

# Black Hills National Forest Botanical Resources Update

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## Montane Grassland Monitoring

Black Hills montane grasslands are diverse, wildflower-rich ecosystems endemic to the Black Hills. These graminoid dominated communities are generally found at 5,900 feet or higher on the Limestone Plateau in the western and northwestern Black Hills. Since the settlement of the Black Hills in the 1800's, montane grasslands have been severely reduced due to conversion to hay meadows and home sites (NatureServe 2011). As a result, The Natural Heritage Network and The Nature Conservancy have ranked this vegetation type as G1S1 (globally and state imperiled) (NatureServe 2011). The vegetation is typically graminoid-dominated but forb-rich. Dominant graminoids often include *Sporobolus heterolepis* (prairie dropseed), *Poa pratensis* (Kentucky bluegrass), *Nassella viridula* (green needlegrass), *Achnatherum richardsonii* (Richardson's needlegrass), *Danthonia intermedia* (timber oatgrass), *Elymus trachycaulis* ssp. *subsecundus* (slender wheatgrass), and *Hesperostipa spartea* (porcupinegrass).

A monitoring protocol has been developed to detect long term trends in grazed montane grasslands. The purpose of montane grassland monitoring is to collect baseline data to be used to detect changes in grassland condition. The monitoring will be able to detect changes in species composition, frequency and abundance as well as detect changes in abundance of plant functional groups such as grasses, shrub and forbs.

### Monitoring Objectives

- Document changes in species composition and species foliar cover.
- Describe and evaluate the current vegetation community and condition of Black Hills montane grasslands.
- Document any changes in vegetation community and condition occurring on Black Hills montane grasslands.
- Identify trends that can be used to guide management of Black Hills montane grasslands.



### Methods

**Data collection** - Sampling began in the summer of 2011 with the establishment of three permanent 100 meter long transects in three different pastures of the Porcupine Allotment. Three more plots were added in 2012 and one in 2013 for a total of 7 plots. Each transect consists of 20, 1 m<sup>2</sup> frames, with two nested 0.10m<sup>2</sup> (20x50 cm) frames randomly placed inside (2 of 10 possible locations).

The mean cover value of each species, collected from the 2 small frames, is used for analysis, with the 1m frame serving as the sampling unit. Cover is recorded using Daubenmire cover classes (Daubenmire 1959) for all vascular species within the 0.10 m<sup>2</sup> frames and frequency of all vascular species is recorded within the 1m<sup>2</sup> frame. Cover is also recorded for the following functional groups: total graminoids, total forbs, and total shrubs within the 0.10 m<sup>2</sup> frames at two of the sites.

**Statistical analysis** - Non-metric multidimensional scaling ordination with 2 axes will be used to examine patterns among sampling units. Species indicator analysis will be used to examine how well species indicate montane grasslands versus non-montane grasslands. Total species richness and diversity will be reported for each transect. All statistical analyses will be conducted using the statistical software PC-ORD (McCune and Mefford 1999).

### Preliminary Results

Preliminary data analysis was done on the three transects read in 2011. One year of data collection is insufficient to draw conclusions of montane grassland condition or trends. However, based on preliminary analysis of species composition we see that the transects are forb dominated. The montane grassland sites monitored in 2011 had between 31 and 36% graminoid cover while forbs had between 59 and 64% cover.



Montane Grassland in the Porcupine Grazing Allotment.

Transect Name	Cover of native indicator grasses (%)	Cover of undesirable native forbs (%)	Cover of introduced forbs (%)	Grass to forb ratio	H' Diversity
Antelope	10.2	13.1	1.7	0.92:1	2.023
Babblington	35.2	9.3	1.2	0.99:1	2.038
Yount	34.4	1.75	1.1	--	2.064

Table 1. Native indicator grasses include *Sporobolus heterolepis* (prairie dropseed), *Achnatherum richardsonii* (Richardson's needlegrass), *Danthonia intermedia* (timber oatgrass), *Elymus trachycaulis* ssp. *subsecundus* (slender wheatgrass), *Hesperostipa spartea* (porcupinegrass), *Carex* sp. (sedges), and *Nassella viridula* (green needlegrass). Undesirable native forbs include *Solidago rigida* (stiff goldenrod), *Artemisia ludoviciana* (white sagebrush), *Symphoricarpos* spp. and (snowberry). Grass to forb ratio and cover values (%) were calculated using Daubenmire cover class midpoints. Total grass cover was not recorded in the Yount pasture in 2011.

## Species of Local Concern Update

In 2011, the Black Hills National Forest revised the list of plant Species of Local Concern, adding four new species. In the last three years, we have added to our knowledge of these species in the Black Hills. Here are profiles for two of them.

### *Pinus flexilis* – limber pine

**GLOBAL** *Pinus flexilis* has a widespread, but patchy distribution from British Columbia and Alberta, Canada south through the Rocky Mountains and Great Basin with isolated populations in Arizona, California, Nebraska, North Dakota, and South Dakota. Generally it is found in high montane forests, often at timberline (Kral 1993). *P. flexilis* appears to need fire to stimulate regeneration (Blodgett 2009). Seeds are dispersed by birds especially Clark's nutcracker (*Nucifraga columbiana*, Blodgett 2009).

**BLACK HILLS** In the Black Hills, *P. flexilis* occurs within a three square mile area in the Black Elk Wilderness and Custer State Park. Black Hills sites are characterized by large granite outcrops with *P. flexilis* growing on north-facing, open, rocky sites, or partially shaded upper slopes with *Picea glauca* (white spruce), *Pinus ponderosa* (ponderosa pine), and *Juniperus communis* (common juniper). *P. flexilis* grows in cracks with little soil. Elevations range from 6,400 to 7,100 feet. A total of seventeen live trees in three populations occur on the Black Hills National Forest, most of which are saplings. A stand with more than 80 individuals occurs in Custer State Park.

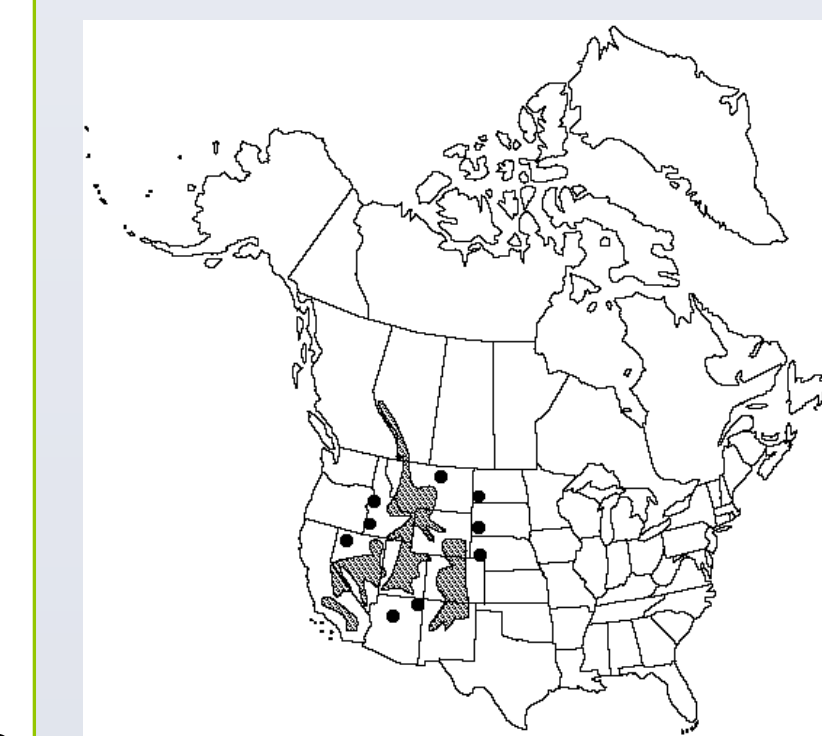
**THREATS** Threats to these populations include *Dendroctonus ponderosae* (mountain pine beetle), *Ips* sp. (wood engraving beetle), *Cronartium ribicola* (white pine blister rust), catastrophic wildfire, limited habitat, and loss of habitat due to climate change.

The two mature trees near Harney Peak are threatened by *D. ponderosae*, so the Forest annually places verbenone pouches on these and surrounding trees. Verbenone is the main component of an anti-aggregate pheromone released by pine beetles. Placing these pouches in an area signals to the pine beetles that the trees in that area already have been infested and discourages further attacks (Phero Tech 2000). Seeds were also collected and preserved from both the Black Hills National Forest and Custer State Park populations.

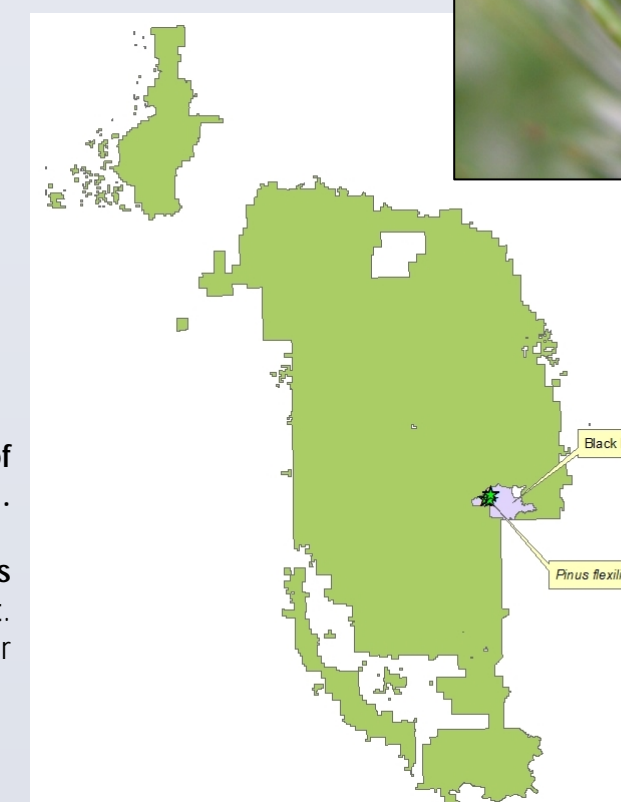
White pine blister rust is a disease caused by a non-native fungus called *Cronartium ribicola*. This fungus requires two species of plant to complete its life cycle; one is a 5-needle pine and the other is typically a *Ribes* sp. (currant). White pine blister rust is documented as affecting the *P. flexilis* population on Black Hills National Forest and has caused some mortality. The population is visited annually and cankers caused by white pine blister rust are removed if possible without killing the tree.



Left: *Pinus flexilis* in a granite outcrop near Harney Peak, Black Hills National Forest. Below: First year *P. flexilis* cone. Photo Credit: Cheryl Mayer



Above: Distribution of *Pinus flexilis* (Flora of North America North of Mexico).



Right: Known distribution on the Black Hills National Forest. Photo Credit: Cheryl Mayer

### Fun Facts:

- Also known as: *Alpinus flexilis*, pino torcido (ITIS 2014)
- Protected as a "Cactus, Yucca, or Christmas tree" in Nevada (USDA Plants)
- Listed as S1 (critically imperiled) in Nebraska, North Dakota, and South Dakota (NatureServe 2013)
- The oldest *P. flexilis* is over 2,000 years old (Schoettle 2004)
- Members of the Navajo used parts of the tree for several purposes, including in ceremonial rituals (including construction of a bow and arrow used in the Witch and Shooting Chants), in fever and cough medicine, and smoked it for "good luck" while hunting. The Montana Tribes, Apache, Chiricahua, and Mescalero roasted the seeds for food (University of Michigan 2014).

## *Mitella pentandra* – fivestamen miterwort

- Fun Facts:**
- Family: Saxifragaceae
  - Also known as *Pectiantia pentandra*
  - Reproduces by seed and through rooting of stolons (LBJ Wildflower Center 2014).



Clockwise from left: Known distribution of *Mitella pentandra* on the Black Hills National Forest, flowers of *M. pentandra*, distribution of *M. pentandra* (Flora of North America North of Mexico), and *M. pentandra* in flower.

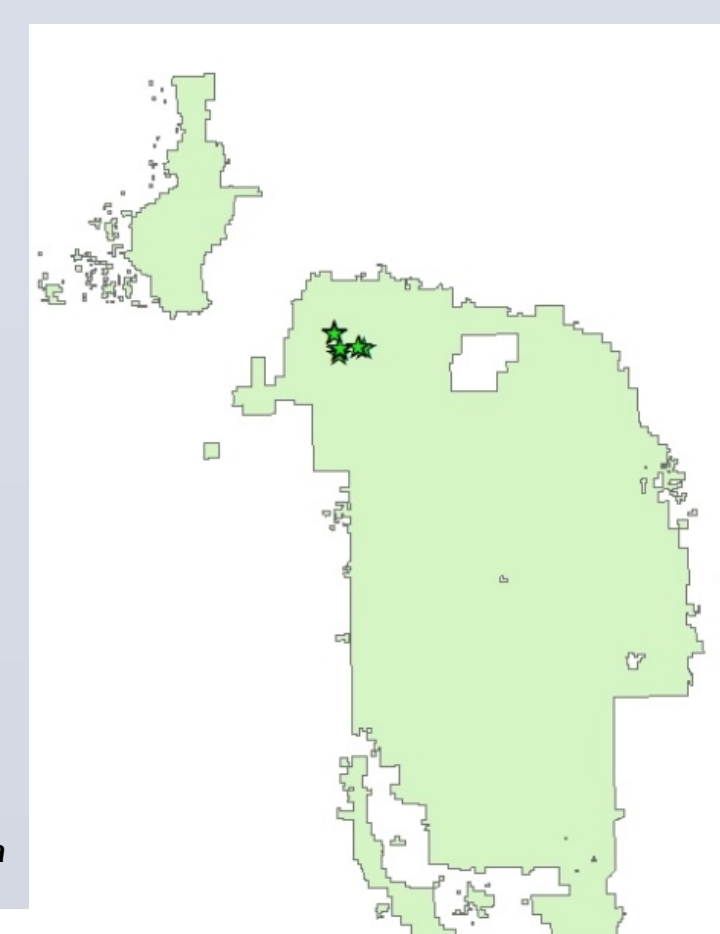


Photo Credit: Cheryl Mayer



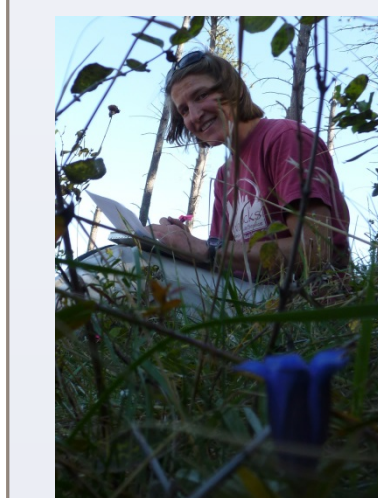
**GLOBAL** *Mitella pentandra* (fivestamen miterwort) occurs in western North America extending from Alaska south to central California and Colorado, reaching its eastern limit in the Black Hills. Rangeland habitat includes moist woods, stream banks, avalanche chutes, wet mountain meadows, and shaded banks (Soltis & Freeman 2009).

**BLACK HILLS** There are seven known occurrences in the Black Hills, all occurring in a seven square mile area in the vicinity of Tinton, South Dakota. Black Hills sites occur in *Picea glauca* (white spruce) and *Betula papyrifera*/*Corylus cornuta* (paper birch/beaked hazelnut) communities along small perennial and intermittent streams. Plants occur in mossy, moist to saturated, low-lying areas as well as seeps. *M. pentandra* is a facultative species in the Black Hills meaning that it is a hydrophyte that can occur in both wetland and non-wetland habitat (USDA NRCS 2014). Elevations in the Black Hills range from 5,300 to 6,280 feet. The Rocky Mountain Research Station developed a GIS based habitat model that helped us focus our survey for this species. These surveys were initiated in 2013 and led to the discovery of a new occurrence.

**THREATS** Generally *M. pentandra* distribution is limited by its short dispersal range; they are dispersed by falling drops of water splashing propagules out of a splash cup (Savile 1979) as well as from stolons (LBJ Wildflower Center 2014). On the Black Hills, *M. pentandra* is most susceptible to impacts associated with livestock and mining activities.

## Who are we?

Nick Drozda, Bearlodge District Botanist, has a Bachelor's degree in Biology with a minor in Chemistry from Northern Kentucky University and studied the Aristolochiaceae as a graduate at Western Kentucky University. He first joined the Forest Service as a botanist at the Savannah River Site in South Carolina in 2005 and has been on the Bearlodge Ranger District since 2008.



Cheryl Mayer, Forest Plan Plant Monitoring Coordinator, obtained her Bachelor's degree in Biology from Washington University in St. Louis. She has completed additional field study experience through Black Hills State University and Colorado State University. She has worked for the Black Hills National Forest since 2002 and is particularly fond of being confused by the genus *Carex*.

Chelsea Monks, Forest Botanist, received her Bachelor's degree in Biology with options in Botany and Ecology from the University of Montana – Missoula in 2003. She has worked as a botanist for the Forest Service for over ten years, most of which on the Black Hills National Forest. She has recently caught the bryophyte bug and enjoys searching for new-to-her moss.



Rylan Sprague, Northern Hills District Botanist, received a Bachelor of Science in Biology with Botany emphasis from Black Hills State University in 2012. He is currently pursuing a Master of Science in Sustainability degree from Black Hills State University. Rylan worked as a Hydrology Technician for three years before focusing on botany. Some of his favorite plants are in the orchid family, partially due to an acquaintance with the plants stemming from molecular and phylogenetic studies of the family. Rylan enjoys working on projects with area schools to promote appreciation of Black Hills botany and ecology to the next generation.

Kelly Warnke, Mystic District Botanist, received her Bachelor of Science degree in Botany at the University of Wyoming in 2008. She has spent three years working for the Forest Service in botany and research. Her favorite flower is *swertia* (*Frasera speciosa*) because the flowers are so intricate.



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