USGS-NPS VEGETATION MAPPING PROGRAM

Classification of the Vegetation of Devils Tower National Monument

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1. VEGETATION SAMPLING AND CLASSIFICATION

Introduction

This report presents the results of the vegetation classification portion of the USGS-NPS Vegetation Mapping Program at Devils Tower National Monument. The major goal of this portion of the project was to classify and describe all plant communities found within the study area. In addition, vegetation data were used by the photointerpreter to determine relationships between signatures on aerial photos and vegetation types on the ground, and in some cases, to correlate habitat characteristics and vegetation types for predictive modeling.

Sampling strategy and field methods are described for vegetation sampling. The vegetation classification, field key to the vegetation types, and descriptions of each type are also included. As a supplement to this report, the raw plot data are included as original field forms and in electronic form in the PLOTS database (a Microsoft Access database).

Methods

The methods used for the sampling and analysis of vegetation data and the development of the classification generally followed the standards outlined in the Field Methods for Vegetation Mapping document produced for this project. This process began with the development of a preliminary list of vegetation types from the National Vegetation Classification System (NVCS) that were thought to have a high likelihood of being in the mapping area. The list was prepared by literature review, including previous vegetation classifications of the Monument, and contacting knowledgeable experts. Due to the small size of the mapping area, it was initially thought that sampling would occur across the entire mapping area. However, it was not possible to obtain permission to go on private lands beyond the Monument's boundaries, so all sampling was done within Devils Tower NM. There were no areas that were not accessible within the Monument.

Twenty-eight plots were collected in late July and August of 1996. The field team attempted to place plots in each of the vegetation types on the preliminary list that they could find. In addition, vegetation types that were encountered in the field which appeared distinct from any on the preliminary list were sampled. Plots were subjectively placed, generally in vegetation that was representative of an area of relatively homogeneous vegetation which covered more than 1/2 ha (the minimum mapping unit). Thus, ecotones and small patches were avoided. However, in cases where several vegetation types regularly occurred in mosaics of small stands, it was necessary to use multiple plots and sample smaller patches.

Number of plots and plot size varied by community. The number of plots depended on the areal extent of the community on Devils Tower NM, i.e. more widespread communities had more plots than rarer ones. Forest and woodland communities were generally sampled with 20 x 20 meter plots

while herbaceous communities were generally sampled with 10 x 10 meter plots. In some instances rectangular plots of the same area were used (i.e. 10 x 40 m or 5 x 20 m) in linear or narrow polygons.

In late May and June of 1997, after a preliminary vegetation map had been prepared by the photointerpreter, a map validation step was performed in which further data were collected to obtain more information on the vegetation types and to better correlate the vegetation with the signatures on the aerial photographs. With the exception of two communities, every polygon within the Monument boundaries that had not been sampled the previous year was visited. This resulted in the collection of thirty-eight observation points. At each point, the dominant species in each vegetation stratum were recorded with an estimated cover class. These extra points gave a better understanding of the variation within vegetation types and allowed sampling of three types that had not been found the previous field season.

The final vegetation classification and descriptions were produced using plots, observation points, and the experience of the field team. Field personnel organized the plots and observation points into groups based on vegetation structure and composition. The number of plots ranged from 0-6 per type and the average number of observation points ranged from 0-6 per type. The two sparsely vegetated communities were not sampled with either plots or observation points because they were easily distinguished from surrounding vegetation types and adequate descriptions existed. Quantitative analyses were also completed to compare to the subjective classification. Average cover of each species and vegetation stratum were computed. Only the plots were used for quantitative analysis because of the more detailed information collected for them. They were analyzed using an ordination technique, Detrended Correspondence Analysis (DCA), and a clustering algorithm, Unweighted Pair-Group Method Using Arithmetic Means (UPGMA). Because there were few plots per type and the locations of the plots were chosen to emphasize the variation within a vegetation type, there was substantial variation within each type. These factors lessened the utility of the numerical analyses. Thus, the results of the numerical analyses were not used to derive the classification, but were compared to the subjective classification and any discrepancies in plot placement were examined.

Results

The classification of the vegetation at Devils Tower NM resulted in 16 types being defined, including two forest types, five woodland types, seven herbaceous types, and two sparsely vegetated types. Two of the herbaceous types and the two sparsely vegetated types do not have rangewide descriptions because they were newly described from Devils Tower NM. One of the herbaceous types is heavily dominated by exotics and the other is the result of continuing and extensive disturbance by prairie dogs. The names of these two herbaceous vegetation types end with "Community" to signify that they do not fully fit within the NVCS.

Some parts of the mapping area that have been classified as natural vegetation have been disturbed in the past. This is especially true in the floodplain of the Belle Fourche River where Euphorbia esula (leafy spurge) dominates the herbaceous stratum in some areas. Species lists and structure of these areas are different from less disturbed examples of the same community. The descriptions of the vegetation of each community were written based on information from the plots, observation points,

and experience of the field team. The two sparsely vegetated communities (Redbeds Sparse Vegetation and Phonolite Porphyry Sparse Vegetation) did not have samples collected because good descriptions already existed from previous vegetation classifications of Devils Tower NM.

The vegetation types described in this report do not necessarily correspond to units on the final vegetation map, for several reasons. In some cases, two or more plant communities distinguishable on the ground could not be distinguished in aerial photographs, nor predicted based on habitat characteristics. In this type of situation, the photointerpreter lumped multiple plant communities into a single map unit, labeled as a complex. In other cases, multiple communities occur as mosaics of small distinct stands which vary over too fine a scale to be mapped individually. These are mapped as mosaics.

In classifying vegetation, we attempt to recognize distinctive assemblages of plant species that occur repeatedly in appropriate habitat conditions. These plant communities become the basic mapping units in preparing vegetation maps. In some cases, the concept of a discrete assemblage of plants characteristic of a given habitat works very well. For example, in the Black Hills it is easy to correctly predict associated species and habitat characteristics for stands of paper birch and beaked hazel. In other cases, it can be very difficult to subdivide vegetation into consistent, repeating assemblages of species. Much of the ponderosa pine vegetation in the Black Hills presents this problem to some degree. Understory composition often is too variable or varies over too fine a scale to easily define discrete communities, especially from remotely sensed data. Boundaries are not easily recognized. Types grade into other types. The extensive disturbance history of ponderosa pine stands in the Black Hills makes this picture even more difficult to interpret.

In the Black Hills, many investigators have reported difficulties in classifying ponderosa pine vegetation. In our study, we encountered the same problems. Pine stands at environmental extremes (most xeric, most mesic) tended to be fairly consistent in species composition. Pinus ponderosa / Schizachyrium scoparium Wooded Herbaceous Vegetation (dry slopes, often south-facing) and Pinus ponderosa / Physocarpus monogynus Forest (northerly slopes) are two good examples. In contrast, stands found on intermediate sites were often problematic due to variable understory composition.

The classification of Devils Tower NM follows. A field key and descriptions for each of the types are included in later sections of the report.

I. FOREST
I.A. Evergreen forest
I.A.8. Temperate or subpolar needle-leaved evergreen forest
I.A.8.N Natural/semi-natural
I.A.8.N.b. Rounded-crowned temperate subpolar needle-leaved evergreen forest
PINUS PONDEROSA FOREST ALLIANCE
Pinus ponderosa / Mahonia repens Forest

I.B. Deciduous forest
I.B.2. Cold-deciduous forest
I.B.2.N Natural/semi-natural
I.B.2.N.a. Lowland or submontane cold-deciduous forest
***FRAXINUS PENNSYLVANICA* - (ULMUS AMERICANA) FOREST ALLIANCE**
Fraxinus pennsylvanica - Ulmus americana / Symphoricarpos occidentalis Forest

II WOODLAND
II.A Evergreen woodland
II.A.4 Temperate or subpolar needle-leaved evergreen woodland
II.A.4.N Natural/semi-natural
II.A.4.N.a. Rounded-crowned temperate or subpolar needle-leaved evergreen woodland

PINUS PONDEROSA WOODLAND ALLIANCE
Pinus ponderosa / Carex inops ssp. *Heliophila* Woodland
Pinus ponderosa / Juniperus communis Woodland
Pinus ponderosa / Pseudoroegneria spicata Woodland
Pinus ponderosa / Quercus macrocarpa Woodland

II.B Deciduous woodland
II.B.2 Cold-deciduous woodland
II.B.2.N Natural/semi-natural
II.B.2.N.b. Temporarily flooded cold-deciduous woodland
POPULUS DELTOIDES TEMPORARILY FLOODED WOODLAND ALLIANCE
Populus deltoides - (Salix amygdaloides) / *Salix exigua* Woodland

V. HERBACEOUS VEGETATION
V.A. Perennial graminoid. vegetation
V.A.5. Temperate or subpolar grassland
V.A.5.N Natural/semi-natural
V.A.5.N.c. Medium-tall sod temperate or subpolar grassland
PASCOPYRUM SMITHII HERBACEOUS ALLIANCE
Pascopyrum smithii - Bouteluoa gracilis - Carex filifolia Herbaceous Vegetation

ALLIANCE UNDEFINED
Poa pratensis Disturbed Community

SCHIZACHYRIUM SCOPARIUM - BOUTELOUA CURTIPENDULA HERBACEOUS ALLIANCE
Schizachyrium scoparium - *Bouteloua* (curtipendula, gracilis) - *Carex filifolia* herbaceous Vegetation

V.A.5.N.j. Temporarily flooded temperate or subpolar grassland

SPARTINA PECTINATA TEMPORARILY FLOODED HERBACEOUS ALLIANCE
Spartina pectinata - *Scirpus pungens* Herbaceous Vegetation

V.A.6 Temperate or subpolar grassland with a sparse tree layer
V.A.6.N Natural/semi-natural
V.A.6.N.f. Medium-tall temperate or subpolar grassland with a sparse needle-leaved evergreen or mixed tree layer

PINUS PONDEROSA WOODED MEDIUM-TALL HERBACEOUS ALLIANCE
Pinus ponderosa / Schizachyrium scoparium Wooded Herbaceous Alliance

V.A.7. Temperate or subpolar grassland with a sparse shrub layer
V.A.7.N Natural/semi-natural
V.A.7.N.e. Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer

ARTEMISIA CANA SHRUB HERBACEOUS ALLIANCE
Artemisia cana ssp. *cana* / *Pascopyrum smithii* Shrub Herbaceous Vegetation

V.A.7.N.g. Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer

RHUS TRILOBATA SHRUB HERBACEOUS ALLIANCE
Rhus trilobata / Pseudoroegneria spicata Shrub Herbaceous Vegetation

VII SPARSE VEGETATION
VII.A Consolidated rock sparse vegetation
VII.A.1 Sparsely vegetated cliffs
VII.A.1.N Natural/semi-natural
VII.A.1.N.a. Cliffs with a sparse vascular vegetation

ROCK OUTCROP / BUTTE SPARSE VEGETATION
Phonolite Porphyry Sparse Vegetation
Redbeds Sparse Vegetation

Conclusion

The vegetation of Devils Tower NM was classified using the techniques established for the NPS/BRD Vegetation Mapping Program. Most of the vegetation types fit within existing associations in the NVCS. Due to extensive disturbance and regional variation, some of the vegetation at Devils Tower NM did not closely match the more general, national description of the community into which it was placed. In addition, four did not fit within the current NVCS and retained park-specific names and descriptions. It is expected that these will be fully placed within a national hierarchy and given rangewide descriptions as the NVCS is further developed.

Several recommendations for future mapping projects have flowed from the experience gained mapping Devils Tower NM. It is recommended that future mapping projects begin fieldwork with a reconnaissance step involving observation point data collection from a large number of points. This type of sampling goes relatively fast and would allow the project investigators to identify plant communities within the study area and to get some feel for variation within each type. After a preliminary classification is in hand, representative stands could be selected for more detailed vegetation plots. Data collected for observation points would also supplement vegetation plot data in preparing community descriptions. This approach is most suited to small parks where regaining access to an area is not especially time-consuming or difficult. In larger parks or those with remote areas, it would still be beneficial to collect observation points from the same area and at the same time as plots are being collected.

Communication between the field ecologists and the photointerpreters/mappers is vital for a successful project. One step that can help this is to begin field work with aerial photos with preliminary vegetation polygons delineated. This helps the ecologists direct their sampling and the process of polygon delineation often generates questions relating to vegetation classification which the field team can investigate during vegetation sampling instead of after the field season.

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2. FIELD KEY TO THE PLANT COMMUNITIES OF DEVILS TOWER NATIONAL MONUMENT

1. > 10% vegetated

    2. trees present, > 10% cover

        3. broadleaf trees cover > 10% (canopy and/or subcanopy)

            4. floodplain

                5. *Populus deltoides* and/or *Salix amygdaltoides* present; isolated stands various grasses in understory often with leafy spurge (*Euphorbia esula*); may have a subcanopy of *Fraxinus pennsylvanica* and *Quercus macrocarpa.*

                ***Populus deltoides* - (Salix amygdaloides) / *Salix exigua* Woodland**

                5. *Quercus macrocarpa* and/or *Fraxinus pennsylvanica* present; *Acer negundo* occasionally dominant; *Populus deltoides* absent

                ***Fraxinus pennsylvanica - Ulmus americana / Symphoricarpos occidentalis* Forest**

            4. upland; *Quercus macrocarpa* cover > 10%; *Q. macrocarpa* dominates subcanopy with scattered *Pinus ponderosa* in canopy (vs. scattered oaks in pine stand)

            ***Pinus ponderosa / Quercus macrocarpa* Woodland**

        3. broadleaf trees absent or < 10% cover in canopy/subcanopy

            6. *Schizachyrium scoparium* cover > 10%; *Bouteloua curtipendula* and *Koeleria macrantha* usually present; *Juniperus scopulorum* can be significant; pine cover occasionally less than 25%, but greater than 10%

            ***Pinus ponderosa / Schizachyrium scoparium* Wooded Herbaceous Vegetation**

            6. not as above

                7. *Carex inops* ssp. *heliophila* cover > 5%; *Danthonia spicata* usually present

                ***Pinus ponderosa* /*Carex inops* ssp. *heliophila* Woodland**

                7. not as above

                    8. *Pseudoroegneria spicata* cover > 10%

                    ***Pinus ponderosa / Pseudoroegneria spicata* Woodland**

                8. not as above

9. *Mahonia repens* with cover > 5%; *Symphoricarpos albus* present but sparse

***Pinus ponderosa / Mahonia repens* Forest**

9. not as above; *Juniperus communis* cover >5%

***Pinus ponderosa / Juniperus communis* Woodland**

2. trees absent or < 10% cover

10. shrub cover > 10%

11. top of Devils Tower

***Rhus trilobata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation**

11. floodpalin; *Artemisia cana* cover > 10%, may be dominated by *Symphoricarpos occidentalis* locally.

***Artemisia cana / Pascopyrum smithii* Shrub Herbaceous Vegetation**

10. shrub cover < 10%

12. *Schizachyrium scoparium* cover > 20%

***Schizachyrium scoparium - Bouteloua* (curtipendula, gracilis) -*Carex filifolia* Herbaceous Vegetation**

12. not as above

13. river banks; *Spartina pectinata* present

***Spartina pectinata - Scirpus pungens* Herbaceous Vegetation**

14. *Poa pratensis* cover >25%

***Poa pratensis* Disturbed Community**

14. not as above; grassland with various dominants including *P. smithii, B. gracilis, Andropogon gerardii,* and *Stipa comata*

***Pascopyrum smithii - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation**

1. < 10% vegetated

    10. soil red

    Redbeds Sparse Vegetation

    10. not as above

        11. on Devils Tower and talus below

        Phonolite Porphyry Sparse Vegetation

        11. other barren lands

        miscellaneous outcrops, e.g. sandstones, shales

3. VEGETATION DESCRIPTION FOR DEVILS TOWER NATIONAL MONUMENT

NOTE: "*" Indicates a new formation to the National Vegetation Classification System

Pinus ponderosa / Mahonia repens Forest

COMMON NAME	Ponderosa Pine / Oregon Grape Woodland
SYNONYM	Ponderosa Pine / Holly-leaf Grape Woodland
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (I.A.8.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.a.)
ALLIANCE	*Pinus ponderosa* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
A similar vegetation type has been reported from central Montana in the vicinity of Lewiston and Roundup, where it was considered to be a phase of the *Pinus ponderosa* - *Symphoricarpos albus* Habitat Type in Montana (Pfister et al. 1977).

Devils Tower National Monument
This community is widespread. It is well developed on the slopes below the base of Devils Tower, as well as on slopes in the western and northern parts of the park.

ENVIRONMENTAL DESCRIPTION
Globally
In the vicinity of Lewiston and Roundup, MT, a similar vegetation type has been reported from gentle slopes and benches, on silt loam to clay loam soils derived from limestone (Pfister et al. 1977). In the northwestern Black Hills in Wyoming, this community has been found predominantly on northerly aspects with slopes from 8 to 26 degrees, in areas underlain by buried talus or sandstone.

Devils Tower National Monument
This community occurs predominantly on northerly aspects with slopes from 8 to 26 degrees. It was found in areas underlain by buried talus or sandstone.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Tree canopy	*Pinus ponderosa*
Short shrub	*Mahonia repens, Symphoricarpos albus, Spiraea betulifolia, Juniperus communis*
Herbaceous	*Schizachne purpurescens*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Pinus ponderosa*
Short shrub	*Mahonia repens, Symphoricarpos albus*

DIAGNOSTIC SPECIES
Globally
Pinus ponderosa, Mahonia repens

Devils Tower National Monument
Pinus ponderosa, Mahonia repens, Symphoricarpos albus

VEGETATION DESCRIPTION
Globally
Few stands of this vegetation type have been studied, and rangewide information is limited. The overstory of this community is dominated by *Pinus ponderosa.* In stands in central Montana, the shrub layer was dominated by *Mahonia repens*, with *Spiraea betulifolia* and *Juniperus communis* also common (Pfister et al. 1977). In the western Black Hills, *M. repens* is dominant with *Symphoricarpos albus* often present but sparse.

Devils Tower National Monument
Stands of this vegetation type are dominated by *Pinus ponderosa*. Canopy and subcanopy coverages both range from 10 to 50% typically. *Quercus macrocarpa* occasionally occurs in the subcanopy. Short shrub cover is sparse to moderate, but usually less than 25%. *Mahonia repens* is present consistently, and often dominates the short shrub stratum. *Symphoricarpos albus* is often present, but sparse.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL000187

COMMENTS
Globally
Few stands of this vegetation type have been studied, and rangewide information is limited.

Devils Tower National Monument
Stands of this type originally were classified as *Pinus ponderosa / Symphoricarpos albus* Forest. However they differ significantly from that type as previously described for the Black Hills (Thilenius 1972, Hoffman and Alexander 1987). Canopy cover typically is less than 60% and *Symphoricarpos albus* usually is sparse to absent. Both Thilenius (1972) and Hoffman and Alexander (1987) found *Mahonia repens* to be an important component of the short shrub stratum in stands of this type. At Devils Tower this is the case as well, but *M. repens* is much more common and consistent than *S. albus.* During accuracy assessment, the investigator reported, "I did not observe this community [*Pinus ponderosa / Symphoricarpos albus* Forest], only the *PP/Oregon Grape* Woodland [*Pinus ponderosa / Mahonia repens*]" (K. West, pers. comm. to D. Salas), again suggesting that the stands of this type at Devils Tower NM differ from previous descriptions. Thus, these stands were classified as *Pinus ponderosa / Mahonia repens* Forest even though they differ from the type as described in north-central Montana. As further information is gathered on the rangewide characteristics of both *Pinus ponderosa / Symphoricarpos albus* Forest and *Pinus ponderosa / Mahonia repens* Forest, the stands at Devils Tower NM should be compared to verify their classification here.

REFERENCES
Hoffman, G. R. and R. R. Alexander. 1987. Forest vegetation of the Black Hills National Forest of South Dakota and Wyoming: A habitat type classification. Research Paper RM-276. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 48 p.

Pfister, R. D., B. L. Kovalchik, S. F. Arno, and R. C. Prebby. 1974. Forest habitat types of Montana. INT- 34. USDA Forest Service Intermountain Forest and Range Experiment Station, Missoula, MT. 312p.

Thilenius, J. F. 1972. Classification of deer habitat in the ponderosa pine forest of the Black Hills, South Dakota. RM-91. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 28p.

Fraxinus pennsylvanica - Ulmus americana / Symphoricarpos occidentalis Forest

COMMON NAME Green Ash - American Elm / Wolfberry Forest

SYNONYM Ash - Elm / Wolfberry Forest

PHYSIOGNOMIC CLASS Forest (I)

PHYSIOGNOMIC SUBCLASS Deciduous forest (I.B)

PHYSIOGNOMIC GROUP Cold-deciduous forest (I.B.2)

PHYSIOGNOMIC SUBGROUP Natural/semi-natural (I.B.2.N)

FORMATION Lowland or submontane cold-deciduous forest (I.B.2.N.a.)

ALLIANCE *Fraxinus pennsylvanica* - (Ulmus americana) Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in southern Manitoba, North Dakota and South Dakota. Its range within these states and province is not known.

Devils Tower National Monument
This community occurs on the floodplain of the Belle Fourche River (see Comments below).

ENVIRONMENTAL DESCRIPTION
Globally
This community occurs on upland sites along steep north-facing slopes and, occasionally, along drainages or near the bases of north-facing slopes of upland sites. Soils are moist to dry and poorly drained. Girard et al. (1989) found this community on silty clay and clay soils.

Devils Tower National Monument
This community occurs on level sites on alluvial soils of the Belle Fourche River floodplain (see Comments below).

MOST ABUNDANT SPECIES
Globally

Strata	Species
Tree canopy	*Fraxinus pennsylvanica, Ulmus americana*
Short shrub	*Symphoricarpos occidentalis*
Herbaceous	*Andropogon gerardii, Carex spp., Pascopyrum smithii*

Devils Tower National Monument

Strata	Species
Tree canopy	*Quercus macrocarpa, Fraxinus pennsylvanica*
Subcanopy	*Acer negundo, Prunus virginiana*

DIAGNOSTIC SPECIES
Globally
Fraxinus pennsylvanica, Juniperus virginiana, Ulmus americana, Celtis occidentalis, Symphoricarpos occidentalis, Ribes americanum, Prunus virginiana, Elymus canadensis

Devils Tower National Monument
Quercus macrocarpa, Fraxinus pennsylvanica without *Pinus ponderosa*

VEGETATION DESCRIPTION
Globally
This community is a moderately to densely vegetated forest with an open to dense shrub understory. The average height of the tree layer was 4.7 to 6.7 meters in southcentral South Dakota (US Army Corps of Engineers 1979) and 8 meters in southwestern North Dakota (Girard et al. 1989). There is 25-30% bare soil and litter is present as trace amounts of the previous year's vegetation. The tree layer is dominated by *Fraxinus pennsylvanica* and *Ulmus americana.* Widely scattered old Populus deltoides occur as remnants of previous vegetation types. The shrub layer is dominated by *Symphoricarpos occidentalis*. Other shrubs that can be found with it are *Rosa woodsii, Juniperus scopulorum* (which can also be in the canopy or subcanopy), and *Prunus virginiana. S. occidentalis* tends to increase under grazing pressure and it may be almost the only shrub where grazing has been intense. Herbaceous species that may be found in this community are *Pascopyrum smithii, Andropogon gerardii, Poa* spp., *Carex* spp. (wide leaf), *Rumex* spp., *Carex filifolia, Anemone cylindrica, Oryzopsis micrantha, Galium* spp., *Anemone canadensis, Taraxacum* spp., *Lappula* spp., *Conyza canadensis*, and *Circium* spp.

Devils Tower National Monument
This vegetation type is dominated by deciduous trees, usually *Quercus macrocarpa* and *Fraxinus pennsylvanica. Acer negundo* occasionally is dominant. Canopy cover ranges from 10 to 50%. *Prunus virginiana* and *A. negundo* are common subcanopy species. The herbaceous stratum is often weedy. *Carex sprengelii* appears to be the most common native herbaceous species.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G?

RANK JUSTIFICATION

DATABASE CODE CEGL002082

COMMENTS
Globally
These description are taken, in part, from Steve Archer and Larry L. Tieszen, who in 1979 studied patterns and distributions of upland plant communities along the east bank of the Lake Francis Case Reservoir on the Missouri River in southcentral South Dakota (U.S. Army Corp of Engineers 1979). They recognized four types that are treated together here: 1. *Juniperus virginiana-Fraxinus pennsylvanica-Ulmus americana*, 2. *Fraxinus pennsylvanica-Juniperus virginiana-Symphoricarpos occidentalis*, 3. *Juniperus virginiana-Fraxinus pennsylvanica-Prunus virginiana*, 4. *Fraxinus pennsylvanica-Juniperus virginiana-Celtis occidentalis*. Species composition for this type may reflect a C-quality condition caused by grazing. Characteristic species are those given a dominance ranking in Archer's and Tieszen's plant community classification and gradient analysis. Dominance appears to be based on percent cover and frequency of occurrence.

Devils Tower National Monument
Quercus macrocarpa and *Fraxinus pennsylvanica* also occur together in the bottoms of upland draws. In these situations, however, hardwoods form the subcanopy with scattered trees of *Pinus ponderosa* making up the canopy (see *Pinus ponderosa / Quercus macrocarpa* Woodland).

REFERENCES
Girard, M. M., H. Goetz, and A. J. Bjugstad. 1989. Native woodland habitat types of southwestern North Dakota. Research Paper RM-281. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 36 p.

U.S. Army Corps of Engineers. 1979. A cultural resources reconnaissance of the federal lands on the east bank of Lake Francis Case, South Dakota. U.S. Army Engineer District, Corps of Engineers, Omaha, NE.

Pinus ponderosa / Carex inops ssp. heliophila Woodland

COMMON NAME	Ponderosa Pine / Sun Sedge Woodland
SYNONYM	Ponderosa Pine / Long Stolon Sedge Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*Pinus ponderosa* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in Colorado, Wyoming, western South Dakota, and Montana.

Devils Tower National Monument
This community is best developed below the base of Devils Tower in areas underlain by buried talus. Elsewhere in the park, it typically occurs in mosaics with *Pinus ponderosa / Schizachyrium scoparium* Wooded Herbaceous Vegetation.

ENVIRONMENTAL DESCRIPTION
Globally
This community is often found on gentle and moderate south to west facing slopes (Hansen and Hoffman 1988, Hoffman and Alexander 1987).

Devils Tower National Monument
This vegetation type is best developed below the base of Devils Tower on gentle to moderate slopes (less than 15 degrees) underlain by buried talus. There is no clear correlation with aspect. Elsewhere in the park, especially in areas of sandstone outcrops, this community typically occurs in mosaics with *Pinus ponderosa / Schizachyrium scoparium* Wooded Herbaceous Vegetation.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Tree canopy	*Pinus ponderosa*
Herbaceous	*Carex inops* ssp. *heliophila, Danthonia spicata*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Pinus ponderosa*
Herbaceous	*Carex inops* ssp. *heliophila, Danthonia spicata*

DIAGNOSTIC SPECIES
Globally
Pinus ponderosa, Carex inops ssp. *heliophila*

Devils Tower National Monument
Pinus ponderosa, Carex inops ssp. *heliophila*

VEGETATION DESCRIPTION
Globally
The tree canopy and subcanopy are dominated by *Pinus ponderosa. Juniperus scopulorum* and *Quercus macrocarpa* are occasionally found in the subcanopy. Shrubs are infrequent in this type. The herbaceous layer is dominated by *Carex inops* ssp. *heliophila*, with inclusions of *Danthonia spicata, Schizachyrium scoparium*, and *Pseudoroegneria spicata* -- generally in areas with more open canopies.

Devils Tower National Monument
Stands of this vegetation type are dominated by *Pinus ponderosa.* Below the base of Devils Tower on gentle to moderate slopes underlain by buried talus, canopy and subcanopy coverages both typically are between 25 and 50%, resulting in relatively high tree cover. Herbaceous cover is quite variable, ranging from 15 to 75%. It is in these situations that *Danthonia spicata* commonly is found with *Carex inops* ssp. *heliophila*. Elsewhere in the park, smaller stands of *Pinus ponderosa / Carex inops* ssp. *heliophila* Woodland occur in mosaics with *Pinus ponderosa / Schizachyrium scoparium* Wooded Herbaceous Vegetation.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL000849

COMMENTS
Globally
The canopy in this type is usually moderately open but can become nearly closed in undisturbed stands (i.e., where the natural disturbance regime has been disrupted).

The stands used to document the *Pinus ponderosa / Carex inops* ssp. *heliophila* Woodland Habitat Type described by Hoffman and Alexander (1987) and Hansen and Hoffman (1988) had very high basal area and densities for a woodland, possibly due to their sampling procedure. The dense structure may have affected the floristic makeup of the stands. This type, however, is a woodland (not forest) type in its typically high-quality state.

REFERENCES
Hansen, P. L. and G. R. Hoffman. 1988. The vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer National Forest: A habitat type classification. General Technical Report RM-157. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 68 p.

Hoffman, G. R. and R. R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: A habitat type classification. Research Paper RM-170. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 38 p.

Hoffman, G. R. and R. R. Alexander. 1987. Forest vegetation of the Black Hills National Forest of South Dakota and Wyoming: A habitat type classification. Research Paper RM-276. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 48 p.

McAdams, A. G., D. A. Stutzman, and D. Faber-Langendoen. 1998. Black Hills Community Inventory, unpublished data. The Nature Conservancy, Midwest Regional Office, Minneapolis, MN.

Pinus ponderosa / Juniperus communis Woodland

COMMON NAME	Ponderosa Pine / Common Juniper Woodland
SYNONYM	Ponderosa Pine / Common Juniper Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*Pinus ponderosa* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in eastern Montana, the Bighorn Mountains in northern Wyoming and the Black Hills of western South Dakota and eastern Wyoming.

Devils Tower National Monument
This vegetation type was observed in the area of sandstone canyons in the southwest part of the park. *Pinus ponderosa* and *Juniperus communis* occur together elsewhere, but in these situations, J. communis is not as abundant.

ENVIRONMENTAL DESCRIPTION
Globally
This community is most often found on moderate north and west facing slopes (Hansen and Hoffman 1987, Hoffman and Alexander 1987, Hoffman and Alexander 1976). The soils are shallow and loamy.

Devils Tower National Monument
This community was found on sandy soils near sandstone outcrops on moderately steep slopes (16 - 22 degrees) with northerly aspects.

MOST ABUNDANT SPECIES

Globally

Strata	Species
Tree canopy	*Pinus ponderosa*
Short shrub	*Juniperus communis*
Herbaceous	*Carex inops* ssp. *heliophila, Schizachyrium scoparium*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Pinus ponderosa, Juniperus scopulorum*
Short shrub	*Juniperus communis*

DIAGNOSTIC SPECIES

Globally

Pinus ponderosa, Juniperus communis, Mahonia repens, Achillea millefolium

Devils Tower National Monument

Pinus ponderosa, Juniperus communis

VEGETATION DESCRIPTION

Globally

This community is dominated by *Pinus ponderosa* in the overstory. Other tree species that may be present are *Picea glauca* and *Populus tremuloides*. The canopy is usually moderately closed but can become nearly closed in stands that are not disturbed for long periods. There is a prominent low shrub layer whose most abundant component is *Juniperus communis*. This species covered an average of 25% (range of 4-42%) in 7 stands in the Black Hills of South Dakota and Wyoming (Hoffman and Alexander 1987). Total average cover by the shrub layer was 51% and by the herb layer was 8%. Other shrub species found in this community across its range are *Arctostaphylos uva-ursi, Mahonia repens, Spiraea betulifolia,* and *Symphoricarpos albus.* Typical herbaceous species are *Achillea millefolium, Carex inops* ssp. *heliophila, Schizachyrium scoparium, Fragaria* spp., and *Lathyrus ochroleucus* (McAdams et al. 1998).

Devils Tower National Monument

This community is dominated by Pinus ponderosa. Two mappable stands were found. Canopy and subcanopy coverages each ranged from 10 to 50%. *Juniperus scopulorum* was a consistent component of the subcanopy. *J. communis* dominated the short shrub stratum, with coverage as high as 25%. *Mahonia repens* occurred consistently and was sometimes common. *Carex inops* ssp. *heliophila* and *Nassella viridula* were the most common herbaceous species.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4?

RANK JUSTIFICATION

DATABASE CODE CEGL000859

COMMENTS

Globally

The canopy in this type is usually moderately closed but can become nearly closed in undisturbed stands (i.e., where the natural disturbance regime has been disrupted).

The stands used to document the *Pinus ponderosa / Juniperus communis* Habitat Type described by Hoffman and Alexander (1987) and Hansen and Hoffman (1988) had very high basal area and densities for a woodland, possibly due to their sampling procedure. The dense structure may have affected the floristic makeup of the stands. Additionally, there is some ambiguity as to whether to call this type a forest or woodland; in increasingly dense stands, this type has >60% canopy closure.

REFERENCES
Hansen, P. L. and G. R. Hoffman. 1988. The vegetation of the Grand River/ Cedar River, Sioux, and Ashland Districts of the Custer National Forest: A habitat type classification. General Technical Report RM-157. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 68 p.

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Thilenius, J. F. 1970. An isolated occurrence of limber pine (Pinus flexilis James) in the Black Hills of South Dakota. American Midland Naturalist 84(2):411-417.

Pinus ponderosa / Pseudoroegneria spicata Woodland

COMMON NAME	Ponderosa Pine / Bluebunch Wheatgrass Woodland
SYNONYM	Ponderosa Pine / Bluebunch Wheatgrass Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*Pinus ponderosa* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This community is found in eastern Washington, eastern Oregon, western, central and southeastern Montana, northern Wyoming, western South Dakota, and southwestern North Dakota. It has not yet been identified in Idaho.

Devils Tower National Monument

This community was found only in two locations: on slopes north and east of Devils Tower. The stand north of the Tower was too small to be sampled or mapped.

ENVIRONMENTAL DESCRIPTION

Globally

This community occurs mostly on steep southerly aspects. It is found on course soils derived from sandstone, porcillenate, or limestone (Thilenius et al. 1995). These include sandy alluvium, gravelly or sandy till, and loams with high stone content. Rock and mineral soil are commonly exposed.

Devils Tower National Monument

The single sampled stand of this community was found on a relatively-steep northerly slope underlain by sandstone.

MOST ABUNDANT SPECIES

Globally

Strata	Species
Tree canopy	*Pinus ponderosa*
Herbaceous	*Pseudoroegneria spicata, Carex filifolia, Carex inops* ssp. *heliophila, Stipa comata*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Pinus ponderosa*
Herbaceous	*Pseudoroegneria spicata*

DIAGNOSTIC SPECIES

Globally

Pinus ponderosa, Pseudoroegneria spicata, Carex spp., *Festuca idahoensis, Balsamorhiza sagittata, Koeleria macrantha*

Devils Tower National Monument

Pinus ponderosa, Pseudoroegneria spicata

VEGETATION DESCRIPTION

Globally

This community is dominated by the tree and herbaceous strata. On three stands in the eastern portion of its range, Hansen and Hoffman (1988) found that total cover by understory strata was 55%. Shrubs made up only 1.3% of this total. *Pinus ponderosa* is often the only tree in the overstory. The tree coverage can vary from open to moderately closed. In northeastern Wyoming, most of the trees were less than 15 m tall and 60 cm dbh (Thilenius et al. 1995). The herbaceous stratum is also open to moderately dense. *Pseudoroegneria spicata* is the dominant species. Other species that are often found in the central and eastern portions of its range are *Achillea millefolium* var. *occidentalis, Carex filifolia, Carex inops* ssp. *heliophila, Koeleria macrantha,* and *Stipa comata*. In the western portion of the range of this community *Festuca idahoensis* may be present (Daubenmire 1952). When shrubs are present they typically include Rhus aromatica and, especially on sandy soils, *Chrysothamnus nauseosus.*

Devils Tower National Monument

This vegetation type is dominated by *Pinus ponderosa* in both the canopy and subcanopy. In the single stand sampled, canopy coverage was estimated at 5 to 25%; subcanopy coverage was estimated at 25 to 50%. *Pseudoroegneria spicata* dominates the herbaceous stratum, with coverage estimated at 5 to 25%. A variety of other graminoids were found, but none had coverages greater than 1%.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G4

RANK JUSTIFICATION

DATABASE CODE CEGL000865

COMMENTS
Globally
Periodic fires are probably important in maintaining the open grassland understory of this type.

The stands used to document the *Pinus ponderosa / Pseudoroegneria spicata* Habitat Type described by Hansen and Hoffman (1988) and Hoffman and Alexander (1976) had very high basal area and densities for a woodland, possibly due to their sampling procedure. The dense structure may have affected the floristic makeup of the stands and made the list of dominant species a poor reflection of the community as a whole.

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Johnston, B. C. 1987. Plant associations of region two. R2-ECOL-87-2. USDA Forest Service, Rocky Mountain Region, Lakewood, CO. 429 p.

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Thilenius, J. F., G. R. Brown, and A. L. Medina. 1995. Vegetation on semi-arid rangelands, Cheyenne River basin, Wyoming. General Technical Report RM-263. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 60 p.

Pinus ponderosa / Quercus macrocarpa Woodland

COMMON NAME	Ponderosa Pine / Bur Oak Woodland
SYNONYM	Ponderosa Pine / Bur Oak Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*Pinus ponderosa* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in northeastern Wyoming and in parts of southeastern Montana and western South Dakota.

Devils Tower National Monument
This community commonly is found in the bottoms of draws throughout the park. *Quercus macrocarpa* also occurs in other *Pinus ponderosa* stands in the park, but is not present consistently in these situations. On the floodplain, *Q. macrocarpa* forms stands with *Fraxinus pennsylvanica.* These are treated as the *Fraxinus pennsylvanica* - (Ulmus americana) / *Symphoricarpos occidentalis* Woodland type.

ENVIRONMENTAL DESCRIPTION
Globally
This community is found on rolling hills and ridgetops on calcareous substrates (Hoffman and Alexander 1987, Johnston 1987). Hoffman and Alexander report that it may also occur on soils derived from igneous substrates. The soils are sandy loams to clayey loams with a pH of 5.3-6.0.

Devils Tower National Monument
This community occurs on the lowermost slopes and in drainage bottoms. *Quercus macrocarpa* may be a significant component in *Pinus ponderosa* stands in more mesic situations -- for example on northerly slopes. However, it is not present consistently in these situations.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Quercus macrocarpa*
Short shrub	*Amelanchier alnifolia, Mahonia repens, Prunus virginiana*
Herbaceous	*Carex foenea, Galium boreale, Maianthemum stellatum, Oryzopsis asperifolia, Vicia americana*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Quercus macrocarpa*
Short shrub	*Mahonia repens*
Herbaceous	*Carex sprengelii, Poa pratensis*

DIAGNOSTIC SPECIES
Globally
Pinus ponderosa, Quercus macrocarpa

Devils Tower National Monument
Quercus macrocarpa, Pinus ponderosa

VEGETATION DESCRIPTION
Globally
Pinus ponderosa is the only species found in the canopy in most stands of this community. Hoffman and Alexander (1987) sampled 4 stands of this type and found an average basal area of 36.2 m2/ ha and an average density of 587 trees/ ha. Quercus macrocarpa forms a discontinuous subcanopy with an average cover of 18%. Common shrubs are *Amelanchier alnifolia, Mahonia repens, Prunus virginiana,* and *Spiraea betulifolia.* Typical herbaceous species are *Carex foenea, Apocynum androsaemifolium, Galium boreale, Maianthemum stellatum, Oryzopsis asperifolia, Lupinus argentus,* and *Vicia americana.* Hoffman and Alexander (1987) found the cover by strata was shrubs - 60%, and herbaceous - 18%.

Devils Tower National Monument
This community is dominated by *Quercus macrocarpa* in the subcanopy. Subcanopy coverage typically ranges from 25 to 75%, with *Q. macrocarpa* most abundant. *Fraxinus pennsylvanica* is often present. Scattered *Pinus ponderosa* trees form a sparse canopy. The tall shrub stratum, when present, is sparse and is composed of saplings of species such as Quercus macrocarpa, Pinus ponderosa and *Prunus virginiana. Mahonia repens* is common in the short shrub stratum, often with seedlings of the species mentioned above. The herbaceous canopy cover typically approaches 100%, with *Carex sprengelii* and *Poa pratensis* contributing most of the cover. The understory is often weedy with *Cynoglossum officinale* and *Bromus inermis*.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL000873

COMMENTS
Globally
Periodic fires are probably important in maintaining the grassland groundlayer and promoting oak regeneration.

The stands used to document the *Pinus ponderosa / Quercus macrocarpa* Habitat Type described by Hoffman and Alexander (1987) had very high basal area and densities for a woodland, possibly due to their sampling procedure. The dense structure may have affected the floristic makeup of the stands.

REFERENCES
Hoffman, G. R. and R. R. Alexander. 1987. Forest vegetation of the Black Hills National Forest of South Dakota and Wyoming: a habitat type classification. Research Paper RM-276. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 48 p.

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Thilenius, J. F. 1972. Classification of deer habitat in the ponderosa pine forest of the Black Hills, South Dakota. USDA Forest Service Research Paper RM-1, Fort Collins, CO. 28 p.

Populus deltoides - (Salix amygdaloides) / Salix exigua Woodland

COMMON NAME	Eastern Cottonwood - Peach-Leaf Willow / Narrow-Leaf Willow Woodland
SYNONYM	Cottonwood - Peach-Leaf Willow Floodplain Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (II.B.2.N)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*Populus deltoides* Temporarily Flooded Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in southern Manitoba, North Dakota, South Dakota, central and western Nebraska, western Kansas, eastern Colorado, and Oklahoma. It may occur in Texas and New Mexico.

Devils Tower National Monument
This community occurs on the floodplain of the Belle Fourche River.

ENVIRONMENTAL DESCRIPTION
Globally
This community is found along the banks of streams and rivers. It develops on newly deposited alluvium. The soils are predominantly sand, although silt, clay, or loam may be present. Soils are poorly developed. The water table fluctuates with the level of the river or stream and flooding is common, especially in the spring.

Devils Tower National Monument
This community occurs on level, alluvial soils on the floodplain of the Belle Fourche River.

MOST ABUNDANT SPECIES

Globally

Strata	Species
Tree canopy	*Populus deltoides, Salix amygdaloides*
Tall shrub	*Salix exigua*
Short shrub	*Symphoricarpos occidentalis*
Herbaceous	*Ambrosia psilostachya, Carex emoryi, Carex pellita, Equisetum arevense, Glycyrrhiza lepidota, Helianthus petiolaris, Pascopyrum smithii, Poa pratensis, Spartina pectinata, Sporobolus cryptandrus*

Devils Tower National Monument

Strata	Species
Tree canopy	*Populus deltoides*
Herbaceous	highly variable, often weedy

DIAGNOSTIC SPECIES

Globally

Populus deltoides, Salix amygdaloides, Salix exigua

Devils Tower National Monument

Populus deltoides

VEGETATION DESCRIPTION

Globally

This community has an open canopy dominated by *Populus deltoides* and *Salix amygdaloides* which reach 6-12 m. *Salix amygdaloides* is absent to common in examples of this community. *Fraxinus pennsylvanica* may be present, especially on the upland side of this community, and *Elaeagnus angustifolia* or *Juniperus* spp. may invade some sites. This woodland community has closely spaced shrubs and small trees. *Salix exigua* is usually more abundant along the streamside margins of this community and where the canopy of taller trees is most open. This shrub grows to 2-5 m tall. Other shorter shrubs that can be found are *Symphoricarpos occidentalis* and *Toxicodendron rydbergii*. Graminoids adapted to mesic sites dominate the understory of most sites, the most common species including Carex emoryi, C. pellita, Elymus canadensis, Hordeum jubatum, *Muhlenbergia racemosa, Pascopyrum smithii, Poa pratensis*, and *Spartina pectinata*. Forbs that are frequently abundant in relatively undisturbed sites include *Equisetum arvense* and *Glycyrrhiza lepidota*. Flooding often creates open patches in the herbaceous layer which are available for colonization by nearby species. The floristic composition of these patches is greatly affected by the species that are near and can invade the disturbed areas. Because of the high permeability of the sandy floodplain soils, species typical of upland prairie may invade in addition to annual forbs typical of disturbed sites. Widely distributed species that are adapted to these sites include *Ambrosia psilostachya, Artemisia campestris* ssp. *caudata, A. ludoviciana, Calamovilfa longifolia, Cenchrus longispinus, Euphorbia serpyllifolia, Grindelia squarrosa, Helianthus petiolaris, Heterotheca villosa, Lippia lanceolata, Opuntia macrorhiza*, and *Sporobolus cryptandrus*. These sites are prone to invasion by exotic grasses and forbs, the *most widely established being* Agrostis stolonifera, Bromus tectorum, Cirsium arvense, Kochia scoparia, Melilotus spp., *Taraxacum officinale*, and *Tragopogon dubius.*

Devils Tower National Monument

This community occurs as scattered small stands and individual trees. The healthiest stand is found in the area of the campground. No young trees were observed. *Salix amygdaloides* is present, but occurs only as widely scattered individuals, with no young trees observed. *S. exigua* is absent. *Quercus macrocarpa, Fraxinus pennsylvanica,* and *Acer negundo* are occasional. Stands where these species are more abundant are treated as the *Fraxinus pennsylvanica* - (Ulmus americana) / *Symphoricarpos occidentalis* Woodland. The herbaceous stratum is highly variable and often quite weedy.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G2G3

RANK JUSTIFICATION
In the absence of regular flooding, many sites will undergo succession to later seral stages. Many sites are overgrazed and invaded by exotic woody and herbaceous species.

DATABASE CODE CEGL000659

COMMENTS
Globally
Restoring natural flooding regimes in areas where water levels have been lowered will help maintain this community type. Occasional spring burning to control exotic species may also prove beneficial.

Devils Tower National Monument
This community differs significantly from previously described stands in that *Salix exigua* is absent. However, the Belle Fourche River floodplain has been severely impacted by flood control (Keyhole Reservoir) and herbicide use, and it is impossible to know what the community composition would be in an undisturbed state.

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Pascopyrum smithii - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation

COMMON NAME	Western-Wheat Grass - Blue Grama - Threadleaf Sedge Herbaceous Vegetation
SYNONYM	Western Wheatgrass - Blue Grama - Threadleaf Sedge Prairie
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)

PHYSIOGNOMIC GROUP Temperate or subpolar grassland (V.A.5)

PHYSIOGNOMIC SUBGROUP Natural/semi-natural (V.A.5.N)

FORMATION Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)

ALLIANCE *Pascopyrum smithii* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in Colorado, Wyoming, Montana, North Dakota, South Dakota, and Saskatchewan. Details of its distribution within these states are not available.

Devils Tower National Monument
This community is best developed on Joyner Ridge and in the northeast part of the park. Small stands occur on the floodplain, and in openings in pine forest.

ENVIRONMENTAL DESCRIPTION
Globally
This community is found on flat or gently sloping terrain. Many stands are on floodplains or gentle valley slopes, others are on uplands (Hanson and Whitman 1938, Hansen and Hoffman 1988). The soils are clay loam, silt loam, or loam and usually deep and fertile. This community appears to be only in basins or other broad lowlands. It does not appear to be found in mountain valleys (Hanson and Dahl 1956, Jones 1992).

Devils Tower National Monument
This community was found on level to gently sloping sites (usually less than 10 degrees) underlain by sedimentary rocks or alluvium. No clear correlation with aspect was observed.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Herbaceous	*Bouteloua gracilis, Carex filifolia, Pascopyrum smithii, Schizachyrium scoparium, Stipa comata*

Devils Tower National Monument

Strata	Species
Herbaceous	*Pascopyrum smithii, Stipa comata, Poa pratensis*

DIAGNOSTIC SPECIES
Globally
Pascopyrum smithii, Carex filifolia, Bouteloua gracilis, Buchloe dactyloides

Devils Tower National Monument
Pascopyrum smithii, Stipa comata

VEGETATION DESCRIPTION
Globally
This community is dominated by medium and short graminoids. Total vegetation cover is usually high (Hanson and Dahl 1956, Hansen et al. 1984.) The midgrass stratum is dominated by *Pascopyrum smithii*. Common associates include *Koeleria macrantha, Stipa comata,* and *Nassella viridula. Stipa comata* is more common on the upper slopes and drier upland sites while *Nassella viridula* is more common on the lower slopes and floodplains. Short graminoids are very abundant in this community. The most common are *Bouteloua gracilis* and *Carex filifolia.* Other upland sedges, such as

C. inops ssp. *heliophila, C. eleocharis*, and *C. pensylvanica* are usually found with these. Forbs do not contribute much of the canopy cover but they are scattered throughout this community. Typical forbs are *Astragalus* spp., *Tragopogon dubius, Gaura coccinea, Hedeoma hispida, Lappula occidentalis*, and *Sphaeralcea coccinea.* Shrubs are a very minor component of the vegetation. The half-shrub *Artemisia frigida* is often present and some stands contain Artemisia cana, Opuntia spp., or *Symphoricarpos occidentalis.*

Devils Tower National Monument
This community typically has herbaceous cover greater than 60%. *Pascopyrum smithii* and *Stipa comata* are present and locally dominant. In general, species distribution is quite patchy and other graminoids may be locally dominant, including *Andropogon gerardii, Bouteloua curtipendula*, and *Calamovilfa longifolia. Bouteloua gracilis* was observed only occasionally. *Poa pratensis* is ubiquitous and may be locally dominant. Stands in which *P. pratensis* is strongly dominant have been classified as *Poa pratensis* Herbaceous Vegetation. On the floodplain, stands of this type occur as small patches in otherwise weedy vegetation (Euphorbia esula).

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G4

RANK JUSTIFICATION

DATABASE CODE CEGL001579

COMMENTS
Globally
Fire was likely a common event in this type historically.

This type was described from communities described as *Pascopyrum smithii - Bouteloua gracilis* or *Pascopyrum smithii - Carex filifolia*. It is unclear whether *Pascopyrum smithii - Bouteloua gracilis* Herbaceous Vegetation overlaps with these descriptions.

Devils Tower National Monument
Graminoid dominance changes with the growing season.

REFERENCES
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Poa pratensis Disturbed Community

COMMON NAME	Kentucky Bluegrass Disturbed Community
SYNONYM	Bluegrass Prairie
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
ALLIANCE	Undefined

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
Information not available.

Devils Tower National Monument
This community is very widespread.

ENVIRONMENTAL DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This community occurs on a wide range of sites. It was observed on gentle to moderate slopes of all aspects, as well as on the floodplain.

MOST ABUNDANT SPECIES
Globally

Strata	Species

Information not available.

Devils Tower National Monument

Strata	Species
Herbaceous	*Poa pratensis*

DIAGNOSTIC SPECIES
Globally
Information not available.

Devils Tower National Monument
Poa pratensis

VEGETATION DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This vegetation type is dominated by *Poa pratensis*. At some sites, few other species are present. In other situations, *P. pratensis* is dominant but with mixed grass prairie species significant. *P. pratensis* also occurs as a non-dominant component of many vegetation types at Devils Tower NM.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK GW

RANK JUSTIFICATION
The dominant species of this community is an invasive exotic species. Thus, it falls under the definition of a GW ranking.

DATABASE CODE Not applicable.

COMMENTS
Devils Tower National Monument
Poa pratensis also occurs as a non-dominant component of many vegetation types at Devils Tower NM.

REFERENCES

Schizachyrium scoparium - Bouteloua (curtipendula, gracilis) - Carex filifolia Herbaceous Vegetation

COMMON NAME	Little Bluestem - Grama (Side-oats, Blue) - Threadleaf Sedge Herbaceous Vegetation
SYNONYM	Northern Great Plains Little Bluestem Prairie
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural / semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
ALLIANCE	*Schizachyrium scoparium - Bouteloua curtipendula* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in western North Dakota, western South Dakota, eastern and northern Wyoming, central and eastern Montana, southern Saskatchewan, and southern Manitoba.

Devils Tower National Monument
This community is widespread, occurring in areas underlain by sedimentary rocks. It is well-developed on the open lower slopes north of the park road from Prairie Dog Town to Tarpot Draw, and on open slopes along the northeast part of the Red Beds Trail. In the northeast part of the park, this type occurs in a mosaic with *Poa pratensis* Herbaceous Vegetation.

ENVIRONMENTAL DESCRIPTION
Globally
This community is usually found on gentle to steep slopes with variable aspects (Thilenius 1972, Hansen et al. 1984, Johnston 1987, Hansen and Hoffman 1988). The soil may be loamy sand, sandy loam, loam, or clay loam. There may be a substantial component of gravel. Hansen et al. (1984) found 7-36% gravel by weight in 16 stands in western North Dakota. The soils are typically shallow and occur over sandstone or limestone (Johnston 1987, Thilenius et al. 1995).

Devils Tower National Monument
This community occurs on moderate slopes (less than 15 degrees) underlain by sedimentary rocks. It was observed on all aspects but northerly. In the northeast part of the park, this type occurs in a mosaic with *Poa pratensis* Herbaceous Vegetation. In this area, *Schizachyrium scoparium* covers low ridges with *Poa pratensis* in the intervening swales.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Herbaceous	*Bouteloua curtipendula, Bouteloua gracilis, Carex filifolia, Schizachyrium scoparium*

Devils Tower National Monument

Strata	Species
Herbaceous	*Schizachyrium scoparium*

DIAGNOSTIC SPECIES
Globally
Schizachyrium scoparium, Carex filifolia, Bouteloua gracilis, Andropogon gerardii

Devils Tower National Monument
Schizachyrium scoparium

VEGETATION DESCRIPTION
Globally
This community is predominantly composed of graminoid species less than 1 m tall. Occasional *Pinus ponderosa* are scattered throughout the type. The vegetation cover is moderate to high. Thilenius et al. (1995) found that vegetation cover was 44% in Wyoming and Hansen and Hoffman (1988) found 75% cover in North Dakota. The dominant species is *Schizachyrium scoparium* with *Bouteloua curtipendula, B. gracilis,* and *Carex filifolia* as associates or co-dominants. *Andropogon gerardii, Carex inops* ssp. *heliophila, C. eleocharis, Koeleria macrantha* and *Calamovilfa longifolia* are often present. *C. longifolia* may be abundant on sandier soils. *Muhlenbergia cuspidata, Stipa comata, Pascopyrum smithii,* and *Nassella viridula* may also be present. *Pseudoroegneria spicata* may be found in the western portions of this community (Jones 1992). In Manitoba, the graminoids *Festuca ovina* and *Elymus trachycaulus* and the lichen *Selaginella densa* are more abundant (Greenall 1995). Forbs do not contribute greatly to the canopy, but many species may be found in this community (Hanson and Whitman 1938). Among the forbs that may be found are *Echinacea angustifolia, Aster oblongifolius, A. ericoides, Gaura coccinea, Lygodesmia juncea, Helianthus pauciflorus* ssp. *pauciflorus, Rosa arkansana, Liatris punctata, Psoralea argophylla, Dalea purpurea, Phlox hoodii,* and *Campanula rotundifolia.* There are very few woody species; those that are present are usually short shrubs such as *Artemisa frigida, Juniperus horizontalis,* and *Yucca glauca.* Litter often accumulates and may cover more than 50% of the ground (Hirsch 1985).

Devils Tower National Monument
The herbaceous stratum typically ranges from 25 to 75% cover and is dominated by *Schizachyrium scoparium. Bouteloua curtipendula, Stipa comata,* and *Andropogon gerardii* are sometimes common. At Devils Tower NM, *Carex filifolia* was not observed in this community.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3

RANK JUSTIFICATION

DATABASE CODE CEGL001681

COMMENTS
Globally
Fire likely played a major role in this type. Periodic fire likely helped graminoid production and deterred tree growth.

REFERENCES
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Greenall, J. A. 1995. Draft element descriptions for natural communities of southern Manitoba (prairie and parkland regions). Manitoba Conservation Data Centre, Winnipeg. 17 p.

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Montana Natural Heritage Program (MT NHP). 1988. Draft Guide to the natural vegetation of Montana. Montana Natural Heritage Program, Helena. 389 p.

Thilenius, J. F., G. R. Brown, and A. L. Medina. 1995. Vegetation on semi-arid rangelands, Cheyenne River basin, Wyoming. General Technical Report RM-GTR-263. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 60 p.

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Spartina pectinata - Scirpus pungens Herbaceous Vegetation

COMMON NAME	Freshwater Cord Grass - Three-Square Bulrush Herbaceous Vegetation
SYNONYM	Prairie Cordgrass - Bulrush Wet Meadow
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.5.N)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
ALLIANCE	*Spartina pectinata* Temporarily Flooded Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Palustrine

RANGE
Globally
This community is found in eastern Wyoming and eastern Montana.

Devils Tower National Monument
This community occurs along the Belle Fourche River and as isolated small stands in the abandoned river channel.

ENVIRONMENTAL DESCRIPTION
Globally
This community is usually found as narrow bands along the margins of low gradient or standing open water and in depressions where the soil is saturated or flooded for short periods during the growing season (Jones and Walford 1995). Soils are fine textured and often have a high organic content.

Devils Tower National Monument
This community occurs on level sites on alluvial soils along the Belle Fourche River and as small stands in the abandoned river channel.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Herbaceous	*Scirpus pungens, Sparitina pectinata*

Devils Tower National Monument

Strata	Species
Herbaceous	*Spartina pectinata*

DIAGNOSTIC SPECIES
Globally
Spartina pectinata, Scirpus pungens

Devils Tower National Monument
Spartina pectinata

VEGETATION DESCRIPTION
Globally
This community is dominated by tall graminoids approximately 1-2 meters tall. Vegetation cover is usually high. *Spartina pectinata* is dominant and can form near monocultures. *Scirpus pungens, Poa pratensis, Carex praegracilis,* and *Carex nebrascensis* are all common constituents of the herbaceous stratum (Jones 1992). Shrubs and trees are not abundant, but *Salix* spp. can be found in many stands.

Devils Tower National Monument
This community is strongly dominated by *Spartina pectinata* on the banks of the Belle Fourche River. In the abandoned river channel, *S. pectinata* is dominant but *Poa pratensis* also is common. At Devils Tower NM, *Scirpus pungens* was not observed in stands of this community during this study. However, it has been found in the park (Marriott 1982).

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3Q

RANK JUSTIFICATION

DATABASE CODE CEGL001478

COMMENTS

REFERENCES
Jones, G. 1992. Wyoming plant community classification. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie, WY. 184 pp.

Jones, G. and G. Walford. 1995. Major riparian vegetation types of eastern Wyoming. A report submitted to the Wyoming Department of Environmental Quality, Water Quality Division. 245 pp.

Marriott, H. J. 1982. Devils Tower National Monument Plant Checklist. Unpublished report for the Devils Tower Natural History Association.

Prairie Dog Town Disturbed Community

COMMON NAME	Prairie Dog Town Disturbed Community
SYNONYM	Prairie Dog Town
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.5.N)
FORMATION	Short sod temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	Undefined

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
Information not available.

Devils Tower National Monument
This vegetation type occurs on the floodplain in the single prairie dog town in the park.

ENVIRONMENTAL DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This vegetation type occurs on the floodplain on disturbed alluvial soils in the single prairie dog town in the park.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Information not available	

Devils Tower National Monument

Strata	Species
Herbaceous	*Buchloe dactyloides, Bromus tectorum, Melilotus* sp., *Ranunculus testiculatus*

DIAGNOSTIC SPECIES
Globally
Information not available.

Devils Tower National Monument
Information not available.

VEGETATION DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This vegetation type varies greatly in terms of local species composition. The species which are present depend on the intensity and duration of disturbance and the kinds of species found in local seed sources which can colonize bare soil. Non-native species are common. Forbs can contribute nearly as much cover as graminoids. Herbaceous cover is short (often less than 20 cm); coverage typically is in the 60 to 100% range.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G?

RANK JUSTIFICATION

DATABASE CODE

COMMENTS
Globally
This community is subject to repeated disturbance by prairie dogs and thus has not been classified up to this point. However, because the disturbance is natural and relatively long-lasting, prairie dog towns may fit the definition of a natural/semi-natural community. Further comparison with other prairie dog towns will be done in the future to determine if they are similar across the landscape.

REFERENCES

Pinus ponderosa / Schizachyrium scoparium Wooded Herbaceous Vegetation

COMMON NAME	Ponderosa Pine / Little Bluestem Wooded Herbaceous Vegetation
SYNONYM	Ponderosa Pine / Little Bluestem Savanna
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse tree layer (V.A.6)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.6.N)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse needle-leaved evergreen or mixed tree layer (V.A.6.N.f.)
ALLIANCE	*Pinus ponderosa* Wooded Medium-tall Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
Currently reported from western Nebraska, South Dakota, and eastern Wyoming; it is unknown if it also occurs in Montana and Colorado.

Devils Tower National Monument
This community occurs throughout the park on steeper slopes underlain by sedimentary rocks. It is especially well-developed on the slopes above the floodplain south and east of Devils Tower, near the east end of the Joyner Ridge Trail loop and along the northeast part of the Red Beds Trail loop. Non-mappable stands occur in many places as ecotones between ponderosa pine communities and grassland.

ENVIRONMENTAL DESCRIPTION
Globally
This community is found on loamy, sandy, or rocky soil. It is usually found on gentle to moderate slopes. Parent material is usually either sandstone or limestone (McAdams et. al 1998).

Devils Tower National Monument
The larger stands of this community were observed on slopes ranging from 13 to 30 degrees. Stands were found on all aspects but northerly. Soils typically are sandy and sandstone outcrops are common.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Tree canopy	*Pinus ponderosa, Juniperus scopulorum*
Short shrub	*Rhus trilobata, Symphoricarpos occidentalis*
Herbaceous	*Bouteloua gracilis, Carex filifolia, Schizachyrium scoparium*

Devils Tower National Monument

Strata	Species
Tree canopy	*Pinus ponderosa*
Subcanopy	*Juniperus scopulorum*
Short shrub	*Rhus trilobata*
Herbaceous	*Schizachyrium scoparium*

DIAGNOSTIC SPECIES
Globally
Pinus ponderosa, Schizachyrium scoparium, Yucca glauca, Opuntia spp.

Devils Tower National Monument
Pinus ponderosa, Schizachyrium scoparium

VEGETATION DESCRIPTION
Globally
This community has scattered mature trees with a fairly continuous graminoid understory. *Pinus ponderosa* is the most abundant tree species, sometimes with *Juniperus scopulorum* present as small trees or tall shrubs. The most abundant graminoids in the understory are *Schizachyrium scoparium, Stipa comata, Carex filifolia, Bouteloua gracilis,* and *B. curtipendula. Calamovilfa longifolia* and *Koeleria macrantha* may be found on sandy soils in the eastern part of this community's range. Forbs that may be present include *Gaura coccinea, Psoralidium lanceolatum,* and *Asclepias pumila.* In addition to the herbaceous species, shrubs such as *Symphoricarpos occidentalis, Rhus aromatica,* and *Cercocarpus montanus* are sometimes found in this community.

Devils Tower National Monument
This community is dominated by *Pinus ponderosa* in the canopy and by dry prairie graminoids in the understory with *Schizachyrium scoparium* consistently most abundant. *Carex filifolia* and *Bouteloua curtipendula* often are significant components of the herbaceous stratum. *Juniperus scopulorum* (subcanopy) and *Rhus trilobata* (short shrub) are consistent components, though not abundant. Canopy cover typically is sparse, with few widely-spaced trees (this is easily seen in aerial photographs). The subcanopy and shrub strata typically are sparse or occasionally absent. Herbaceous cover generally is greater than 50%.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G2G3

RANK JUSTIFICATION
There are probably fewer than 100 occurrences in a restricted range in the northwestern Great Plains. Over 3000 ha are currently documented, and at least that much is expected in other occurrences. Two of the currently documented occurrences are in fair condition; it seems likely that occurrences have been degraded by cattle grazing.

DATABASE CODE CEGL002019

COMMENTS
Globally
Periodic fires are probably important in maintaining the open grassland understory of this type.

Devils Tower National Monument
In some areas, this community probably is an artifact of fire history, representing post-burn pine encroachment into *Schizachyrium scoparium - Bouteloua* (curtipendula, gracilis) - *Carex filifolia* Herbaceous Vegetation.

REFERENCES
Hayward, H. H. 1928. Studies of plants in the Black Hills of South Dakota. Botanical Gazette 85(4):353-412.

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Artemisia cana ssp. cana / Pascopyrum smithii Shrub Herbaceous Vegetation

COMMON NAME	Coaltown Sagebrush / Western-Wheat Grass Shrub Herbaceous Vegetation
SYNONYM	Silver Sagebrush / Western Wheatgrass Shrub Prairie
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.7.N)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)
ALLIANCE	*Artemisia cana* Shrub Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community has only been identified in northeastern Wyoming.

Devils Tower National Monument
This community occurs on the Belle Fourche River floodplain. Individuals or small stands of *Artemisia cana* occasionally are found elsewhere in the park.

ENVIRONMENTAL DESCRIPTION
Globally
This community is found on flat to gently sloping alluvial terraces and fans near larger creeks and rivers. Thilenius et al. (1995) found that most stands were raised at least 1 m above the general floodplain. Soils are formed from alluvium and are medium to fine textured. Flooding may occur infrequently.

Devils Tower National Monument
This community occurs on level sites on alluvial soils of the Belle Fourche River floodplain.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Short shrub	*Artemisia cana*
Herbaceous	*Pascopyrum smithii, Poa pratensis, Bouteloua gracilis*

Devils Tower National Monument

Strata	Species
Short shrub	*Artemisia cana, Symphoricarpos occidentalis*
Herbaceous	*Poa pratensis, Pascopyrum smithii*

DIAGNOSTIC SPECIES
Globally
Artemisia cana, Pascopyrum smithii, Poa pratensis

Devils Tower National Monument
Artemisia cana

VEGETATION DESCRIPTION
Globally
This community is dominated by moderately dense to dense graminoids less than 1 meter tall. *Pascopyrum smithii* is usually the most abundant of these. *Poa pratensis, Bouteloua gracilis,* and *Nassella viridula* are also common. *Calamovilfa longifolia, Stipa comata,* and *Oryzopsis hymenoides* are sometimes present. Short shrubs, especially *Artemisia cana* and sometimes *Symphoricarpos occidentalis*, have 10-25% cover. Forbs and non-vascular species are rare.

Devils Tower National Monument
This community is characterized by stands of *Artemisia cana* often with *Symphoricarpos occidentalis.* Shrub coverage typically ranges from 10 to 25%. *S. occidentalis* may be locally dominant. Herbaceous species are predominantly graminoid with *Poa pratensis* and *Pascopyrum smithii* being the most common.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G3?

RANK JUSTIFICATION

DATABASE CODE CEGL001556

COMMENTS
Globally
This type appears to be very closely related to *Artemisia cana / Pascopyrum smithii* Shrubland which is found in Montana, western North Dakota, and western South Dakota. The most apparent difference is in the cover of shrubs. Further comparison may result in the combination of these two types.

REFERENCES
Thilenius, J. F., G. R.. Brown, and A. L. Medina. 1995. Vegetation on semi-arid rangelands, Cheyenne River Basin, Wyoming. General Technical Report RM-GTR-263. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, Colorado. 60 pp.

Rhus trilobata / Pseudoroegneria spicata Shrub Herbaceous Vegetation

COMMON NAME	Skunkbush Sumac / Bluebunch Wheatgrass Shrub Herbaceous Vegetation
SYNONYM	Skunkbush Sumac / Bluebunch Wheatgrass Shrub Prairie
PHYSIOGNOMIC CLASS	Herbaceous vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (V.A.7.N)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.g.)
ALLIANCE	*Rhus trilobata* Shrub Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community is found in Montana and Wyoming.

Devils Tower National Monument
This community is found on the summit of Devils Tower.

ENVIRONMENTAL DESCRIPTION
Globally
This community is typically found on dry mid to upper slopes and ridge tops. It has been identified on butte tops in eastern Wyoming (Thilenius et al. 1995). Slope and aspect are variable but soils are consistently shallow and rocky. They often form from sandstone parent materials and rock fragments, outcrops, and bare soil cover much of the ground (Mueggler and Stewart 1978).

Devils Tower National Monument
This community occurs on the summit of Devils Tower, a gently sloping very rocky site underlain by phonolite porphyry. Soil development is poor.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Short shrub	*Rhus trilobata*
Herbaceous	*Bromus tectorum, Pascopyrum smithii, Pseudoroegneria spicata*

Devils Tower National Monument

Strata	Species
Short shrub	*Rhus trilobata, Artemisia frigida*
Herbaceous	*Pseudoroegneria spicata, Koeleria macrantha*

DIAGNOSTIC SPECIES
Globally
Rhus trilobata, Pseudoroegneria spicata, Koeleria macrantha

Devils Tower National Monument
Artemisia tridentata, Pseudoroegneria spicata, Rhus trilobata

VEGETATION DESCRIPTION
Globally
Herbaceous species dominate the vegetation, with short shrubs and non-vascular plants present but of lesser importance. Total vegetation cover is moderate (Brown 1971, Thilenius et al. 1995) and few plants grow taller than 1 meter. *Pseudoroegneria spicata* is the most abundant herbaceous species. Others commonly found include *Koeleria macrantha, Schizachyrium scoparium, Bouteloua curtipendula, Bromus tectorum*, and *Opuntia*

polyacantha. Shrubs generally have from 10-25% cover. *Rhus trilobata* is the most common. It is often found with *Artemisia frigida, A. tridentata, Prunus virginiana, Ribes cereum,* or *Eriogonum* spp.

Devils Tower National Monument
A single stand of this vegetation type was observed. Both the short shrub and herbaceous strata were estimated at 5 to 25% cover. Non-vascular cover (lichens and mosses) is significant. *Rhus trilobata* and *Artemisia frigida* are the dominant short shrub species. A. tridentata also occurs on the summit of Devils Tower but is not common.

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G4

RANK JUSTIFICATION

DATABASE CODE CEGL001120

COMMENTS
Devils Tower National Monument
The single stand sampled in this study is also similar to *Artemisia tridentata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation in terms of species composition, but *A. tridentata* is not abundant. Thus, it is currently placed in *Rhus trilobata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation.

REFERENCES
Brown, R. W. 1971. Distribution of plant communities in southeastern Montana Badlands. American Midland Naturalist 85(2):458-477.

Mueggler, W. F. and W. L. Stewart. 1978. Grassland and shrubland habitat types of western Montana. General Technical Report INT-66. Intermountain Forest and Range Experiment Station, USDA Forest Service, Ogden, Utah. 154 pp.

Thilenius, J. F., G. R.. Brown, and A. L. Medina. 1995. Vegetation on semi-arid rangelands, Cheyenne River Basin, Wyoming. General Technical Report RM-GTR-263. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, Colorado. 60 pp.

Phonolite Porphyry Sparse Vegetation

COMMON NAME	Phonolite Porphyry Sparse Vegetation
SYNONYM	
PHYSIOGNOMIC CLASS	Sparse vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Consolidated rock sparse vegetation (VII.A)
PHYSIOGNOMIC GROUP	Sparsely vegetated cliffs (VII.A.1)
PHYSIOGNOMIC SUBGROUP	Natural/semi-natural (VII.A.1.N)
FORMATION	Cliffs with sparse vascular vegetation (VII.A.1.N.a)
ALLIANCE	Rock Outcrop / Butte Sparse Vegetation

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community has only been identified at Devils Tower National Monument. It is likely that further review will identify it in other areas, as well.

Devils Tower National Monument
This vegetation type occurs on the sides of Devils Tower and on the talus slopes below.

ENVIRONMENTAL DESCRIPTION
Globally
Information not available

Devils Tower National Monument
This vegetation type occurs on exposures of phonolite porphyry, an intrusive igneous rock, on the sides of Devils Tower, and on the talus slopes below. Vegetation is found on pockets of soil on ledges, in cracks, and among talus.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Information not available	

Devils Tower National Monument

Strata	Species
Short shrub	*Ribes cereum, R. setosum, Rhus trilobata*
Herbaceous	*Campanula rotundifolia, Cystopteris fragilis*

DIAGNOSTIC SPECIES
Globally
Information not available

Devils Tower National Monument
Information not available.

VEGETATION DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This vegetation type varies greatly in terms of local species composition. The more common species are listed above. Vegetative cover is sparse, usually less than 1%. Lichens are abundant (Marriott 1985)

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G?

RANK JUSTIFICATION

DATABASE CODE Information not available.

COMMENTS

REFERENCES
Marriott, H. 1985. Plant associations and vegetation map of Devils Tower National Monument. Unpublished report prepared for the Devils Tower Natural History Association.

Redbeds Sparse Vegetation

COMMON NAME Redbeds Sparse Vegetation

SYNONYM Redbeds

PHYSIOGNOMIC CLASS Sparse vegetation (VII)

PHYSIOGNOMIC SUBCLASS Consolidated rock sparse vegetation (VII.A)

PHYSIOGNOMIC GROUP Sparsely vegetated cliffs (VII.A.1)

PHYSIOGNOMIC SUBGROUP Natural/semi-natural (VII.A.1.N)

FORMATION Cliffs with sparse vascular vegetation (VII.A.1.N.a)

ALLIANCE Rock Outcrop / Butte Sparse Vegetation

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This community has only been identified at Devils Tower National Monument. This community is also found in low elevations around the Black Hills.

Devils Tower National Monument
This sparse vegetation type is best developed near the east boundary of the park above the Belle Fourche River.

ENVIRONMENTAL DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This sparse vegetation type occurs on exposures of the red Spearfish Formation (sandstones and siltstones). The type is best developed near the east park boundary above the Belle Fourche River on red badlands.

MOST ABUNDANT SPECIES
Globally

Strata	Species
Information not available	

Devils Tower National Monument

Strata	Species
Herbaceous	*Hymenoxys acaulis, Oxytropis lambertii, Eriogonum pauciflorum, Oryzopsis hymenoides*

DIAGNOSTIC SPECIES
Globally
Information not available.

Devils Tower National Monument
Information not available.

VEGETATION DESCRIPTION
Globally
Information not available.

Devils Tower National Monument
This vegetation type varies greatly in terms of local species composition. The more common species are listed above. Herbaceous cover is sparse (less than 10% and often less than 1%).

OTHER NOTEWORTHY SPECIES Information not available.

CONSERVATION RANK G?

RANK JUSTIFICATION

DATABASE CODE Information not available.

COMMENTS

REFERENCES
Marriott, H. 1985. Plant associations and vegetation map of Devils Tower National Monument. Unpublished report prepared for the Devils Tower Natural History Association.