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# GERMPLASM RESOURCES INFORMATION NETWORK AND *EX SITU* CONSERVATION OF GERMPLASM

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**Abstract.** The Germplasm Resources Information Network (GRIN), the master database of the National Plant Germplasm System, was queried to measure the usefulness and limitations of *ex situ* germplasm collections for prairie research. A list of 862 taxa of grasses and forbs native to the prairies of the midwestern United States was checked in a stepwise fashion against recognized names in the GRIN database. Each species was checked against recognized names in the taxonomy area of the database. For each recognized species, the accessions area was queried to see if any populations were entered in the database. The inventory area was then searched to learn if samples of these populations were available for free distribution to researchers and to determine which site is responsible for the maintenance of each available population. Populations of 146 taxa of prairie plants were represented in the GRIN database. Another major *ex situ* source of prairie plant germplasm was not accessible through the GRIN database. The USDA Soil Conservation Service Plant Materials Centers evaluate native species for their potential use in conservation and windbreak plantings. The holdings of the Plant Materials Centers and other institutions not yet part of the GRIN database are briefly discussed.

**Key Words.** germplasm, genetic diversity, database, seed sources, National Plant Germplasm System, species introduction

## INTRODUCTION

The Agricultural Research Service of the U. S. Department of Agriculture coordinates a national network to maintain germplasm of agronomic and horticultural crop plants and their relatives. This system, also known as the National Plant Germplasm System (NPGS), preserves hundreds of thousands of seed and vegetative samples of a wide range of genera at sites throughout the United States (Council for Agricultural Science and Technology 1985). These germplasm collections are used by plant breeders, pathologists, entomologists, botanists, anthropologists, and other researchers in many nations. Samples are provided by the NPGS for scientific research at no cost to the user.

However, the collections in the NPGS have not been widely used by prairie researchers or others studying North American plant communities. This may be due to a lack of pertinent information about the system. Now that most of the holdings of the NPGS can be searched, both by sites within the system and by the public, by using the Germplasm Resources Information Network (GRIN) database (Perry *et al.* 1988), a database search was initiated to determine the extent of the prairie plant germplasm held by the NPGS. This report summarizes the results of a database search conducted during the spring of 1988 and provides information that may be helpful for potential users of the NPGS.

## METHODS

During the spring of 1988, a list of species native to the prairies of the midwestern United States was compiled by checking habitats of all species described in the Flora of the Great Plains (Great Plains Flora Association 1986). To create a more complete listing, the initial compilation was supplemented by lists obtained from publications by Betz (1965) for Illinois, Morley (1969) for Minnesota, and Steyermark (1962) for Missouri. From these four sources, 862 taxa were identified that could be considered as native to the midwestern prairies.

These 862 taxa were then checked against the taxonomy area of the GRIN database. The taxa listed as valid names in the GRIN database were then checked for accession and inventory records. A hard copy of accession and inventory records was made from the database. Notes were taken on the availability of the accessions, the origins of the accessions, and the location of the site within the NPGS maintaining each accession.

## RESULTS

Of the 862 taxa identified from a search of midwestern floras, 295 were found in the GRIN database. Of these 295 taxa, 275 were found to be valid names, whereas the other 20 were listed as synonyms. That only about a third of the taxa were listed may reflect a natural bias in the NPGS to emphasize crop plants and their relatives.

The 275 valid taxa, plus the GRIN-recognized names for the 20 synonyms, were then checked against the accession and inventory areas of the database to see if any populations of these species were being maintained in the NPGS. Only 146 taxa, of the original 862, were represented in the GRIN database with populations of U.S. or Canadian origin. These 146 taxa are listed in Table 1, along with the number of accessions that have inventory which is actually available for distribution. The site within the NPGS from which they can be obtained is also shown. Table 2 lists addresses for sites within the NPGS that maintain populations of prairie plant germplasm as indicated in the GRIN database search.

## DISCUSSION

The sample of prairie plant germplasm represented in Table 1 is not extensive, but it does include some important collections. Many of the populations of big bluestem (*Andropogon gerardii* Vitman) and switchgrass (*Panicum virgatum* L.) held at the National Seed Storage Laboratory serve as reserve collections for a large nursery of native grasses established in the 1970s (Ross 1973 and 1974). This nursery is presently maintained by Dr. Arvid Boe, Department of Plant Science, South Dakota State University, Brookings, South Dakota 57707. Another important holding is the wild sunflower (*Helianthus spp.*) nursery at the Plant Introduction Station in Ames, Iowa. Sunflower is one of only a few important crops domesticated from germplasm native to North American prairies (Heiser 1978). In addition, a good cross section of western range grasses and legumes can be found at the Plant Introduction Station in Pullman, Washington.

The lack of good representation of many of the other prairie genera should not be too surprising, as the core of the NPGS includes the working collections of the four Regional Plant Introduction Stations. These introduction stations were originally established primarily to handle the maintenance of foreign germplasm of major crops (Wilson *et al.* 1985). As researchers consider more carefully the economic value of native species, representation of native species in the NPGS should increase.

Another branch of the United States Department of Agriculture works with native germplasm outside of the NPGS. Soil Conser-

**Table 1. Prairie plant germplasm in the National Plant Germplasm System.**

<i>Taxon</i>	<i>Site</i> <sup>1</sup>	<i>Total number accessions</i>	<i>Number available</i>
<i>Acacia angustissima</i> (P. Mill.) Kuntze	KPMC	8	8
<i>Achillea millefolium</i> L.	W-6	2	2
<i>Allium cernuum</i> Roth	W-6	1	0
<i>Amelanchier alnifolia</i> (Nutt.) Nutt	CCOR	20	20
	NC-7	5	3
	CPMC	1	0
<i>Ammoselinum popei</i> Torr. & Gray	NSSL	1	— <sup>2</sup>
<i>Amorpha canescens</i> Pursh	NC-7	9	0
	KPMC	1	1
<i>Amorpha nana</i> Nutt.	NPMC	1	0
<i>Andropogon gerardii</i> Vitman	NSSL	1063	— <sup>2</sup>
	S-9	19	14
	CPMC	1	0
	KPMC	2	1
<i>Andropogon hallii</i> Hack.	NSSL	3	— <sup>2</sup>
	S-9	5	1
	KPMC	4	1
<i>Andropogon ternarius</i> Michx.	S-9	1	1
<i>Anemone cylindrica</i> Gray	NSSL	1	2
<i>Asclepias tuberosa</i> L.	NPMC	18	10
<i>Aster ericoides</i> L.	KPMC	33	2
<i>Aster novae-angliae</i> L.	NPMC	50	16
<i>Astragalus aboriginum</i> Richards.	W-6	1	1
<i>Astragalus adsurgens</i> var. <i>robustior</i> Hook.	W-6	2	2
<i>Astragalus agrestis</i> Dougl. ex D. Don	W-6	1	0
<i>Astragalus bisulcatus</i> (Hook.) Gray	W-6	2	2
<i>Astragalus canadensis</i> L.	W-6	5	5
<i>Astragalus crassicaulus</i> Nutt.	W-6	2	1
<i>Astragalus drummondii</i> Dougl. ex Hook.	W-6	1	1
<i>Astragalus flexuosus</i> (Hook.) G. Don.	W-6	2	2
<i>Astragalus lindheimeri</i> Engelm. ex Gray	W-6	1	1
<i>Astragalus missouriensis</i> Nutt.	W-6	2	2
<i>Astragalus racemosus</i> Pursh	W-6	1	1
<i>Atriplex heterosperma</i> Bunge	W-6	1	0
<i>Baptisia australis</i> (L.) R. Br.	BPMC	1	1
	KPMC	3	2
<i>Buchloe dactyloides</i> (Nutt.) Engelm.	W-6	1	1
<i>Calamovilfa longifolia</i> (Hook.) Scribn.	CPMC	1	0
	NC-7	3	0
<i>Calylophus serrulatus</i> (Nutt.) Raven	NPMC	1	0
<i>Carex lasiocarpa</i> var. <i>latifolia</i> (Boeckl.) Gilly	W-6	1	0
<i>Carex praegracilis</i> W. Boott	W-6	1	0
<i>Ceanothus americanus</i> L.	NPMC	2	0
<i>Ceanothus herbaceus</i> var. <i>pubescens</i> (Torr. & Gray) Shinnars	NC-7	1	0
<i>Cephalanthus occidentalis</i> L.	NPMC	1	0
<i>Chamaecrista nictitans</i> (L.) Moench	NSSL	1	— <sup>2</sup>
<i>Crataegus crus-galli</i> L.	CCOR	3	3
<i>Crataegus succulenta</i> Schrad. ex Link	CCOR	1	1
<i>Croton capitatus</i> Michx.	KPMC	2	2

Table 1. Continued

Taxon	Site <sup>2</sup>	Total number accessions	Number available
<i>Dalea aurea</i> Nutt. ex Pursh	KPMC	2	2
<i>Dalea candida</i> Michx. ex Willd.	NPMC	3	0
	NC-7	1	0
<i>Dalea enneandra</i> Nutt.	NC-7	4	0
<i>Dalea multiflora</i> (Nutt.) Shinnery	NPMC	1	0
<i>Dalea purpurea</i> Vent.	NSSL	1	— <sup>2</sup>
	NPMC	2	0
<i>Daucus pusillus</i> Michx.	NC-7	3	0
	NSSL	1	— <sup>2</sup>
<i>Deschampsia caespitosa</i> (L.) Beauv.	W-6	9	8
<i>Desmanthus illinoensis</i> (Michx.) MacM. ex B.L. Robins & Fern.	KPMC	21	8
	CPMC	1	1
	S-9	2	1
	NSSL	1	— <sup>2</sup>
<i>Distichlis spicata</i> (L.) Greene	CPMC	7	0
<i>Distichlis stricta</i> (Torr.) Rydb.	CPMC	7	0
<i>Echinacea pallida</i> var. <i>angustifolia</i> (DC.) Cronq.	NC-7	1	1
	KPMC	1	1
<i>Elymus canadensis</i> L.	NSSL	2	— <sup>2</sup>
	W-6	27	27
	KPMC	15	8
<i>Elymus virginicus</i> L.	W-6	31	31
	KPMC	4	1
<i>Elytrigia dasystachya</i> (Hook.) Love & Love	NSSL	3	— <sup>2</sup>
	W-6	7	7
<i>Eragrostis secundiflora</i> Presl.	W-6	1	1
<i>Eragrostis trichodes</i> (Nutt.) Wood	NSSL	4	— <sup>2</sup>
	W-6	3	3
<i>Festuca ovina</i> L.	W-6	8	8
<i>Festuca scabrella</i> Torr. ex Hook.	W-6	6	5
<i>Fragaria vesca</i> L.	CCOR	25	20
<i>Fragaria vesca</i> ssp. <i>bracteata</i> (Heller) Staudt.	CCOR	2	2
<i>Fragaria virginiana</i> Duchn.	CCOR	34	27
<i>Fragaria virginiana</i> ssp. <i>glauca</i> (S. Wats.) Staudt.	CCOR	23	21
<i>Fraxinus pennsylvanica</i> Marsh.	NSSL	1	— <sup>2</sup>
	KPMC	1	1
	NC-7	3	0
<i>Glycyrrhiza lepidota</i> Pursh	W-6	6	0
<i>Hedysarum boreale</i> ssp. <i>mackenzii</i> (Richards.) Welsh	NE-9	1	0
<i>Helianthus grosseserratus</i> Martens	NC-7	34	1
<i>Helianthus maximilianii</i> Schrad.	NC-7	57	0
	NPMC	3	2
	NSSL	1	— <sup>2</sup>
<i>Helianthus mollis</i> Lam.	NC-7	29	0
	KPMC	1	1
	CPMC	3	0
<i>Helianthus occidentalis</i> Riddell	NC-7	6	0
<i>Helianthus occidentalis</i> ssp. <i>plantagineus</i> (Torr. & Gray) Heiser	NC-7	11	0
<i>Helianthus rigidus</i> (Cass.) Desf.	NC-7	22	3
<i>Helianthus rigidus</i> ssp. <i>subrhomboides</i> (Rydb.) Heiser	NC-7	12	0

Table 1. Continued

Taxon	Site <sup>1</sup>	Total number accessions	Number available
<i>Helianthus salicifolius</i> A. Dietr.	NC-7	5	0
	CPMC	1	0
<i>Hilaria jamesii</i> (Torr.) Benth.	S-9	1	0
	NSSL	1	— <sup>2</sup>
	NPMC	1	0
<i>Indigofera miniata</i> var. <i>leptosepala</i> (Nutt.) B.L. Turner	S-9	2	0
<i>Iris missouriensis</i> Nutt.	W-6	1	0
<i>Koeleria cristata</i> (L.) Pers.	W-6	2	2
	NSSL	1	— <sup>2</sup>
<i>Lathyrus polymorphus</i> Nutt.	W-6	2	1
<i>Lespedeza capitata</i> Michx.	S-9	23	0
	NSSL	15	— <sup>2</sup>
	NPMC	17	0
	KPMC	1	1
<i>Lespedeza stuevei</i> Nutt.	KPMC	2	1
<i>Lesquerella auriculata</i> (Engelm. & Gray) S. Wats.	W-6	1	0
<i>Lesquerella gracilis</i> (Hook.) S. Wats.	W-6	2	0
<i>Leymus cinereus</i> (Scribn. & Merr.) Love	NSSL	1	— <sup>2</sup>
	W-6	10	8
<i>Leymus innovatus</i> (Beal) Pilger	W-6	9	9
<i>Liatris punctata</i> Hook.	W-6	5	0
	KPMC	2	1
<i>Liatris pycnostachya</i> Michx.	NSSL	1	— <sup>2</sup>
<i>Liatris spicata</i> (L.) Willd.	NPMC	1	0
<i>Lotus purshianus</i> (Benth.) Clem. & Clem.	NE-9	3	3
<i>Lupinus argenteus</i> Pursh	W-6	9	5
<i>Lupinus argenteus</i> var. <i>tenellus</i> (Dougl. ex G. Don) D. Dunn	W-6	14	10
<i>Lupinus caudatus</i> Kellogg	W-6	4	4
<i>Lupinus pusillus</i> Pursh	W-6	1	1
<i>Lupinus sericeus</i> Pursh	W-6	28	24
<i>Lupinus sericeus</i> var. <i>egglestonianus</i> C.P. Sm.	W-6	4	2
<i>Lupinus sericeus</i> var. <i>flexuosus</i> (Lindl. ex J.G. Agardh) C.P. Sm.	W-6	20	16
<i>Lupinus sericeus</i> var. <i>maximus</i> C.P. Sm. ex Fleak & D. Dunn	W-6	2	2
<i>Monarda citriodora</i> Cerv. ex Lag.	NC-7	1	0
<i>Monarda fistulosa</i> L.	NC-7	16	0
<i>Monarda pectinata</i> Nutt.	NC-7	1	0
<i>Monarda punctata</i> L.	NC-7	2	1
<i>Oenothera macrocarpa</i> Nutt.	NSSL	3	— <sup>2</sup>
<i>Oenothera speciosa</i> Nutt.	KPMC	1	1
<i>Oenothera villosa</i> Thunb.	NSSL	42	— <sup>2</sup>
<i>Oxytropis campestris</i> var. <i>gracilis</i> (A. Nels.) Barneby	W-6	1	1
<i>Oxytropis deflexa</i> (Pallas) DC.	W-6	4	3
<i>Oxytropis lambertii</i> Pursh	W-6	1	1
<i>Oxytropis sericea</i> Nutt. ex Torr. & Gray	W-6	2	2
<i>Panicum obtusum</i> H.B.K.	S-9	2	0
	KPMC	3	1
	NPMC	1	1
	NSSL	141	— <sup>2</sup>
<i>Panicum virgatum</i> L.	S-9	23	20
	BPMC	4	1
	CPMC	6	1
	KPMC	1	1
	QPMC	1	1

Table 1. Continued

Taxon	Site <sup>1</sup>	Total number accessions	Number available
<i>Pediomelum cuspidatum</i> (Pursh) Rydb.	NPMC	3	0
<i>Penstemon albidus</i> Nutt.	NC-7	1	0
<i>Penstemon secundiflorus</i> Benth	NC-7	1	0
<i>Phalaris caroliniana</i> Walt.	NPMC	1	0
<i>Phyla cuneifolia</i> (Torr.) Greene	NC-7	1	0
<i>Poa arida</i> Vasey	CPMC	3	0
	NSSL	1	— <sup>2</sup>
<i>Poa canbyi</i> (Scribn.) Piper	W-6	6	6
<i>Poa interior</i> Rydb.	W-6	4	4
<i>Psoralidium tenuiflorum</i> (Pursh) Rydb.	KPMC	9	2
<i>Pycnanthemum tenuifolium</i> Schrad.	NC-7	7	0
<i>Pycnanthemum virginianum</i> (L.) Durand & Jackson	NC-7	8	0
<i>Rhus aromatica</i> var. <i>serotina</i> (Greene) Rehd.	NC-7	1	1
<i>Rhus copallina</i> L.	NC-7	18	10
	KPMC	1	1
<i>Rosa setigera</i> Michx.	NC-7	3	3
<i>Rosa woodsii</i> Lindl.	NC-7	4	4
<i>Rubus allegheniensis</i> Porter	CCOR	5	5
<i>Rubus flagellaris</i> Willd.	CCOR	3	3
<i>Rudbeckia hirta</i> L.	BPMC	1	1
	NPMC	3	4
<i>Salix humilis</i> var. <i>tristis</i> (Ait.) Griggs	CPMC	1	0
<i>Salvia azurea</i> var. <i>grandiflora</i> Benth.	NC-7	11	0
	NSSL	1	— <sup>2</sup>
<i>Schedonnardus paniculatus</i> (Nutt.) Trel.	NC-7	1	0
<i>Schizachyrium scoparium</i> (Michx.) Nash	NSSL	6	— <sup>2</sup>
	S-9	26	22
	CPMC	1	1
	KPMC	8	2
	NPMC	2	1
	W-6	2	2
<i>Schrankia nuttallii</i> (DC. ex Britt. & Rose) Standl.	W-6	2	0
<i>Shepherdia argentea</i> (Pursh) Nutt.	NC-7	1	1
<i>Silphium laciniatum</i> L.	W-6	2	0
<i>Sorghastrum nutans</i> (L.) Nash	NSSL	12	— <sup>2</sup>
	S-9	12	7
	CPMC	20	8
	KPMC	3	2
<i>Spartina pectinata</i> Link	NPMC	13	1
	W-6	2	2
<i>Stachys palustris</i> L.	NC-7	1	0
<i>Stachys tenuifolia</i> Willd.	NC-7	1	0
<i>Stipa comata</i> Trin. & Rupr.	W-6	2	2
<i>Stipa spartea</i> Trin.	W-6	1	1
<i>Stipa viridula</i> Trin.	NSSL	2	— <sup>2</sup>
	W-6	6	6
<i>Strophostyles helvola</i> (L.) Ell.	CPMC	2	2
<i>Tephrosia virginiana</i> (L.) Pers.	KPMC	2	2
<i>Tridens muticus</i> (Torr.) Nash	NC-7	1	1
	KPMC	2	2
<i>Verbena halei</i> Small	NC-7	1	0
<i>Vicia americana</i> Muhl. ex Willd.	S-9	1	0
<i>Yucca glauca</i> Nutt. ex Fraser	NC-7	4	0

<sup>1</sup>For explanation of site abbreviations see Table 2.<sup>2</sup>The National Seed Storage Laboratory (NSSL) will only provide samples to researchers if there is no other source of the material, either within the NPGS or through commercial sources.

**Table 2. Addresses for National Plant Germplasm System Sites with available prairie plant germplasm.****Plant Introduction Stations and Addresses:**

NC-7	- North Central Regional Plant Introduction Station Iowa State University Ames, Iowa 50011
NE-9	- Northeastern Regional Plant Introduction Station New York State Agricultural Experiment Station Geneva, New York 14456
S-9	- Southern Regional Plant Introduction Station 1109 Experiment Griffin, Georgia 30223-1797
W-6	- Western Regional Plant Introduction Station Washington State University 59 Johnson Hall Pullman, Washington 99164-6402

**Plant Materials Centers and Addresses:**

BPMC	- Big Flats Plant Materials Center RD #1, Box 360A Corning, New York 14830
CPMC	- Coffeeville Plant Materials Center Route 3, Box 215A Coffeeville, Mississippi 38922
KPMC	- Knox City Plant Materials Center Route 1, Box 155 Knox City, Texas 79529
NPMC	- National Plant Materials Center BARC-East, Building 509 Beltsville, Maryland 20705
QPMC	- Quicksand Plant Materials Center Quicksand, Kentucky 41363

**Other Sites and Addresses:**

CCOR	- National Clonal Germplasm Repository 33447 SE Peoria Road Corvallis, Oregon 97333
NSSL	- National Seed Storage Laboratory Colorado State University Fort Collins, Colorado 80523

vation Service Plant Materials Centers evaluate populations of a broad range of native species for their potential as windbreak and conservation plants (Soil Conservation Service 1979). A few of the populations held by the Plant Materials Centers are listed in the GRIN database, but more comprehensive lists can be obtained from the National Plant Materials Center (BARC-East, Building 509, Beltsville, Maryland 20705). Plant Materials Centers known for their collections of prairie plants include those at Manhattan, Kansas; Bismarck, North Dakota; Elsberry, Missouri; and Knox City, Texas.

Although the prairie plant germplasm held in the NPGS may be limited in scope, scientists may still find it useful for a number of purposes. Most NPGS collections are well documented geographically and taxonomically, and they may be useful for comparative studies or even for particular problems in prairie establishment or restoration. Obtaining documented seed samples from native stands can be a tedious process, which depends greatly upon proper timing and the right environmental conditions for seed production. Sites in the NPGS can provide specific documentation about collections and actual seed samples at no charge to *bona fide* researchers. If inventory is available, samples can usually be sent in a matter of weeks. When inventory is not available, ar-

rangements can often be made to expedite seed increases. Some germplasm collections may even represent populations that are no longer growing *in situ*.

As scientists who work with prairie plants learn more about the NPGS, personal connections may be made that will lead to greater use of this resource and allow for a larger number of accessions of prairie species to be brought into the NPGS for preservation and the benefit of all.

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