difficult to establish, requiring irrigation, but exhibits adequate cold tolerance.

*Miscanthus* is of great interest as an ornamental and is variable in hardiness. *Miscanthus sacchariflorus*, Chinese silvergrass, is somewhat common and very hardy. It even appears to have become naturalized in parts of central Minnesota. It is occasionally seen growing along roadsides or in ditches. In addition, it develops an extensive and robust rhizome mat making it a potential aggressive invader. It blooms reliably in early August, and exhibits showy bright orange fall color. Plants of Chinese silvergrass are propagated asexually, by rhizome division, and therefore show no variation.

Another species, *Miscanthus sinensis*, forms clumps, and exhibits great variation, with nearly 40 named cultivars in the trade. Unfortunately, several of these variants did not survive or showed major injury during the years of this test and are not consistently hardy in Minnesota. Table 1 lists the *Miscanthus* cultivars included in this study that were marginally hardy.

Two *Miscanthus* cultivars which did show adequate hardiness and survived all six years in this test were 'Purpurascens' and 'Silver Feather'. These two *Miscanthus* are good selections for USDA Zone 4a, since they form clumps, and do not have invasive rhizomes as *Miscanthus sacchariflorus*.

Two other species of *Miscanthus* also proved hardy. *Miscanthus oligostachyus*, small Japanese silvergrass, grows to 1–1½ m (3–5 ft) tall, and flowers in early August with short, bamboo-like leaves forming a dense clump. *Miscanthus floridulus*, giant miscanthus, grows 2–3½ m (8–10 ft) tall, with huge bamboo-like culms. This species never flowered in our trials. It formed a large clump, and attracted attention because of its stiff towering culms.

*Pennisetum alopecuroides* 'Moudry' (synonym *P. alopecuroides* 'Viridescens'), black flowering fountain grass, did not survive and is listed as non-hardy. Other cultivars of *P. alopecuroides* and the species showed variablity in winter injury, from death to no injury, and are classified as marginally hardy. In summary, 85 ornamental grasses survived and are considered suitable for landscape use as far north as USDA Zone 4a.

Hardiness zones cannot always predict the survival of herbaceous plants, including ornamental grasses. Snowfall, microclimate, exposure, etc., can play a major role in protection of the crown or growing point of herbaceous plants. A reliable snow cover, such as on the north side of a building, may provide adequate protection for a plant that would not survive on the exposed southern side of the same building. Therefore the hardiness of most perennials does not always match the hardiness zone for which they are rated.

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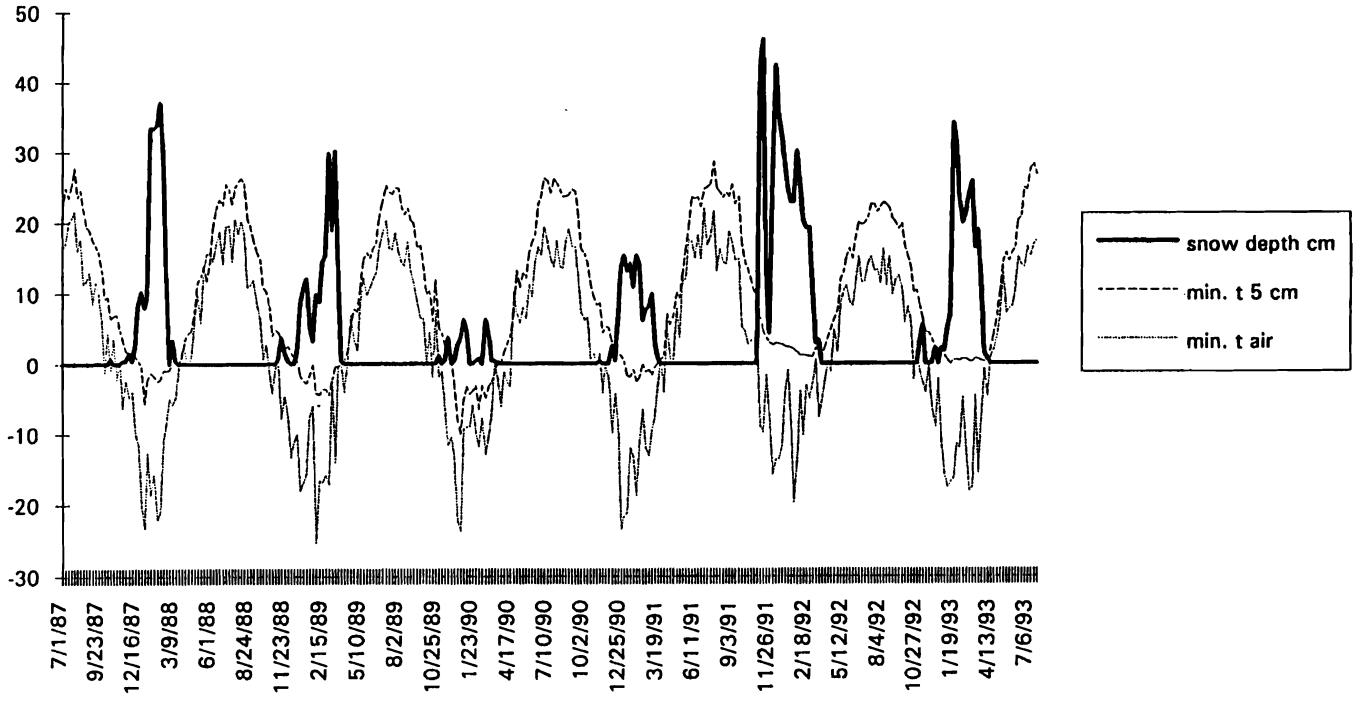


**Fig.1. Minimum air, 5 cm soil temperature and snow depth (cm) for July 1987 to July 1993 for Chanhassen, Minnesota, USDA Zone 4a. Y axis represents °C for temperature and cm for snow depth.**


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