

CHARACTERIZATION ABSTRACTS FOR VEGETATION TYPES  
ON THE  
BIGHORN, MEDICINE BOW, AND SHOSHONE NATIONAL FORESTS

Perpared for  
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The following vegetation abstracts describe vegetation types on the three Region 2 forests. These are dominance types, recognized by the dominant species in the tallest vegetation layer. The forest vegetation types are essentially equivalent to Society of American Foresters forest cover types (Eyre 1980). Each type corresponds to at least one alliance from the new National Vegetation Classification (Anderson et al. 1998).

We selected the vegetation types by reviewing published and unpublished literature about Wyoming vegetation. Much of that information has been summarized for an unpublished draft classification of Wyoming plant communities (Jones 1992). Reports on potential research natural areas also provided useful information. While this list of vegetation types is not exhaustive, we believe it encompasses most of the vegetation found on the three national forests.

To evaluate the status of each vegetation type, we relied on the National Vegetation Classification (Anderson et al. 1998), which lists the terrestrial plant communities that have been described from the United States by the network of state natural heritage programs. For each vegetation type, we examined the information on the documented occurrences, which are listed for each forest in the characterization abstracts. Then we applied the name of a plant association from the national classification to each occurrence. While the national classification does not describe the plant associations, many of the associations have been described by various state natural heritage programs. Using those descriptions, we were able to assign an association name to most of the occurrences on the forests.

The national classification also provides a global conservation rank for each association. This rank is based on the size of the geographic range, the acreage covered, the number of occurrences, and the condition and viability of the occurrences. While many of these conservation ranks are based on estimates and incomplete information, they provide a way of judging the relative rarity of various plant associations and the threats to their existence. Once we had assigned association names to the occurrences in a vegetation type, we were able to use the conservation ranks as an estimate of which vegetation types on the three forests are common and which are rare.

Each vegetation characterization abstract briefly explains what sort of vegetation the type includes. It then summarizes the geographic range throughout the western United States and in Wyoming. A range-wide perspective is then given on the environmental setting, vegetation composition and structure, salient points about succession and other ecological characteristics, status of the plant associations, and management considerations. This range-wide section is followed by information about the type on each forest, including a table showing the references used to document the occurrence of the type. Finally, areas are listed that are known or thought to contain stands representing the vegetation type in good condition. We tried to identify areas that meet three of the four criteria used by the Forest Service to assess potential research natural areas (USDA Forest Service 1993). These criteria are:

- (1) quality: the degree to which the area represents the range in variability within the vegetation type;
- (2) condition: the degree to which the vegetation has been altered from pre-settlement condition by management, exotic weeds, and other factors;
- (3) viability: the prospect for long-term maintenance of the vegetation type in the area.

For many vegetation types, we were unable to identify areas with high-quality occurrences because the information available to us was insufficient to judge which areas met the three criteria. Moreover, some vegetation types are so poorly known that we lack information to assess how well a particular area represents that type.

## RESULTS (Table V1).

Of the 41 vegetation types we described, 33 are represented by several common plant associations. For these vegetation types, the question for USFS biologists and managers is what areas represent the range in variation of vegetation structure and composition and seral stage within each type. Eight of the common vegetation types include rare associations. Those are the *Picea engelmannii* Upland, *Picea engelmannii* Riparian, *Pinus ponderosa*, *Populus angustifolia*, *Festuca idahoensis*, and *Elymus spicatus* types. Five

more vegetation types apparently are represented only by rare or uncommon associations. One of those, *Salix reticulata* vegetation, is an alpine dwarf-willow type that is poorly known throughout its range. Two more, *Salix candida* vegetation and *Salix eastwoodiae* vegetation, are subalpine willow types with wide geographic ranges, but the literature indicates that each is rare within its range. A fourth rare vegetation type, *Artemisia tridentata* ssp. *tridentata* shrub vegetation, is a low-elevation type that is more common off the national forests, in the basins of Wyoming. The fifth rare vegetation type, *Elymus cinereus* (syn. *Leymus cinereus*) grass vegetation, also is more common off of the national forests.

The Shoshone National Forest contains 35 of the 41 vegetation types. Seven of these associations are listed only from this forest: *Geum rossii* alpine turf, *Salix arctica* and *Salix reticulata* alpine dwarf-shrub types, *Pinus albicaulis* forests, *Salix candida* shrub vegetation, *Artemisia tridentata* ssp. *tridentata* shrub vegetation, and *Elymus cinereus* grass type. All five of the vegetation types represented only by rare or uncommon associations are found on the Shoshone. This forest contains 114 plant associations, eleven or them rare.

Twenty-six vegetation types are listed from the Bighorn National Forest, of which one (*Salix eastwoodiae* shrub type) is represented solely by rare or uncommon associations. Two vegetation types, the *Cornus sericea* riparian shrub type and *Cercocarpus ledifolius* upland shrub vegetation, are listed only from the Bighorn. The Bighorn contains nine rare associations.

The Medicine Bow National Forest contains 27 vegetation types. None of them are represented solely by rare or uncommon associations. Two (*Salix brachycarpa* alpine shrub vegetation and *Quercus gambelii* shrubland) are not listed from the other forests. Sixty-nine associations are attributed to the Medicine Bow, and none are considered rare.

To some extent, these number reflect ecological and biogeographic reality. The Shoshone extends across a much broader range in latitude than do the other forests, and it encompasses a wider array of geologic substrates. *Pinus albicaulis* reaches its southern limit in the Wind River Mountains and does not extend as far east as the Bighorns. But undoubtedly the comparative richness of the Shoshone National Forest also reflects a greater sampling effort. While forest habitat type classifications have been completed for all three forests, the Shoshone was classified as part of a large project covering western Wyoming and eastern Montana (Steele et al. 1983). It is likely that this project identified more habitat types on the Shoshone than would a smaller project restricted to the forest, as were the projects on the Bighorn (Hoffman and Alexander 1976) and Medicine Bow (Alexander et al. 1986). Once habitat types had been identified from forests outside the Shoshone, then areas on that forest could be assigned to those habitat types. Had the sampling been restricted to the Shoshone, those areas might have simply been assigned to one of the habitat types already identified from the forest.

The Shoshone National Forest also has benefitted from greater riparian vegetation sampling effort. The riparian classification for the Shoshone (Walford et al. 1997) included two years of sampling over a broad range in elevation. On the Bighorn, the riparian classification (Girard et al. 1997) also is based on several years of sampling, but few of the samples were taken from above 9,000 feet. The riparian vegetation classification for the Medicine Bow (Jones 1992b) included only one field season and the sites were not selected to encompass the known variation in the vegetation.

A classification of non-forest habitat types has been completed for the Shoshone (Tweit and Houston 1980), but no such classifications are available for the Bighorn or the Medicine Bow National Forests. If they were, then more foothills plant associations would be recognized from the latter forests. The paucity of alpine vegetation types from the Bighorns may be explained in the same way: we found no published literature or unpublished reports on the alpine zone of the Bighorns, while a number of references are available for the Shoshone.

## REFERENCES

- Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>
- Jones, George P. 1992. Wyoming plant community classification. Wyoming Natural Diversity Database, Laramie WY. Unpublished.
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS >
- Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister. 1983. Forest Habitats of Eastern Idaho-Western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. <N83STE01WYUS>
- Tweit, Susan J. and Kent E. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service Rocky Mountain Region. 143 pp. <B80TWE01WYUS>
- USDA Forest Service. 1993. Research natural areas guide for the Rocky Mountain Region, USDA Forest Service. Review draft. Rocky Mountain Region, Lakewood CO. 38 pp.
- Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Table V1. General vegetation types and plant associations (with global conservation ranks) present on each of the three Region 2 national forests. X indicates that the association is present and its identity is certain, and ? indicates that the identity of the association is uncertain.

VEGETATION TYPE (and page # in text)	Rank	National Forest		
		Bighorn	Medicine Bow	Shoshone
<b>ALPINE</b>				
CAREX ELYNOIDES (page 1)				
Carex elynoides-Geum rossii	G4	X		X
Carex elynoides	G4		?	X
CAREX RUPESTRIS (page 5)				
Carex rupestris-Geum rossii	G4		X	X
Carex rupestris-Potentilla ovina	G3			X
Carex rupestris-Trifolium dasyphyllum	G3G4		X	
CAREX SCOPULORUM (page 9)				
Carex scopulorum ?	G5			X
Carex scopulorum-Caltha leptosepala	G4		X	X
DRYAS OCTOPETALA (page 14)				
Dryas octopetala/Carex rupestris	G4			X
GEUM ROSSII (page 17)				
Geum rossii-Minuartia obtusiloba	G3			X
Geum rossii-Polygonum bistortoides	G4G5			X
Geum rossii-Selaginella densa	G2G3			X
Geum rossii-Trifolium spp.	G3			X
SALIX ARCTICA (page 22)				
Salix arctica/Geum rossii Plant association?	G4			X
Salix arctica/Polygonum bistortoides ?	G2G3			?
SALIX BRACHYCARPA (page 26)				
Unknown			X	
SALIX GLAUCA (page 29)				
Salix glauca	G3?			?
Salix glauca/Deschampsia cespitosa	G4			?
SALIX RETICULATA (page 32)				
Salix reticulata/Caltha leptosepala	G2			?
<b>SUBALPINE</b>				
ABIES LASIOCARPA-PICEA ENGELMANNII (page 35)				
Abies lasiocarpa/Actaea rubra	G4?			X
Abies lasiocarpa/Arnica cordifolia	G5	X		X
Abies lasiocarpa/Arnica latifolia	G4			X
Abies lasiocarpa/Juniperus communis	G4G5		X	X
Abies lasiocarpa/Linnaea borealis	G5			X
Abies lasiocarpa/Moss	G4		X	
Abies lasiocarpa/Ribes montigenum	G5			?
Abies lasiocarpa/Thalictrum occidentale	G4			X
Abies lasiocarpa/Vaccinium scoparium	G5	X	X	X
Abies lasiocarpa-Picea engelmannii Ribbon Forest	GUQ		X	

PICEA ENGELMANNII UPLAND (page 42)				
Picea engelmannii/Arnica cordifolia	G3?		?	X
Picea engelmannii/Hypnum revolutum	G2			X
Picea engelmannii/Juniperus community	G4G5			X
Picea engelmannii/Physocarpus malvaceus	G2			X
Picea engelmannii/Ribes montigenum	G5			X
Picea engelmannii/Vaccinium scoparium	G3G5	X	?	X
Unknown				
PICEA ENGELMANNII RIPARIAN (page 48)				
Picea engelmannii/Calamagrostis canadensis	G4		?	
Picea engelmannii/Caltha leptosepala	G3	?	X	X
Picea engelmannii/Carex disperma	G2	?		X
Picea engelmannii/Cornus sericea	G3	X		
Picea engelmannii /Equisetum arvense	G4	X	X	X
Picea engelmannii /Galium triflorum	G4			X
Picea engelmannii/Linnaea borealis	G3	X		X
PINUS ALBICAULIS (page 54)				
Pinus albicaulis / Carex geeyeri	G3			X
Pinus albicaulis / Carex rossii	G3?			X
Pinus albicaulis / Festuca idahoensis	G4			X
Pinus albicaulis / Juniperus communis	G4?			X
Pinus albicaulis / Vaccinium scoparium	G4			X
PINUS CONTORTA (page 60)				
Pinus contorta/Arctostaphylos uva-ursi	G5	X	X	
Pinus contorta/Arnica cordifolia	G4?			X
Pinus contorta/Calamagrostis canadensis ?	G5Q	?		
Pinus contorta/Carex geeyeri	G4?		X	
Pinus contorta/Carex rossii	G5		X	X
Pinus contorta/Juniperus communis	G5	X	X	X
Pinus contorta/Linnaea borealis	G5			X
Pinus contorta/Mahonia repens	G4G5		X	
Pinus contorta/Shepherdia canadensis	G3G4		X	X
Pinus contorta/Vaccinium scoparium	G5	X	X	X
POPULUS TREMULOIDES (page 68)				
Populus tremuloides / Artemisia tridentata	G3G4			X
Populus tremuloides / Calamagrostis canadensis	G3	X		
Populus tremuloides / Calamagrostis rubescens	G5?		X	
Populus tremuloides / Carex geeyeri	G4		X	
Populus tremuloides / Heracleum sphondylium	G4Q		X	
Populus tremuloides / Juniperus communis	G4		X	X
Populus tremuloides / Lupinus argenteus	G2?	X		X
Populus tremuloides / Pteridium aquilinum	G4		X	
Populus tremuloides / Symphoricarpos oreophilus	G5Q			X
Populus tremuloides / Thalictrum fendleri	G5		X	X

ALNUS INCANA (page 76)				
Alnus incana / Cornus sericea Plant Community	G3Q		X	X
Alnus incana / Equisetum arvense Plant Community	G3?		X	X
Alnus incana / Mesic Graminoids	G2G3Q		X	X
Alnus incana – Betula occidentalis / Salix spp.	G3		X	X
SALIX BOOTHII (page 82)				
Salix boothii/Carex rostrata	G4	?		X
Salix boothii/Mesic Forbs	G3		?	?
Salix boothii/Mesic Graminoids	G3			?
Unknown association		X	X	
SALIX CANDIDA (page 87)				
Salix candida/Carex rostrata	G3			X
SALIX EASTWOODIAE (page 90)				
Salix eastwoodiae Association	G1?	?		?
Salix eastwoodiae/Carex aquatilis	G2			X
SALIX GEYERIANA (page 94)				
Salix geeyeriana/Calamagrostis canadensis	G5	X	X	
Salix geeyeriana/Carex rostrata	G5	X	X	X
Salix geeyeriana/Deschampsia cespitosa	G4	X		X
Salix geeyeriana/Mesic Forbs	G3			?
Unknown			X	
SALIX PLANIFOLIA (page 99)				
Salix planifolia/Calamagrostis canadensis	G3	X	X	?
Salix planifolia/Caltha leptosepala	G4			X
Salix planifolia/Carex aquatilis	G5	X	X	X
Salix planifolia/Carex scopulorum	G4	?		X
Salix planifolia/Deschampsia cespitosa	G2G3	X		
SALIX WOLFII (page 105)				
Salix wolfii/Carex aquatilis	G4			X
Salix wolfii/Carex rostrata	G4			
Salix planifolia/Carex scopulorum	G4	?		
Salix wolfii/Deschampsia cespitosa	G3	X	X	X
Salix wolfii/Mesic Forbs	G3			?
Unknown		X		
CALAMAGROSTIS CANADENSIS (page 109)				
Calamagrostis canadensis Western Herbaceous Vegetation	G4Q	X	X	X
CAREX AQUATILIS (page 114)				
Carex aquatilis	G5	X	X	X
Carex aquatilis-Carex rostrata	G3G4	X		X
CAREX ROSTRATA (page 119)				
Carex rostrata	G5	X	X	X
DESCHAMPSIA CESPITOSA (page 125)				
Deschampsia-Caltha leptosepala	G4		X	X
Deschampsia cespitosa-Carex microptera	G2G3	?	?	?
Deschampsia cespitosa-Carex spp.	G4Q		X	X
Deschampsia cespitosa-Geum rossii ?	G5		X	
Deschampsia cespitosa-Phleum alpinum ?	G3?			?
Deschampsia cespitosa-Potentilla diversifolia	G5			X



<b>MONTANE</b>				
<b>PINUS PONDEROSA (page 132)</b>				
Pinus ponderosa / Arctostaphylos uva-ursi	G4		X	
Pinus ponderosa / Carex geeyeri	G3G4		X	
Pinus ponderosa / Carex rossii	G4G5		X	
Pinus ponderosa / Cornus sericea	G3	X		
Pinus ponderosa / Festuca idahoensis	G4	X		
Pinus ponderosa / Juniperus communis	G4?	X	X	
Pinus ponderosa / Pseudoroegneria spicata	G4		X	
Pinus ponderosa / Physocarpus monogynus	G3	X	X	
Pinus ponderosa / Spiraea betulifolia	G2?	X		
<b>PINUS FLEXILIS (page 139)</b>				
Pinus flexilis / Arctostaphylos uva ursi	G4		X	
Pinus flexilis / Cercocarpus ledifolius	G3G4	X		
Pinus flexilis / Festuca idahoensis	G5	X	X	X
Pinus flexilis / Festuca kingii	G3		X	X
Pinus flexilis / Juniperus communis	G5	X	X	X
<b>PSEUDOTSUGA MENZIESII (page 145)</b>				
Pseudotsuga menziesii / Acer glabrum	G4?			X
Pseudotsuga menziesii / Arnica cordifolia	G4	X		X
Pseudotsuga menziesii / Calamagrostis rubescens	G5			X
Pseudotsuga menziesii / Carex geeyeri	G4?		X	X
Pseudotsuga menziesii / Festuca idahoensis	G4		X	X
Pseudotsuga menziesii / Juniperus communis	G4	X	X	X
Pseudotsuga menziesii / Mahonia repens	G5	X	X	X
Pseudotsuga menziesii / Physocarpus malvaceus	G5			X
Pseudotsuga menziesii / Physocarpus monogynus	G4	X	X	
Pseudotsuga menziesii / Purshia tridentata	G3Q		X	
Pseudotsuga menziesii / Spiraea betulifolia	G5			X
Pseudotsuga menziesii / Symphoricarpos albus	G5			X
Pseudotsuga menziesii / Symphoricarpos oreophilus	G5	X		X
<b>POPULUS ANGUSTIFOLIA (page 153)</b>				
Populus angustifolia Alliance (several undetermined associations)			X	
Populus angustifolia / Betula occidentalis	G1G3			X
Populus angustifolia / Cornus sericea	G4	X		
Populus angustifolia / Prunus virginiana	G2G3	X		
Populus angustifolia / Rosa woodsii	G2G3	X		X
<b>BETULA OCCIDENTALIS (page 160)</b>				
Betula occidentalis / Cornus sericea	G2G3	X		X
<b>CORNUS SERICEA (page 164)</b>				
Cornus sericea (Provisional)	G4Q	X		

FESTUCA IDAHOENSIS (page 167)				
Festuca idahoensis – Carex inops ssp. heliophila	G3		?	
Festuca idahoensis – Carex obtusata	G3	?	?	
Festuca idahoensis – Deschampsia cespitosa	G3	X		X
Festuca idahoensis – Elymus trachycaulus	G4			X
Festuca idahoensis – Festuca Kingii	G2?	X		
Festuca idahoensis – Pascopyrum smithii	G4			X
Festuca idahoensis – Potentilla diversifolia	G3			X
Festuca idahoensis – Pseudoroegneria spicata	G4	X	X	X
Festuca idahoensis	G2?	X		
FOOTHILLS				
ARTEMISIA NOVA (page 174)				
Artemisia nova / Pseudoroegneria spicata	G4G5	X		X
ARTEMISIA TRIDENTATA SSP. TRIDENTATA (page 178)				
Artemisia tridentata ssp. tridentata / Leymus cinereus	G2			X
Artemisia tridentata ssp. tridentata / Pseudoroegneria spicata	G2G4			X
ARTEMISIA TRIDENTATA SSP. VASEYANA (page 182)				
Artemisia tridentata ssp. vaseyana / Festuca idahoensis	G5	X	X	X
Artemisia tridentata ssp. vaseyana / Leymus cinereus	G4?			X
Artemisia tridentata ssp. vaseyana / Pseudoroegneria spicata	G5	X	X	X
Artemisia tridentata ssp. vaseyana – Symphoricarpos oreophilus / Pseudoroegneria spicata	G5?			X
ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS (page 189)				
Artemisia tridentata ssp. wyomingensis / Pseudoroegneria spicata	G2G4		X	X
CERCOCARPUS LEDIFOLIUS (page 194)				
Cercocarpus ledifolius / Pseudoroegneria spicata	G4Q	X		
QUERCUS GAMBELII (page 198)				
Quercus gambelii / Symphoricarpos oreophilus	G5		X	
ELYMUS CINEREUS (page 201)				
Leymus cinereus (Provisional)	G2G3Q			X
ELYMUS SPICATUS (page 204)				
Pseudoroegneria spicata ?	G2?	X		X
Pseudoroegneria spicata / Pascopyrum smithii	G4			X
Pseudoroegneria spicata / Poa secunda	G4?		X	X
Pseudoroegneria spicata / Stipa comata	G4			?

**CHARACTERIZATION ABSTRACT FOR**  
***Carex elynoides* Vegetation Type**  
**Kobresia-like Sedge Vegetation Type**

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**SUMMARY**

This vegetation type includes alpine turf growing on relatively dry, wind-blown slopes. The low vegetation is composed primarily of sedges and grasses, although forbs may contribute the majority of cover in some stands. Shrubs are all but absent. *Carex elynoides* (Kobresia-like sedge, or blackroot sedge) contributes at least as much cover as does any other single species. This vegetation has been described from the Shoshone and Bighorn National Forests, and may be present on the Snowy Range in the Medicine Bow National Forest. The largest stands occur on carbonate sedimentary rocks, and smaller stands are found on granitic rocks.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Carex elynoides* vegetation occurs from Idaho and Montana south to New Mexico, and it probably grows in the mountains of Utah and Nevada (Reid et al. 1999). This vegetation type has been described from the Shoshone National Forest (Johnson and Billings 1962, Jones and Fertig 1999a, 1999b, 1999c) and the Bighorn National Forest (Welp et al. 1998). Although it has not been described from the Medicine Bow National Forest, *C. elynoides* vegetation may occur in the Snowy Range: Billings (2000) gives cover data from plots along a vegetation gradient in the Medicine Bow Mountains in which *C. elynoides* is a major species in the sparse vegetation. *C. elynoides* alpine vegetation has been described from the Roosevelt National Forest to the south in Colorado (Johnston 1987).

**PHYSICAL ENVIRONMENT**

*Carex elynoides* vegetation occurs in the Shoshone National Forest primarily on slopes with aspects from southeast to northwest (Jones and Fertig 1999a, 1999b, 1999c), facing the prevailing westerly and southwesterly winds. The stands reported from the Bighorn National Forest (Welp et al. 1998) grow on sites exposed to strong winds. This pattern of occurrence on windswept slopes repeats the distribution pattern observed for *C. elynoides* communities in Montana (Cooper et al. 1997) and elsewhere (Reid et al. 1999). It also agrees with the distribution pattern for the sedge revealed by detailed studies of vegetation gradients showing that it reaches its maximum cover on windswept slopes (Johnson and Billings 1962, Billings 2000). On the Bighorn National Forest, *C. elynoides* vegetation has been described from carbonate sedimentary rocks (Welp et al. 1998). In the Shoshone National Forest, the vegetation type has been described from carbonate rocks (Jones and Fertig 1999a, 1999b) and from crystalline rocks (Johnson and Billings 1962, Jones and Fertig 1999c). Apparently it is far more common on the sediments, as has been reported from Montana (Cooper et al. 1997).

**VEGETATION DESCRIPTION**

This type consists of low-growing (< 1 foot) alpine turf vegetation. Canopy cover usually exceeds 50% but may be sparse on some sites (Welp et al. 1998). Graminoids usually contribute more canopy cover than do forbs, and shrubs are virtually absent. In the stands described from the Shoshone (Jones and Fertig 1999a, 1999b, 1999c) and Bighorn National Forests (Welp et al. 1998), *Carex elynoides* generally dominated the vegetation, and other species contributing substantial cover included *Geum rossii*, *Arenaria congesta*, *Erigeron* spp., *Artemisia frigida*, and *Poa secunda* var. *secunda*. Many other species were present in small amounts.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Exposure to wind apparently is the most important factor in shaping the composition and structure of the vegetation. Stands of *C. elynoides* vegetation occur on slopes exposed to winds that remove snow and create relatively dry environments. Reid et al. (1999) cite references suggesting that pocket gophers (Geomysidae) are abundant in Colorado stands, but references from Wyoming do not mention these animals.

Johnson and Billings (1962) describe the *C. elynoides* community turf as "...perhaps the closest approach to climax alpine vegetation...", but they do not expand on this remark.

## STATUS AND TRENDS

The *Carex elynoides* vegetation on the Shoshone and Bighorn National Forests represents two plant associations from the National Vegetation Classification (Anderson et al. 1998). Both are considered common (G4 conservation ranks) throughout western North America.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Hermann (1970) reports that *C. elynoides* is important as a source of forage for domestic sheep in Utah and Wyoming.

### Effects of Management Practices

No information was found in the literature on the effects of management in the *Carex elynoides* vegetation type.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This vegetation type has been described from the Pete's Hole area in the Crystal Creek drainage (Welp et al. 1998). Given that this vegetation type is most common on carbonate sedimentary rocks, it probably occurs mainly on the northern end of the Forest, where limestone and dolomite cover much of the mountain range.

#### Physical environment

The limited information about this type on the Bighorn National Forest suggests that it occupies windswept slopes (Welp et al. 1998), as it does elsewhere throughout its range.

#### Vegetation description

Stands contain sparse vegetation with a high proportion of cushion plants (Welp et al. 1998).

#### Management

No information was found.

### MEDICINE BOW NATIONAL FOREST

A *Carex elynoides* vegetation type apparently has not been described from the forest, but data from Billings (2000) suggests that it occurs in the Snowy Range. If so, it probably exists as small stands, because the alpine zone contains little of the carbonate bedrock that supports large stands of this vegetation elsewhere.

### SHOSHONE NATIONAL FOREST

#### Distribution

This vegetation type is widespread on the forest, from the Beartooth Plateau in the north (Johnson and Billings 1962, Jones and Fertig 1999a and 1999b) to the southern end of the Wind River Mountains (Jones and Fertig 1999c). It apparently is common only in the east-central part of the Wind River Mountains, where carbonate sediments occur in the alpine zone (Jones and Fertig 1999b). On the granitic rocks of the Beartooth Plateau, *C. elynoides* turf occurs in small, infrequent stands within the matrix *Geum rossii* turf (Johnson and Billings 1962). This same distribution pattern is seen on the granitic bedrock of the southern Wind River Mountains (Jones and Fertig 1999c).

Physical environment

The distribution on the Forest conforms to the distribution of the vegetation type throughout its larger range.

Vegetation description

Stand composition and structure appear to fall well within the variation described for *C. elynoides* vegetation throughout the western U.S.

Management

No information was found about the management of this type on the Forest.

**AREAS WITH HIGH-QUALITY OCCURRENCES**

The potential Arrow Mountain Research Natural Area in the Shoshone National Forest, with its extensive area of carbonate sediments in the alpine zone, contains large stands of the *Carex elynoides* vegetation type that appear to represent the structure and composition of the vegetation described for the type. These stands contain very few exotic plants or evidence of anthropogenic disturbances (Jones and Fertig 1999a). Given the association of this vegetation type with carbonate bedrock, stands of this size are unlikely to occur elsewhere on the Shoshone National Forest where the alpine zones lie mainly atop granitic rocks. The northern part of the Bighorn Mountains contains large areas of carbonate sedimentary bedrock, but that part of the mountain range is at a low enough elevation that this alpine vegetation is poorly developed.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

**GENERAL COMMENTS**

This *Carex elynoides* vegetation type, as it has been described from the Shoshone and Bighorn National Forests, is similar to the *C. elynoides* plant associations listed by Johnston (1987) from Colorado. It falls within the *C. elynoides* Herbaceous Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999)

**REPRESENTATION ON THE THREE FORESTS**

The *Carex elynoides* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Welp et al. (1998)	Kobresia sedge/Ross' avens plant community	<i>Carex elynoides</i> - <i>Geum rossii</i> Plant Association	G4
<b>MEDICINE BOW NATIONAL FOREST</b>			
Billings (2000)	No name; plot data from Table 14.2	<i>Carex elynoides</i> Herbaceous Vegetation?	G4
<b>SHOSHONE NATIONAL FOREST</b>			
Johnson and Billings (1962)	<i>Carex elynoides</i> turf	<i>Carex elynoides</i> - <i>Geum rossii</i> Herbaceous Vegetation	G4
Jones and Fertig (1999a, 1999c)	<i>Carex elynoides</i> Herbaceous Vegetation	<i>Carex elynoides</i> - <i>Geum rossii</i> Herbaceous Vegetation	G4
Jones and Fertig (1999b)	Kobresia-like sedge vegetation type	<i>Carex elynoides</i> Herbaceous Vegetation	G4

**EQUIVALENT SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Carex elynoides* vegetation type does not correspond to any SAF forest cover type.

**EQUIVALENT SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPES (SHIFLET 1994)**

The *Carex elynoides* vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume II: the national vegetation classification system: list of types. The Nature Conservancy, Arlington VA, USA. <N98AND01WYUS>
- Billings, William Dwight. 2000. Alpine vegetation. Chapter 14 in: Michael G. Barbour and William Dwight Billings (editors). Terrestrial vegetation of North America. Second edition. Cambridge University Press. 708 pp. <B00BAR01WYUS>
- Cooper, Stephen V. Peter Lesica, and Deborah Page-Dumroese. 1997. Plant community classification for alpine vegetation on the Beaverhead National Forest, Montana. USDA Forest Service General Technical Report INT-GTR-362. Intermountain Research Station, Ogden UT. 61 pp. <N97COO01WYUS>
- Hermann, Frederick J. 1970. Manual of the Carices of the Rocky Mountains and Colorado Basin. USDA Forest Service Agriculture Handbook No. 374. 397 pp.
- Johnson, Philip L. and W.D. Billings. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. Ecological Monographs 32(2): 105-135. <A62JOH02WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>
- Reid, Marion S., Keith A. Schulz, Patrick J. Comer, Michael H. Schindel, Denise R. Culver, Daniel A. Sarr, and Mary C. Damm. 1999. An alliance level classification of vegetation of the coterminous western United States. A report to the University of Idaho Cooperative Fish and Wildlife Research Unit and National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder CO. <N99REI01WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential Pete's Hole research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL09WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Carex rupestris* Vegetation Type  
Curly sedge Vegetation Type**

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**SUMMARY**

This vegetation type includes alpine turf that occurs in small stands throughout the Rocky Mountains from Montana south to north-central New Mexico. In Wyoming, it has been documented on the Shoshone and Medicine Bow National Forest, but it probably also occurs on the Bighorn and Bridger-Teton National Forests. *Carex rupestris* (curly sedge) dominates the vegetation or co-dominates with a number of forb species.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Carex rupestris* vegetation is widespread throughout the alpine zones of the Rocky Mountain from southern Montana south to north-central New Mexico, and it may also occur in the Uinta Mountains of Utah (Reid et al. 1999). Within Wyoming, it has been documented on the Medicine Bow and Shoshone National Forests, but it may also occur in the Bighorn and Bridger-Teton National Forests.

**PHYSICAL ENVIRONMENT**

Stands of this vegetation type occur on windswept ridges and slopes where virtually no snow accumulates. Soils generally contain a substantial proportion of gravel and rock. Substrates are mostly granitic and metamorphic, although occurrences on limestone bedrock have been described from Montana and Wyoming. See Reid et al. (1999) for more information.

**VEGETATION DESCRIPTION**

This type consists of low-growing, herbaceous alpine vegetation. Stands may be dominated by graminoids, or they may contain roughly equal amounts of graminoids and forbs. Shrubs are rare or absent. The vegetation often forms a dense turf, but especially severe sites may support open vegetation. Throughout the range (Reid et al. 1999), *Carex rupestris* dominates or co-dominates the vegetation, and other major species are *Geum rossii*, *Trifolium dasyphyllum*, *Phlox pungens* (syn. = *Phlox sibirica*), *Arenaria obtusiloba*, *Zigadenus elegans*, and *Potentilla ovina* (especially on limestone substrates; Cooper et al. 1997).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Stands are restricted to windswept ridges and slopes and usually are small. They lie within a matrix of other alpine vegetation types (especially *Geum rossii* turf) that grow on more protected parts of the landscape.

**STATUS AND TRENDS**

Most plant associations in this vegetation type are widespread and common (Anderson et al. 1998). One association, the *Carex rupestris*-*Potentilla ovina* association in the Shoshone National Forest, is thought to be uncommon and localized (G3 conservation rank). Information is unavailable on changes in the distribution, abundance, and condition of this type. Stands are naturally small because they are restricted to harsh sites.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Areas with this vegetation type in Wyoming and Montana are grazed by domestic livestock (Thilenius et al. 1980, Jones and Fertig 1999, Cooper et al. 1997), but the vegetation produces relatively little forage (Cooper et al. 1997, Bliss 1956).

### Effects of Management Practices

The effects of grazing and other management practices apparently have not been reported.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

This vegetation type apparently has not been documented on this forest. If it does occur there, it probably will be found in the alpine zone of the high peaks in the south-central part of the Forest and on the limestone and dolomite bedrock in the northern part of the Forest.

### **MEDICINE BOW NATIONAL FOREST**

#### Distribution

The *Carex rupestris* vegetation type has been documented from the Glacier Lakes area in the Snowy Range, where it grows in a mosaic with *Geum rossii* herbaceous vegetation (with which it merges) and, in some places, with *Salix* spp. shrublands (Bliss 1956, Regan et al. 1997). It may occur elsewhere in the alpine zones of the Snowy Range and perhaps the Sierra Madre, especially on quartzite or limestone bedrock.

#### Physical environment

This vegetation type occurs on snow-free ridges and upper slopes with shallow, rocky soils that represent the most severe of the alpine environments in Snowy Range (Bliss 1956, Regan et al. 1997). The substrate is Precambrian quartzite with mafic dikes, and glacial deposits (Regan et al. 1997).

#### Vegetation description

Stands in the Snowy Range contain a substantial amount of *Calamagrostis purpurascens* and *Geum rossii*. This vegetation resembles the species composition of the *Carex rupestris/Trifolium dasyphyllum* plant association listed by Johnson (1987) from the Arapaho and Roosevelt National Forests to the south in Colorado. In most of the Snowy Range, *Geum rossii* seems so uncommon that the vegetation can be placed into the *Carex rupestris-Trifolium dasyphyllum* association of the National Vegetation Classification (Anderson et al. 1998). Where *G. rossii* co-dominates, the vegetation may belong to the *C. rupestris-G. rossii* association.

#### Management

The area of the Snowy Range in which this plant association occurs was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997).

### **SHOSHONE NATIONAL FOREST**

#### Distribution

This vegetation type is known from the northern part of the Forest. In the Twin Lakes area on the Beartooth Plateau, it occurs as stands (apparently small) of distinct vegetation within a matrix of *Geum rossii* turf (Johnson and Billings 1962). It is also known from Pat O'Hara Mountain in the northern Absaroka Mountains, where it occurs as small stands in a matrix of *Festuca idahoensis* and *Geum rossii* vegetation (Jones and Fertig 1999). In both areas, this type grades into the surrounding vegetation. It may also occur elsewhere on the Beartooth Plateau and in the Absaroka and Wind River Mountains.

#### Physical environment

This vegetation type grows on snow-free ridgetops and upper slopes. On the Beartooth Plateau, the substrate is derived from granitic rocks and migmatite (Johnson and Billings 1962); on Pat O'Hara Mountain, the bedrock is limestone (Jones and Fertig 1999).

#### Vegetation description

The vegetation on the Beartooth Plateau, for the most part, contains *Geum rossii* as a co-dominant or sub-dominant species to *C. rupestris* (Johnson and Billings 1962). On Pat O'Hara Mountain (Jones and Fertig 1999), the *C. rupestris* stand lies in a matrix of vegetation on limestone bedrock that contains no *Geum rossii*, and it appears to be a low-elevation representative of the *C. rupestris/Potentilla ovina* community type described from limestone substrates in Montana (Cooper et al. 1997).



### Management

Both areas with documented stands have been grazed by livestock, but the effects of that grazing on the composition of the vegetation apparently are unknown. On the Beartooth Plateau, the occurrence of this vegetation type lies within an area that was grazed by domestic sheep starting early in the 20th century (Thilenius et al. 1980), but grazing may have been light (Hendzel 1985). The occurrence on Pat O'Hara Mountain is in an area grazed by cattle, but no signs of heavy grazing were noted in an evaluation of the area (Jones and Fertig 1999).

### AREAS WITH HIGH-QUALITY OCCURRENCES

This vegetation type apparently occurs as small stands throughout the alpine zones of the Region 2 national forests of Wyoming, but no areas are known to contain obviously outstanding examples. All three of the areas in which the vegetation type has been documented have been grazed by domestic livestock, but the effects of that grazing are unknown. Livestock grazing may have had a minor effect in the Twin Lakes area of the Beartooth Plateau (Hendzel 1985)..

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

Most of the occurrences of this vegetation type are on metamorphic or igneous bedrock and belong to the *Carex rupestris-Geum rossii* plant association or the *C. rupestris-Trifolium dasyphyllum* plant association of the National Vegetation Classification (Anderson et al. 1998). The occurrence on limestone bedrock, in contrast, appears to belong to the *C. rupestris-Potentilla ovina* plant association.

#### REPRESENTATION ON THE THREE FORESTS

The *Carex rupestris* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
Bliss (1956)	<i>Carex drummondiana</i> vegetation (Stations 11 & 12)	<i>Carex rupestris-Trifolium dasyphyllum</i> plant association	G3G4
Regan et al. (1997)	<i>Calamagrostis purpurascens/Carex rupestris</i> plant association	<i>Carex rupestris-Trifolium dasyphyllum</i> plant association	G3G4
Bliss (1956)	<i>Carex drummondiana</i> vegetation (Station 10)	<i>Carex rupestris-Geum rossii</i> plant association	G4
SHOSHONE NATIONAL FOREST			
Jones and Fertig (1999)	Curly sedge-sheep cinquefoil plant community type	<i>Carex rupestris-Potentilla ovina</i> Herbaceous Vegetation	G3
Johnston (1987)	<i>Carex rupestris/Phlox sibirica</i> plant association	<i>Carex rupestris-Geum rossii</i> Herbaceous Vegetation ?	G3
Johnson and Billings (1962)	Cushion plant ( <i>Carex drummondiana</i> ) community	<i>Carex rupestris-Geum rossii</i> Herbaceous Vegetation	G3

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Carex rupestris* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Carex rupestris* vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

- Bliss, L.C. 1956. A comparison of plant development in microenvironments of Arctic and alpine tundras. *Ecological Monographs* 26:303-337. <A56BLI01RMUS>
- Cooper, Stephen V. Peter Lesica, and Deborah Page-Dumroese. 1997. Plant community classification for alpine vegetation on the Beaverhead National Forest, Montana. USDA Forest Service General Technical Report INT-GTR-362. Intermountain Research Station, Ogden UT. <97COO01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Henzel, Leonard. 1985. Suitability investigation report, Twin Lakes Basin Alpine Glaciation and Aquatic Special Interest Area. USDA Forest Service, Rocky Mountain Region. 10 pp. Unpublished.
- Johnson, Philip L. and W.D. Billings. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. *Ecological Monographs* 32(2): 105-135. <A62JOH02WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Pat O'Hara Mountain research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON06WYUS>
- Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes Ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp.
- Reid, Marion S., Keith A. Schulz, Patrick J. Comer, Michael H. Schindel, Denise R. Culver, Daniel A. Sarr, and Mary C. Damm. 1999. An alliance level classification of vegetation of the coterminous western United States. A report to the University of Idaho Cooperative Fish and Wildlife Research Unit and National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder CO. <N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>
- Thilenius, John, Robert Buttery, and Ronnie Julian. 1980. Draft establishment report for the Twin Lakes Research Natural Area. USDA Forest Service, Rocky Mountain Region. 21 pp. Unpublished.

**CHARACTERIZATION ABSTRACT FOR  
*Carex scopulorum* Vegetation Type  
Rocky Mountain Sedge Vegetation Type**

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**SUMMARY**

This vegetation type includes herbaceous wetlands of alpine zones throughout the Rocky Mountains and the interior West. *Carex scopulorum* (Rocky Mountain sedge) is a major species and usually dominates the dense, rhizomatous vegetation. Stands of this type have been documented from the Shoshone and Medicine Bow National Forests, and they should be expected on the Bighorn National Forest as well.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation type is found in the mountains of Nevada and eastern Oregon, and in the Rocky Mountains from Montana south into Colorado. In Wyoming, it has been documented from the Beartooth Plateau (Johnson and Billings 1962, Fertig and Bynum 1994, Walford et al. 1997), the northern Absaroka Mountains (Jones and Fertig 1999), the Snowy Range (Bliss 1956), and the western slope of the Wind River Mountains (Potkin and Munn 1989).

**PHYSICAL ENVIRONMENT**

This is an alpine vegetation type that occupies wet soils high in organic matter, on stream terraces, around lake shores, and downslope from snowbanks that provide water throughout the summer. Standing water may be present throughout the growing season. Parent materials are granitic igneous and metamorphic rocks (Reid et al. 1999).

**VEGETATION DESCRIPTION**

Reid et al. (1999) review this vegetation type throughout its range. The vegetation can grow up to 15 inches tall, and usually is a dense, rhizomatous mat in which graminoids contribute more cover than do forbs. Shrubs (especially *Salix* spp.) may be present but they contribute little cover. *Carex scopulorum* dominates or co-dominates the vegetation; other important species are *Carex illota*, *Deschampsia cespitosa*, *Caltha leptosepala*, *Pedicularis groenlandica*, and *Potentilla* sp.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1999) suggest that this vegetation is stable in the absence of disturbance.

**STATUS AND TRENDS**

This is a widespread and common type. Two plant associations have been identified, and both are considered abundant (conservation ranks of G4 and G5; Anderson et al. 1998). Information apparently has not been compiled on changes in the distribution, abundance, and condition of this type.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

In southwestern Montana, this is a major vegetation type in high-elevation grazing allotments (Hansen et al. 1995). *Carex scopulorum*, though, is rated as having only medium palatability to livestock (Hermann 1970).

Effects of Management Practices

Hansen et al. (1995) report that grazing and trampling in stands of this type cause the cover of *C. scopulorum* to decrease and the cover of forbs to increase. They also point out that the saturated soils are subject to compaction.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

This vegetation type apparently has not been documented from this Forest, but it probably is present in the alpine zone of the south-central part.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

The *C. scopulorum* vegetation type has been described from wet meadows in the Snowy Range area of the Medicine Bow Mountains (Bliss 1956).

#### Physical environment

Sites supporting this vegetation type are level, usually next to ponds or small lakes, and have saturated soils (Bliss 1956).

#### Vegetation description

*Carex scopulorum*, *Caltha leptosepala*, and *Senecio cymbalarioides* dominate the vascular vegetation. Scattered *Salix planifolia* often are present. Mosses may contribute as much cover as vascular plants.

#### Management

The area of the Snowy Range in which this plant association occurs was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997).

### SHOSHONE NATIONAL FOREST

#### Distribution

Occurrences of this vegetation type have been described from the Beartooth Plateau (Johnson and Billings 1962, Tweit and Houston 1980, Collins et al. 1984, Fertig and Bynum 1994, Walford et al. 1997) and from Sheep Mesa in the eastern Absaroka Mountains (Jones and Fertig 1999). Johnston (1987) reports several *C. scopulorum* plant associations from the Forest, based on Johnson and Billings (1964) or Tweit and Houston (1980).

*C. scopulorum* vegetation has been described from the western side of the Wind River Mountains in the Bridger-Teton National Forest (Potkin and Munn 1989) and it probably also occurs in wetlands on the eastern slope of the Wind Rivers, in the Shoshone National Forest.

#### Physical environment

On the Beartooth Plateau, this vegetation occurs on stream terraces and on gentle slopes downhill from snowbanks that provide water throughout the summer (Johnson and Billings 1962, Fertig and Bynum 1994, Walford et al. 1997). On Sheep Mesa, this vegetation has been described from gentle slopes and swales on the floor of the north-facing cirque at the head of Blackwater Creek (Jones and Fertig 1999). Soils are wet and usually have a large amount of organic matter (Johnson and Billings 1962, Walford et al. 1997).

#### Vegetation description

Johnson and Billings (1962) report *Eriophorum callitrix* as a sub-dominant in all stands, and *Caltha leptosepala* present in most stands. At Sawtooth Fen on the southern Beartooth Plateau (Collins et al. 1984), *C. scopulorum* and several other sedges co-dominate a fen surrounding the palsa; *Deschampsia cespitosa* and moss dominate drier hummocks in the fen. The stands described by Walford et al. (1997) often contain substantial amounts of *Carex illota*, *Deschampsia cespitosa*, *Juncus mertensianus*, *Senecio cymbalarioides*, and mosses. *Salix planifolia* often is present, and their stands merge into *Salix planifolia*/*Carex scopulorum* shrub vegetation. On Sheep Mesa (Jones and Fertig 1999), the major species are *Poa arctica* and *Potentilla* sp., but *Carex scopulorum* is sub-dominant. The species list and description of the environment match those given by Cooper et al. (1997) for their *Carex scopulorum*-*Caltha leptosepala* community type in Montana.

#### Management

The Twin Lakes area of the Beartooth Plateau from which this type has been documented has been grazed by domestic sheep since early in the 20th century (Thilenius et al. 1980), but the effects have not been documented.

Tweit and Houston (1980) suggest that the susceptibility of the saturated organic soils to damage from trampling makes this vegetation type unsuitable for livestock grazing.

#### AREAS WITH HIGH-QUALITY OCCURRENCES

The Twin Lakes area of the Beartooth Plateau apparently represents this type well. Numerous small stands there are typical of the manner in which this type occurs in the alpine zone. Those stands have been open to livestock (sheep) grazing since early in the 20th century (Thilenius et al. 1980), but grazing may have been light (Hendzel 1985).

#### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

##### GENERAL COMMENTS

This *Carex scopulorum* vegetation type, as it is described for the three national forests, is part of the *Carex scopulorum* Seasonally Flooded Herbaceous Alliance from the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999), and it contains two plant associations from that classification. This type also contains four plant associations as described by Johnston (1987) for USDA Forest Service Region 2.

##### REPRESENTATION ON THE THREE FORESTS

The *Carex scopulorum* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			G
MEDICINE BOW NATIONAL FOREST			
Bliss (1956)	Wet meadow	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> plant association	G4
SHOSHONE NATIONAL FOREST			
Johnson and Billings (1962)	<i>Carex scopulorum</i> Bog Vegetation	<i>Carex scopulorum</i> Herbaceous Vegetation?	G5
Fertig and Bynum (1962)	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> community type	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> plant association	G4
Jones and Fertig (1999)	Mesic alpine vegetation type	<i>Carex scopulorum</i> Herbaceous Vegetation?	G5
Walford et al. (1997)	<i>Carex scopulorum</i> Community Type	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> plant association?	G4
Collins et al. (1984)	<i>Carex fen</i>	<i>Carex scopulorum</i> Herbaceous Vegetation?	G5
Tweit and Houston (1980)	<i>Carex scopulorum</i> Bog Community Type	<i>Carex scopulorum</i> Herbaceous Vegetation?	G5
Johnston (1987)	<i>Carex scopulorum</i> - <i>Acomastylis rossii</i> plant association	Unknown	
Johnston (1987)	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> plant association	<i>Carex scopulorum</i> - <i>Caltha leptosepala</i> plant association	G4
Johnston (1987)	<i>Carex scopulorum</i> - <i>Deschampsia cespitosa</i> plant association	<i>Carex scopulorum</i> Herbaceous Vegetation	G5
Johnston (1987)	<i>Carex scopulorum</i> /moss plant association	<i>Carex scopulorum</i> Herbaceous Vegetation	G5

##### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Carex scopulorum* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)  
The *Carex scopulorum* vegetation type does not correspond to any SRM rangeland cover type.

#### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Collins, Ellen I., Robert W. Lichvar, and Erwin F. Evert. 1984. Description of the only known fen-palsa in the contiguous United States. *Arctic and Alpine Research* 16(2): 255-258. <A84COL01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Twin Lakes research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER11WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Henzel, Leonard. 1985. Suitability investigation report, Twin Lakes Basin Alpine Glaciation and Aquatic Special Interest Area. USDA Forest Service, Rocky Mountain Region. 10 pp. Unpublished.

Hermann, Frederick J. 1970. Manual of the Carices of the Rocky Mountains and Colorado Basin. USDA Forest Service Agriculture Handbook No. 374. 397 pp.

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <N99JON08WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. <U89POT01WYUS>

Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp. <U97REG01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Thilenius, John, Robert Buttery, and Ronnie Julian. 1980. Draft establishment report for the Twin Lakes Research Natural Area. USDA Forest Service, Rocky Mountain Region. 21 pp. Unpublished.

Tweit, Susan J. and Kent E. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service Rocky Mountain Region. 143 pp. <B80TWE01WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Dryas octopetala* Vegetation Type**  
**Mountain avens Vegetation Type**

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**SUMMARY**

This vegetation type consists of patches of low-growing, usually sparse shrubs with a few graminoids and forbs on windswept alpine sites. It is widespread in the western United States, and has been documented from the Shoshone National Forest in Wyoming.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Dryas octopetala* vegetation grows in the alpine zones of the northwestern and west-central U.S., from the eastern Cascade Mountains east to the Rocky Mountains in Montana and south into Colorado (Reid et al. 1999).

**PHYSICAL ENVIRONMENT**

Stands of this vegetation type are found in the alpine zone, on windswept ridges and slopes. Soils usually are shallow and rocky and may be derived from a variety of rock types. Soils often are disturbed by frost boiling and formation of needle ice (Reid et al. 1999).

**VEGETATION DESCRIPTION**

This type consists of low-growing vegetation with patches of *Dryas octopetala*. In most stands, a few herbaceous species are present, usually as scattered individuals; the most common species are *Carex rupestris* (which may co-dominate with *Dryas*), *Arenaria (Minuartia) obtusiloba*, *Sedum lanceolatum*, *Lupinus* sp., *Danthonia intermedia*, *Festuca brachyphylla*, and *Luzula spicata*. In stands on protected sites with moist soils (the *D. octopetala*/*Polygonum viviparum* association; Cooper et al. 1997), the vegetation is denser and contains substantial amounts of *Polygonum viviparum*, *Polygonum bistortoides*, *Zigadenus elegans*, and *Oxytropis viscida*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Distribution and composition of this vegetation type is controlled mainly by the harsh physical environment (Reid et al. 1999). Johnson and Billings (1962) suggest that stands on the Beartooth Plateau are being invaded by species from the surrounding *Geum rossii* turf.

**STATUS AND TRENDS**

Of the four plant associations recognized in National Vegetation Classification (Anderson et al. 1998), one apparently is restricted to Montana and is considered rare (conservation rank G2), two are considered uncommon (G3? rank), and the association found on the Shoshone National Forest is considered abundant (G4 rank).

No information was found on changes in the distribution, abundance, or condition of this vegetation type.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Given the sparseness of the vegetation, this type probably produces little forage for domestic livestock.

Effects of Management Practices

No information was found on the effects of management practices on this vegetation type.



## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

This vegetation type is not known to occur on this forest, although it may be found on windswept alpine sites of the south-central Bighorn Mountains.

### MEDICINE BOW NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### SHOSHONE NATIONAL FOREST

#### Distribution

This vegetation has been documented in small stands in the Twin Lakes area (Johnson and Billings 1962) and atop Beartooth Butte (Jones and Fertig 1999b) on the Beartooth Plateau, on Pat O'Hara Mountain in the eastern Absaroka Mountains (Jones and Fertig 1999c), and at Arrow Mountain in the east-central Wind River Mountains (Jones and Fertig 1999a).

#### Physical environment

All stands documented from the forest occur on windswept slopes or saddles. In the Twin Lakes area, the bedrock apparently is granitic igneous rock or metamorphic rock. At Beartooth Butte, Pat O'Hara Mountain, and Arrow Mountain, stands grow on limestone or dolomite, and much of the ground surface is covered with gravel.

#### Vegetation description

The vegetation in all of the stands consists of scattered patches of low-growing *Dryas octopetala* with a few other species. In the stands at Beartooth Butte, Pat O'Hara Mountain, and Arrow Mountain, the most constant species are *Carex elynoides*, *Carex rupestris*, *Antennaria* spp., *Saxifraga* spp., *Oxytropis* spp., and *Arenaria obtusiloba*. Johnson and Billings (1962) suggest that species from the surrounding *Geum rossii* turf vegetation are invading stands of this vegetation type at Twin Lakes.

#### Management

No information on the management of this vegetation type was encountered. It probably is unimportant for livestock grazing because of the sparse growth.

### AREAS WITH HIGH-QUALITY OCCURRENCES

It is unknown whether any of the four documented occurrences are outstanding representatives of the vegetation.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

None

### REPRESENTATION ON THE THREE FORESTS

The *Dryas octopetala* vegetation is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Jones and Fertig (1999a)	<i>Dryas octopetala</i> / <i>Carex rupestris</i> plant community type	<i>Dryas octopetala</i> / <i>Carex rupestris</i> plant association	G4
Jones and Fertig (1999b)	Mountain avens-curlly sedge plant community type	<i>Dryas octopetala</i> / <i>Carex rupestris</i> plant association	G4
Jones and Fertig (1999c)	Mountain avens-curlly sedge plant community type	<i>Dryas octopetala</i> / <i>Carex rupestris</i> plant association	G4
Johnson and Billings (1962)	<i>Dryas octopetala</i> mats	Unknown	

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Dryas octopetala* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Dryas octopetala* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>

Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Pat O'Hara Mountain research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON06WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Geum rossii* Vegetation Type**  
**Alpine avens Vegetation Type**

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**SUMMARY**

This vegetation type encompasses alpine turf in which *Geum rossii* (alpine or Ross's avens) dominates or co-dominates.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Geum rossii* vegetation is widespread throughout the western United States, occurring in alpine zones of mountains from Montana southward into New Mexico, northern Arizona, and southeastern Nevada (Reid et al. 1999). Within Wyoming, it has been documented from the Shoshone, Medicine Bow, and Bridger-Teton National Forests, and it may also occur in the Bighorn National Forest.

**PHYSICAL ENVIRONMENT**

Stands occupy well-drained slopes and ridges in the alpine zone. These sites usually are less windswept than those supporting cushion plant vegetation and short sedge turf, and they may have a moderate amount of snow cover during the winter (Regan et al. 1997). Information from Montana (Cooper et al. 1997) and from the Shoshone National Forest (Jones and Fertig 1999a, 1999b, 1999c) suggest that *G. rossii* vegetation is far less common on carbonate sedimentary rocks (limestone and dolomite) than it is on other types of bedrock.

**VEGETATION DESCRIPTION**

This is a low-growing herbaceous vegetation type in which forbs (principally *Geum rossii*) contribute more cover than do graminoids. Shrubs are rare or absent, although some stands contain dwarf willows. On the more windswept sites, cushion plants and low sedges contribute substantial cover and the vegetation may be patchy; common species are *Trifolium nanum*, *T. dasyphyllum*, *Phlox* spp., *Arenaria (Minuartia) spp.*, *Selaginella densa*, *Carex rupestris*, and *C. elynoides*. These stands may grade into low sedge turf. On protected sites, the vegetation contains more coverage of upright plants and less cover of cushion plants and the vegetation is a dense turf; common species in these stands are *Polygonum bistortoides*, *Artemisia scopulorum*, *Trifolium parryi*, and *Carex scopulorum*. This vegetation often grades into *Carex scopulorum* or *Deschampsia cespitosa* vegetation.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Wind exposure and soil moisture apparently exert primary control in the distribution, structure, and composition of this vegetation type. Reid et al. (1999) review information suggesting that *G. rossii* vegetation may replace cushion plant vegetation when the latter is weakened by the grazing of meadow voles.

**STATUS AND TRENDS**

This widespread vegetation type contains one rare plant association (Anderson et al. 1998), the *G. rossii-Carex albonigra* association from the western slope of the Wind River Mountains (G2 conservation rank). Three associations are considered uncommon (G2G3 or G3 ranks): the *G. rossii-Selaginella densa* association from the Wind River Mountains (including the Shoshone National Forest), the *G. rossii-Trifolium* spp. association (from the Shoshone and Medicine Bow National Forests), and the *G. rossii-Minuartia (Arenaria) obtusiloba* association (from the Shoshone National Forest). (The classification of these rare and uncommon types is uncertain, though, and if combined, this vegetation probably would be considered common.) A fifth association, the *G. rossii-Polygonum bistortoides* association, is common (rank of G4G5) and occurs on the Medicine Bow and Shoshone National Forests.

Information on changes in distribution, abundance, and condition of this vegetation type apparently is unavailable.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

*Geum rossii* vegetation provides more forage than do the drier, more windswept sedge turf vegetation types (Tweit and Houston 1980, Smith 1969). This vegetation type has been grazed by domestic livestock, principally sheep (Thilenius et al. 1980, Regan et al. 1997).

### Effects of Management Practices

The effects of livestock grazing and other management practices on this type apparently have not been documented for this type.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

This vegetation type has not been documented on this forest, but *G. rossii* has been collected in the alpine zone of the Bighorn Mountains, so the vegetation type probably occurs there.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation type has been documented from the alpine zone of the Snowy Range peaks (Smith 1969, Jankovsky-Jones et al. 1997a, Regan et al. 1997) and from the Sierra Madre at Standard Park (Jankovsky-Jones 1997b).

#### Physical environment

In the Snowy Range, stands occur on slopes with moderate snow cover, on well-drained, relatively coarse-textured soils (Smith 1969, Regan et al. 1997). Stands in Standard Park also occur on slopes.

#### Vegetation description

*Geum rossii* dominates or co-dominates all of the vegetation described from both areas. Much of the vegetation in the Snowy Range and the Sierra Madre contains a substantial amount of upright plants characteristic of the *G. rossii-Polygonum bistortoides* plant association. In the lower part of the alpine zone in the Snowy Range, *Carex rossii* co-dominates the vegetation (Regan et al. 1997). Vegetation with a larger proportion of cushion plants and a lower proportion of upright plants apparently fits the *G. rossii-Trifolium* spp. plant association.

In both areas, the *G. rossii* vegetation type occurs in a mosaic with subalpine forest, and it blends into subalpine meadow, *Salix* spp. shrublands, and *Deschampsia cespitosa* meadow. In the Snowy Range, it merges with *Carex rupestris* alpine vegetation on windblown slopes.

#### Management

The area of the Snowy Range in which this plant association occurs was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997).

### SHOSHONE NATIONAL FOREST

#### Distribution

This is a common alpine vegetation type throughout the Forest (Tweit and Houston 1980). It is the major part of the alpine mosaic around Twin Lakes on the Beartooth Plateau (Johnson and Billings 1962, Fertig and Bynum 1997), on Sheep Mesa (Jones and Fertig 1999c) and Carter Mountain (Thilenius and Smith 1985) in the eastern Absaroka Mountains, and on Roaring Fork Mountain in the southern Wind River Mountains (Jones and Fertig 1999b). *Geum rossii* vegetation is a smaller part of the vegetation mosaic on Arrow Mountain in the central Wind River Mountains, with its preponderance of carbonate sedimentary bedrock (Jones and Fertig 1999a).

#### Physical environment

*Geum rossii* vegetation occurs on slopes with well-drained soils. It is a major vegetation type on igneous rock (Johnson and Billings 1962, Fertig and Bynum 1994, Jones and Fertig 1999b, 1999c) and volcanic rock

(Thilenius and Smith 1985), but appears to be only a minor part of the vegetation on carbonate sedimentary rock (Jones and Fertig 1999a).

Vegetation description

*Geum rossii* dominates or co-dominates all of the vegetation. On windswept slopes, cushion plants contribute substantial cover and upright plants are minor components of the vegetation, while the reverse is true on protected slopes.

Management

This vegetation type produces more forage than other alpine types because it grows on relatively protected sites, and therefore it is better suited to grazing (Tweit and Houston 1980). The occurrences on the Beartooth Plateau (Thilenius et al. 1980), Carter Mountain (Thilenius and Smith 1985), and the Snowy Range (Regan et al. 1997) have been grazed by domestic livestock.

AREAS WITH HIGH-QUALITY OCCURRENCES

In the Shoshone National Forest, the Beartooth Plateau and Roaring Fork Mountain contain large areas of this vegetation. It is unclear whether either area is a particularly good representation of this type.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

GENERAL COMMENTS

This *Geum rossii* vegetation type apparently represents four plant associations from the National Vegetation Classification (Anderson et al. 1998), and it is part of the *Geum rossii* Herbaceous Alliance from that classification as described by Reid et al. (1999).

REPRESENTATION ON THE THREE FORESTS

The *Geum rossii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
None			
<b>MEDICINE BOW NATIONAL FOREST</b>			
Regan et al. (1997)	<i>Geum rossii</i> / <i>Carex rossii</i> plant association	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association?	G4G5
Smith (1969)	<i>Geum</i> turf	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association?	G3
Johnston (1987)	<i>Acomatsylis rossii</i> / <i>Trifolium dasyphyllum</i> plant association	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Jankovsky-Jones et al. (1995a)	<i>Trifolium parryi</i> - <i>Geum rossii</i> community	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Jankovsky-Jones et al. (1995b)	<i>Trifolium parryi</i> - <i>Geum rossii</i> community	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
<b>SHOSHONE NATIONAL FOREST</b>			
Johnson and Billings (1962)	<i>Geum rossii</i> turf (stands 24,36,23,15)	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Johnson and Billings (1962)	<i>Geum rossii</i> turf (stands 31,32)	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Johnson and Billings (1962)	<i>Geum rossii</i> turf (stands 38,6,5)	<i>Geum rossii</i> - <i>Minuartia obtusiloba</i> plant association	G3
Johnston (1987)	<i>Acomastylis rossii</i> / <i>Bistorta bistortoides</i> plant association	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Johnston (1987)	<i>Acomastylis rossii</i> / <i>Carex rupestris</i> plant association	<i>Geum rossii</i> - <i>Minuartia obtusiloba</i> plant association?	G3

Johnston (1987)	<i>Acomatsylis rossii</i> / <i>Trifolium dasyphyllum</i> plant association	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Johnston (1987)	<i>Acomatsylis rossii</i> / <i>Trifolium nanum</i> plant association	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Johnston (1987)	<i>Acomatsylis rossii</i> / <i>Trifolium</i> sp.- <i>Deschampsia cespitosa</i> plant association	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Thilenius and Smith (1985)	<i>Geum rossii</i> - <i>Trifolium nanum</i> community type	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Thilenius and Smith (1985)	<i>Trifolium dasyphyllum</i> - <i>Geum rossii</i> community type	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Thilenius and Smith (1985)	<i>Geum rossii</i> - <i>Trifolium parryi</i> community type	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Tweit and Houston (1980)	<i>Geum rossii</i> turf	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Fertig and Bynum (1994)	Alpine tundra complex	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Fertig and Bynum (1994)	Alpine tundra complex	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Jones and Fertig (1999a)	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant community type	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3
Jones and Fertig (1999b)	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant community type	<i>Geum rossii</i> - <i>Polygonum bistortoides</i> plant association	G4G5
Jones and Fertig (1999b)	<i>Geum rossii</i> - <i>Selaginella densa</i> plant community type	<i>Geum rossii</i> - <i>Selaginella densa</i> plant association	G2G3
Jones and Fertig (1999c)	Ross's avens-clover species community type	<i>Geum rossii</i> - <i>Trifolium</i> spp. plant association	G3

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Geum rossii* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Geum rossii* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Twin Lakes research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER11WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Ribbon Forest research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN06WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Standard Park and Bogs research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN03WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Thilenius, John, Robert Buttery, and Ronnie Julian. 1980. Draft establishment report for the Twin Lakes Research Natural Area. USDA Forest Service, Rocky Mountain Region. 21 pp. Unpublished.

Thilenius, H.F. and D.R. Smith. 1985. Vegetation and soils of an alpine range in the Absaroka Mountains, Wyoming. Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-121. 51 pp. <N85THI40WYUS>

Tweit, Susan J. and Kent E. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service Rocky Mountain Region. 143 pp. <B80TWE01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix arctica* Vegetation Type**  
**Arctic Willow Vegetation Type**

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**SUMMARY**

This type includes alpine vegetation throughout western North America in which *Salix arctica* (Arctic willow) dominates or co-dominates. Stands have been documented from three locations on the Shoshone National Forest, on both dry, windblown and wet, protected sites. It may also occur in the Bighorn and Medicine Bow National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Salix arctica* vegetation occurs in western Canada (references cited in Cooper et al. 1997), in the U.S. Rocky Mountains from Montana south into New Mexico, and in Nevada (Reid et al. 1999). In Wyoming, this vegetation has been described from the Beartooth Plateau (Johnson and Billings 1962, Jones and Fertig 1998b) and the Wind River Mountains (Jones and Fertig 1999a) of the Shoshone National Forest, and from the western slope of the Wind River Mountains in the Bridger-Teton National Forest (Potkin and Munn 1989).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) report that this vegetation type occurs on gently to moderately sloping alpine sites, usually with northerly aspects, where snow lingers well into the growing season. Soils are moist and may be saturated.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have summarized the scant information on this type throughout the western U.S. *Salix arctica* dominates the vegetation, forming a mat only several inches tall. *Salix reticulata* may co-dominate and *Polygonum bistortoides* is a common associate. Stands on saturated soils contain *Caltha leptosepala* and *Pedicularis groenlandica*, while stands on drier sites contain *Geum rossii*, *Sibbaldia procumbens*, *Erigeron melanocephalus*, *Agrostis* spp., and *Juncus drummondiana*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Johnson and Billings (1962) suggest that areas on the Beartooth Plateau dominated by *Salix arctica* are frost boils (patches of soil disturbed by frost) in various stages of recovery to the surrounding *Deschampsia* meadow.

**STATUS AND TRENDS**

Stands on the Region 2 forests seem to correspond to both rare (G2G3 global conservation rank) and common (G4 rank) plant associations from the National Vegetation Classification (Anderson et al. 1998). Reid et al. (1999) note that *S. arctica* vegetation is poorly known and that the relationship of *S. arctica* vegetation to *S. reticulata* vegetation needs review. Such a review might show that the two should be combined and, as one type, are more common than now thought. Information apparently has not been collected on changes in the distribution, abundance, and condition of this vegetation.

**MANAGEMENT CONSIDERATIONS**

No information is known about the management or uses of this vegetation. Information about *S. arctica* vegetation suggests that it forms small stands in the alpine zone, and therefore is of little economic importance.



## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

This vegetation has not been documented from this forest, but *Salix arctica* has been collected from the Bighorn Mountains and the vegetation type may occur in the alpine zone.

### MEDICINE BOW NATIONAL FOREST

This vegetation has not been documented from this forest, but *S. arctica* has been collected in the Medicine Bow Mountains and this vegetation type may occur in the alpine zone there. Johnston (1987) reports *S. arctica* vegetation from the Arapaho and Roosevelt National Forests to the south in Colorado.

### SHOSHONE NATIONAL FOREST

#### Distribution

Stands of *Salix arctica* vegetation have been described from Twin Lakes (Johnson and Billings 1962) and Beartooth Butte (Jones and Fertig 1998b) on the Beartooth Plateau, and from Arrow Mountain in the Wind River Mountains (Jones and Fertig 1998a).

#### Physical environment

This vegetation type forms small patches (to 6 feet diameter) on soils disturbed by frost (Johnson and Billings 1962), and slightly larger stands on talus slopes (Jones and Fertig 1998b) and benches (Jones and Fertig 1998a).

#### Vegetation description

On relatively dry, windblown sites (Johnson and Billings 1962), associated species are *Geum rossii* and *Trifolium parryi*. A wet bench (Jones and Fertig 1998a) contained large amounts of *Carex scopulorum* and *Sedum integrifolium*, while a talus slope (Jones and Fertig 1998b) included substantial amounts of *Salix rotundifolia*, *Hedysarum sulphurescens*, and *Polygonum viviparum*, and smaller amounts of numerous additional species.

#### Management

No specific information was found about the management of this type on the forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

The distribution of this vegetation type is poorly known and areas with particularly good examples have not been identified.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

The National Vegetation Classification (Anderson et al. 1998) contains four *Salix arctica* plant associations in two alliances (the *S. arctica* Dwarf-Shrubland Alliance and the *S. arctica* Saturated Dwarf-Shrubland Alliance), and both alliances seem to be represented on the three national forests. Reid et al. (1999) note that both of the alliances are poorly known.

### REPRESENTATION ON THE THREE FORESTS

The *Salix arctica* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Johnson and Billings (1962)	<i>Trifolium parryi</i> - <i>Salix anglorum</i> soil frost areas in <i>Deschampsia</i> meadows	<i>Salix arctica</i> / <i>Geum rossii</i> Plant association?	G4
Johnston (1987)	<i>Salix arctica</i> / <i>Acomastylis rossii</i> Plant Association	<i>Salix arctica</i> / <i>Geum rossii</i> Plant association?	G4
Jones and Fertig (1999a)	<i>Salix arctica</i> Dwarf-shrubland Alliance	Unknown; probably in the <i>Salix arctica</i> Saturated Dwarf-shrub Alliance	G?
Jones and Fertig (1998b)	<i>Salix arctica</i> / <i>Polygonum bistortoides</i> Community Type	<i>Salix arctica</i> / <i>Polygonum bistortoides</i> Plant Association?	G2G3

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix arctica* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix arctica* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Cooper, Stephen V. Peter Lesica, and Deborah Page-Dumroese. 1997. Plant community classification for alpine vegetation on the Beaverhead National Forest, Montana. USDA Forest Service General Technical Report INT-GTR-362. Intermountain Research Station, Ogden UT. < N97COO01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Johnson, Philip L. and W.D. Billings. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. Ecological Monographs 32(2): 105-135. <A62JOH02WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON02WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON03WYUS>

Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. < U89POT01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Salix brachycarpa* Name Vegetation Type  
Short-fruited Willow Vegetation Type**

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**SUMMARY**

This is a shrubland of drier riparian sites in the montane and subalpine zones, where it usually is mixed with *S. planifolia* willow shrublands. *Salix brachycarpa* dominates the shrub layer, which often contains other willows. Although the type is thought to be widespread in the Rocky Mountains, it is poorly documented from Wyoming.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Vegetation dominated or co-dominated by *Salix brachycarpa* occurs in the montane and subalpine zones throughout the Rocky Mountains and the Cascade Mountains in the U.S. (Reid et al. 1999). Within Wyoming, Johnson (1961) has described alpine shrublands dominated by *Salix brachycarpa* from the alpine zones, but he gives no information on specific locations.

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) have summarized the information on this type throughout its range. *S. brachycarpa* stands occupy drier fringes of stream valleys and glaciated basins, and may occur on hummocks in wetter valley bottom. *Salix planifolia* occupies wetter soils, and the two shrubs are often mixed in riparian zones. In Wyoming, Johnson (1961) indicates that *S. brachycarpa* dominates stands on dry fell-field slopes protected by topography or krummholz, and in wetlands with standing water.

**VEGETATION DESCRIPTION**

According to Reid et al. (1999), *Salix brachycarpa* dominates the low-growing shrub layer (to 3 feet tall), *S. planifolia* co-dominates on wetter sites, and *S. monticola*, *S. wolfii*, and *Pentaphylloides floribunda* often are present. Common understory species include *Carex aquatilis*, *C. utriculata* (syn. *C. rostrata*), *C. scopulorum*, *Deschampsia cespitosa*, and *Caltha leptosepala*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this topic.

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) contains four *S. brachycarpa* plant associations, three of which have no global conservation rank assigned (GU or GQ? rank) and one of which is common (G4 rank). No information is known about changes in distribution, abundance, or condition of this type.

**MANAGEMENT CONSIDERATIONS**

Johnson (1961) reports that domestic sheep and wildlife have grazed this vegetation extensively in the mountains of Wyoming.

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

**BIGHORN NATIONAL FOREST**

No stands of this type have been documented from the forest. *S. brachycarpa* has been collected in the Bighorn Mountains, though, and Johnson (1961) may have described an alpine dwarf-willow shrubland dominated by *S. brachycarpa* from this forest.

**MEDICINE BOW NATIONAL FOREST**

All of the information on this type comes from one stand described by Jankovsky-Jones et al. (1995).

Distribution

This type occurs at 10,200 feet elevation in the Snowy Range at the headwaters of the Little Laramie River. The surrounding vegetation is *Abies lasiocarpa*-*Picea engelmannii* forest.

Physical environment

This vegetation has been described from the first terrace above the stream channel in a wide valley bottom.

Vegetation description

The vegetation consists of willow shrub patches mixed with patches of herbaceous vegetation. The shrub layer contains *Salix brachycarpa* and smaller amounts of *S. glauca* and *S. planifolia* ssp. *monica*. The most common herbaceous species are *Carex scopulorum*, *Deschampsia cespitosa*, and *Pedicularis groenlandica*.

Management

No information was available.

**SHOSHONE NATIONAL FOREST**

No stands have been documented from the forest. *S. brachycarpa* has been collected in the Absaroka Mountains, though, and Johnson (1961) may have described an alpine dwarf-willow shrubland dominated by *S. brachycarpa* from this forest.

**AREAS WITH HIGH-QUALITY OCCURRENCES**

This type is known from only one location on the Medicine Bow National Forest. That area was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997), but the effects of this grazing are undocumented.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

**GENERAL COMMENTS**

The relationship between *S. brachycarpa*, *S. glauca*, and *S. planifolia* vegetation types appears to be a source of confusion, and it is unclear what the stand in the Snowy Range (Jankovsky-Jones et al. 1995) represents. Neither description of two *S. brachycarpa* plant associations from Colorado (Kittel et al. 1999) appear to apply to the Snowy Range. Similarly, because Johnson (1961) combined cover data from stands from different environments, it's impossible to tell what types from the National Vegetation Classification are represented by his dwarf shrubland. The National Vegetation Classification (Anderson et al. 1998) contains two *Salix brachycarpa* alliances (the *S. brachycarpa* Temporarily Flooded Herbaceous Alliance and the *S. brachycarpa* Seasonally Flooded Herbaceous Alliance) that have been described by Reid et al. (1999). It also contains a *Salix brachycarpa*-*S. planifolia*/*Caltha leptosepala* association in the *S. planifolia* Seasonally Flooded Shrubland Alliance.

**REPRESENTATION ON THE THREE FORESTS**

The *Salix brachycarpa* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
None			
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	<i>Salix glauca</i> - <i>Salix brachycarpa</i> / <i>Deschampsia cespitosa</i> community	Unknown	
<b>SHOSHONE NATIONAL FOREST</b>			
None			

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix brachycarpa* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix brachycarpa* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Ground Moraine research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN04WYUS>

Johnson, Wallace M. 1961. The ecology of alpine and subalpine ranges in Wyoming as related to use by game and domestic sheep. Ph.D. Thesis, Division of Plant Science, University of Wyoming, Laramie WY. 79 pp. <U61JOH01WYUS>

Kittel, Gwen, Erica VanWie, Mary Damm, Renee Rondeau, Steve Kettler, Amy McMullen, and John Sanderson. 1999. A classification of riparian wetland plant associations of Colorado: user guide to the classification project. Colorado Natural Heritage Program, Colorado State University, Fort Collins CO. <N99KIT01WYUS>

Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes Ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp.

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix glauca* Vegetation Type**  
**Grayleaf Willow Vegetation Type**

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**SUMMARY**

This vegetation type includes low-growing shrublands of the upper subalpine zone in the Shoshone National Forest. *Salix glauca* dominates or co-dominates the shrub layer, and other willows often are present. The undergrowth is dominated by sedges and grasses, and mosses cover much of the ground.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Salix glauca* vegetation occurs in the alpine and upper subalpine zones throughout the Rocky Mountains of Colorado, Wyoming, Utah (Reid et al. 1999) and Montana (Lesica 1993, Cooper et al. 1997). In Wyoming, this type has been documented from the lower alpine zone (around timberline) of the Beartooth Plateau (Walford et al. 1997, Jones and Fertig 1998a) and the southern Wind River Mountains (Jones and Fertig 1998b) in the Shoshone National Forest. It also is known from the western slope of the Wind River Mountains in the Bridger-Teton National Forest (Potkin and Munn 1989). *S. glauca* vegetation is present on the Line Creek Plateau in Montana (Lesica 1993) immediately north of the Shoshone National Forest.

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) have summarized information for this type throughout its range. Stands occupy well-drained, mineral soils on slopes facing directions other than south. Early-melting snowbanks often provide soil water. Substrates are granitic rocks and schist. Cooper et al. (1997) and Jones and Fertig (1998a) have also documented stands on calcareous sedimentary rock.

**VEGETATION DESCRIPTION**

According to the summary by Reid et al. (1999), *Salix glauca* dominates a shrub layer that grows to 3 feet tall, and associated herbaceous species are *Deschampsia cespitosa*, *Artemisia scopulorum*, *Carex* spp., and other graminoids and forbs. Mosses may cover much of the ground (Walford et al. 1997).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this topic.

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) contains two plant associations, one considered abundant (G4 global conservation rank) and one considered rare or uncommon (G3? rank). Information apparently has not been compiled on changes in distribution, abundance, and condition of this type.

**MANAGEMENT CONSIDERATIONS**

No information was found on management or economic importance of this type.

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

**BIGHORN NATIONAL FOREST**

This vegetation type has not been documented on the forest. *Salix glauca* has been collected from the northern half of the Bighorn Mountains, though, and the vegetation type may occur there.

**MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on the forest. Jankovsky-Jones et al. (1995) report a *S. glauca*-*S. brachycarpa*/*Deschampsia cespitosa* community type from the Snowy Range, but it seems to represent the *S. brachycarpa* vegetation type rather than this *S. glauca* vegetation type.

## SHOSHONE NATIONAL FOREST

### Distribution

Stands of *S. glauca* shrubland have been documented from Beartooth Butte (Jones and Fertig 1998a) and Twin Lakes (Walford et al. 1997) on the Beartooth Plateau, and from Roaring Fork Mountain in the southern Wind River Mountains (Jones and Fertig 1998b). Potkin and Munn (1989) sampled *S. glauca* shrublands on the western side of the Wind River Mountains in the Bridger-Teton National Forest, so this type may also be found in additional locations on the eastern side in the Shoshone National Forest.

### Physical environment

This type has been documented from granitic substrates at Roaring Fork Mountain (Jones and Fertig 1998b) and Twin Lakes (Walford et al. 1997), and from limestone at Beartooth Butte (Jones and Fertig 1998a). Most sites are upland slopes or drier valley-bottom sites where snow probably accumulates, but some stands at Roaring Fork Mountain grow along watercourse on rocky slopes.

### Vegetation description

The low-growing shrub layer (to 3 feet tall) consists of *S. glauca* and *Salix planifolia* ssp. *monica*, the latter co-dominating on wet sites. *Betula glandulosa* also is present along water courses. The common undergrowth plants on wetter sites are mosses, *Calamagrostis canadensis*, *Mertensia ciliata*, *Carex atrata*, *Pedicularis groenlandica*, and *Sedum integrifolium*. On drier sites, common associates are *Deschampsia cespitosa*, *Luzula parviflora*, *Artemisia scopulorum*, *Salix reticulata*, and *Carex scopulorum*. *Hedysarum sulphurescens* and *Solidago multiradiata* are common on limestone.

### Management

No specific information was found about the management of this type on the forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

The degree to which the documented stands of this type represent high-quality occurrences is unknown.

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

None.

#### REPRESENTATION ON THE THREE FORESTS

The *Salix glauca* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Jones and Fertig (1998a)	Grayleaf willow community type	<i>Salix glauca</i> Plant Association?	G3?
Jones and Fertig (1998b)	<i>Salix glauca</i> Shrubland	<i>Salix glauca</i> Plant Association?	G3?
Walford et al. (1997)	<i>Salix glauca</i> Vegetation	<i>Salix glauca/Deschampsia cespitosa</i> Plant Association?	G4



CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix glauca* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix glauca* vegetation type does not correspond to any SRM rangeland cover type.

#### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Ground Moraine research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN04WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>

Lesica, Peter. 1993. Vegetation and flora of the Line Creek Plateau area, Carbon County, Montana. Montana Natural Heritage Program, Helena MT. 30 pp. + appendices. <U93LES01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix reticulata* Vegetation Type**  
**Snow Willow Vegetation Type**

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**SUMMARY**

This alpine type includes patches dominated by the dwarf willow *Salix reticulata*. Stands have been described from the mountains of the northwestern U.S. In Wyoming, it is known from the Beartooth Plateau and the eastern and western sides of the Wind River Mountains. This type is considered rare or uncommon (albeit widespread), but it is poorly known, and more information may show that it should be combined with other vegetation types.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Salix reticulata* vegetation has been described from mountains in western Canada (references reviewed in Cooper et al. 1997), from the North Cascade Mountains of Washington State, and from the Rocky Mountains in western Montana (Reid et al. 1999). In Wyoming, stands of this type have been described from the Beartooth Plateau (Jones and Fertig 1998a), the southeastern Wind River Mountains (Jones and Fertig 1998b), and the western slope of the Wind River Mountains (Potkin and Munn 1989).

**PHYSICAL ENVIRONMENT**

In Montana (Cooper et al. 1997), stands occur on north-facing slopes with active solifluction lobes over limestone bedrock. The soil is sub-irrigated by melting snowfields on the higher slopes. Drier stands occur on south-facing slopes with rocky soils in the Cascade Mountains (Reid et al. 1999) and on the western side of the Wind River Mountains in Wyoming (Potkin and Munn 1989).

**VEGETATION DESCRIPTION**

*Salix reticulata* dominates the low-growing vegetation, forming a mat several inches tall. In wet sites (Cooper et al. 1997), associated species are *Salix arctica* and *S. rotundifolia* (two other dwarf willows), *Caltha leptosepala*, and minor amounts of several graminoids. In drier stands (Reid et al. 1999), associated species are *Festuca brachyphylla*, *Carex scirpoidea*, *Selaginella densa*, and several forbs.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this topic.

**STATUS AND TRENDS**

Two *Salix reticulata* plant associations are named in the National Vegetation Classification (Anderson et al. 1998), of which one is considered rare (G2 global conservation rank) and the other uncommon (G3G4 rank). Reid et al. (1999) note that the relationship of *S. reticulata* vegetation to *S. arctica* vegetation needs review. Such a review might show that the two types should be combined into a single more common type. Information has not been compiled on changes in the distribution, abundance, and condition of this type.

**MANAGEMENT CONSIDERATIONS**

No information is known about management or uses of this vegetation type. Literature on *S. reticulata* vegetation suggests that it forms small stands in the alpine zone, and therefore may be of little economic importance.

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

**BIGHORN NATIONAL FOREST**

This vegetation type has not been documented on the forest. *Salix reticulata* has been collected in the Bighorn Mountains, and the vegetation type may occur in the alpine zone there.

## MEDICINE BOW NATIONAL FOREST

This vegetation type has not been documented on the forest. *Salix reticulata* has been collected in the Medicine Bow Mountains, and the vegetation type may occur in the alpine zone there.

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation type has been described from Beartooth Butte on the Beartooth Plateau (Jones and Fertig 1998a) and Roaring Fork Mountain in the southern Wind River Mountains (Jones and Fertig 1998b). In both locations, this type occurs as patches covering less than 0.1 acre.

### Physical environment

This type has been documented from sites at the foot of slopes. At Beartooth Butte (Jones and Fertig 1998a), the substrate was wet soil derived from limestone, and at Roaring Fork Mountain (Jones and Fertig 1998b), drier soil on granitic rock.

### Vegetation description

*Salix reticulata* var. *nana* forms a mat and dominates the low-growing vegetation. At Beartooth Butte (Jones and Fertig 1998a), only *Carex scirpoidea* was present in more than trace amounts, but a number of species typical of wet sites were present (*Caltha leptosepala*, *Parnassia fimbriata*, *Pedicularis groenlandica*, *Saxifraga* spp., and *Trollius laxus*). Based on this species list and on the wet soil, this occurrence is assigned to the *S. reticulata*/*Caltha leptosepala* plant association from the National Vegetation Classification (Anderson et al. 1998), described from southwestern Montana (Cooper et al. 1997). At Roaring Fork Mountain (Jones and Fertig 1998b), common species are *Geum rossii*, *Carex atrata* var. *calceolepis*, *Potentilla diversifolia*, and *Trifolium nanum*. This occurrence cannot be assigned to any association from the National Vegetation Classification.

### Management

No specific information was found about the management of this type on the forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

Roaring Fork Mountain and Beartooth Butte on the Shoshone National Forest are the only locations from which this type has been documented. Because the type is so poorly known, it is unclear if these locations are high-quality representations.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

The National Vegetation Classification (Anderson et al. 1998) contains two *Salix reticulata* alliances, the *S. reticulata* Dwarf-Shrubland Alliance and the *S. reticulata* Saturated Dwarf-Shrubland Alliance. The stands in the Shoshone National Forest seem to represent both alliances. The associations in those alliances are so poorly known that the Shoshone National Forest stands cannot be definitively assigned to any of them.

### REPRESENTATION ON THE THREE FORESTS

The *Salix reticulata* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Jones and Fertig (1999a)	Net-leaf willow plant community type	<i>Salix reticulata</i> / <i>Caltha leptosepala</i> plant association?	G2
Jones and Fertig (1999b)	<i>Salix reticulata</i> Dwarf-Shrubland	Unknown; probably <i>Salix reticulata</i> Dwarf-Shrubland Alliance	

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix reticulata* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix reticulata* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Cooper, Stephen V. Peter Lesica, and Deborah Page-Dumroese. 1997. Plant community classification for alpine vegetation on the Beaverhead National Forest, Montana. USDA Forest Service General Technical Report INT-GTR-362. Intermountain Research Station, Ogden UT. <N97COO01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>

Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. <U89POT01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Abies lasiocarpa*-*Picea engelmannii* Upland Vegetation Type**  
**Subalpine Fir-Engelmann Spruce Upland vegetation Type**

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**SUMMARY**

This is a widespread forest vegetation type in which *Abies lasiocarpa* and *Picea engelmannii* co-dominate the tree overstory. Stands are common throughout the Rocky Mountains (including all three Region 2 forests), where they constitute a large part of the vegetation in the subalpine zone. Composition of the overstory depends to some extent on substrate and climate, but *Pseudotsuga menziesii*, *Pinus contorta*, *Populus tremuloides*, and *Pinus albicaulis* are often present. Undergrowths usually are dominated by dwarf-shrubs or forbs.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This is a major vegetation type throughout the Rocky Mountains. In Wyoming, it is common in the Overthrust Belt, Absaroka Mountains, Wind River Mountains (Steele et al. 1983), Bighorn Mountains (Hoffman and Alexander 1976), Medicine Bow Mountains, and Sierra Madre (Alexander et al. 1986).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) report that this vegetation occurs on a wide variety of bedrock types. It occupies the relatively cold environment of the higher mountains, and extends to lower elevations in areas of cold-air drainage.

**VEGETATION DESCRIPTION**

Reid et al. (1999) give a regional perspective for this vegetation type. Stands have a tree overstory co-dominated by *Abies lasiocarpa* and *Picea engelmannii*. *Abies* usually is present as smaller trees and saplings and *Picea* as fewer, larger trees. The overstory often includes substantial amounts of other trees considered seral to *Abies* and *Picea*; in the Rocky Mountains, these are *Pinus contorta*, *Pseudotsuga menziesii*, and *Populus tremuloides*. *Pinus albicaulis* is present in high-elevation stands of the central Rocky Mountains, from western and west-central Wyoming north. Stands at timberline consist of ribbon forests or islands of krummholz. The shrub and herbaceous layers are highly variable and are described below in the section on the three Region 2 forests.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Knight (1994) and Peet (2000) review literature indicating that insects, fungi, and fires have been major types of disturbance in *Abies-Picea* forests. The fire regime generally has been one of infrequent, stand-replacing fires. *Pseudotsuga menziesii*, *Pinus contorta*, and *Populus tremuloides* are considered seral trees. They persist for long times in many stands, and the overstory is a mix of putative seral and climax species. As Knight (1994) notes, these *Abies-Picea* forests probably are changing slowly after past disturbance rather than acting as stable climaxes.

**STATUS AND TRENDS**

Based on Alexander et al. (1986), Hoffman and Alexander (1976), and Steele et al. (1983), we include ten plant associations from the National Vegetation Classification (Anderson et al. 1998). Those ten associations are listed below in the section on the three Region 2 forests. The global conservation ranks assigned to those associations illustrate how widespread and common this vegetation type is. Nine associations are considered common (G4, G4G5, or G5 ranks) and one is of questionable taxonomy (GUQ rank). Information on changes in the distribution, abundance, and condition of these associations apparently has not been compiled.

**MANAGEMENT CONSIDERATIONS**

See the information on this topic presented below for each national forest.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This vegetation type occurs from about 7,550 to 10,000 feet throughout the Bighorn Mountains, but is best-developed in the northern one-third of the range (Despain 1973). Hoffman and Alexander (1976) sampled vegetation on habitat types supporting *Abies-Picea* vegetation north and south of the Cloud Peak Wilderness Area. Jones and Fertig (1998) and Welp et al. (1998a, 1998b, 1998c) have sampled stands from locations at the northern and northwestern boundaries of the national forest.

#### Physical environment

Stands have been sampled on slopes with a variety of aspects (Hoffman and Alexander 1976), although Despain (1973) reports that stands are "best-developed" on north-facing slopes atop Gros Ventre Shale bedrock.

#### Vegetation description

*Picea engelmannii* and *Abies lasiocarpa* contribute substantial cover to the tree overstory. The two species often have about the same density, but the *Picea* are larger (Despain 1973, Hoffman and Alexander 1976). *Pinus contorta* often is present as a seral species on granitic rocks, and stands on limestone often contain *Pseudotsuga menziesii*. *Shepherdia canadensis* may form a distinct shrub layer, but most stands have only scattered shrubs (*S. canadensis*, *Juniperus communis*, *Ribes* spp.). Common species in the herbaceous undergrowth are *Poa nervosa*, *Arnica cordifolia*, *Epilobium angustifolium*, *Fragaria virginiana*, *Lupinus argenteus*, *Potentilla diversifolia*, *Pyrola secunda*, *Senecio streptanthifolius*, and *Vaccinium scoparium*. Lichens and mosses cover much of the ground.

#### Management

As early as 1973, Despain noted that many stands were being logged.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

Habitat types that support *Abies-Picea* forests occur throughout the forest at elevations from 8,000 feet to timberline (Hoffman and Alexander 1986). This vegetation type is widespread in the Medicine Bow Mountains and the Sierra Madre, and occupies smaller areas in the Pole Mountain and Laramie Peak areas. Stands have been described from the Laramie Peak area (Jones 1989, Jankovsky-Jones et al. 1995d), Medicine Bow Mountains from the subalpine zone (Jankovsky-Jones et al. 1995c & 1995f) and timberline (Jankovsky-Jones et al. 1995e, Regan et al. 1997), and the Sierra Madre (Jankovsky-Jones et al. 1995a & 1995b)

#### Physical environment

Stands occur relatively cold, mesic sites with any slope aspect (Alexander et al. 1986).

#### Vegetation description

*Abies lasiocarpa* and *Picea engelmannii* generally co-dominate the overstory, although *Picea* trees are larger (Alexander et al. 1986). *Pinus contorta* or *Populus tremuloides* (or both) are present in most stands; these are considered seral species, although they often become established at the same time as *Abies* and *Picea*. No distinct shrub layer is present, although scattered shrubs (usually *Juniperus communis*, *Shepherdia canadensis*, or *Ribes* spp.) may be present. Common species in the undergrowth are *Vaccinium scoparium*, *Carex geyeri*, *Carex rossii*, *Arnica cordifolia*, and *Erigeron peregrinus*. Vascular plants often are sparse in the undergrowth, and lichens and moss cover much of the ground. At timberline, this type grows as ribbon forest or as krummholz islands, interspersed with subalpine meadows and wetlands (Regan et al. 1997, Jankovsky-Jones et al. 1995e).

#### Management

Alexander et al. (1986) have summarized management implications for habitat types supporting this vegetation. Stands with graminoid-rich undergrowths provide summer forage for wildlife and livestock. Timber production is low from most stands. Logging can increase water yield from basins vegetated with *Abies-Picea* forest.

## SHOSHONE NATIONAL FOREST

### Distribution

*Abies lasiocarpa* habitat types that often support *Abies lasiocarpa-Picea engelmannii* vegetation are common throughout the forest, although they cover only limited areas on the eastern flank of the Absaroka Mountains and in the southern Wind River Mountains (Steele et al. 1983). Stands of *Abies-Picea* forest have been described from the Beartooth Plateau (Jones and Fertig 1999a, 1999b), the eastern and central Absaroka Mountains (Jones and Fertig 1999c, 1999e), and the southern end of the Wind River Mountains (Jones and Fertig 1999d).

### Physical environment

This vegetation type occupies granite, rhyolite, andesite, sandstone, and limestone substrates, although mixed *Abies-Picea* forests are absent from limestone bedrock in some locations (Steele et al. 1983).

### Vegetation description

*Abies lasiocarpa* and *Picea engelmannii* generally co-dominate the overstory, although the vegetation often consists of large *Picea* with shorter *Abies* trees and saplings (Steele et al. 1983). *Pinus contorta* is a seral tree in colder sites, and it often persists for long times with the *Abies* and *Picea*. *Pseudotsuga menziesii* is the major seral tree in warmer sites, especially on limestone, and it, too, may persist in the vegetation. *Populus tremuloides* often is present on the margins of stands and as stunted trees within the stand. *Juniperus communis*, *Shepherdia canadensis*, or *Paxistima myrsinites* may form distinct shrub layers, but often they (and *Lonicera* sp., *Symphoricarpos oreophilus*, and *Ribes montigenum*) are present only as scattered individuals. Common undergrowth dominants are the dwarf-shrubs *Vaccinium scoparium* and *Linnaea borealis*, and the forbs *Arnica cordifolia* and *Astragalus miser*.

### Management

Steele et al. (1983) summarize management considerations on habitat types supporting this vegetation. Low elevation stands, especially those with *Pinus contorta* and *Pseudotsuga menziesii*, may produce considerable timber. High-elevation stands are unproductive of timber and are used for recreation, wildlife habitat, and snowpack management. Browsing by moose has greatly reduced *Abies lasiocarpa* in some stands, and browsing by wildlife has reduced the amounts of *Populus tremuloides* and deciduous shrubs in some stands.

## AREAS WITH HIGH-QUALITY OCCURRENCES

High-quality occurrences have not been delineated on the Shoshone National Forest, but they undoubtedly occur there because the vegetation type is so widespread in the wilderness areas of the Shoshone National Forest. On the Bighorn National Forest, the McClain Lake area (Welp et al. 1998b), Devil Canyon (Welp et al. 1998a), and Pete's Hole (Welp et al. 1998c) may contain high-quality stands. The Cloud Peak Wilderness area also may contain high-quality occurrences of the type. On the Medicine Bow National Forest, the Snowy Range Research Natural Area contains a small amount of this type (Ryan et al. 1994), and the Brown's Peak area of the Snowy Range contains examples of *Abies-Picea* ribbon forest (Jankovsky-Jones et al. 1995e, Regan et al. 1997). The latter area was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997).

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

Johnston (1987) combines mixed *A. lasiocarpa-P. engelmannii* forests with pure *P. engelmannii* forests and *A. lasiocarpa* forests in his description of plant associations in Region 2.

### REPRESENTATION ON THE THREE FORESTS

The *Abies lasiocarpa-Picea engelmannii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Despain (1973)	<i>Picea engelmannii</i> - <i>Abies lasiocarpa</i> Forests	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> & <i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Associations	G5
Hoffman and Alexander (1976)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Hoffman and Alexander (1976)	<i>Abies lasiocarpa</i> / <i>Shepherdia canadensis</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association?	G5
Hoffman and Alexander (1976)	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association	G5
Welp et al. (1998a)	Subalpine Fir-Engelmann Spruce/Heartleaf Arnica Community	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association	G5
Welp et al. (1998b)	Subalpine Fir-Engelmann Spruce/Heartleaf Arnica Community	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association	G5
Jones and Fertig (1998)	Subalpine fir/Heartleaf arnica Community	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association	G5
<b>MEDICINE BOW NATIONAL FOREST</b>			
Alexander et al. (1986)	<i>Abies lasiocarpa</i> /Moss Habitat Type	<i>Abies lasiocarpa</i> /Moss Plant Association	G4
Alexander et al. (1986)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995a)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Plant	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995b)	<i>Abies lasiocarpa</i> / <i>Juniperus communis</i> Community	<i>Abies lasiocarpa</i> / <i>Juniperus communis</i> Plant Association	G4G5
Jankovsky-Jones et al. (1995c)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Community	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995d)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Community	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association?	G5
Jankovsky-Jones et al. (1995e)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Plant	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> Ribbon Forest Plant Association	GUQ
Jankovsky-Jones et al. (1995e)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Plant	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995f)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Plant Community	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jones (1989)	Subalpine fir forests	Unknown	
Regan et al. (1997)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Carex rossii</i> Plant Association	Unknown	
Regan et al. (1997)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Juniperus communis</i> Plant Association	<i>Abies lasiocarpa</i> / <i>Juniperus communis</i> Plant Association	G4G5
Regan et al. (1997)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Ryan et al. (1994)	Mixed Engelmann spruce and subalpine fir	Unknown	
<b>SHOSHONE NATIONAL FOREST</b>			
Fertig and Bynum (1994)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Type	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1999a)	Engelmann spruce-subalpine fir woodland	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association?	G5
Jones and Fertig (1999b)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Community Type	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5



Jones and Fertig (1999c)	<i>Picea engelmannii</i> / <i>Arnica cordifolia</i> Community, plot 1	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association?	G5
Jones and Fertig (1999d)	<i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Forest, location 26b	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1999e)	Engelmann spruce/gooseberry currant community type	<i>Abies lasiocarpa</i> / <i>Ribes montigenum</i> Plant Association?	G5
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Actaea rubra</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Actaea rubra</i> Plant Association	G4?
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Linnaea borealis</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Linnaea borealis</i> Plant Association	G5
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Vaccinium globulare</i> Habitat Type	Unknown	
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Habitat Type, <i>Vaccinium scoparium</i> phase	<i>Abies lasiocarpa</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Arnica latifolia</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Arnica latifolia</i> Plant Association	G4
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Thalictrum occidentale</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Thalictrum occidentale</i> Plant Association	G4
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Juniperus communis</i> Habitat Type	<i>Abies lasiocarpa</i> / <i>Juniperus communis</i> Plant Association	G4G5
Steele et al. (1983)	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Habitat Type, <i>Picea engelmannii</i> Phase	<i>Abies lasiocarpa</i> / <i>Arnica cordifolia</i> Plant Association	G5

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Abies lasiocarpa*-*Picea engelmannii* Upland vegetation type falls within the within the Engelmann Spruce - Subalpine Fir forest cover type (206).

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Abies lasiocarpa*-*Picea engelmannii* Upland vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

- Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. <A73DES01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Pickett's Knob research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER12WYUS>

- Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. < B76HOF01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential East Fork Encampment River research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN05WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN02WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential Ground Moraine research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN04WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN08WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e. Ecological evaluation for the potential Ribbon Forest research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN06WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995f. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN11WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON03WYUS>
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON05WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Pat O'Hara Mountain research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON06WYUS>
- Jones, George P. and Walter Fertig. 1999d. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON07WYUS>
- Jones, George P. and Walter Fertig. 1999e. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < N99JON08WYUS>

Peet, Robert K. 2000. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 2000. Terrestrial vegetation of North America. Second Edition. Cambridge University Press. 708 pp. < B00BAR01WYUS>

Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp. < U97REG01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Ryan, Michael G., Linda A. Joyce, Tom Andrews, and Kate Jones. 1994. Research natural areas in Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 57 pp. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, Robert, Stephen V. Cooper, David M. Ondov, David W. Roberts, and Robert D. Pfister. 1983. Forest habitat types of eastern Idaho-western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden UT. 122 pp. < N83STE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. < U98WEL07WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Pete's Hole research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. < U98WEL09WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Picea engelmannii* Upland Vegetation Type  
Engelmann Spruce Upland Vegetation Type**

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**SUMMARY**

This vegetation type includes upland forests and woodlands in which *Picea engelmannii* dominates or co-dominates the tree overstory. Seral trees (*Pseudotsuga menziesii*, *Pinus contorta*, *P. flexilis*, *P. albicaulis*) usually are present and may co-dominate, but *Abies lasiocarpa* is rare. A shrub layer may be present, and the herbaceous undergrowth generally consists mainly of forbs or moss. This type is most common on the Shoshone National Forest, where it is a major component of the subalpine forest. It occurs on the Bighorn National Forest and may be present on the Medicine Bow National Forest as well.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Reid et al. (1999) report that *Picea engelmannii* vegetation occurs in the Rocky Mountains, from Montana (east of the Continental Divide) south into New Mexico and Arizona, with a few stands documented from California. This is primarily a subalpine type, but it extends to the foothills in some areas. In Wyoming, *P. engelmannii* Upland vegetation occurs in the Salt River Range, Beartooth Plateau, Absaroka Mountains, Wind River Mountains (Steele et al. 1983), Bighorn Mountains (Alexander et al. 1976), and possibly in the Medicine Bow Mountains (Jankovsky-Jones et al. 1995).

**PHYSICAL ENVIRONMENT**

This type occurs on slopes and level terrain with a wide variety of substrates (granitic, volcanic, limestone, and sandstone bedrock, moraine, alluvium, volcanic ash). Soils are also variable, ranging from fine- to coarse-textured.

**VEGETATION DESCRIPTION**

Vegetation varies greatly in composition and structure, but stands have an overstory dominated or co-dominated by *Picea engelmannii* (or *P. engelmannii* x *P. glauca* hybrids in Montana). Other common trees are *Pseudotsuga menziesii*, *Pinus flexilis*, *Pinus contorta*, *Pinus albicaulis* (in Wyoming and Montana), and *Larix occidentalis* (in Montana). Reid et al. (1999) include stands in which *Abies lasiocarpa* may contribute substantial cover, but mixed *Abies-Picea* stands are excluded from this *Picea engelmannii* Upland vegetation type. A low-growing shrub layer may be present. The herbaceous undergrowth may be dominated by graminoids or forbs, or it may consist mainly of mosses.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1999) have summarized information for this type throughout its range. *Picea engelmannii* stands may become established immediately after fire, or develop as *P. engelmannii* replaces early-successional species (*Pseudotsuga menziesii*, *Pinus contorta*, *Populus tremuloides*). The fire regime is one of infrequent, stand-replacing fires. Outbreaks of spruce budworm, spruce beetle, and dwarf mistletoe kill many *P. engelmannii*.

**STATUS AND TRENDS**

Based on Alexander et al. (1986), Hoffman and Alexander (1976), and Steele et al. (1983), we include seven plant associations from the National Vegetation Classification (Anderson et al. 1998). Those seven associations are listed below in the section on Region 2 forests. Of those seven associations, two are considered common (global conservation ranks of G5 and G3G5), three uncommon (G3 ranks), and two rare (G2 ranks). Information on changes in the distribution, abundance, and condition of these associations apparently has not been compiled.

**MANAGEMENT CONSIDERATIONS**

See the information on this topic presented below for the Shoshone National Forest.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Hoffman and Alexander (1976) describe a habitat type that supports *P. engelmannii* upland vegetation, without *Abies lasiocarpa*. It occurs primarily in the central third of the Bighorn Mountains, at elevations of 6600 to 8600 feet. Jones and Fertig (1998) describe plots of *P. engelmannii* forest from Mann Creek on the northern end of the forest, at elevations of 8,000 to 8,800 feet. Welp et al. (1998) sampled plots northwest of Powder River Pass at 10,000 feet.

#### Physical environment

Stands occur on level sites or on north- to northwest-facing slopes with granitic bedrock, granitic moraine, and limestone bedrock (Hoffman and Alexander 1976, Jones and Fertig 1998). These sites are more mesic than nearby sites that support climax stands of *Pinus contorta* (Hoffman and Alexander 1976).

#### Vegetation description

*P. engelmannii* forms the tree overstory, which often contains *Pinus contorta* (sometimes in substantial amounts). *Abies lasiocarpa* may be present, but only as scattered trees in the overstory or the understory. At higher elevations (Hoffman and Alexander 1976), *Vaccinium scoparium* dominates the undergrowth, and *Juniperus communis*, *Antennaria racemosa*, *Arnica cordifolia*, *Epilobium angustifolium*, *Fragaria virginiana*, *Lupinus sericeus*, *Rosa* sp., *Senecio streptanthifolius*, and *Poa nervosa* usually are present. In the lower-elevation stands (Jones and Fertig 1998), *Physocarpus monogynus*, *Spiraea betulifolia*, *Clematis columbiana* var. *tenuiloba*, and *Thalictrum occidentale* are the major species in the undergrowth.

According to Hoffman and Alexander (1976), the stands in the central Bighorns succeed *Pinus contorta* vegetation (hence the presence of *P. contorta* in the overstory), and the undergrowth is very similar in species composition to the undergrowth in *P. contorta* stands.

#### Management

No information was found about management of this type on the forest.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

Jankovsky-Jones et al. (1995) described one stand that may represent *P. engelmannii* vegetation on Platte Ridge in the Medicine Bow National Forest at 8,640 feet elevation. Jones and Fertig (1996) mentioned small stands of Engelmann spruce/Heartleaf arnica community on Deep Creek in the Sierra Madre ca. 8,400 feet elevation. The assignment of these stands to *P. engelmannii* vegetation, instead of *Abies lasiocarpa*-*Picea engelmannii* vegetation, should be considered questionable, because the information on both is limited and because Alexander et al. (1986) characterize the subalpine forests of the area as a mix of both species.

#### Physical environment

The stand described by Jankovsky-Jones et al. (1997) lies at the foot of a gentle, north-facing slope on gneiss and granitic rock. The vegetation mentioned by Jones and Fertig (1996) grows at the edges of small stream valleys.

#### Vegetation description

*Picea engelmannii* dominates the overstory, which contains *Pinus contorta* as a sub-dominant species represented by large trees (individuals may be larger than the *Picea*) and a small amount of *Abies lasiocarpa*. The undergrowth consists of a low-growing shrub layer of *Shepherdia canadensis* and small amounts of other species, and a sparse undergrowth of *Linnaea borealis*, *Erigeron peregrinus*, *Osmorhiza depauperata*, *Bromus ciliatus*, and several other species.

#### Management

No information was found about management of this type on the forest.

## SHOSHONE NATIONAL FOREST

### Distribution

Habitat types that support *Picea engelmannii* Upland vegetation are found from the Beartooth Plateau south through the Absaroka and Wind River Mountains over a broad elevation range from 6,200 to 10,800 feet (Steele et al. 1983). Stands have been described from the Lake Creek area of the Beartooth Plateau (Jones and Fertig 1999b), Pat O'Hara Mountain in the eastern Absaroka Mountains (Jones and Fertig 1999c), and Arrow Mountain and Roaring Fork Mountain in the Wind River Mountains (Jones and Fertig 1998a, 1998d).

This type may form extensive stands on volcanic and limestone bedrock (Steele et al 1983). Near timberline, it occurs as patches interspersed with grassy meadows and wetlands.

### Physical environment

Steele et al. (1983) have summarized site information for this type. The presence of some pure *P. engelmannii* stands (instead of mixed *Abies-Picea* vegetation) may be explained by the presence of limestone bedrock, where *P. engelmannii* readily established and *Abies lasiocarpa* and *Pinus contorta* rarely occur. Jones and Fertig (1999c) document this pattern at Pat O'Hara Mountain, where *Abies* is absent from *P. engelmannii* forests on limestone bedrock, but present in the forests on volcanic rocks. Elsewhere on the forest, pure *P. engelmannii* stands occupy a range of substrate types -- granitic rock, volcanic rock, and limestone -- and extensive stands are found on Absaroka volcanics. Stands occur on gentle terrain and slopes (sometimes steep) facing northwest to east.

### Vegetation description

*Picea engelmannii* stands are successional to other types, and composition of the tree overstory depends on stand age and substrate (Steele et al. 1983). *P. engelmannii* dominates or co-dominates the overstory. Major seral species that often co-dominate are *Pseudotsuga menziesii* and *Pinus flexilis* on limestone bedrock, *Pinus contorta* on substrates other than limestone, and *Pinus albicaulis* at high elevations. *Abies lasiocarpa* may be present as scattered trees in the overstory or the understory that contribute only a trace of cover. A low-growing shrub layer may be present, dominated by *Juniperus communis* on cool, dry sites; *Physocarpus malvaceus* on low-elevation, moist sites; *Vaccinium scoparium* at high elevations; and *Ribes montigenum* near timberline. Common herbaceous species are *Arnica cordifolia*, *Poa nervosa*, *Astragalus miser*, *Epilobium angustifolium*, and *Fragaria virginiana*. The undergrowth may contain few vascular plants and consist mainly of mosses (particularly *Hypnum revolutum*).

### Management

Steele et al. (1983) note that high-elevation stands of *P. engelmannii* vegetation are of marginal timber productivity.

## AREAS WITH HIGH-QUALITY OCCURRENCES

On the Shoshone National Forest, high-quality occurrences of *P. engelmannii* Upland vegetation are a major component of the subalpine forest at Arrow Mountain, on limestone bedrock over a wide elevation range (Jones and Fertig 1999a). Pat O'Hara Mountain appears to contain pure *P. engelmannii* stands on limestone bedrock that contrast with *Picea-Abies* stands on volcanic rock (Jones and Fertig 1999), although the area should be surveyed more completely to confirm this. Suitable areas may also be found on the Bighorn National Forest. The information about the Medicine Bow National Forest in Alexander et al. (1986) suggests that particularly high-quality representatives are unlikely to be found there.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

Johnston (1987) treats pure *Picea engelmannii* stands with *Abies lasiocarpa-Picea engelmannii* stands.

### REPRESENTATION ON THE THREE FORESTS

The *Picea engelmannii* Upland vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Hoffman and Alexander (1976)	<i>Picea engelmannii/Vaccinium scoparium</i> Habitat Type	<i>Picea engelmannii/Vaccinium scoparium</i> Plant Association	G3G5
Jones and Fertig (1998)	Engelmann spruce/Mountain ninebark Community	Unknown	
Welp et al. (1998)	Engelmann Spruce/Grouse Whortleberry Community	<i>Picea engelmannii/Vaccinium scoparium</i> Plant Association	G3G5
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	<i>Abies lasiocarpa-Picea engelmannii/Vaccinium scoparium</i> Community	<i>Picea engelmannii/Vaccinium scoparium</i> Plant Association?	G3G5
Jones and Fertig (1996)	Engelmann spruce/Heartleaf arnica Community	<i>Picea engelmannii/Arnica cordifolia</i> Plant Association?	G3?
<b>SHOSHONE NATIONAL FOREST</b>			
Jones (1991)	<i>Picea engelmannii/Hypnum revolutum</i> Community	<i>Picea engelmannii/Hypnum revolutum</i> Plant Association	G2
Jones and Fertig (1999a)	<i>Picea engelmannii/Juniperus</i> community Forest	<i>Picea engelmannii/Juniperus</i> community Plant Association	G4G5
Jones and Fertig (1999a)	<i>Picea engelmannii/Ribes montigenum</i> Forest	<i>Picea engelmannii/Ribes montigenum</i> Plant Association	G5
Jones and Fertig (1999b)	<i>Picea engelmannii/Linnaea borealis</i> Community Type	<i>Picea engelmannii/Linnaea borealis</i> Plant Association	G3
Jones and Fertig (1999c)	<i>Picea engelmannii/Arnica cordifolia</i> Community	<i>Picea engelmannii/Arnica cordifolia</i> Plant Association	G3?
Jones and Fertig (1999d)	<i>Picea engelmannii</i> Forest	Unknown	
Jones and Fertig (1999d)	<i>Picea engelmannii/Vaccinium scoparium</i> Forest	<i>Picea engelmannii/Vaccinium scoparium</i> Plant Association	G3G5
Steele et al. (1983)	<i>Picea engelmannii/Physocarpus malvaceus</i> Habitat Type	<i>Picea engelmannii/Physocarpus malvaceus</i> Plant Association	G2
Steele et al. (1983)	<i>Picea engelmannii/Linnaea borealis</i> Habitat Type	<i>Picea engelmannii/Linnaea borealis</i> Plant Association	G3
Steele et al. (1983)	<i>Picea engelmannii/Vaccinium scoparium</i> Habitat Type	<i>Picea engelmannii/Vaccinium scoparium</i> Plant Association	G3G5
Steele et al. (1983)	<i>Picea engelmannii/Juniperus communis</i> Habitat Type	<i>Picea engelmannii/Juniperus communis</i> Plant Association	G3
Steele et al. (1983)	<i>Picea engelmannii/Ribes montigenum</i> Habitat Type	<i>Picea engelmannii/Ribes montigenum</i> Plant Association	G5?
Steele et al. (1983)	<i>Picea engelmannii/Arnica cordifolia</i> Habitat Type	<i>Picea engelmannii/Arnica cordifolia</i> Plant Association	G3G4
Steele et al. (1983)	<i>Picea engelmannii/Hypnum revolutum</i> Habitat Type	<i>Picea engelmannii/Hypnum revolutum</i> Plant Association	G2

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Picea engelmannii* Upland vegetation type falls within the within the Engelmann Spruce - Subalpine Fir forest cover type (206).

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Picea engelmannii* Upland vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

- Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. 1991. Report on the proposed Bald Ridge special botanical area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database (The Nature Conservancy). Laramie WY. Unpublished. <U91JON02WYUS>
- Jones, George P. and Walter Fertig. 1996. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON03WYUS>
- Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON05WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Pat O'Hara Mountain research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON06WYUS>
- Jones, George P. and Walter Fertig. 1999d. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>



Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Steele, Robert, Stephen V. Cooper, David M. Ondov, David W. Roberts, and Robert D. Pfister. 1983. Forest habitat types of eastern Idaho-western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden UT. 122 pp. <N83STE01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL08WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Picea engelmannii* Riparian Vegetation Type  
Engelmann Spruce Riparian Vegetation Type**

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**SUMMARY**

This vegetation type includes riparian woodlands and forests dominated by *Picea engelmannii*. It is widespread in the mountains of Wyoming, where it is represented mainly by narrow streamside stands. The vegetation may contain a dense shrub layer or an undergrowth dominated by forbs or graminoids.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Reid et al. (1999) characterize *Picea engelmannii* riparian vegetation as a type of the Pacific Northwest, from Washington east to northwestern Montana. Nevertheless, this vegetation type is known to be widespread in Wyoming, with stands described from the Teton Mountains, Salt River Mountains, Wyoming Range (Youngblood et al. 1985), Beartooth Plateau, Absaroka Mountains, Wind River Mountains (Steele et al. 1983, Jones and Fertig 1999), Bighorn Mountains (Girard et al. 1997, Jones and Fertig 1998), Sierra Madre (Olson and Gerhart 1982, Jones 1992, Jankovsky-Jones et al. 1995), and Medicine Bow Mountains (Regan et al. 1997).

**PHYSICAL ENVIRONMENT**

In the Pacific Northwest (Reid et al. 1999), *P. engelmannii* riparian vegetation occurs around the margins of wet mountain meadows on gently-sloping sites, and in narrow riparian zones along streams. In Wyoming, this vegetation occurs along steep streams on alluvial soils.

**VEGETATION DESCRIPTION**

Stands always contain a coniferous tree overstory (dense to open) dominated or co-dominated by *Picea engelmannii* and (often) with *Pinus contorta* and *Abies lasiocarpa*. A shrub layer of *Betula* spp., *Alnus incana*, *Cornus sericea*, or (rarely) *Salix* spp. may be present. The herbaceous undergrowth may be dominated by forbs (including *Equisetum arvense*, *Senecio triangularis*, *Caltha leptosepala*, and *Trollius laxus*) or graminoids (including *Carex* spp., *Calamagrostis canadensis*, and *Deschampsia cespitosa*).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Picea engelmannii* stands are generally considered to be stable (Youngblood et al. 1985, Hansen et al. 1995). In western Wyoming (Youngblood et al. 1985), *P. engelmannii* may succeed *Populus angustifolia* riparian woodlands on some sites.

**STATUS AND TRENDS**

Eight *Picea engelmannii* plant associations have been recognized in the National Vegetation Classification (Anderson et al. 1998). Four are considered common (global conservation ranks of G4), three are considered uncommon (G3 ranks), and one is considered rare (G2 rank). The rare and uncommon associations apparently are represented on the three Region 2 national forests. Information on changes in the distribution, abundance, and condition of these associations apparently has not been compiled.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Riparian *P. engelmannii* stands generally provide little livestock forage, but they are used by livestock and wildlife for cover (Youngblood et al. 1985, Hansen et al. 1995). Timber productivity in Wyoming stands is low to moderate, and wet soils preclude or severely limit timber harvest (Steele et al. 1983).

### Effects of Management Practices

Steele et al. (1983) review the effects of management in the riparian habitat types in northwestern Wyoming that support this vegetation type. Heavy equipment can severely damage the soil. Even limited cutting of trees can have a large effect on the vegetation by increasing the already-substantial risk of windthrow for the remaining trees. Stands on wet sites (the *P. engelmannii*/*Caltha leptosepala* habitat type) harvested in the Wind River Mountains in the 1930s were converted to wetlands dominated by willows and ericaceous shrubs. *P. engelmannii* and *Pinus contorta* were slow to become established on those sites. Few untrampled stands remain on the *P. engelmannii*/*Carex disperma* habitat type because they provide particularly cool, shady resting spots for livestock.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

Girard et al. (1997) describe *Picea engelmannii* riparian vegetation primarily from the central part of the Bighorn Mountains, at 7,440 to 9,280 feet elevation. Jones and Fertig (1998) describe stands from Mann Creek at the northern end of the forest between 6,400 and 6,800 feet. This type is represented on the Bighorns by narrow bands of streamside vegetation.

#### Physical environment

Stands of this type occur on both granitic and sedimentary (especially limestone) alluvium (Girard et al. 1997, Jones and Fertig 1998). The substrates often are cobbly. Stands typically occur in narrow valley-bottoms with high-gradient streams.

#### Vegetation description

Vegetation structure and composition are variable (Girard et al. 1997, Jones and Fertig 1998). *Picea engelmannii* dominates the overstory, and *Abies lasiocarpa* or *Pinus contorta* often are present. *P. contorta* may co-dominate in drier stands. In some stands, the overstory is sparse, consisting of scattered trees above a shrub layer of *Cornus sericea* or *Salix boothii*. (In the latter stands, the *P. engelmannii* appear to be invading *S. boothii*/*Deschampsia cespitosa* stands.) In other stands, the overstory is dense and few shrubs, such as *Salix planifolia* ssp. *planifolia*, *S. boothii*, *Ribes* spp. in wet stands and *Vaccinium scoparium* in drier stands, are present. Undergrowths usually are dominated by forbs, the most common species of which are *Equisetum arvense*, *Caltha leptosepala*, *Trollius laxus*, *Senecio triangularis*, *Mertensia ciliata*, *Saxifraga odontoloma*, *Allium brevistyle*, *Aster foliaceus*, *Geranium richardsonii*, *Epilobium angustifolium*, *Pyrola* sp., *Thalictrum venulosum*, and *Achillea millefolium*.

#### Management

No information was found about management of this type on the forest.

### **MEDICINE BOW NATIONAL FOREST**

#### Distribution

Stands of this type have been described from the Sierra Madre at 8500 to 9200 feet elevation (Olson and Gerhart 1982, Jones 1992, Jankovsky-Jones et al. 1995a & 1995b, Jones and Fertig 1996), and from the Snowy Range above 10,400 feet elevation (Regan et al. 1997). Typically, they form narrow fringes along the streams, and may occur in a mosaic with *Alnus incana* shrub stands (Jones and Fertig 1996). They also occur in depressions near timberline (Regan et al. 1997). Broad, wet meadows with sparse *P. engelmannii* overstories (e.g., Jankovsky-Jones et al. 1995) may qualify as representatives of this type.

#### Physical environment

*P. engelmannii* riparian stands occur along high-gradient streams on granitic substrates (Olson and Gerhart 1982, Jones and Fertig 1996) in both wide and narrow valleys (Jones 1992).

### Vegetation description

The structure and composition of the vegetation varies widely from stand to stand (Olson and Gerhart 1982, Jones 1992, Jankovsky-Jones et al. 1995, Jones and Fertig 1996). *Picea engelmannii* dominates the overstory, which may consist of scattered or dense trees. *Abies lasiocarpa* may be present but rarely co-dominates. Tall shrub layers of *Alnus incana* and *Salix* spp. are present in some stands. Undergrowths typically are dominated by forbs, including *Equisetum arvense*, *Aster* sp., *Senecio triangularis*, and *Fragaria virginiana*. Common graminoids are *Carex nigricans*, *Glyceria* sp., and sedges. *Vaccinium scoparium* may be present on drier sites.

### Management

No information was found about management of this type on the forest.

## SHOSHONE NATIONAL FOREST

### Distribution

Stands have been described from the Beartooth Plateau (Steele et al. 1983), Absaroka Mountains (Steele et al. 1983, Walford et al. 1997, Jones and Fertig 1999), and Wind River Mountains (Steele et al. 1983, Walford et al. 1997), over an elevation range of 6,100 to 9,500 feet. They form narrow fringes or small patches along streams in valley bottoms.

### Physical environment

Stands occur on stream terraces and around seeps, on alluvial soils developed in granitic or sedimentary parent materials (Steele et al. 1983). Soils often are saturated and fine textured, with organic rich horizons and gleyed horizons (Steele et al. 1983). In addition, Walford et al. (1997) describe stands from coarse-loamy soils.

### Vegetation description

Overstories usually are dense and dominated by *Picea engelmannii*. *Abies lasiocarpa* and *Pinus contorta* often are present in small amounts and grow on hummocks, and *Pseudotsuga menziesii* is a seral species in low-elevation stands (Steele et al. 1983). *Alnus incana* forms an open tall-shrub layer in some stands. Undergrowths usually are dominated by an array of forbs, including *Actaea rubra*, *Caltha leptosepala*, *Galium triflorum*, *Equisetum arvense*, *Maianthemum stellatum*, *Mertensia ciliata*, *Mitella pentandra*, *Parnassia fimbriata*, *Saxifraga* sp., *Senecio triangularis*, *Streptopus amplexifolius*, *Trollius laxus*, and *Veronica* spp. The most common graminoids are *Calamagrostis canadensis*, *Carex disperma*, *Juncus* spp., and *Luzula parviflora*. Species typical of upland sites (*Juniperus communis*, *Linnaea borealis*, *Symphoricarpos albus*) contribute substantial cover in stands transitional to the uplands. Walford et al. (1997) describe vegetation with scattered *P. engelmannii* and *Pinus contorta* above a dense *Salix boothii* shrub layer. This vegetation apparently represents a *S. boothii*/*Calamagrostis canadensis* stand being succeeded by conifer woodland.

### Management

None of the *P. engelmannii* habitat types described by Steele et al. (1983) on the forest are mentioned as important sources of forage for livestock. Widespread trampling by cattle has disturbed the undergrowth in most stands on the *P. engelmannii*/*Carex disperma* habitat type. The susceptibility of saturated soils to compaction makes this type unsuitable for timber harvest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

Mann Creek on the Bighorn National Forest contains an occurrence of *Picea engelmannii* riparian vegetation with few exotic species, that appears to be a good representative of this vegetation at low elevation. We found insufficient information to determine which areas are high-quality occurrences at high elevation.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

This vegetation type includes two alliances from the National Vegetation Classification (Anderson et al. 1998), the *Picea engelmannii* Temporarily Flooded Forest alliance and the *P. engelmannii* Seasonally Flooded Woodland alliance. Both have been described by Reid et al. (1999). Much of the information on the distribution,

species composition, and environments occupied by this type comes from the habitat type publication for western Wyoming (Steele et al. 1983).

#### REPRESENTATION ON THE THREE FORESTS

The *Picea engelmannii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Picea engelmannii</i> - <i>Pinus contorta</i> Community Type	Unknown; perhaps upland <i>Picea engelmannii</i> / <i>Vaccinium scoparium</i> Plant Association	
Girard et al. (1997)	<i>Picea engelmannii</i> /Carex Ecological Type	<i>Picea engelmannii</i> /Carex <i>disperma</i> Plant Association?	G2
Girard et al. (1997)	<i>Picea engelmannii</i> /Linnaea borealis Community Type	<i>Picea engelmannii</i> /Linnaea borealis Plant Association	G3
Girard et al. (1997)	<i>Picea engelmannii</i> /Salix boothii Community Type	Unknown; perhaps Salix boothii/ Deschampsia cespitosa Shrubland	
Girard et al. (1997)	<i>Picea engelmannii</i> /Senecio triangularis Ecological Type	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association?	G3
Jones and Fertig (1998)	<i>Picea engelmannii</i> /Cornus sericea Association	<i>Picea engelmannii</i> /Cornus sericea Plant Association	G3
Jones and Fertig (1998)	<i>Picea engelmannii</i> /Equisetum arvense Association	<i>Picea engelmannii</i> /Equisetum arvense Plant Association	G4
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / Senecio triangularis Community Type	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association	G3
Jankovsky-Jones et al. (1995a)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / Calamagrostis canadensis Community Type	<i>Picea engelmannii</i> /Calamagrostis canadensis Plant Association?	G4
Jankovsky-Jones et al. (1995b)	<i>Picea engelmannii</i> -Caltha leptosepala Community	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association	G3
Jones (1992)	<i>Picea engelmannii</i> /Galium triflorum Community	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association?	G3
Jones and Fertig (1996)	Engelmann spruce/Field horsetail Community Type	<i>Picea engelmannii</i> /Equisetum arvense Plant Association	G4
Olson and Gerhart (1982)	<i>Picea engelmannii</i> - <i>Pinus contorta</i> - <i>Abies lasiocarpa</i> Subtype	Unknown	
Regan et al. (1997)	<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / Caltha leptosepala Forest	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association	G3
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston (1987)	<i>Picea engelmannii</i> /Caltha leptosepala Plant association	<i>Picea engelmannii</i> /Caltha leptosepala Plant Association	G3
Johnston (1987)	<i>Picea engelmannii</i> /Carex disperma Plant Association	<i>Picea engelmannii</i> /Carex disperma Plant Association	G2
Johnston (1987)	<i>Picea engelmannii</i> - <i>Picea pungens</i> / Equisetum arvense Plant Association	<i>Picea engelmannii</i> /Equisetum arvense Plant Association	G4
Johnston (1987)	<i>Picea engelmannii</i> - <i>Picea pungens</i> / Galium triflorum Plant Association	<i>Picea engelmannii</i> /Galium triflorum Plant Association	G4
Jones and Fertig (1999)	Engelmann spruce/Field horsetail Community Type	<i>Picea engelmannii</i> /Equisetum arvense Plant Association	G4
Steele et al. (1983)	<i>Picea engelmannii</i> /Equisetum arvense Habitat Type	<i>Picea engelmannii</i> /Equisetum arvense Plant Association	G4

Steele et al. (1983)	<i>Picea engelmannii</i> / <i>Caltha leptosepala</i> Habitat Type	<i>Picea engelmannii</i> / <i>Caltha leptosepala</i> Plant Association	G3
Steele et al. (1983)	<i>Picea engelmannii</i> / <i>Carex disperma</i> Habitat Type.	<i>Picea engelmannii</i> / <i>Carex disperma</i> Plant Association	G2
Steele et al. (1983)	<i>Picea engelmannii</i> / <i>Galium triflorum</i> Habitat Type	<i>Picea engelmannii</i> / <i>Galium triflorum</i> Plant Association	G4
Steele et al. (1983)	<i>Picea engelmannii</i> / <i>Linnaea borealis</i> Habitat Type	<i>Picea engelmannii</i> / <i>Linnaea borealis</i> Plant Association	G3
Walford et al. (1997)	<i>Picea engelmannii</i> / <i>Salix boothii</i> Community Type	Unknown; perhaps <i>Salix boothii</i> / <i>Deschampsia cespitosa</i> Shrubland	

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Picea engelmannii* Riparian vegetation type that we're describing falls within the Engelmann Spruce - Subalpine Fir forest cover type (206).

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Picea engelmannii* Riparian vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential East Fork Encampment River research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN05WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Standard Park and Bogs research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN03WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS >

Jones, George P. and Walter Fertig. 1996. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON03WYUS>

Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <N99JON08WYUS>

Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp. <U97REG01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, Robert, Stephen V. Cooper, David M. Ondov, David W. Roberts, and Robert D. Pfister. 1983. Forest habitat types of eastern Idaho-western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden UT. 122 pp. <N83STE01WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. <N85YOU01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Pinus albicaulis* Vegetation Type**  
**Whitebark Pine Vegetation Type**

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**SUMMARY**

*Pinus albicaulis* vegetation grows in the sub-alpine forest zone forming woodlands and forests. Undergrowth of shrubs or grasses is relatively sparse under closed canopies while being much better developed under the open canopies. This vegetation type is known to occur in the Shoshone National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Pinus albicaulis* vegetation occurs from northern British Columbia to southern California and northwestern Wyoming (McCaughy and Schmidt 1990). This vegetation type occurs in the Shoshone National Forest (Steele et al. 1983).

**PHYSICAL ENVIRONMENT**

*Pinus albicaulis* vegetation occurs in the subalpine forest at elevations from 6300 to over 10,500 feet (Johnston 1987, Peet 1988). It tends to occur in areas that are too extreme for *Abies* or *Picea* (Steele et al. 1983). These areas have very cold, snowy winters and relatively warm, arid summers (Weaver 1990). The growing season is very short and afternoon thunderstorms are quite common, providing low amounts of moisture (McCaughy and Schmidt 1990). Since the environment is very cold and wind-blown, tree growth is often stunted at these higher elevations taking on a "krummholz" appearance near timberline (Steele et al. 1983, McCaughy and Schmidt 1990). Landforms in these areas tend to be relatively unstable and highly erodable, causing minimal soil development (Hansen-Bristow et al. 1990). The substrate is typically derived from granitic type rocks and often acidic (Steele et al. 1983).

**VEGETATION DESCRIPTION**

*Pinus albicaulis* can form closed or open stands of trees. Closed stands have a single overstory stratum with very minimal development of understory vegetation. Open stands have two strata; an overstory dominated by more widely spaced trees and an understory dominated by shrubs and/or grasses (Steele et al. 1983). *P. albicaulis* may attain heights of 30 to 90 feet, depending on elevation. In addition, these trees are sometimes multi-stemmed in open stands, presumably due to less intense competition for light (McCaughy and Schmidt 1990, Weaver and Jacobs 1990). *P. albicaulis* vegetation grades into *Pinus contorta* vegetation, creating transition zones where both co-dominate the overstory. In addition, *P. contorta* can dominate earlier successional seres prior to being replaced by *P. albicaulis*. *P. albicaulis* stands can also grade into vegetation dominated by *Abies* or *Picea*, and all three species can be found dominating in the transition zones. However, *Abies* and *Picea* are more shade tolerant species and eventually replace *P. albicaulis* as the canopy dominants. The most common dominants in the understory of woodland stands include *Carex geyeri*, *Festuca idahoensis*, or *Juniperus communis*. Common dominants in the understory of forest stands include *Carex rossii* and *Vaccinium scoparium*. According to Steele et al. (1983), *Carex geyeri* has only been found as an understory dominant in Yellowstone National Park

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Pinus albicaulis* vegetation occurs in subalpine forest which are not strongly influenced by fire (Peet 1988). In fact, Fischer and Clayton (1983) place this vegetation type in their fire group 10; this group is considered to have a long fire return interval. In addition, fires are generally very localized because of low amounts of fuel (Steele et al. 1983). *P. albicaulis* is moderately resistant to fire because the bark is fairly thin (McCaughy and Schmidt 1990), providing limited protection from surface fires. However, even this limited protection may allow *P. albicaulis* to survive surface fires, and persist for extended periods without being replaced by *Abies* or *Picea* (Arno and Weaver 1990, Morgan and Bunting 1990). Mountain pine beetle is another disturbance agent in this vegetation. Damage from the beetle is most common at lower elevations, particularly near *Pinus contorta* vegetation (Bartos and Gibson 1990). Steele et al. (1983) consider outbreaks to be localized for the most part with no widespread tree mortality. In



contrast, white pine blister rust is a considerably more destructive disturbance agent in terms of widespread mortality (Hoff and Hagle 1990). In fact, *P. albicaulis* vegetation in northern Idaho is threatened to disappear due to this disease (Steele et al. 1983). The blister rust is thought to be at its ecological limit in Wyoming due to its apparent lack of tolerance for the more arid climate of the region (Hoff and Hagle 1990). However, Kendall (1998) has recently reported that the blister rust will move south in to regions that include Wyoming within the next few decades. This raises considerable doubt about the earlier predictions. Disturbance can often be followed by the invasion of exotic plants. In fact, the probability of invasion is extremely low in this vegetation type without some disturbance. The plant species most likely to invade this vegetation type following disturbance are *Phleum pratense*, *Poa pratensis*, *Polygonum aviculare*, *Taraxacum officinale*, *Descurainia pinnata*, and *Festuca rubra* (Weaver et al. 1990). *P. albicaulis* is beneficial for wildlife because seeds are an important food source, particularly for Clark's nutcracker, red squirrels, and bears (Kendall and Arno 1990). In addition, *P. albicaulis* seeds are dispersed by the Clark's nutcracker and this has important ecological implications for future distribution of this vegetation type. The nutcracker will cache seeds outside of the current forests and woodlands into open areas such as meadows (Hutchins 1990). In fact, this is a key for the pine's establishment in large burns, extending its current distribution within local areas (Tomback et al. 1990).

*Pinus albicaulis* vegetation is considered climax vegetation at the highest elevations (Eyre 1980). However, it can also be a seral type, and later replaced by *Abies* or *Picea* forests (Steele et al. 1983). *P. albicaulis* is sometimes preceded by a sere dominated by *Pinus contorta* (Steele et al. 1983, Johnston 1987).

#### STATUS AND TRENDS

For this vegetation, two plant associations have conservation ranks suggesting that they are uncommon. Those two are the *Pinus albicaulis* / *Carex rossii* and *Pinus albicaulis* / *Carex geyeri* plant associations. All others have conservation ranks suggesting they are abundant. See the section entitled "Representations on the Three Forests" for a complete list of associations and ranks. In general, *P. albicaulis* vegetation is threatened by white pine blister rust. Early predictions suggested that the blister rust was at the edge of its ecological tolerance in northwestern Wyoming and would not cause widespread mortality (Hoff and Hagle 1990). Recently, Kendall et al. (1998) have found evidence that raises considerable doubt about the earlier prediction. They suggested outbreaks would become more common in the Wyoming over the next few decades, leading to high mortality in this vegetation type.

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

*P. albicaulis* was harvested for timber earlier in the 20<sup>th</sup> century, but today it is not an important commercial source of timber (Steele et al. 1983, Losensky 1990). These areas are used for raising livestock and are best suited for sheep grazing (Willard 1990). Herbage production within this vegetation type is considered poor to fair depending on the undergrowth (Steele et al. 1983).

##### Effects of Management Practices

In general, fire suppression during the past century has probably not affected this vegetation type because it occurs at high elevations where there are long fire return intervals (Peet 1988). However, fire may be necessary for its existence at lower elevations or where it is a seral type (Arno and Weaver 1990, Morgan and Bunting 1990). If these sites are never burned (or disturbed by some other agent), the earlier successional seres do not regenerate over time. As for grazing management, *P. albicaulis* vegetation is fragile and excessive grazing can easily destroy the herbaceous plants. If the high elevation forests are overgrazed, they tend to recover at a very slow rate (Steele et al. 1983). Exotic plants have mostly invaded disturbed areas in these high elevation forests. *Phleum pratense* and *Poa pratensis* are of primary concern for removal because they tend to dominate sites following establishment (Weaver et al. 1990).

### **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

#### **BIGHORN NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

**MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

**SHOSHONE NATIONAL FOREST**

Distribution

*Pinus albicaulis* vegetation grows in both the Absaroka and Wind River ranges, but Steele et al. (1983) consider the best representative stands to occur in the Wind River Range.

Physical environment

*Pinus albicaulis/Vaccinium scoparium* stands occur on concave slopes that provide protection from the wind. These slopes are typically facing north, west, or south with gentle slopes (Fertig and Bynum 1994, Jones 1999, Jones and Fertig 1999a). In addition, *P. albicaulis/Vaccinium scoparium* stands are known to be more restricted to south and west facing slopes at lower elevations (Jones 1999). *P. albicaulis* is found on the driest slopes in association with *Juniperus communis*; *Pinus contorta* is also sporadically found throughout these stands (Fertig and Bynum 1994, Jones and Fertig 1999b).

Vegetation description

No additional information is known beyond that given in the general information section.

Management

No additional information is known beyond that given in the general information section.

**AREAS WITH HIGH-QUALITY OCCURRENCES**

Arrow Mountain, Roaring Fork Mountain, and Sheep Mesa contain quality representations of this vegetation with no widespread impacts due to human intervention or exotic plant invasion (Jones and Fertig 1999b, Jones 1999, Jones and Fertig 1999a). Pickett’s Knob may have the best representation of *P. albicaulis* vegetation among the four areas, but local stands adjacent to Pickett’s Knob have been clearcut. This raises some question as to maintaining the quality of stands in Pickett’s Knob (Fertig and Bynum 1994).

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

**GENERAL COMMENTS**

*Pinus albicaulis* vegetation, as described here, falls within the *Pinus albicaulis* Forest and Woodland Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

**REPRESENTATION ON THE THREE FORESTS**

The *Pinus albicaulis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
None			
<b>MEDICINE BOW NATIONAL FOREST</b>			
None			
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston 1987	<i>Pinus albicaulis</i> / <i>Carex geyeri</i> Plant Association	<i>Pinus albicaulis</i> / <i>Carex geyeri</i> Plant Association	G3
Johnston 1987	<i>Pinus albicaulis</i> / <i>Carex rossii</i> Plant Association	<i>Pinus albicaulis</i> / <i>Carex rossii</i> Plant Association	G3?
Johnston 1987	<i>Pinus albicaulis</i> / <i>Festuca idahoensis</i> Plant Association	<i>Pinus albicaulis</i> / <i>Festuca idahoensis</i> Plant Association	G4

Johnston 1987, Fertig and Bynum 1994	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Plant Association	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Plant Association	G4?
Jones and Fertig 1999b	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Plant Community?	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Plant Association	G4?
Johnston 1987	<i>Pinus albicaulis</i> - <i>Pinus flexilis</i> / <i>Potentilla diversiflora</i> Plant Association	Unknown	
Johnston 1987, Fertig and Bynum 1994, Jones 1999	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Plant Association	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Plant Association	G4
Jones 1999	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Plant Community	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Plant Association	G4
Jones and Fertig 1999a	Whitebark Pine / Gooseberry Currant Plant Community	Unknown	G4
Steele et al. 1983	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Habitat Type	<i>Pinus albicaulis</i> / <i>Vaccinium scoparium</i> Plant Association	G4
Steele et al. 1983	<i>Pinus albicaulis</i> / <i>Carex geyeri</i> Habitat Type	<i>Pinus albicaulis</i> / <i>Carex geyeri</i> Plant Association	G3
Steele et al. 1983	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Habitat Type	<i>Pinus albicaulis</i> / <i>Juniperus communis</i> Plant Association	G4?
Steele et al. 1983	<i>Pinus albicaulis</i> / <i>Carex rossii</i> Habitat Type	<i>Pinus albicaulis</i> / <i>Carex rossii</i> Plant Association	G3?
Steele et al. 1983	<i>Pinus albicaulis</i> / <i>Festuca idahoensis</i> Habitat Type	<i>Pinus albicaulis</i> / <i>Festuca idahoensis</i> Plant Association	G4

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Pinus albicaulis* vegetation type that we're describing falls within the Whitebark Pine forest cover type (208).

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Pinus albicaulis* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Arno, S.F. and T. Weaver. 1990. Whitebark pine community types and their patterns on the landscape. In W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Bartos, D.L. and K.E. Gibson. 1990. Insects of Whitebark Pine with Emphasis on Mountain Pine Beetle. In W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, W. and M. Bynum. 1994. Biological Report on the Proposed Picketts Knob Research Natural Area. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U94FER12WYUS>

Fischer, W.C. and B.D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experimental Station, Ogden, UT. <N83FIS41WYUS>

Hansen-Bristow K., C. Montagne, G. Schmid. 1990. Geology, Geomorphology, and Soils within Whitebark Pine Ecosystems. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Hoff, R. and S. Hagle. 1990. Diseases of Whitebark Pine with Special Emphasis on White Blister Rust. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Hutchins, H.E. 1990. Whitebark Pine Seed Dispersal and Establishment: Who's Responsible? *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, G.P. 1999. Ecological Evaluation of the Potential Roaring Fork Mountain Research Natural Area within the Shoshone National Forest, Fremont County, Wyoming. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U99JON07WYUS>

Jones, G.P. and W. Fertig. 1999a. Ecological Evaluation of the Potential Sheep Mesa Research Natural Area within the Shoshone National Forest, Park County, Wyoming. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U99JON08WYUS>

Jones, G.P. and W. Fertig. 1999b. Ecological Evaluation of the Potential Arrow Mountain Research Natural Area within the Shoshone National Forest, Fremont County, Wyoming. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U99JON02WYUS>

Kendall, Katherine C. 1998. Limber pine. Page 486 in: Mac, Michael J. (project director). Status and trends of the nation's biological resources. Volume 2. USDI Geological Survey.

Kendall, K.C. and S.F. Arno. 1990. Whitebark Pine-An Important but Endangered Wildlife Resource. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Losensky, B.J. 1990. Historical Uses of Whitebark Pine. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

McCaughey, W.W. and W.C. Schmidt. 1990. Autecology of Whitebark Pine. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Morgan, P. and S.C. Bunting. 1990. Fire Effects in Whitebark Pine Forests. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister. 1983. Forest Habitats of Eastern Idaho-Western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. <N83STE01WYUS>

Tomback, D.F., L.A. Hoffman, and S.K. Sund. 1990. Coevolution of Whitebark Pine and Nutcrackers: Implications for Forest Regeneration. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Weaver, T. 1990. Climates of Subalpine Pine Woodlands. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Weaver, T. and J. Jacobs. 1990. Occurrence of Multiple Stems in Whitebark Pine. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Weaver, T., J. Lichthart, and D. Gustafson. 1990. Exotic invasions of Timberline Vegetation, Northern Rocky Mountains, USA. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

Willard, E.E. 1990. Use and Impact of Domestic Livestock in Whitebark Pine Forests. *In* W.C Schmidt and K.J. McDonald (compilers). Proceedings-Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. USDA Forest Service General Technical Report INT-270. Intermountain Research Station, Ogden, UT. <N90SCH01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Pinus contorta* Vegetation Type**  
**Lodgepole Pine Vegetation Type**

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**SUMMARY**

This widespread and common vegetation type includes forests and woodlands dominated by *Pinus contorta*. Stands can be found throughout the upper montane and subalpine forest zones on a variety of topographic positions and substrates. Most stands are on uplands, but a few riparian types have been described. This type includes both climax and seral stands.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Pinus contorta* vegetation is widespread in western North America, from British Columbia south through the Rocky Mountains into Colorado and through the Cascade Mountains and the Sierra Nevada to southern California (Reid et al. 1999). In Wyoming, this type is known from all of the mountain ranges except the Black Hills.

**PHYSICAL ENVIRONMENT**

Stands occupy a wide variety of sites in the upper montane and subalpine zones (Reid et al. 1999). In the Rocky Mountains of Wyoming (Despain 1973, Steele et al. 1983) and Montana (Pfister et al. 1977), *P. contorta* stands (especially climax stands) are found on granite, rhyolite, and sandstone, but are absent from limestone and dolomite. Steele et al. (1983) suggest that persistent *P. contorta* stands are found on gentle terrain unlikely to support extensive, catastrophic fires, and in valleys where cold air collects.

**VEGETATION DESCRIPTION**

In climax stands, *Pinus contorta* forms a tree overstory that may contain no other species. In seral stands, *Pinus contorta* dominates the overstory, but other species (*Abies lasiocarpa*, *Picea engelmannii*, *Pinus albicaulis*) are present, and the amount of each species varies from stand to stand. Saplings of *A. lasiocarpa* and *P. engelmannii* usually are present in the understory of seral stands. The undergrowth may include an open shrub layer, or it may consist of herbs. See the sections below on each of the three Region 2 forests for information on important species.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

This vegetation type includes *Pinus contorta* stands that climax vegetation, and stands that are clearly seral to other types (principally *Abies lasiocarpa*-*Picea engelmannii* forests).

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) contains 43 *Pinus contorta* plant associations. Stands on the three Region 2 forests represent ten of those associations; nine are considered common (G4 or G5 global conservation ranks) and one may be uncommon (G3G4 rank). Information on changes in the distribution, abundance, and condition of these associations has not been compiled.

**MANAGEMENT CONSIDERATIONS**

See the sections below on the individual Region 2 national forests.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

*Pinus contorta* forests are nearly continuous on the granitic central third of the range at 6,990 to 9,515 feet, and small stands occur in the northern third (on granite outcrops or Flathead sandstone) and the southern third (on granite or Tensleep sandstone) (Despain 1973).

#### Physical environment

*P. contorta* forests are well-developed on granite, limited on sandstone, and rare on shale and limestone (Despain 1973). Although they are principally upland forests, Girard et al. (1997) found stands on riparian sites where the *P. contorta* grows on hummocks.

#### Vegetation description

Despain (1973) reports that overstories of *Pinus contorta* stands vary widely in structure, from dense stands of small trees (ca. 15 inches dbh) to open stands of large trees (50 inches dbh). Most stands have trees in only two or three size classes. The dense overstories are nearly pure *Pinus contorta*, and the open overstories generally are mixes of *Pinus contorta*, *Picea engelmannii*, and *Abies lasiocarpa*. Open stands may contain shrub layers of *Juniperus communis* and *Ribes lacustre*. Common undergrowth species are *Arnica cordifolia*, *Vaccinium scoparium*, *Arctostaphylos uva-ursi*, *Senecio streptanthifolius*, and *Lupinus argenteus*. Lichens and mosses provide considerable ground cover. Hoffman and Alexander (1976) report stands in which *Shepherdia canadensis* forms a dense shrub layer. Stands sampled by Girard et al. (1997) had undergrowths dominated by riparian and wetland species (*Calamagrostis canadensis*, *Carex rostrata*, *Carex aquatilis*).

At higher elevations, *Pinus contorta* forests are seral to *Abies lasiocarpa*-*Picea engelmannii* forests, but *P. contorta* forms stable, climax forests over much of the elevation range of the species (Despain 1973).

#### Management

Despain (1973) noted that by the early 1970s, *Pinus contorta* was the most important timber tree on the Bighorns. Clearcutting was the common harvest method, and large barren areas occurred with poor regeneration.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

*Pinus contorta* forests are best developed between 8,000 and 10,000 feet elevation in the Medicine Bow Mountains and the Sierra Madre, where they form the major part of the subalpine forest (Alexander et al. 1986). Small stands are present in the Laramie Range as well. *Pinus contorta* forests are clearly seral to *Abies lasiocarpa*-*Picea engelmannii* forests at higher elevations (approximately 9,000 feet), but they seem to be climax at lower elevations.

#### Physical environment

Sites supporting climax *Pinus contorta* forests seem to occur on moderately acid, well-drained sands or gravelly loams that hold less water than do the soils of *Abies*-*Picea* forests (Alexander et al. 1986).

#### Vegetation description

*Pinus contorta* in several age classes forms the overstory in climax stands (Alexander et al. 1986). In seral stands, the overstory consists of even-aged *Pinus contorta* with *Abies lasiocarpa*, *Picea engelmannii*, and *Populus tremuloides* in some stands. *Juniperus communis* or *Shepherdia canadensis* form an open shrub layer in some stands, but many stands have only scattered shrubs above an undergrowth of *Vaccinium scoparium*, *Carex geyeri*, *Carex rossii*, *Arnica cordifolia*, and small amounts of other species. Moss and lichen contribute little cover.

#### Management

Alexander et al. (1986) characterize these forests as providing little habitat for wildlife or forage for livestock. Tree regeneration often is poor following timber harvest on dry sites.

## SHOSHONE NATIONAL FOREST

### Distribution

*Pinus contorta* vegetation is common throughout the forest, from the northern Absaroka Mountains south through the Owl Creek and Wind River Mountains (Steele et al. 1983).

### Physical environment

Stands occupy a wide range of topographic positions, and they do not seem to occupy unique environments.

### Vegetation description

*Pinus contorta* dominates the overstory in climax stands, and often is the only tree present (Steele et al. 1983). In seral stands, *P. contorta* often dominates the overstory following disturbance, and persists for long periods with the climax species (chiefly *Abies lasiocarpa* and *Picea engelmannii*). *Pinus albicaulis* often is present at high elevations. In most stands, the undergrowth is sparse. An open layer of the low shrubs *Juniperus communis* or *Shepherdia canadensis* may be present, or the undergrowth may be dominated by dwarf-shrubs, forbs, or graminoids. Common species are *Vaccinium scoparium*, *Linnaea borealis*, *Mahonia repens*, *Arnica cordifolia*, *Astragalus miser*, *Antennaria racemosa*, *Pyrola secunda*, *Lupinus* spp., and *Carex rossii*.

### Management

Steele et al. (1983) report that *P. contorta* stands generally have little value as habitat for wildlife (other than cover for large species) or forage for livestock. Timber production is low to moderate.

## AREAS WITH HIGH-QUALITY OCCURRENCES

In the Shoshone and the Bighorn National Forests, the wilderness areas no doubt contain high-quality occurrences of *Pinus contorta* vegetation. In the Medicine Bow National Forest, several areas have been identified that may contain high-quality occurrences (Jankovsky-Jones et al. 1995c, 1995h, 1995i).

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Pinus contorta* vegetation occurs on a number of habitat types from the three Region 2 national forests.

### REPRESENTATION ON THE THREE FORESTS

The *Pinus contorta* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Despain (1973)	<i>Pinus contorta</i> Forests	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association and <i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Girard et al. (1997)	<i>Pinus contorta</i> / <i>Calamagrostis canadensis</i> Ecological Type	<i>Pinus contorta</i> / <i>Calamagrostis canadensis</i> Plant Association?	G5Q
Girard et al. (1997)	<i>Pinus contorta</i> / <i>Carex rostrata</i> Ecological Type	Unknown	
Girard et al. (1997)	<i>Pinus contorta</i> / <i>Kalmia microphylla</i> / <i>Carex aquatilis</i> Ecological Type	Unknown	
Hoffman and Alexander (1976)	<i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Habitat Type	<i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Plant Association	G5
Hoffman and Alexander (1976)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Habitat Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5



Johnston (1987)	<i>Pinus contorta</i> / <i>Arctostaphylos adenotricha</i> Plant Association	<i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Welp et al. (1998a)	Lodgepole pine/Common juniper Community Type	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Welp et al. (1998b)	Lodgepole pine/Grouse Whortleberry Community Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Welp et al. (1998c)	Lodgepole pine/Grouse Whortleberry Community Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Welp et al. (1998d)	Lodgepole pine/Grouse Whortleberry Community Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Welp et al. (1998e)	Lodgepole pine/Grouse Whortleberry Community Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
MEDICINE BOW NATIONAL FOREST			
Alexander et al. (1986)	<i>Pinus contorta</i> / <i>Carex geyeri</i> Habitat Type	<i>Pinus contorta</i> / <i>Carex geyeri</i> Plant Association	G4?
Alexander et al. (1986)	<i>Pinus contorta</i> / <i>Carex rossii</i> Habitat Type	<i>Pinus contorta</i> / <i>Carex rossii</i> Plant Association	G5
Alexander et al. (1986)	<i>Pinus contorta</i> / <i>Juniperus communis</i> Habitat Type	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Alexander et al. (1986)	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Habitat Type	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Plant Association	G3G4
Alexander et al. (1986)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Habitat Type	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995a)	<i>Pinus contorta</i> / <i>Carex geyeri</i> Community	<i>Pinus contorta</i> / <i>Carex geyeri</i> Plant Association	G4?
Jankovsky-Jones et al. (1995b)	<i>Pinus contorta</i> / <i>Carex geyeri</i> Community	<i>Pinus contorta</i> / <i>Carex geyeri</i> Plant Association	G4?
Jankovsky-Jones et al. (1995b)	<i>Pinus contorta</i> / <i>Juniperus communis</i> Community	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1995c)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995d)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995e)	<i>Pinus contorta</i> / <i>Juniperus communis</i> Community	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1995f)	<i>Pinus contorta</i> / <i>Juniperus communis</i> Community	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1995f)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995g)	<i>Pinus contorta</i> / <i>Juniperus communis</i> Community	<i>Pinus contorta</i> / <i>Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1995g)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995h)	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Community	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Plant Association	G3G4
Jankovsky-Jones et al. (1995h)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995h)	<i>Pinus contorta</i> / <i>Carex geyeri</i> Community	<i>Pinus contorta</i> / <i>Carex geyeri</i> Plant Association	G4?
Jankovsky-Jones et al. (1995i)	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Community	<i>Pinus contorta</i> / <i>Vaccinium scoparium</i> Plant Association	G5
Jankovsky-Jones et al. (1995i)	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Community	<i>Pinus contorta</i> / <i>Shepherdia canadensis</i> Plant Association	G3G4

Jankovsky-Jones et al. (1995i)	<i>Pinus contorta/Juniperus communis</i> Community	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1996)	<i>Pinus contorta/Arctostaphylos uva-ursi</i> Community	<i>Pinus contorta/Arctostaphylos uva-ursi</i> Plant Association	G5
Jankovsky-Jones et al. (1996)	<i>Pinus contorta/Carex geyeri</i> Community	<i>Pinus contorta/Carex geyeri</i> Plant Association	G4?
Jankovsky-Jones et al. (1996)	<i>Pinus contorta/Juniperus communis</i> Community	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Jankovsky-Jones et al. (1996)	<i>Pinus contorta/Mahonia repens</i> Community	<i>Pinus contorta/Mahonia repens</i> Plant Association	G4G5
Jankovsky-Jones et al. (1996)	<i>Pinus contorta/Shepherdia canadensis</i> Community	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	G3G4
Johnston (1987)	<i>Pinus contorta/Arctostaphylos adenotricha</i> Plant Association	<i>Pinus contorta/Arctostaphylos uva-ursi</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta/Carex geyeri</i> Plant Association	<i>Pinus contorta/Carex geyeri</i> Plant Association	G4?
Johnston (1987)	<i>Pinus contorta/Carex rossii</i> Plant Association	<i>Pinus contorta/Carex rossii</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta/Juniperus communis</i> Plant Association	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	G3G4
Johnston (1987)	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Jones (1989)	Lodgepole pine forests	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Jones and Fertig (1996a)	Lodgepole pine/ Grouse whortleberry Community	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1996a)	Lodgepole pine/Common juniper Community	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Jones and Fertig (1996a)	Lodgepole pine/Elk sedge Community	<i>Pinus contorta/Carex geyeri</i> Plant Association	G4?
Jones and Fertig (1996b)	Lodgepole pine/Grouse whortleberry Community	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1996b)	Lodgepole pine/Elk sedge Community	<i>Pinus contorta/Carex geyeri</i> Plant Association	G4?
Ryan et al. (1994)	Lodgepole pine vegetation	Unknown	
SHOSHONE NATIONAL FOREST			
Johnston (1987)	<i>Pinus contorta/Carex rossii</i> Plant Association	<i>Pinus contorta/Carex rossii</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta/Juniperus communis</i> Plant Association	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Johnston (1987)	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	G3G4
Johnston (1987)	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1999a)	<i>Pinus contorta/Juniperus communis</i> Woodland	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Jones and Fertig (1999b)	<i>Pinus contorta/Vaccinium scoparium</i> Forest	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Jones and Fertig (1999c)	<i>Pinus contorta/Vaccinium scoparium</i> Forest	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5
Steele et al. (1983)	<i>Pinus contorta/Arnica cordifolia</i> Community Type	<i>Pinus contorta/Arnica cordifolia</i> Plant Association	G4?

Steele et al. (1983)	<i>Pinus contorta/Carex rossii</i> Community Type	<i>Pinus contorta/Carex rossii</i> Plant Association	G5
Steele et al. (1983)	<i>Pinus contorta/Juniperus communis</i> Community Type	<i>Pinus contorta/Juniperus communis</i> Plant Association	G5
Steele et al. (1983)	<i>Pinus contorta/Linnaea borealis</i> Community Type	<i>Pinus contorta/Linnaea borealis</i> Plant Association	G5
Steele et al. (1983)	<i>Pinus contorta/Shepherdia canadensis</i> Community Type	<i>Pinus contorta/Shepherdia canadensis</i> Plant Association	G3G4
Steele et al. (1983)	<i>Pinus contorta/Vaccinium scoparium</i> Community Type	<i>Pinus contorta/Vaccinium scoparium</i> Plant Association	G5

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Pinus contorta* vegetation type that we're describing falls within the Lodgepole Pine forest cover type (218).

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Pinus contorta* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. <A73DES01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02.

Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential East Fork Encampment River research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d. Ecological evaluation for the potential Ground Moraine research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e. Ecological evaluation for the potential LaBonte Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995f. Ecological evaluation for the potential Many Ponds research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995g. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995h. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995i. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jones, George. 1989. Report on the Ashenfelder Basin special interest area. Prepared for the U.S. Forest Service by the Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.

Jones, George P. and Walter Fertig. 1996a. Ecological evaluation of the potential Cedar Pass research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished.

Jones, George P. and Walter Fertig. 1996b. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished.

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished.

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished.

Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished.

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Pfister, Robert D., Bernard L. Kovalchik, Stephen F. Arno, and Richard C. Presby. 1977. Forest habitat types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station, Ogden UT. <N77PFI01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Ryan, Michael G., Linda A. Joyce, Tom Andrews, and Kate Jones. 1994. Research natural areas in Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 57 pp.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, Robert, Stephen V. Cooper, David M. Ondov, David W. Roberts, and Robert D. Pfister. 1983. Forest habitat types of eastern Idaho-western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden UT. 122 pp. <N83STE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Crazy Woman Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished.

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Dry Fork research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished.

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished.

Welp, Laura, Walter Fertig, and George Jones. 1998d. Ecological evaluation of the potential Pheasant Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished.

Welp, Laura, Walter Fertig, and George Jones. 1998e. Ecological evaluation of the potential Poison Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished.

**CHARACTERIZATION ABSTRACT FOR  
*Populus tremuloides* Vegetation Type  
Quaking Aspen Vegetation Type**

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**SUMMARY**

*Populus tremuloides* vegetation is a forest type that occurs within uplands and riparian zones. Stands grow on moist sites and have tree-dominated overstories as well as a shrub- or herbaceous-dominated understories. Management concerns include overgrazing, fire suppression, and heavy browsing. This type is known to occur in the Bighorn, Medicine Bow, and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Populus tremuloides* vegetation is a widespread forest type occurring throughout western North America and east to the Great Lakes Region (Reid et al. 1999). It is common in the Rocky Mountains including the Bighorn, Medicine Bow, and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

Stands occur in the foothills and mountains of Wyoming from about 6500 feet to 9500 feet. They are found in moist ravines and north facing slopes (Knight 1994), in addition to riparian areas (Girard et al. 1997, Reid et al. 1999). This vegetation is restricted to mesic areas, presumably due to moisture requirements for seedling establishment (Knight 1994).

**VEGETATION DESCRIPTION**

Stands are often small patches of trees in the forest matrix (Knight 1994). *Populus tremuloides* is the characteristic species creating a canopy 15 to 60 feet in height with cover ranging from 60 to 100% (Reid et al. 1999). A variety of species can dominate the understory of this vegetation, but the more common dominants are *Calamagrostis rubescens*, *Carx geyeri*, *Lupinus argenteus*, *Symphoricarpos oreophilus*, or *Thalictrum fendleri* (Hoffman and Alexander 1976, Steele et al. 1983, Alexander et al. 1986). Stands in riparian areas have understories dominated by *Calamagrostis canadensis*, *Amelanchier alnifolia*, *Prunus virginiana*, *Betula occidentalis*, *Poa pratensis*, or *Heracleum sphondylium* (Girard et al. 1997, Jankovsky-Jones et al. 1996, Jones and Fertig 1996b, Welp et al. 1998b).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Populus tremuloides* spreads vegetatively by sprouting from roots. The small stands which are characteristic of Wyoming probably arise from just a few individuals that have spread in this manner. In fact, establishment from seed is considered uncommon which may limit the spread of this species (Knight 1994). Stands have well-developed grass understories that thrive in the mesic conditions. In addition, *Populus tremuloides* is a deciduous tree that loses its leaves in the fall. This is thought to promote the growth of grasses due to enhanced nutrient availability as the deciduous leaves decompose (Peet 1988). In turn, the thick growth of grasses helps perpetuate this vegetation. The grasses reduce seedling establishment of conifers that eventually replace *Populus tremuloides* in the overstory as the successional climax (Peet 1988). Regeneration of *Populus tremuloides* following disturbance is a key to its persistence in the forest matrix. For example, this tree can quickly re-vegetate a site following fire or logging by sprouting from root stocks (Steele et al. 1983, Alexander et al. 1986, Peet 1988, Knight 1994). In addition, Jones (1989) suggested that outbreaks of mountain pine beetles could open canopies allowing *Populus tremuloides* to regain dominance of sites with an overstory of *Pinus ponderosa*. Beetles create patches of dead trees during outbreaks, and this should allow *Populus tremuloides* to become the canopy dominant if it is present in the understory. Interestingly, *Populus tremuloides* has chlorophyll in its bark allowing it to photosynthesize even after its deciduous leaves are shed in the fall. In effect, *Populus tremuloides* is a functional evergreen since it can theoretically photosynthesize at any time during the year (Knight 1994). *Populus tremuloides* can be damaged or killed by root rot and cankers (Knight 1994). Stands are often browsed by elk and deer as well as used by beavers for constructing dams (Knight 1994).

This vegetation is a major seral type in the montane zone of the Rocky Mountains. *Populus tremuloides* is the common seral species in the southern most reaches of the Rocky Mountains, but is more restricted to isolated patches moving northward. *Pinus contorta* is the more common seral species to the north, presumably due to its superior competitive ability (Peet 1988). *Abies lasiocarpa* vegetation typically replaces *Populus tremuloides*, but *Picea engelmannii*, *Pseudotsuga menziesii*, and *Pinus contorta* are also potential successors (Peet 1988, Knight 1994). *Populus tremuloides* vegetation is a climax type in the foothills below the elevational extent of conifer forests (Steele et al. 1983). In addition, this vegetation might be a fire-maintained climax in the absence of fire suppression (Peet 1988).

#### STATUS AND TRENDS

For this vegetation, most of the plant associations in the three forests have G4 or G5 conservation ranks, meaning they are abundant. However, the *Populus tremuloides* / *Lupinus argenteus* plant association has a G2(?) conservation rank, meaning it is rare. In addition, *Populus tremuloides* / *Calamagrostis canadensis* plant association has a G3 conservation rank, meaning it is uncommon. The *Populus tremuloides* / *Artemisia tridentata* plant association has a G3G4 conservation rank, meaning it could be uncommon or abundant (Anderson et al. 1998). More information is needed about this association to better clarify the rank. See the section entitled "Representations on the Three Forests" for a complete list of association and ranks. In general, this vegetation is thought to be declining in abundance due to heavy browsing and fire suppression (Steele et al. 1983, Knight 1994).

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

Stands support grazing by livestock and wildlife (Hoffman and Alexander 1976, Steele et al. 1983, Alexander et al. 1986). Sprouts of *Populus tremuloides* are also browsed by big game species (Hoffman and Alexander 1976, Steele et al. 1983). Smaller wildlife species use the stands as habitat (Alexander et al. 1986). This vegetation can be harvested for timber but for the most part is not highly productive (Hoffman and Alexander 1976, Alexander et al. 1986). Lastly, stands have scenic value providing fall color to the forest matrix as the deciduous leaves turn bright yellow during senescence (Hoffman and Alexander, Alexander et al. 1986).

##### Effects of Management Practices

Overgrazing is problematic in this vegetation causing shifts in dominance to less desirable forage (Steele et al. 1983). Heavy browsing is also a management concern because continual removal of sprouts may reduce the vegetative spread and viability of *Populus tremuloides* (Steele et al. 1983, Knight 1994). In addition, fire suppression may limit the regeneration of this vegetation. Fire is needed for *Populus tremuloides* to eventually regain dominance of a site following succession to climax types (Knight 1994).

### **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

#### BIGHORN NATIONAL FOREST

##### Distribution

This vegetation is not common in the Bighorns (Hoffman and Alexander 1976). In fact, it is only considered a major cover type for one isolated area in this national forest, based on the GAP land cover map (Merrill et al. 1996).

### Physical environment

Stands occur on deep soils with more moisture available than surrounding sites dominated by conifers (Hoffman and Alexander 1976).

### Vegetation description

*Populus tremuloides* dominates the overstory while *Lupinus argenteus*, *Amelanchier alnifolia*, *Prunus virginiana*, *Calamagrostis canadensis*, or *Poa pratensis* may dominate the understory (Hoffman and Alexander 1976, Girard et al. 1997, Welp et al. 1998a-b).

### Management

This vegetation is not very valuable for timber, but does have high forage production if not overgrazed. It is also valuable as fall scenery when the leaves are turning colors. Sprouts are an important source of browse for big game species (Hoffman and Alexander 1976).

## MEDICINE BOW NATIONAL FOREST

### Distribution

Stands are common throughout the Medicine Bow National Forest (Alexander et al. 1986), particularly at lower elevations (Merrill et al. 1996).

### Physical environment

Stands form large patches on the west slope of the Sierra Madre. This is unusual for *Populus tremuloides* in Wyoming and presumably is due to heightened summer rainfall from the Arizona monsoon (Knight 1994). In addition, the Sierra Madre stands occur on humic soils with high porosity that may contribute to or be a result of their success in that area (Alexander et al. 1986).

### Vegetation description

Alexander et al. (1986) considered this vegetation both seral and climax depending on the conditions and evidence of conifer establishment in the understory. *Populus tremuloides* is the overstory dominant while the understory dominants include a variety of species such as *Calamagrostis rubescens*, *Carex geyeri*, *Thalictrum fendleri*, *Juniperus communis*, *Ligusticum porteri*, *Heracleum sphondylium*, *Betula occidentalis*, *Arctostaphylos uva-ursi*, and *Pteridium aquilinum* (Alexander et al. 1986, Jankovsky-Jones et al. 1995a-e, Jankovsky-Jones et al. 1996, Jones and Fertig 1996a-b).

### Management

This vegetation can be a source of timber, particularly in stands with an understory of *Thalictrum fendleri*. Such stands are highly productive and therefore yield some harvestable timber. Alexander et al. (1986) suggest that any logging should be done in small blocks so that there will be effective regeneration in the stands. This vegetation also provides forage and habitat for livestock and wildlife. Heavy use by sheep can reduce the forb cover (Alexander et al. 1986).

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation is fairly common in the Shoshone National Forest (Steele et al. 1983), particularly in the southern two-thirds of the forest (Merrill et al. 1996).



### Physical environment

Stands are found on concave slopes and low hills below the elevational limits of conifers (Steele et al. 1983). No additional information is available about the physical environment at higher elevations beyond that provided in the general information section.

### Vegetation description

*Populus tremuloides* dominates the overstory while the most common dominants of the understory appear to migrate from neighboring stands of conifers (Steele et al. 1983). Below the elevational limits of conifers, Steele et al. (1983) consider this type to be climax with an understory dominated by *Symphoricarpos oreophilus*.

### Management

Stands provide forage for livestock, but are often overgrazed leading to increasing abundance of *Nemophila breviflora*, *Dactylis glomerata*, *Cerastium arvense*, *Rudbeckia occidentalis*, *Poa* spp., and *Helianthella* spp. Wildlife may also heavily browse the sprouts, which may lead to sites dominated by shrubs or forbs (Steele et al. 1983).

### AREAS WITH HIGH-QUALITY OCCURRENCES

This vegetation is subjected to overgrazing and heavy browsing at times, which can have profound effects (Steele et al. 1983, Knight 1994). In addition, fire suppression is thought to reduce the areal extent of this vegetation (Knight 1994). However, some stands have apparently escaped heavy use and are quality representations. Such stands are thought to occur in Battle Mountain (Jankovsky-Jones et al. 1995a), Platte Ridge and North Platte River Canyon (Jankovsky-Jones et al. 1995c), Threemile (Jankovsky-Jones et al. 1995e), Cedar Pass (Jones and Fertig 1996a), and Deep Creek (Jones and Fertig 1996b) Potential Research Natural Areas of the Medicine Bow National Forest. Quality representations still need to be identified in the Shoshone and Bighorn National Forests.

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

*Populus tremuloides* vegetation, as described here, falls within the *Populus tremuloides* Forest and Seasonally Flooded Forest Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

#### REPRESENTATION ON THE THREE FORESTS

The *Populus tremuloides* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Hoffman and Alexander 1976	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Habitat Type	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Forest Plant Association	G2?
Johnston 1987	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Plant Association	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Forest Plant Association	G2?
Girard et al. 1997	Quaking Aspen / Reedgrass Plant Community	<i>Populus tremuloides</i> / <i>Calamagrostis canadensis</i> Forest Plant Association	G3
Girard et al. 1997, Welp et al. 1998a	Quaking Aspen / Kentucky Bluegrass Plant Community	Unknown	
Welp et al. 1998a	Quaking Aspen / Silver Lupine Plant Community	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Forest Plant Association	G2?

Welp et al. 1998b	Quaking Aspen / Saskatoon Serviceberry – Chokecherry Plant Community	Unknown	
Jones and Fertig 1998, Welp et al. 1998c(?)	Quaking Aspen Woodland Plant Community	Unknown	
Merrill et al. 1996	Aspen Forest GAP Cover Type (41001)	N/A	
MEDICINE BOW NATIONAL FOREST			
Alexander et al. 1986	<i>Populus tremuloides</i> / <i>Carex geyeri</i> Habitat Type	<i>Populus tremuloides</i> / <i>Carex geyeri</i> Forest Plant Association	G4
Alexander et al. 1986	<i>Populus tremuloides</i> / <i>Thalictrum fendleri</i> Habitat Type	<i>Populus tremuloides</i> / <i>Thalictrum fendleri</i> Forest Plant Association	G5
Alexander et al. 1986	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Habitat Type	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Forest Plant Association	G5?
Johnston 1987	<i>Populus tremuloides</i> / <i>Amelanchier alnifolia</i> – <i>Padus virginiana</i> Plant Association	Unknown	
Johnston 1987	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Plant Association	<i>Populus tremuloides</i> / <i>Calamagrostis rubescens</i> Forest Plant Association	G5?
Johnston 1987	<i>Populus tremuloides</i> / <i>Carex geyeri</i> Plant Association	<i>Populus tremuloides</i> / <i>Carex geyeri</i> Forest Plant Association	G4
Johnston 1987	<i>Populus tremuloides</i> / <i>Juniperus communis</i> Plant Association	<i>Populus tremuloides</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Johnston 1987	<i>Populus tremuloides</i> / <i>Lathyrus leucanthus</i> Plant Association	Unknown	
Johnston 1987	<i>Populus tremuloides</i> / <i>Ligusticum</i> spp. Plant Association	Unknown	
Jones 1989	<i>Populus tremuloides</i> Stands	N/A	
Jankovsky-Jones et al. 1995a	Quaking Aspen / Saskatoon Serviceberry – Common Chokecherry Plant Community	Unknown	
Jankovsky-Jones et al. 1995b	Quaking Aspen / Western Brackenfern Plant Community	<i>Populus tremuloides</i> / <i>Pteridium aquilinum</i> Forest Plant Association	G4
Jankovsky-Jones et al. 1995c, Jankovsky-Jones et al. 1995d, Jankovsky-Jones et al. 1996, Jones and Fertig 1996a	Quaking Aspen / Common Juniper Plant Community	<i>Populus tremuloides</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Jankovsky-Jones et al. 1995b, Jankovsky-Jones et al. 1995e, Jankovsky-Jones et al. 1996	Quaking Aspen / Fendler’s Meadowrue Plant Community	<i>Populus tremuloides</i> / <i>Thalictrum fendleri</i> Forest Plant Association	G5
Jankovsky-Jones et al. 1996	Quaking Aspen / Kinnikinnick Plant Community	Unknown	
Jankovsky-Jones et al. 1996	Quaking Aspen / Water Birch Plant Community	Unknown	
Jankovsky-Jones et al. 1996	Quaking Aspen / Star Gentian (actually Cow Parsnip?) Plant Community	<i>Populus tremuloides</i> / <i>Heracleum sphondylium</i> Forest Plant Association	G4Q
Jones and Fertig 1996a	Quaking Aspen / Licoriceroot Plant Community	Unknown	
Jones and Fertig 1996b	Quaking Aspen / Cow Parsnip Plant Community	<i>Populus tremuloides</i> / <i>Heracleum sphondylium</i> Forest Plant Association	G4Q

Jankovsky-Jones et al. 1995b, Jankovsky-Jones et al. 1996, Jones and Fertig 1996a, Jones and Fertig 1996b	Quaking Aspen / Elk Sedge Plant Community	<i>Populus tremuloides</i> / <i>Carex geyeri</i> Forest Plant Association	G4
Merrill et al. 1996	Aspen Forest GAP Cover Type (41001)	N/A	
SHOSHONE NATIONAL FOREST			
Steele et al. 1983	<i>Populus tremuloides</i> Series	N/A	
Johnston 1987	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Plant Association	<i>Populus tremuloides</i> / <i>Artemisia tridentata</i> Forest Plant Association	G3G4
Johnston 1987	<i>Populus tremuloides</i> / <i>Juniperus communis</i> Plant Association	<i>Populus tremuloides</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Johnston 1987	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Plant Association	<i>Populus tremuloides</i> / <i>Lupinus argenteus</i> Forest Plant Association	G2?
Johnston 1987	<i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i> Plant Association	<i>Populus tremuloides</i> / <i>Symphoricarpos oreophilus</i> Forest Plant Association	G5Q
Johnston 1987	<i>Populus tremuloides</i> / <i>Thalictrum fendleri</i> Plant Association	<i>Populus tremuloides</i> / <i>Thalictrum fendleri</i> Forest Plant Association	G5
Merrill et al. 1996	Aspen Forest GAP Cover Type (41001)	N/A	

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Populus tremuloides* vegetation type that we're describing falls within the Aspen forest cover type (217).

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Populus tremuloides* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

- Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN02WYUS>

- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Standard Park and Bogs research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN03WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN11WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1989. Report on the Ashenfelder Basin special interest area. Prepared for the U.S. Forest Service by the Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished.
- Jones, George P. and Walter Fertig. 1996a. Ecological evaluation of the potential Cedar Pass research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. A report prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON02WYUS>
- Jones, George P. and Walter Fertig. 1996b. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON03WYUS>
- Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>
- Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister. 1983. Forest Habitats of Eastern Idaho-Western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. <N83STE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Poison Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL06WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL07WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Dry Fork research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL10WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Alnus incana* Vegetation Type**  
**Thinleaf Alder Vegetation Type**

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**SUMMARY**

*Alnus incana* vegetation is a riparian shrub type occurring at mid to low elevations in the Rocky Mountains. Stands generally form a narrow band of vegetation along fast moving streams on banks, alluvial bars, and floodplains. Soils are coarse textured and contain a large amount of rock fragments. Stands have a shrub-dominated layer and a herbaceous layer. This vegetation is susceptible to exotic plant invasion. It is found in the Medicine Bow and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This type is found throughout the western United States in mountainous terrain including the Rocky Mountain Region (Reid et al. 1999). It is known to occur in the Medicine Bow and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

This vegetation is found in the mountain and foothill zones on gently sloping valley floors with a three to five percent grade. Stands form narrow bands along fast moving streams on banks, alluvial bars, and floodplains (Jones 1992, Hansen et al. 1995, Reid et al. 1999). The water table is typically below the surface of the ground, but flooding is not unusual, particularly in younger stands (Reid et al. 1999). Soils are comprised of alluvial material with a coarse texture and a considerable amount of rock fragments (Padgett et al. 1989, Hansen et al. 1995, Reid et al. 1999). In addition, soils are typically wet but are well oxygenated due to rapid flushing of groundwater through the profile (Padgett et al. 1989).

**VEGETATION DESCRIPTION**

Stands have a dense shrub layer ranging in height from 6 to 16 feet with 60 to 100% cover. Below the shrubs is a herbaceous layer containing forbs, grasses, and ferns, although all three may not present in the same stand (Reid et al. 1999). The shrub layer is characterized by the dominance of *Alnus incana* but may include other co-dominants such as *Betula occidentalis*, *Cornus sericea*, and *Salix* spp. Common species found in the herbaceous layer include *Equisetum arvense*, *Calamagrostis canadensis*, *Carex rostrata*, *Glyceria stiata*, *Glyceria grandis*, *Eleocharis palustris*, *Juncus balticus*, *Erigeron glabellus*, *Maianthemum stellatum*, *Mentha arvensis*, and *Prunella vulgaris*, *Ribes* spp., *Rosa* spp., or *Rubus* spp. (Jones 1992, Walford et al. 1997). Exotic plants are often present including *Poa pratensis* and *Agrostis stolonifera* (Jones 1992, Hansen et al. 1995, Walford et al. 1997).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Young stands are susceptible to frequent flooding, but as they mature sediment is trapped and deposited on the surface raising the stand further above the stream. In turn this decreases the amount of flooding and allows other species to establish in the understory (Hansen et al. 1995, Reid et al. 1999). *Alnus incana* is adapted to disturbances due its sprouting capability, but is not able to survive intense fires that presumably destroy the roots (Hansen et al. 1995). This shrub is capable of nitrogen fixation in symbiosis with bacteria, which increases its own nitrogen supply (Reid et al. 1999). The presence of *Alnus incana* along streambanks stabilizes the ground and provides shade and cover for wildlife (Padgett et al. 1989, Hansen et al. 1995). This vegetation is a long-lived seral type occurring on newly formed streambanks. Eventually, it is succeeded by willow or conifer vegetation (Hansen et al. 1995).

## STATUS AND TRENDS

For this vegetation, all plant associations that are recognized from the three forests have G3 or G2G3 conservation rank, meaning they are rare to uncommon (Anderson et al. 1998). See the table in the section entitled “Representations on the Three Forests” for a complete list of the plant associations and conservation ranks.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands can provide some forage for livestock but are not optimal for grazing because of the tall shrubs. Large wildlife species use the stands as cover and may browse the shrubs. Birds use the habitat for food and nesting (Hansen et al. 1995). Stands also provide habitat for fish through the development of overhanging banks and deep narrow channels. Such impacts maintain cool water temperatures that are more conducive for the growth of salmonoids (Hansen et al. 1995).

### Effects of Management Practices

This vegetation is susceptible to trampling and possibly overgrazing by livestock, which opens stands to invasion by exotic plants, particularly *Poa pratensis* (Hansen et al. 1995). In addition, dish-shaped streams can result from excessive use and congregation by large ungulates. Such changes in stream morphology are not conducive for the growth of *Alnus incana* (Hansen et al. 1995).

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### BIGHORN NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation is found along mid-elevation streams below 8,000 feet (Jones 1992).

#### Physical environment

Stands grow in valleys ranging from 200 to 1000 feet in width (Jones 1992).

#### Vegetation description

Species composition is similar to that provided in the general information section. However, Jones (1992) also found a large component of *Populus angustifolia* seedlings in the understory of some stands. Such stands may represent a seral community that will eventually form *Populus angustifolia* vegetation. Jones (1992) did not speculate on this successional possibility.

#### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.

## SHOSHONE NATIONAL FOREST

### Distribution

Merrill et al. (1996) have mapped this vegetation as part of the Shrub-Dominated Riparian GAP Cover Type (62001). These areas are distributed along streams from mid to low elevations throughout the Shoshone National Forest (Merrill et al. 1996).

### Physical environment

Stands occur in valley bottoms that can be wide to moderately wide (Walford et al. 1997).

### Vegetation description

Species composition is similar to that given in the general information section. Walford et al. (1997) surveyed a stand in the Wapiti Ranger district that had high cover of the exotic plant *Poa pratensis*. They suggested a nearby right of way had provided a point of introduction for the exotic plants.

### Management

No specific information is known about management of this vegetation in the Shoshone National Forests.

## AREAS WITH HIGH-QUALITY OCCURRENCES

High quality stands of riparian vegetation are not very common because of their susceptibility to invasion by exotic plants. Riparian areas in the Threemile Potential Research Natural Area appear to typify this condition. *Alnus incana* stands along the streams have 10% cover of the exotic plant *Phleum pratense* (Jankovsky-Jones et al. 1995b). Another case example is an *Alnus incana* / *Equisetum arvense* stand in the Northern Absaroka Range in which the exotic plant *Poa pratensis* is a co-dominant (Walford et al. 1997). Even with this caveat, some areas have quality representations such as Sheep Mountain Potential Research Natural Area in the Medicine Bow National Forest (Jankovsky-Jones et al. 1996), as well as Sheep Mesa Potential Research Natural Area (Jones and Fertig 1999b) and Swamp Lake (Fertig and Jones 1992) in the Shoshone National Forest.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Alnus incana* vegetation, as described here, falls within the *Alnus incana* Temporarily Flooded and Seasonally Flooded Shrubland Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Alnus incana* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
Johnston 1987	<i>Alnus incana</i> ssp. <i>tenuiflora</i> – <i>Betula fontinalis</i> / <i>Salix</i> spp. Plant Association	<i>Alnus incana</i> – <i>Betula occidentalis</i> / <i>Salix</i> spp. Shrubland Plant Association	G3



Jones 1992	<i>Alnus incana</i> / Mesic Graminoid Plant Community	<i>Alnus incana</i> / Mesic Graminoids Shrubland Plant Association	G2G3Q
Jankovsky-Jones et al. 1995a	Thinleaf Alder /Redosier Dogwood Plant Community	<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland Plant Community	G3Q
Jankovsky-Jones et al. 1995b	Thinleaf Alder - River Birch / Willow Plant Community	<i>Alnus incana</i> – <i>Betula occidentalis</i> / <i>Salix</i> spp. Shrubland Plant Association	G3
Jankovsky-Jones et al. 1996	Thinleaf Alder - Water Birch / Willow Plant Community	<i>Alnus incana</i> – <i>Betula occidentalis</i> / <i>Salix</i> spp. Shrubland Plant Association	G3
Jones and Fertig 1996a	Thinleaf Alder / Meadow Horsetail Plant Community	<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrubland Plant Community	G3?
Jones and Fertig 1996b	Thinleaf Alder / Mesic Graminoid Plant Community	<i>Alnus incana</i> / Mesic Graminoids Shrubland Plant Association	G2G3Q
Merrill et al. 1996	Shrub-Dominated Riparian GAP Cover Type (62001)	N/A	
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston 1987	<i>Alnus incana</i> ssp. <i>tenuiflora</i> – <i>Betula fontinalis</i> / <i>Salix</i> spp. Plant Association	<i>Alnus incana</i> – <i>Betula occidentalis</i> / <i>Salix</i> spp. Shrubland Plant Association	G3
Fertig and Jones 1992	<i>Alnus incana</i> Vegetation Type	Unknown	
Walford et al. 1997	<i>Alnus incana</i> / Mesic Graminoid Plant Community	<i>Alnus incana</i> / Mesic Graminoids Shrubland Plant Association	G2G3Q
Walford et al. 1997	<i>Alnus incana</i> / <i>Equisetum arvense</i> Plant Community	<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrubland Plant Community	G3?
Jones and Fertig 1999a	Thinleaf Alder / Red-osier Dogwood Plant community	<i>Alnus incana</i> / <i>Cornus sericea</i> Shrubland Plant Community	G3Q
Jones and Fertig 1999b	Thinleaf Alder / Field Horsetail Plant Community	<i>Alnus incana</i> / <i>Equisetum arvense</i> Shrubland Plant Community	G3?
Merrill et al. 1996	Shrub-Dominated Riparian GAP Cover Type (62001)	N/A	

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Alnus incana* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Alnus incana* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and George Jones. 1992. Plant communities and rare plant species of the Swamp Lake botanical area, Clark's Fork Ranger District, Shoshone National Forest. Report prepared for the Shoshone National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92FER05WYUS>

- Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Platte Ridge and Northe Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN11WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS>
- Jones, George P. and Walter Fertig. 1996a. Ecological evaluation of the potential Cedar Pass research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. A report prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON02WYUS>
- Jones, George P. and Walter Fertig. 1996b. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Prepared for the Medicine Bow National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U96JON03WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON04WYUS>
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <N99JON08WYUS>
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. <N89PAD01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix boothii* Vegetation Type**  
**Booth Willow Vegetation Type**

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**SUMMARY**

This is a widespread shrub type of wetlands and riparian zones. *S. boothii* dominates or co-dominates a tall-shrub layer, and a lower shrub layer (usually of *Salix wolfii*) often is present. The herbaceous undergrowth may be dominated by either graminoids or forbs. Stands of this type often are large, covering entire valley bottoms, and are important as food and cover for terrestrial wildlife.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Reid et al. (1999) report that *S. boothii* vegetation has a large geographic range. It is common in the mountains from Nevada and central Oregon east to Montana, Wyoming, and north-central Colorado, but is less common in California. In Wyoming, *S. boothii* stands are common in the Teton, Salt River, and Wyoming Ranges (Youngblood et al. 1985) and the Bighorn Mountains (Girard et al. 1997). They also occur on the Beartooth Plateau, Absaroka Mountains, northeastern Wind River Mountains (Walford et al. 1997), Sierra Madre (Jones 1992), and Medicine Bow Mountains (Jankovsky-Jones et al. 1995).

**PHYSICAL ENVIRONMENT**

This type grows on swales, stream banks, and terraces in valley bottoms (Reid et al. 1999). Soils are moist throughout the growing season and usually are composed of mineral horizons. Some stands grow on organic soils in wet sites. Mottles are common in the soils. *S. boothii* stands often grow next to *Populus tremuloides* or mixed *P. tremuloides*-conifer woodlands, and sagebrush shrublands.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have summarized the vegetation. *Salix boothii* dominates a dense tall-shrub (3 - 15 feet) layer; *S. drummondiana*, *S. planifolia*, or *S. geeyeriana* often are present and may co-dominate. A lower shrub layer (to ca. 2 feet tall) may be present, usually dominated by *S. wolfii* and often containing *Lonicera involucrata*, *Betula glandulosa*, or *Ribes* spp.. The herbaceous undergrowth may consist primarily of graminoids (especially *Carex aquatilis*, *C. rostrata*, *C. nebrascensis*, *Deschampsia cespitosa*, and *Juncus balticus*) or forbs (especially *Aster foliaceus*, *Hedysarum sulphureum*, *Geum macrophyllum*, *Mertensia ciliata*, *Swertia perennis*, *Pedicularis groenlandica*, *Polygonum bistortoides*, *Heracleum lanatum*, and *Achillea millefolium*).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Youngblood et al. (1985) suggest that stands with *Carex rostrata* and *C. aquatilis* undergrowths in western Wyoming develop on sediment-filled beaver ponds, and succeed *Carex rostrata* wet meadows. In contrast, Padgett et al. (1989) suggest that beaver ponds flood existing *S. boothii* stands and kill the undergrowth plants but not the willows. When the dam is breached, the pond drains, allowing *C. rostrata* and *Glyceria* spp. colonize the bare soil beneath the willows. In Utah (Padgett et al. 1989), some *S. boothii* stands may be succeeded by spruce woodland.

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) divides this widespread vegetation type into 14 *S. boothii* plant associations; of these, four are considered rare (global conservation ranks of G1 or G2), six uncommon (G3 ranks), and four common (G4 ranks). (Note that five of these associations have questionable ranks, indicating uncertainty about the classification.) The associations in the three Region 2 forests are considered uncommon or abundant. No information was found about changes in the distribution, abundance, or condition of this type.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Hansen et al. (1995) treat *Salix boothii* stands with *S. geyeriana* stands in Montana, and consider them important as cover and browse for terrestrial animals, and as shade for aquatic animals. Rhizomatous sedges and grasses protect the streambanks from erosion, but *Poa pratensis*, *Agrostis stolonifera*, and other species with weaker, shallower rhizomes are far less effective. Forage production is high in stands with palatable sedges and grasses, and if such stands are large, they may be important for livestock.

### Effects of Management Practices

Heavy grazing compacts soils and shifts undergrowths from dominance by palatable graminoids (sedges, *Deschampsia cespitosa*, *Calamagrostis canadensis*) and forbs to dominance by *Poa pratensis*, *Juncus balticus*, *Agrostis stolonifera*, *Taraxacum officinale*, and other less-palatable or grazing-resistant species (Padgett et al. 1989)

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This type is common throughout the Forest at elevations from 7,800 to 9,080 feet (Girard et al. 1997)

#### Physical environment

Girard et al. (1997) report that *Salix boothii* stands occur along low-gradient streams and in sediment-filled beaver ponds, on alluvium derived from both sedimentary and granitic parent materials. This type occupies wetter soils than do other willow types.

#### Vegetation description

*Salix boothii* dominates the tall (to 15 feet) shrub layer or co-dominates with *Salix planifolia* ssp. *planifolia*. *Salix wolfii* (a shorter species) may form a low shrub layer with more cover than the taller layer; Girard et al. (1997) include these stands in their *S. boothii* types and state that they are transitional to *S. wolfii* vegetation. Common undergrowth species on wet sites are *Carex rostrata*, *C. aquatilis*, *C. limosa*, *C. microptera*, *Calamagrostis canadensis*, *Aster foliaceus*, *Mertensia ciliata*, *Thalictrum venulosum*, and *Pedicularis groenlandica*. On drier sites, the common undergrowth species are *Deschampsia cespitosa*, *Carex praegracilis*, and *Taraxacum officinale*.

The vegetation sampled by Girard et al (1997) is highly variable and their types are hard to relate to plant associations in the National Vegetation Classification (Anderson et al. 1998).

#### Management

Girard et al. (1997) note that heavy use of stands with wet soils causes compaction of the soil and may increase erosion rates.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

Jones (1992) sampled *S. boothii* stands in the western Sierra Madre at 7,000 feet and the southern Sierra Madre at 8,500 feet. Jankovsky-Jones et al. (1995) sampled stands on Platte Ridge in the Medicine Bow Mountains at 8,700 feet.

#### Physical environment

The stands sampled by Jones (1992) were in broad stream valleys, on terraces approximately 3 feet (1 meter) above the stream channel. Jankovsky-Jones et al. (1995) report that their *S. boothii* stands occurred in a mosaic with *Carex rostrata* vegetation on wet soils along perennial streams.

#### Vegetation description

Stands described from the Sierra Madre (Jones 1992) had tall *S. boothii* shrub layers with few other shrubs and dense undergrowths in which forbs contributed nearly as much cover as graminoids. Shorter shrubs (*Lonicera*

*involucrata*, *Ribes* spp.) were present in some stands, and the major species in the undergrowths were *Poa pratensis*, *Phleum pratense*, *Glyceria striata* (one stand), *Taraxacum officinale*, and *Cirsium arvense*. The higher-elevation stand had an undergrowth of *Carex microptera*, *Galium trifidum*, and *Geum macrophyllum*. In the one stand described from Platte Ridge (Jankovsky-Jones et al. 1995), *Salix drummondiana* contributed substantial cover to the tall shrub layer, and low shrubs (especially *Lonicera involucrata*) were present. The undergrowth consisted of *Heracleum lanatum*, *Thalictrum fendleri*, *Maianthemum stellatum*, and small amounts of other shrubs; graminoids were present in trace amounts.

#### Management

No information was found specific to management of this type on the forest.

### SHOSHONE NATIONAL FOREST

#### Distribution

Stands of this type have been described at elevations from 6,660 to 9,840 feet from the Beartooth Plateau, the Absaroka Mountains, and the northeastern Wind River Mountains (Walford et al. 1997). Stands often are large, covering the bottoms of stream valleys.

#### Physical environment

This vegetation type occurs along streams and around seeps (Walford et al. 1997). Soils usually are mineral in alluvium derived from granitic moraines, volcanic rock, and sedimentary rock. Stands may be found on organic soils. The water table is within several inches of the soil surface in most stands, but it may be found as deep as 32 inches late into the growing season. Soils usually are mottled in the upper 14 inches.

#### Vegetation description

*Salix boothii* dominates or co-dominates a tall shrub layer from 4 to 6 feet tall in most stands, although stands have been sampled with the shrub layer as short as 2 feet and as tall as 13 feet (Walford et al. 1997). Other species found often in the tall shrub layer are *S. drummondiana*, *S. gezeriana*, and *S. bebbiana*; *S. farriae* co-dominates in some low-elevation stands. A shorter shrub layer of *Salix wolfii*, *Salix planifolia* ssp. *monica*, *Betula glandulosa*, *Pentaphylloides floribunda*, or *Ribes* spp. often is present and may be denser than the tall *S. boothii* layer. On wet sites, the herbaceous undergrowth usually contains substantial amounts of *Carex rostrata*, *C. aquatilis*, *C. microptera*, *Carex disperma*, or *Juncus balticus* with smaller amounts of forbs, especially *Aster foliaceus* and *Epilobium angustifolium*, and dense ground cover of moss. Drier sites support stands with substantial amounts of *Carex microptera*, *Juncus balticus*, *Deschampsia cespitosa*, *Carex aquatilis*, or *Calamagrostis canadensis*, and little forb cover, or forb-rich undergrowths of *Aster foliaceus*, *Fragaria virginiana*, *Mertensia ciliata*, and *Epilobium angustifolium* with little graminoid cover.

#### Management

No information was found specific to management of this type on the forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

None of the documented stands of *S. boothii* vegetation clearly represent high-quality occurrences.

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

The National Vegetation Classification (Anderson et al. 1998) contains two *Salix boothii* alliances, the *S. boothii* Temporarily Flooded Shrubland alliance and the *S. boothii* Seasonally Flooded Shrubland alliance. They differ from one another in the amount of time that the ground surface is flooded. Reid et al. (1999) have described both. These two alliances contain 14 plant associations, indicating the wide geographic distribution of *S. boothii* vegetation and the wide variation in its species composition. Relating the stands from the three Region 2 forests to those associations is difficult because these stands, too, are highly variable in species composition.

## REPRESENTATION ON THE THREE FORESTS

The *Salix boothii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Salix boothii</i> /Wet Carex Ecological Type	<i>Salix boothii</i> / <i>Carex rostrata</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix boothii</i> - <i>Salix planifolia</i> ssp. <i>planifolia</i> /Wet Carex Ecological Type	<i>Salix boothii</i> / <i>Carex rostrata</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix boothii</i> - <i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Deschampsia cespitosa</i> Community Type	Unknown	
Girard et al. (1997)	<i>Salix boothii</i> - <i>Salix wolfii</i> /Wet Carex Community Type	<i>Salix boothii</i> / <i>Carex rostrata</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix boothii</i> - <i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Community Type	Unknown	
Girard et al. (1997)	<i>Salix boothii</i> / <i>Deschampsia cespitosa</i> Community Type	Unknown	
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jones (1992)	<i>Salix boothii</i> / <i>Poa pratensis</i> Community	Unknown	
Jankovsky-Jones et al. (1995)	<i>Salix boothii</i> / <i>Maianthemum stellatum</i> Community	<i>Salix boothii</i> /Mesic Forbs Plant Association?	G3
<b>SHOSHONE NATIONAL FOREST</b>			
Jones and Fertig (1999)	<i>Salix boothii</i> / <i>Salix wolfii</i> Community Type	Unknown	
Jones and Fertig (1999)	<i>Salix boothii</i> /Mesic Forb Community Type	<i>Salix boothii</i> /Mesic Forbs Plant Association?	G3
Walford et al. (1997)	<i>Salix boothii</i> / <i>Carex rostrata</i> Community Type	<i>Salix boothii</i> / <i>Carex rostrata</i> Plant Association	G4
Walford et al. (1997)	<i>Salix boothii</i> /Mesic Graminoid Community Type	<i>Salix boothii</i> /Mesic Graminoids Plant Association?	G3
Walford et al. (1997)	<i>Salix boothii</i> /Mesic Forb Community Type	<i>Salix boothii</i> /Mesic Forbs Plant Association?	G3
Walford et al. (1997)	<i>Salix boothii</i> / <i>Salix wolfii</i> Community Type	Unknown	
Walford et al. (1997)	<i>Salix boothii</i> - <i>Salix farriae</i> Community Type	Unknown	

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix boothii* vegetation type does not correspond to any SAF forest cover type.

### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix boothii* vegetation type seems to belong correspond to the Riparian Rangeland Cover Type (SRM 422), although this cover type is described as a Great Basin type.

## REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. < N97GIR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. < U95JAN07WYUS >

Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. < U92JON02WYUS >

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. < N89PAD01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U97WAL01WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. < N85YOU01WYUS>



**CHARACTERIZATION ABSTRACT FOR**  
***Salix candida* Vegetation Type**  
**Hoary Willow Vegetation Type**

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**SUMMARY**

This vegetation type includes stands of low-growing (typically < 3 feet) shrubs dominated or co-dominated by *Salix candida* (hoary willow), growing on wet, organic soils in subalpine zones. Undergrowths are dominated by sedges. Stands of this type are widespread throughout the Rocky Mountains but seem to be rare.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Reid et al. (1999) report this vegetation from western Montana through southeastern Idaho and northwestern Wyoming into central Colorado, and in the Black Hills of South Dakota. Johnston (1987) reports it from southern Saskatchewan. In Wyoming, it is known from northern Yellowstone National Park (Chadde et al. 1988) and from the Beartooth Plateau (Walford et al. 1997).

**PHYSICAL ENVIRONMENT**

Stands of this type grow on organic soils in alkaline fens, from 4,800 to 9,200 feet (Reid et al. 1999).

**VEGETATION DESCRIPTION**

The vegetation consists of a low-growing (3 to 6 feet), deciduous shrub layer dominated by *Salix candida*. Taller willows may be present in small amounts. Common species in the undergrowth are *Carex rostrata*, *C. aquatilis*, *C. simulata*, *Scirpus acutus*, *Triglochin maritimum*, *Menyanthes trifoliata*, and *Polygonum amphibium*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this topic.

**STATUS AND TRENDS**

Only one *Salix candida* plant association is recognized in the National Vegetation Classification (Anderson et al. 1998), and it is considered uncommon (conservation rank of G3). No information was found on changes in the distribution, abundance, or condition of that association.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Hansen et al. (1995) report that the continuously wet soils in this type limit its utility for livestock grazing, and the short willows provide little cover or browse.

Effects of Management Practices

The wet organic soils that support this vegetation are sensitive to damage from trampling by large animals, so grazing should be carefully monitored (Hansen et al. 1995).

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

**BIGHORN NATIONAL FOREST**

This vegetation type is not known to occur on the forest, and *Salix candida* has not been collected from the Bighorn Mountains.

**MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on the forest. *Salix candida* has been collected in the Medicine Bow Mountains, and the type might occur in wetlands there.

## SHOSHONE NATIONAL FOREST

### Distribution

Walford et al. (1997) sampled one stand of this type in the Lake Creek area of the Beartooth Plateau at 7,700 feet elevation.

### Physical environment

The stand sampled by Walford et al. (1997) grows on an anchored organic mat near a small open lake.

### Vegetation description

Patches of low-growing (< 3 feet) *S. candida* (dominant) and *S. planifolia* ssp. *monica* (sub-dominant) are scattered on the surface of the floating mat, with smaller amounts of *S. wolfii* and *Pentaphylloides floribunda*. The undergrowth is co-dominated by *Carex rostrata* and *C. aquatilis*, and contains substantial amounts of *Deschampsia cespitosa*, *Glyceria striata*, *Aster foliaceus*, and *Senecio streptanthifolius*. This stand merges into *S. wolfii* vegetation with increasing distance from the open water.

### Management

No information was found specific to management of this type on the forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

This type is known only from one location, and the degree to which the stand at that location represents this vegetation type cannot be known without further survey.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

The *Salix candida* vegetation type is represented in the National Vegetation Classification (Anderson et al. 1998) by one alliance, the *Salix candida* Seasonally Flooded Shrubland alliance, described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Salix candida* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Walford et al. (1997)	<i>Salix candida</i> / <i>Carex rostrata</i> Community Type	<i>Salix candida</i> / <i>Carex rostrata</i> Plant Association	G3

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix candida* vegetation type does not correspond to any SAF forest cover type.

### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix candida* vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Chadde, Steve W., Paul L. Hansen, and Robert D. Pfister. 1988. Wetland plant communities of the northern range, Yellowstone National Park. School of Forestry, University of Montana, Missoula. <B88CHA01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Johnston, Barry C. 1987. Plant associations of Region Two. Edition 4 USDA Forest Service, Rocky Mountain Region, R2-ECOL-87-2. 429 pp. < N87JOH01WYUS>

Marriott, Hollis, Don Faber-Langendoen, Amanda McAdams, Diane Stutzman, and Beth Burkhardt. 1999. Black Hills community inventory final report. The Nature Conservancy, Midwest Conservation Science Center, Minneapolis MN. 175 pp. < N99MAR02WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U97WAL01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Salix eastwoodiae* Vegetation Type  
Eastwood or Mountain Willow Vegetation Type**

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**SUMMARY**

This vegetation type includes riparian and wetland shrublands dominated or co-dominated by *Salix eastwoodiae* (Eastwood or mountain willow). It is a widespread type, occurring in the mountains of southeastern Idaho, Wyoming, western Nevada, and California. Stands grow on wet, often organic, soils. It apparently is rare within its geographic range and information about it is limited.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation type has been described from the Rocky Mountains of Idaho and Wyoming, western Nevada, and California (Reid et al. 1999). In Wyoming, it is known from the Teton Mountains (Youngblood et al. 1985), Beartooth Plateau, southern Absaroka Mountains, northern Wind River Mountains (Walford et al. 1997) and Bighorn Mountains (Girard et al. 1999).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) report that this vegetation type occurs on wet sites along low-gradient streams, around seeps, and at the foot of slopes. Soils have organic horizons, and the underlying mineral horizons have a variety of textures.

**VEGETATION DESCRIPTION**

Reid et al. (1999) describe this type as shrub vegetation with a dense to open (30% - 75% canopy cover) shrub layer reaching 6 - 15 feet (2 to 5 m) tall. The sparse undergrowth (10 - 20% canopy cover) is dominated by graminoids. *Salix eastwoodiae* dominates the shrub layer, and *S. planifolia*, *S. boothii*, and *Betula glandulosa* often are present. Common undergrowth species are *Carex scopulorum*, *C. aquatilis*, *C. rostrata*, *C. obovoidea*, *C. luzulina*, *Calamagrostis canadensis*, *Mertensia ciliata*, *Saxifraga odontoloma*, and *Thalictrum occidentale*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this subject.

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) contains three *S. eastwoodiae* plant associations, all of which are thought to be rare (global conservation ranks of G1?, G2, and G2?). (But see the general comments in the section on relationships to other types on the Region 2 forests.) Information has not been compiled on changes in the distribution, abundance, and condition of this type.

**MANAGEMENT CONSIDERATIONS**

No information was found on management of this type.

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

**BIGHORN NATIONAL FOREST**

Distribution

Girard et al. (1997) sampled one stand of this type at 9,000 feet in the northwestern part of the Forest. They note that this type may occur elsewhere on the forest at higher elevations.

### Physical environment

The single documented stand occurs in a narrow valley on limestone substrate.

### Vegetation description

*Salix eastwoodiae* dominates the shrub layer, which grows to approximately 5 feet tall. *S. boothii*, *S. planifolia* ssp. *monica*, *S. tweedyi*, and *S. wolfii* are present in smaller amounts. *Carex scopulorum*, *Deschampsia cespitosa*, and *Trisetum wolfii* are present in the undergrowth but none clearly dominates. The forbs include *Aster foliaceus*, *Saxifraga odontoloma*, *Senecio triangularis*, and *Trollius laxus*.

### Management

Girard et al. (1997) suggest that the stand they sampled had been disturbed, causing a decline in the amounts of *Carex scopulorum* and some forbs, and an increase in cover of *Deschampsia cespitosa*, *Trisetum wolfii*, and *Taraxacum officinale*.

### MEDICINE BOW NATIONAL FOREST

This vegetation type is not known to occur on this forest, and *Salix eastwoodiae* has not been collected there.

### SHOSHONE NATIONAL FOREST

### Distribution

Walford et al. (1997) sampled stands dominated by *S. eastwoodiae* at elevations between 7,980 and 9,920 feet in the northern Wind River Mountains, the southern Absaroka Mountains, and the Beartooth Plateau. Adjacent vegetation types are *Carex scopulorum* meadows, drier grass meadows, or conifer forest.

### Physical environment

Stands of this type have been described from riparian zones along low-order streams and from wetlands around seeps (Walford et al. 1997). One stand has been described from along a braided stream. The ground surface may be hummocky. The water table is near the soil surface and water may stand on the ground. Soils may be mineral or organic and often are mottled. Substrates are alluvium derived from granitic moraine deposits or volcanic rocks.

### Vegetation description

Vegetation information comes from Walford et al. (1997). In wetter stands, *Salix eastwoodiae* dominates a shrub layer 3 to 5 feet tall, and *Salix planifolia* ssp. *monica* often is present. The major species in the undergrowth are *Carex aquatilis*, *C. rostrata*, *C. norvegica*, *C. microptera*, *Aster foliaceus*, *Equisetum arvense*, and *Erigeron peregrinus*. Moss covers much of the ground surface. On drier sites, *S. eastwoodiae* forms an open canopy of low-growing (ca. 1 foot tall), widely-spaced shrubs; smaller amounts of *Salix planifolia* ssp. *monica*, *S. boothii*, *S. geyeriana*, and *Pentaphylloides floribunda* may be present. Major species in the undergrowth are *Carex prae-gracilis*, *Deschampsia cespitosa*, *Juncus balticus*, and *Fragaria virginiana*.

One of the stands sampled by Walford et al. (1997) on the Beartooth Plateau has an undergrowth dominated by *Carex scopulorum* and *Deschampsia cespitosa*, with substantial amounts of *Calamagrostis canadensis*, *Saxifraga odontoloma*, *Senecio triangularis*, and *Trollius laxus*. This stand is similar in species composition to the *S. eastwoodiae* stands described from the Bighorn National Forest (Girard et al. 1997).

### Management

No information was found about management of this type on the forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

The scarcity of information about this type precludes our identifying areas with high-quality occurrences.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

The National Vegetation Classification (Anderson et al. 1998) contains three associations in one alliance for *Salix eastwoodiae*, as described by Reid et al. (1999). Stands from the Shoshone National Forest apparently belong to two of those associations, the *S. eastwoodiae/Carex aquatilis* association (G2 conservation rank) and the *S. eastwoodiae* Shrubland association (G1? rank). The classification of the plant associations, though, is confusing. The *S. eastwoodiae/Carex aquatilis* association (and the third association from the national classification, the *S. eastwoodiae/C. rostrata* association) are from Idaho and apparently are based on two studies, both of which described *S. eastwoodiae* shrublands with undergrowths dominated by *Carex scopulorum*. Examination of the stand tables for the *Salix eastwoodiae* Group/*Carex scopulorum* type in one of those studies (Mutz and Quiroz 1983) indicates a strong similarity in species composition to the *S. eastwoodiae* stand described from the Bighorn National Forest (Girard et al. 1997) and one of the stands from the Beartooth Plateau in the Shoshone National Forest (Walford et al. 1997). (We did not examine the data from the other Idaho study.) Consequently, those two stands probably can be assigned to an association already known from Idaho, although the name of that association is uncertain. With one exception, the other *S. eastwoodiae* stands from the Shoshone National Forest have been assigned to the *S. eastwoodiae/Carex aquatilis* plant association, although the basis for this association in the national classification is questionable. The remaining stand on the Shoshone National Forest is dissimilar in species composition to both the *S. eastwoodiae/Carex scopulorum* stands and the *S. eastwoodiae/Carex aquatilis* stands.

### REPRESENTATION ON THE THREE FORESTS

The *Salix eastwoodiae* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Girard et al. (1997)	<i>Salix eastwoodiae/Carex scopulorum</i> Community Type	<i>Salix eastwoodiae</i> Association?	G1?
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Walford et al. (1997)	<i>Salix eastwoodiae</i> /Mesic graminoid Community Type (tentative)	<i>Salix eastwoodiae</i> Association?	G1?
Walford et al. (1997)	<i>Salix eastwoodiae/Carex aquatilis</i> Community Type	<i>Salix eastwoodiae/Carex aquatilis</i> Plant Association	G2

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix eastwoodiae* vegetation type does not correspond to any SAF forest cover type.

### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix eastwoodiae* vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. < N97GIR01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. <N85YOU01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix geyeriana* Vegetation Type**  
**Geyer Willow Vegetation Type**

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**SUMMARY**

This is a widespread tall shrubland of riparian zones and wetlands from the foothills to the higher elevations in the mountains. *Salix geyeriana* dominates the tall-shrub layer, and a lower shrub layer may be present. Undergrowths are dominated by a variety of graminoids or (rarely) forbs, with the composition depending on the wetness of the soil and on grazing history. This type may form large stands that cover most of the riparian zones in valley bottoms.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Salix geyeriana* stands are widespread from the foothills to the high elevations of mountains in the western U.S., including the Rocky Mountains from Idaho and Montana south to Utah and Colorado (and possibly northern Arizona), the mountain ranges of the Great Basin in Nevada, and the mountains of the Pacific Northwest (Reid et al. 1999). In Wyoming, this type is known from the Yellowstone Plateau (Mattson 1984), Absaroka Mountains, northeastern Wind River Mountains (Walford et al. 1997), Bighorn Mountains (Girard et al. 1997), northern Laramie Mountains (Jankovsky-Jones 1995), and Sierra Madre (Jones 1992). It has been found in the mountains of far eastern Idaho immediately west of the Wyoming state line (Youngblood et al. 1985) and in the Uinta Mountains of northeastern Utah (Padgett et al. 1989), so it may also occur in the western and southwestern parts of Wyoming.

**PHYSICAL ENVIRONMENT**

Throughout its range (Reid et al. 1999), stands of this vegetation type occur on alluvial terraces and around springs and seeps. Many stands are found on sediment-filled beaver ponds. Soils have developed in deep alluvium and generally have fine-textured surface horizons (usually with mottles) over deeper horizons with a variety of textures. Water-holding capacity is high.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have summarized the vegetation throughout the range. The vegetation includes a tall-shrub layer (6 - 30 feet), often with an open canopy formed by widely-spaced clumps of shrubs. *Salix geyeriana* usually dominates this shrub layer, and *S. monticola*, *S. boothii*, *S. lemmonii*, or *S. eriocephala* often are present. A shorter shrub layer of *Salix wolfii*, *S. planifolia*, *Lonicera* spp., *Pentaphylloides floribunda*, and *Ribes* spp. may be present. The undergrowth generally is dominated by graminoids, especially *Carex rostrata*, *C. aquatilis*, *Calamagrostis* spp., and *Poa palustris* on wet sites, and *Deschampsia cespitosa* on drier sites. Common forbs are *Geum macrophyllum*, *Epilobium* spp., and *Galium trifidum*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Youngblood et al. (1985) found no clear successional sequences involving *S. geyeriana* community types, and therefore considered them to be stable. Heavy grazing, however, can change the composition and productivity of the undergrowth.

**STATUS AND TRENDS**

Eleven *S. geyeriana* plant associations have been named in National Vegetation Classification (Anderson et al. 1998). Three of those associations are considered common (global conservation ranks of G4 or G4), five are considered uncommon (G3 rank), one is considered rare (G2 rank), and the status of the remaining two is uncertain. The stands on the three Region 2 forests seem to represent two common plant associations and one uncommon association. Information has not been compiled on changes in the distribution, abundance, and condition of this type.



## MANAGEMENT CONSIDERATIONS

### Economic Uses

Hansen et al. (1995), writing about Montana vegetation, group *Salix geyeriana* stands with *S. boothii* stands, and consider them important as cover and browse for terrestrial animals, and as shade for aquatic animals. Rhizomatous species (primarily sedges) protect the streambanks from erosion, but *Poa pratensis*, *Agrostis stolonifera*, and other species with weaker, shallower rhizomes are far less effective. Forage production is high in stands with palatable sedges and grasses, and if such stands are large, they may be important for livestock.

### Effects of Management Practices

Heavy grazing compacts soils and shifts undergrowths from dominance by palatable graminoids (sedges, *Deschampsia cespitosa*, *Calamagrostis canadensis*) and forbs to dominance by *Poa pratensis*, *Juncus balticus*, *Agrostis stolonifera*, *Taraxacum officinale*, and other less-palatable or grazing-resistant species (Padgett et al. 1989). Wet soils also are damaged by heavy equipment operating in the riparian zones.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

*S. geyeriana* stands are uncommon on the Bighorns, where they occur in an elevation range of 7600 to 8680 feet, mainly in central part of the mountains (Girard et al. 1997).

#### Physical environment

Stands of this type rarely occur immediately next to the stream channel. They are found primarily on granitic substrates but also occur on sedimentary substrates.

#### Vegetation description

*Salix geyeriana* dominates or co-dominates a dense tall-shrub layer (10-15 feet), and *S. planifolia* ssp. *planifolia* (slightly shorter) may co-dominate (Girard et al. 1997). Wet sites have undergrowths dominated by *Carex rostrata*, with few forbs; mesic sites have undergrowths with *Calamagrostis canadensis* and more forbs (especially *Aster foliaceus*, *Fragaria virginiana*, *Pedicularis groenlandica*, and *Mertensia ciliata*). None of the sampled stands had a low shrub layer.

#### Management

Girard et al. (1997) mention that *S. geyeriana* stands appear to receive light use by wildlife and livestock.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

Stands of this type have been documented in the Sierra Madre, mainly at elevations from 8,000 to 8,360 feet, although one stand has been sampled at 7,000 feet (Jones 1992). Those stands may be large, covering much of the bottom in wide valleys. A single stand has been reported from the northern Laramie Range at 7,000 feet elevation, where it formed a narrow fringe along a perennial stream (Jankovsky-Jones et al. 1995).

Johnston (1987) reports this type from the Medicine Bow National Forest, based on Olson and Gerhart (1982), but it is unclear which site from the latter study Johnston refers to. He may have mistakenly assigned an Olson and Gerhart site from the Bighorn National Forest to the Medicine Bow.

#### Physical environment

*S. geyeriana* stands grow on alluvium, mostly within 3 feet above the stream channel (Jones 1992).

#### Vegetation description

*S. geyeriana* dominates the tall-shrub layer, or co-dominates with *Salix lasiandra* (Jones 1992). *S. boothii* and *Alnus incana* may also be present, sometimes in substantial amounts. Shorter shrubs usually are present and may form distinct layers; the most common species are *Salix wolfii*, *Lonicera involucrata*, and *Pentaphylloides*

*floribunda*. Undergrowths in wet stands are dominated by *Carex rostrata* and contain few forbs; stands on mesic sites have a rich array of graminoids and forbs, many of them exotic (*Glyceria striata*, *Poa pratensis*, *Taraxacum officinale*, *Trifolium pratense*).

Management

No information was found about management of this type on the forest.

SHOSHONE NATIONAL FOREST

Distribution

This type has been documented at elevations from 7,100 to 8400 feet in the Absaroka Mountains and the northeastern Wind River Mountains (Walford et al. 1997). It often forms large stands that cover the entire valley bottom, sometimes on sites with active beaver dams.

Physical environment

Stands generally grow on mineral soils, often (on wet sites) with an organic horizon (Walford et al. 1997). The water table is near the surface, and the upper soil horizons usually are mottled. The ground surface often is mounded. Beaver dams spread water over the ground surface in some stands.

Vegetation description

*Salix geyeriana* dominates the tall-shrub layer (6 to 9 feet tall), and *Salix boothii* (slightly shorter) usually is present. A shorter shrub layer of *Salix wolfii*, *Pentaphylloides floribunda*, *Lonicera involucrata*, and *Ribes* spp. may be present. Undergrowths in wet stands contain *Carex rostrata*, *Poa palustris*, *Calamagrostis canadensis*, and small amounts of many forbs; moss covers much of ground surface. In mesic stands, *Calamagrostis canadensis*, *Deschampsia cespitosa*, *Carex microptera*, *C. praeegracilis*, *Juncus balticus*, *Poa pratensis*, *Taraxacum officinale*, *Aster foliaceus*, and *Senecio pauperculus* usually are common.

Management

No information was found about management of this type on the forest.

AREAS WITH HIGH-QUALITY OCCURRENCES

One stand sampled by Walford et al. (1997) in the Shoshone National Forest may be a high-quality representative of a wet *Salix geyeriana* type. This stand (143V95N0004) occurs in a complex of beaver dams within an enclosure on Beaver Creek in the Wood River Basin. They describe the enclosure as "large" and encompassing the entire riparian zone and beaver pond complex. They do not give the dimensions, so it is unclear whether this enclosure includes enough of the stream to support a viable willow shrubland.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

GENERAL COMMENTS

This vegetation type includes two alliances from the National Vegetation Classification (Anderson et al. 1998), the *Salix geyeriana* Temporarily Flooded Shrubland alliance (including the drier stands) and the *S. geyeriana* Seasonally Flooded Shrubland alliance (including the wetter stands). Reid et al. have described both.

REPRESENTATION ON THE THREE FORESTS

The *Salix geyeriana* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Girard et al. (1997)	<i>Salix geyeriana</i> /Wet Sedge Ecological Type	<i>Salix geyeriana</i> / <i>Carex rostrata</i> Plant Association	G5
Girard et al. (1997)	<i>Salix geyeriana</i> - <i>Salix planifolia</i> ssp. <i>planifolia</i> /Calamagrostis Ecological Type	<i>Salix geyeriana</i> / <i>Calamagrostis canadensis</i> Plant Association	G5

Girard et al. (1997)	<i>Salix geyeriana</i> - <i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Deschampsia cespitosa</i> Community Type	<i>Salix geyeriana</i> / <i>Deschampsia cespitosa</i> Plant Association	G4
Johnson (1987)	<i>Salix geyeriana</i> - <i>Salix</i> spp./ <i>Calamagrostis canadensis</i> Plant Association	<i>Salix geyeriana</i> / <i>Calamagrostis canadensis</i> Plant Association	G5
Olson and Gerhart (1982)	<i>Salix</i> spp. Subtype (plot J 43)	<i>Salix geyeriana</i> / <i>Calamagrostis canadensis</i> Plant Association	G5
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	<i>Salix geyeriana</i> / <i>Calamagrostis canadensis</i> Community	<i>Salix geyeriana</i> / <i>Calamagrostis canadensis</i> Plant Association	G5
Jones (1992)	<i>Salix geyeriana</i> / <i>Carex rostrata</i> Community Type	<i>Salix geyeriana</i> / <i>Carex rostrata</i> Plant Association	G5
Jones (1992)	<i>Salix geyeriana</i> / <i>Poa pratensis</i> Community Type	Unknown	
Jones (1992)	<i>Salix geyeriana</i> Unclassified Stand	Unknown	
<b>SHOSHONE NATIONAL FOREST</b>			
Walford et al. (1997)	<i>Salix geyeriana</i> / <i>Carex rostrata</i> Community Type	<i>Salix geyeriana</i> / <i>Carex rostrata</i> Plant Association	G5
Walford et al. (1997)	<i>Salix geyeriana</i> /Mesic Graminoid Community Type	<i>Salix geyeriana</i> / <i>Deschampsia cespitosa</i> Plant Association?	G4
Walford et al. (1997)	<i>Salix geyeriana</i> /Mesic Forb Community Type	<i>Salix geyeriana</i> /Mesic Forbs Plant Association?	G3

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix geyeriana* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix geyeriana* vegetation type seems to belong correspond to the Riparian Rangeland Cover Type (SRM 422), although this cover type is described as a Great Basin type.

### REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS >

Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. < U84MAT01WYUS>

Olson, R.A. And W.A. Gerhart. 1982. A physical and biological characterization of riparian habitat and its importance to wildlife in Wyoming. Wyoming Game and Fish Department, Cheyenne WY. 188 pp. <B82OLS01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U97WAL01WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. < N85YOU01WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix planifolia* Vegetation Type**  
**Planeleaf Willow Vegetation Type**

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**SUMMARY**

This vegetation type includes willow shrub stands dominated by *Salix planifolia* ssp. *planifolia* or *S. planifolia* ssp. *monica* (both known as planeleaf willow, or tealeaf willow). These stands are widespread in riparian areas and wetlands of the montane and subalpine zones of western North America, including the Shoshone, Bighorn, and Medicine Bow National Forests. This vegetation type occupies some of the wettest sites that support willow shrublands.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Salix planifolia* vegetation is widespread in the subalpine and alpine zones of mountains in western North America, from Alaska southeast through the Rocky Mountains to New Mexico and Arizona, and in Nevada (Reid et al. 1999). (Reid et al. [1999] report that the vegetation type is present in the Black Hills of South Dakota as well, but Hollis Marriott [personal communication] explained that although *S. planifolia* does grow in the Black Hills, no shrublands dominated by the species have been found.) In Wyoming, this type occurs on the Yellowstone Plateau (Mattson 1984, [*S. phylicifolia*], Youngblood et al. 1985), Beartooth Plateau (Johnson and Billings 1962, Fertig and Bynum 1994, Walford et al. 1997), Absaroka Mountains (Walford et al. 1997), western and eastern slopes of the Wind River Mountains (Potkin and Munn 1989, Jones and Fertig 1999a & 1999b, Walford et al. 1997), Bighorn Mountains (Girard et al. 1997), and Medicine Bow Mountains (Jankovsky-Jones et al. 1995a & 1995b, Regan et al. 1997).

**PHYSICAL ENVIRONMENT**

According to Reid et al. (1999), stands grow on mineral soils (often with an organic surface horizon) or on organic soils, both of which are acidic. The water table usually is near the soil surface. Mottles and gleying may be present, or the soil may be well-aerated.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have characterized two *Salix planifolia* alliances, using information from throughout the range of the type. *Salix planifolia* dominates the dense shrub layer, which is 3 to 6.5 feet (1 - 2 meters) tall. Apparently they include both *S. planifolia* ssp. *planifolia*, the taller subspecies generally from lower elevations, and *S. planifolia* ssp. *monica*, the lower-growing shrub of higher elevations. Other willows often are present, especially *S. monticola*, *S. wolfii*, *S. boothii*, *S. geyeriana*, and *S. drummondiana*. The dense undergrowth is dominated by graminoids, the most common of which are *Carex aquatilis*, *C. rostrata* (syn. *C. utriculata*), *C. scopulorum*, *Calamagrostis canadensis*, and *Deschampsia cespitosa*. Common forbs are *Caltha leptosepala*, *Cardamine cordifolia*, *Pedicularis groenlandica*, and *Mertensia ciliata*.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Cooper (1986) reviews research suggesting that *S. planifolia* can invade fens dominated by *Carex rostrata* or *C. aquatilis*, producing a shrub stand in place of the herbaceous vegetation. Reid et al. (1999) summarize information that suggests changes in the undergrowth of *S. planifolia* with changes in water levels. A shift to wetter conditions favors dominance by *Carex rostrata*, and a shift to drier conditions favors dominance by *Calamagrostis canadensis*.

**STATUS AND TRENDS**

The global conservation ranks assigned to *S. planifolia* associations in the National Vegetation Classification (Anderson et al. 1998) reflect the abundance and the large geographic range of this vegetation type. Five of nine *S. planifolia* associations are considered common (global conservation rank of G4 or G5). Two of the

remaining four associations are considered rare (G2G3 ranks), and two have uncertain ranks (G2G4Q and G3Q). Information has not been compiled on changes in the status of this type

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Hansen et al. (1985) state that short growing seasons and wet soils in *S. planifolia* vegetation prevent livestock from using them until late in the summer. Wildlife may browse *S. planifolia* heavily, particularly the taller subspecies, *S. planifolia* ssp. *planifolia*. The densely rhizomatous sedges that dominate wet stands (*Carex aquatilis* and *C. rostrata*) protect soil from erosion.

### Effects of Management Practices

According to Hansen et al. (1985), season-long grazing reduces the amount of *Salix planifolia*, *Carex aquatilis*, and *C. rostrata* in the vegetation and increases the amount of *Juncus balticus*, *Poa pratensis*, and forbs. Prolonged heavy use may cause the stream to incise, lowering the water table and producing a meadow of *Poa pratensis* vegetation.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Girard et al. (1997) sampled this vegetation throughout the Forest at elevations from 7530 to 9360 feet. Stands occur in riparian zones with other willow shrub types and with herbaceous meadows.

#### Physical environment

Stands dominated by *S. planifolia* ssp. *planifolia* occupy riparian sites in valley bottoms, on soils that are moist throughout the growing season but flooded only during the spring. The soils are developed in alluvium derived from granitic or sedimentary rocks. Stands dominated by *S. planifolia* ssp. *monica* grow along streams and around seeps at higher elevations, often on sites with water standing on the soil surface.

#### Vegetation description

*Salix planifolia* ssp. *planifolia* dominates the shrub layer in stands in the lower and middle parts of the elevation range, forming a shrub layer six to twelve feet tall. *Salix geyeriana*, *S. boothii*, *S. wolfii*, and *Ribes* spp. often are present. In the stands at higher elevation, *S. planifolia* ssp. *monica* dominates the shrub layer, which grows to around five feet tall and often contains *S. wolfii* and *Betula glandulosa*. Common undergrowth plants are *Carex* spp. (principally *C. aquatilis*, *C. rostrata* [syn. *C. utriculata*], and *C. microptera*) and *Calamagrostis canadensis* on wet sites, and *Deschampsia cespitosa* and *Poa pratensis* on drier sites. Common forbs are *Aster foliaceus*, *Mertensia ciliata*, and *Fragaria virginiana*.

Two of the *Salix wolfii* types of Girard et al. (1997), the *Salix wolfii*-*Salix planifolia* ssp. *monica* Community Type and the *Salix wolfii*-*Salix planifolia* ssp. *monica*/*Carex scopulorum* Community Type, appear to be transitional between *S. wolfii* and *S. planifolia* vegetation. They are included in this *Salix planifolia* vegetation type because the summary tables suggest that *S. planifolia* contributes more cover than *S. wolfii*.

#### Management

Girard et al. (1997) report that *Salix planifolia* is palatable to livestock and wildlife, and that many stands have been heavily browsed. Browsing can produce shorter shrub layers and increase the cover of *Salix wolfii*. Heavy grazing of the undergrowth and lowering of the water table by downcutting of the stream decreases the amounts of *Carex aquatilis* and *C. rostrata*, and increases the cover of *Carex microptera*, *Poa pratensis*, *Taraxacum officinale*, and *Trifolium repens*.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation type has been documented from the Snowy Range area of the Medicine Bow Mountains (Jankovsky-Jones et al. 1995a & 1995b, Regan et al. 1997), where stands have been sampled from the upper

subalpine zone. It also is known from the subalpine forest on Sheep Mountain along the eastern edge of the Medicine Bow Range (Jankovsky-Jones et al. 1996).

#### Physical environment

Stands of this type occur in wet soils along perennial streams, around seeps, and in wet depressions. They often occur between *Carex rostrata* vegetation on wetter sites and *Deschampsia cespitosa* meadows, spruce-fir forest, or lodgepole pine forest on drier sites. Bedrock is granite or glacial moraine derived from metamorphic rock.

#### Vegetation description

The shrub layer is dominated by *S. planifolia* ssp. *monica* (Regan et al. 1997) or the taller *S. planifolia* ssp. *planifolia* (Jankovsky-Jones et al. 1995a & 1995b, 1996). *Betula glandulosa* often is present, and *Salix brachycarpa* may be present in the high-elevation stands of the Snowy Range (Regan et al. 1997). Common associated species are *Carex aquatilis*, *C. rostrata* (syn. *C. utriculata*), *Calamagrostis canadensis*, *Caltha leptosepala*, *Saxifraga odontoloma*, *Sedum rhodanthum*, *Trollius laxus*, and *Senecio triangularis*.

#### Management

The area of the Snowy Range in which this plant association occurs was grazed by domestic livestock (primarily sheep) from the late 19th century through the late 20th century (Regan et al. 1997).

### SHOSHONE NATIONAL FOREST

#### Distribution

Stands of this type have been documented from timberline and the alpine zone of the Beartooth Plateau (Johnson and Billings 1962, Fertig and Bynum 1995, Walford et al. 1997), the subalpine zone of the southern Absaroka Mountains (Walford et al. 1997), and timberline and the alpine zone of the Wind River Mountains (Jones and Fertig 1998a & 1998b, Walford et al. 1997).

#### Physical environment

This vegetation occupies valley bottoms along perennial streams, seeps and watercourses on rocky slopes, and wet alpine depressions. Substrates are derived from granitic rocks, sandstone, and alluvium. Walford et al. (1997) report that soils usually have a large proportion of organic matter (sometimes qualifying as organic soil) and that the water table is usually close to the soil surface.

#### Vegetation description

Nearly all of the stands described from the forest are dominated or co-dominated by the shorter of the two *S. planifolia* varieties, *S. planifolia* ssp. *monica*. *Betula glandulosa*, *Salix boothii*, *S. eastwoodiae*, *S. wolfii*, and *Pentaphylloides floribunda* often are present and may contribute substantial cover. Common undergrowth species are *Carex aquatilis*, *C. rostrata*, *C. scopulorum*, *C. paysonis*, *Deschampsia cespitosa*, *Aster occidentalis*, *Senecio sphaerocephalus*, *Caltha leptosepala*, *Trollius laxus*, and mosses.

#### Management

No information was found about management of this type on the forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

Two areas in the Shoshone National Forest may contain good representatives of high-elevation stands. The first is Twin Lakes on the Beartooth Plateau, where *S. planifolia* ssp. *monica* stands occur in the alpine zone on granitic rocks (Johnson and Billings 1962, Fertig and Bynum 1994). That area has been open to domestic sheep grazing since early in the 20th century (Thilenius et al. 1980), but grazing may have been light (Hendzel 1985). The second area is Arrow Mountain in the Wind River Mountains, where *S. planifolia* ssp. *monica* forms a wetland covering 2 to 3 acres in a matrix of *Geum rossii* turf (Jones and Fertig 1999a). In the Medicine Bow National Forest, Sheep Mountain may contain good examples of lower-elevation stands dominated by *S. planifolia* ssp. *planifolia* (Jankovsky-Jones et al. 1996).

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

The stands of this type in the three Region 2 forests represent two alliances from the National Vegetation Classification (Anderson et al. 1998), the *Salix planifolia* Temporarily Flooded Shrubland Alliance and the *S. planifolia* Seasonally Flooded Shrubland Alliance, both of which have been summarized by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Salix planifolia* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>monica</i> /Wet Carex Ecological Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association	G5
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Calamagrostis canadensis</i> Ecological Type	<i>Salix planifolia</i> / <i>Calamagrostis canadensis</i> Plant Association	G3
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Deschampsia cespitosa</i> Community Type	<i>Salix planifolia</i> / <i>Deschampsia cespitosa</i> Plant Association	G2G3
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Festuca idahoensis</i> Community Type	<i>Salix planifolia</i> / <i>Deschampsia cespitosa</i> Plant Association?	G2G3
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> /Mesic Forb Community Type	Unknown	
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Poa pratensis</i> Community Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association?	G5
Girard et al. (1997)	<i>Salix planifolia</i> ssp. <i>planifolia</i> /Wet Carex Ecological Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association	G5
Girard et al. (1997)	<i>Salix wolfii</i> - <i>Salix planifolia</i> ssp. <i>monica</i> / <i>Carex scopulorum</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix wolfii</i> - <i>Salix planifolia</i> ssp. <i>monica</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association?	G4
Welp et al. (1998)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Carex aquatilis</i> Community Type	<i>Salix planifolia</i> / <i>Deschampsia cespitosa</i> Plant Association?	G2G3
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995a)	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Community Type	<i>Salix planifolia</i> / <i>Calamagrostis canadensis</i> Plant Association	G3
Jankovsky-Jones et al. (1995b)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Carex aquatilis</i> Community Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association?	G5
Jankovsky-Jones et al. (1996)	<i>Salix planifolia</i> ssp. <i>planifolia</i> / <i>Carex aquatilis</i> Community Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association?	G5
Regan et al. (1997)	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Thicket	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association	G5
Regan et al. (1997)	<i>Salix planifolia</i> - <i>Salix brachycarpa</i> / <i>Caltha leptosepala</i> Thicket	Association unknown: <i>Salix planifolia</i> Seasonally Flooded Alliance	
<b>SHOSHONE NATIONAL FOREST</b>			
Fertig and Bynum (1994)	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association	G4
Johnson and Billings (1962)	<i>Salix</i> Thicket Vegetation	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association	G4



Jones and Fertig (1999a)	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Shrubland	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association	G4
Jones and Fertig (1999b)	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Shrubland	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association	G5
Jones and Fertig (1999c)	<i>Salix planifolia</i> Shrubland	<i>Salix planifolia</i> / <i>Calamagrostis canadensis</i> Plant Association?	G3
Walford et al. (1997)	<i>Salix planifolia</i> / <i>Caltha leptosepala</i> Community Type	<i>Salix planifolia</i> / <i>Caltha leptosepala</i> Plant Association	G4
Walford et al. (1997)	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Community Type	<i>Salix planifolia</i> / <i>Carex aquatilis</i> Plant Association	G5
Walford et al. (1997)	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association	G4
Walford et al. (1997)	<i>Salix planifolia</i> / <i>Deschampsia cespitosa</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association?	G4

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Salix planifolia* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Salix planifolia* vegetation type seems to belong in the SRM Great Basin Riparian Rangeland Cover Type (SRM 422).

**REFERENCES**

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Cooper, David J. 1986. Community structure and classification of Rocky Mountain wetlands. Chapter 3 in: Windell, John T., Beatrice E. Willard, David J. Cooper, Susan Q. Foster, Christopher F. Knud-Hansen, Lauranne P. Rink, and George N. Kiladis. 1986. An ecological characterization of Rocky Mountain montane and subalpine wetlands. UDSI Fish and Wildlife Service Biological Report 86(11). 299 pp. <P86WIN01WYUS>
- Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Twin Lakes research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER11WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Henzel, Leonard. 1985. Suitability investigation report, Twin Lakes Basin Alpine Glaciation and Aquatic Special Interest Area. USDA Forest Service, Rocky Mountain Region. 10 pp. Unpublished.
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Many Ponds research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Ribbon Forest research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN06WYUS>

- Johnson, Philip L. and W.D. Billings. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. *Ecological Monographs* 32(2): 105-135. < A62JOH02WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON02WYUS>
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON05WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON07WYUS>
- Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. <U84MAT01WYUS>
- Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. < U89POT01WYUS>
- Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp. < U97REG01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>
- Thilenius, John, Robert Buttery, and Ronnie Julian. 1980. Draft establishment report for the Twin Lakes Research Natural Area. USDA Forest Service, Rocky Mountain Region. 21 pp. Unpublished.
- Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U97WAL01WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. < U98WEL08WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Salix wolfii* Vegetation Type**  
**Wolf willow Vegetation Type**

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**SUMMARY**

This vegetation type includes shrublands dominated or co-dominated by *Salix wolfii* (Wolf willow). Stands often are large and occur on drier parts of riparian zones, although small stands may grow in potholes and around seeps. The shrub layer usually is of low stature (to around 3 feet) and may be dense or open. Common associates are various shrubs (especially willows), sedges, *Deschampsia cespitosa*, and numerous forbs. This type is widespread throughout the Rocky Mountains.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Reid et al. (1999) report that *S. wolfii* vegetation occurs in the Wallowa Mountains of eastern Oregon, and in the Rocky Mountains from Idaho east to Montana and south to Colorado and Utah. In Wyoming, stands have been described from the Yellowstone Plateau (Mattson 1984), Salt River Range, Wyoming Range (Youngblood et al. 1985), Beartooth Plateau, Absaroka Mountains, northern Wind River Mountains (Walford et al. 1997, Jones and Fertig 1999), Bighorn Mountains (Girard et al. 1997), and Medicine Bow Mountains (Jones 1992).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) report that stands are found in mountain valleys and basins in glaciated landscapes. Soils may be mineral (the *S. wolfii* Temporarily Flooded Shrubland alliance) or organic (*S. wolfii* Seasonally Flooded Shrubland alliance). In Colorado, *S. wolfii* typically occupies deep, undecomposed peat, whereas *Salix planifolia* stands occur on highly decomposed peat. The water table is usually within a meter of the soil surface.

**VEGETATION DESCRIPTION**

*Salix wolfii* dominates or co-dominates the shrub layer, which typically grows to no more than 5 feet tall and may be dense or open. Other shrubs often are present, including *Pentaphylloides floribunda*, various willows (especially *Salix planifolia*, *S. boothii*, *S. geeyeriana*, *S. brachycarpa*), and *Betula glandulosa*. Common undergrowth species are *Carex aquatilis*, *C. rostrata* (syn. *C. utriculata*), *C. microptera*, *Deschampsia cespitosa*, *Calamagrostis canadensis*, *Caltha leptosepala*, *Ligusticum* spp., *Fragaria virginiana*, *Geum macrophyllum*, and other forbs.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

No information was found on this topic.

**STATUS AND TRENDS**

The National Vegetation Classification (Anderson et al. 1998) identifies ten *Salix wolfii* plant associations. Four are considered common (G4 global conservation rank), four uncommon (G3 global rank), and one rare (G2 rank). The remaining association is unranked. The three Region 2 forests include common and uncommon associations. Information has not been compiled on changes in the distribution, abundance, and condition of *S. wolfii* vegetation.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Hansen et al. (1995) summarize information on *Salix wolfii* vegetation in Montana. This type provides little wildlife forage because *S. wolfii* is unpalatable and often so short that it is buried by snow. Stands on wet sites provide relatively little livestock forage because the wet soils limit use to late summer. Stands on drier sites provide a fair amount of livestock forage, and are large enough to justify the establishment of riparian pastures.

### Effects of Management Practices

Hansen et al. (1995) report that heavy grazing of this type is typical in Montana. Prolonged heavy grazing shifts the composition of the understory by decreasing the cover of *Deschampsia cespitosa* and sedges and increasing the cover of *Juncus balticus* and *Poa pratensis*.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

Girard et al. (1997) sampled *Salix wolfii* stands at elevation from 7,600 to 8,840 feet. They concluded that this vegetation is common at moderate and high elevations throughout the forest, where it often forms a transition between riparian and upland areas.

#### Physical environment

Stands of this type occur on soils derived from granitic and sedimentary rocks in the drier parts of riparian zones, and around seeps and springs.

#### Vegetation description

Stands at lower elevations are highly variable and some of the types described by Girard et al. (1997) cannot be tied to plant associations from the National Vegetation Classification (Anderson et al. 1998). *Salix planifolia* ssp. *planifolia* occurs in these lower-elevation stands. Undergrowths in wet sites contain *Carex rostrata* and *C. aquatilis*, while drier stands contain mainly *Deschampsia cespitosa* and *Poa pratensis*. Stands at higher elevations may be co-dominated by *S. planifolia* ssp. *monica* and contain substantial amounts of *Betula glandulosa*. *Carex scopulorum* is a major species in the undergrowth.

#### Management

Girard et al. (1997) report that trampling and grazing decrease the cover of sedges, and increase the cover of *Deschampsia cespitosa*, *Poa pratensis*, *Taraxacum officinale*, and *Fragaria virginiana*.

### **MEDICINE BOW NATIONAL FOREST**

#### Distribution

This type has been documented from Rock Creek Park in the Medicine Bow Mountains (Jones 1992).

#### Physical environment

The documented stand grows in a broad valley bottom on wet soil at nearly 10,000 feet (Jones 1992).

#### Vegetation description

The shrub layer contains *Salix planifolia* ssp. *monica* and *Pentaphylloides floribunda*. *Carex microptera* dominates the undergrowth, and *Deschampsia cespitosa*, *Aster foliaceus*, and *Fragaria virginiana* are common.

#### Management

No information was found about management of this type on the forest.

### **SHOSHONE NATIONAL FOREST**

#### Distribution

*Salix wolfii* stands have been described at elevations from 6,870 to 9,260 feet from the Lake Creek area of the Beartooth Plateau (Walford et al. 1997, Jones and Fertig 1999), the Clark's Fork valley, the southern Absaroka Mountains, and the northern Wind River Mountains (Jones and Fertig 1999, Walford et al. 1997). Walford et al. (1997) report that stands generally are large.

#### Physical environment

Throughout the Forest, this type occurs in riparian zones next to small or medium-sized channels, in swales, and around seeps. The soils usually are mineral, but stands may grow on organic soils in wet sites (Walford

et al. 1997). In the Lake Creek area (Jones and Fertig 1999), small stands occur in potholes on the glaciated granitic landscape, and larger stands occur in wetlands on alluvial soils.

Vegetation description

The shrub layer, dominated by *S. wolfii*, usually is dense but may be patchy. Shrubs that often occur with *S. wolfii* are *Betula glandulosa*, *Pentaphylloides floribunda* (which may co-dominate in drier stands), *Salix boothii*, *Salix drummondiana*, and *Salix barclayi* (co-dominant in one wet stand). Common undergrowth species are *Carex aquatilis*, *C. rostrata*, *C. microptera*, *C. praeegracilis*, *Calamagrostis canadensis*, *Poa pratensis*, *Potentilla gracilis*, *Aster foliaceus*, *Caltha leptosepala*, *Fragaria virginiana*, and *Geum macrophyllum*. Walford et al. (1997) sampled one stand with the *Salix wolfii* overstory browsed to a height of one foot, and the undergrowth dominated by *Poa pratensis* and *Trifolium repens*.

Management

No information was found about management of this type on the forest.

AREAS WITH HIGH-QUALITY OCCURRENCES

The Lake Creek area of the Beartooth Plateau in the Shoshone National Forest contains many small potholes with stands of *S. wolfii* shrublands mixed with *Carex rostrata* meadows, and this area may be a good representative of the manner in which *S. wolfii* vegetation occurs in a heavily glaciated landscape. Particularly good representatives of this type on the Bighorn and Medicine Bow National Forests have not been identified.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

GENERAL COMMENTS

This vegetation type includes two alliances from the National Vegetation Classification (Anderson et al. 1998), the *Salix wolfii* Temporarily Flooded Shrubland on drier sites and the *S. wolfii* Seasonally Flooded Shrubland on wetter sites. Both have been described by Reid et al. (1999).

REPRESENTATION ON THE THREE FORESTS

The *Salix wolfii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Salix wolfii</i> / <i>Picea engelmannii</i> Community Type	Unknown	
Girard et al. (1997)	<i>Salix wolfii</i> / <i>Poa</i> Community Type	Unknown	
Girard et al. (1997)	<i>Salix wolfii</i> /Wet <i>Carex</i> Community Type	<i>Salix wolfii</i> / <i>Carex rostrata</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix wolfii</i> / <i>Salix planifolia</i> ssp. <i>monica</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association?	G4
Girard et al. (1997)	<i>Salix wolfii</i> / <i>Salix planifolia</i> ssp. <i>monica</i> / <i>Carex scopulorum</i> Community Type	<i>Salix planifolia</i> / <i>Carex scopulorum</i> Plant Association	G4
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jones (1992)	<i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Community	<i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Plant Association	G3
<b>SHOSHONE NATIONAL FOREST</b>			
Jones and Fertig (1999)	<i>Salix wolfii</i> / <i>Carex aquatilis</i> Shrubland	<i>Salix wolfii</i> / <i>Carex aquatilis</i> Plant Association	G4
Walford et al. (1997)	<i>Salix wolfii</i> /Mesic Forb Community Type	<i>Salix wolfii</i> /Mesic Forbs Plant Association?	G3
Walford et al. (1997)	<i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Community Type	<i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Plant Association	G3

Walford et al. (1997)	<i>Salix wolfii</i> / <i>Poa pratensis</i> Community Type	<i>Salix wolfii</i> / <i>Deschampsia cespitosa</i> Plant Association?	G3
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CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Salix wolfii* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Salix wolfii* vegetation type seems to belong in the SRM Great Basin Riparian Rangeland Cover Type (SRM 422).

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS>

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON05WYUS>

Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. <U84MAT01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. <N85YOU01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Calamagrostis canadensis* Vegetation Type  
Bluejoint Reedgrass Vegetation Type**

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**SUMMARY**

This vegetation type includes riparian meadows dominated by *Calamagrostis canadensis* (bluejoint reedgrass). This type usually occurs in a mosaic with *Carex (rostrata, utriculata)* meadows, *C. aquatilis* meadows, and willow shrub stands. Most stands of this type cover several acres or less. This type is widespread throughout the western United States, and stands have been documented from the Bighorn, Medicine Bow, Shoshone, and Bridger-Teton National Forests and from Yellowstone National Park.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This is a widely distributed vegetation type, occurring in mountains (from the montane zone to timberline) of the western U.S. from Washington east to Montana and southward to California and Colorado (Reid et al. 1997). Recent work has also documented its presence in the Black Hills of South Dakota (Marriott et al. 1999). In Wyoming, it has been documented on the Yellowstone Plateau (Mattson 1984) and in the Wind River Mountains (Potkin and Munn 1989), the Absaroka Mountains (Jones and Fertig 1998, Walford et al. 1997), the Bighorn Mountains (Girard et al. 1997, Welp et al. 1998), the Black Hills (Marriott et al. 1999), and the Medicine Bow Mountains (Jankovsky-Jones et al. 1995, 1996).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) report that stands of this vegetation type occupy a variety of wet sites along low-gradient streams, around lakes, and around springs. These sites typically are flooded in the spring and the soils remain wet throughout the growing season. Soils usually have an organic surface horizon, and the deeper horizons range from coarse-textured sediments to decomposed peat.

**VEGETATION DESCRIPTION**

In the western U.S. (Reid et al. 1999), this is a graminoid type often nearly 3 feet tall, with minor amounts of forbs and < 25% canopy cover by shrubs. *Calamagrostis canadensis* dominates, and the common associates are *Carex aquatilis*, *C. rostrata* (syn. *C. utriculata*), *C. scopulorum*, *Deschampsia cespitosa*, *Scirpus* spp., *Glyceria* spp., *Poa* spp., *Elymus glaucus*, *Cardamine cordifolia*, *Senecio triangularis*, *Epilobium* spp., *Achillea millefolium*, *Heracleum lanatum*, *Ligusticum* spp., *Aster* spp., *Mertensia ciliata*, and *Veronica* spp. Willows and *Cornus sericea* are the most common shrubs. This type often grades into the *Carex (rostrata, utriculata)* vegetation type on wetter sites.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1999) report that this is a long-lived vegetation type in the Rocky Mountains.

**STATUS AND TRENDS**

The classification of this widely distributed vegetation is uncertain. The only association relevant to Wyoming in the National Vegetation Classification (Anderson et al. 1998) is abundant (G4 conservation rank). Information has not been compiled on changes in the distribution, abundance, and condition of this type.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Hansen et al. (1995) report that the rhizomatous *Calamagrostis canadensis* stabilizes stream banks and provides late-season forage for cattle in Montana.

### Effects of Management Practices

Continued heavy grazing decreases the cover and production of *Calamagrostis canadensis* and *Deschampsia cespitosa*, and increases the cover of *Poa* spp., *Agrostis stolonifera*, *Juncus balticus*, *Achillea millefolium* and *Aster occidentalis* on dry sites, and of *Juncus balticus*, *Carex nebrascensis*, and a variety of forbs on wet sites (Hansen et al. 1995).

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

Girard et al. (1997) and Welp et al. (1998) have sampled stands of this type from the southeastern half of the Forest, from approximately 7,400 to approximately 8,200 feet elevation. It was found in riparian areas with *Populus tremuloides* woodland, *Salix geeyeriana* and *S. planifolia* ssp. *monica* shrub stands, and sedge meadows. Stands of this type usually are small (Girard et al. 1997).

#### Physical environment

All of the stands documented by Girard et al. (1997) and Welp et al. (1998) are on alluvium derived from granitic rock.

#### Vegetation description

In addition to *Calamagrostis canadensis*, the vegetation usually contains *Juncus* spp., *Phleum pratense*, *Achillea millefolium*, *Senecio sphaerocephalus*, and *Thalictrum venulosum*. Most of these species are generally present in small amounts, but *Juncus* spp. and *Phleum pratense* may contribute substantial amounts of cover.

#### Management

No specific information was found about the management of this type on the forest.

### **MEDICINE BOW NATIONAL FOREST**

#### Distribution

This vegetation type has been sampled on the western side of the Medicine Bow Mountains at Platte Ridge and on the eastern side of the mountains at Sheep Mountain. With additional inventory, it may be found elsewhere on the Forest.

#### Physical environment

Documented stands are in riparian zones of low-gradient streams, in sediment-filled ponds, or around the margins of active beaver ponds.

#### Vegetation description

*C. canadensis* strongly dominates the vegetation; additional species present in more than trace amounts are *Carex aquatilis*, *Carex (rostrata, utriculata)*, *Bromus ciliatus*, *Glyceria striata*, and *Salix planifolia* ssp. *monica*.

#### Management

No specific information was found about the management of this type on the forest.

### **SHOSHONE NATIONAL FOREST**

#### Distribution

This vegetation type has been documented from 8,900 feet elevation in the Warm Springs Creek drainage in the northern Wind River Mountains (Walford et al. 1997) and from 8,000 feet elevation in the Lake Creek area on the Beartooth Plateau (Jones and Fertig 1998). In both areas, it occurs with *Carex (rostrata, utriculata)* vegetation. In the Lake Creek area, it was present both in a large wet meadow and as small patches (several acres each) around potholes. Potkin and Munn (1989) have described this as a major riparian type on the western side of the Wind



River Mountains in the Bridger-Teton National Forest, and it should be expected from other locations on the eastern side of the mountains in the Shoshone National Forest.

Physical environment

This type occupies moist parts of riparian meadows, where the wetter soils support *Carex (rostrata, utriculata)* vegetation.

Vegetation description

*Calamagrostis canadensis* dominates, and *Carex aquatilis*, *Juncus* spp., *Aster foliaceus*, and *Geranium* spp. are usually present. *Salix boothii*, *Poa pratensis*, *Aster foliaceus*, *Geum macrophyllum*, *Equisetum arvense*, *Taraxacum officinale*, and *Thalictrum occidentale* also may be present in more than trace amounts. Moss may form a thick layer beneath the vascular plants.

Management

No specific information was found about the management of this type on the forest.

**AREAS WITH HIGH-QUALITY OCCURRENCES**

In the Shoshone National Forest, the Lake Creek area on the Beartooth Plateau contains stands of this type mixed with *Carex (rostrata, utriculata)* vegetation in a large wet meadow and in numerous small meadows around potholes. These stands may represent this type as it occurs on that glaciated landscape. In the Medicine Bow National Forest, both Platte Ridge (Jankovsky-Jones et al. 1995) and Sheep Mountain (Jankovsky-Jones et al. 1996) contain stands that may represent this type as it occurs in the Medicine Bow Mountains. Other high-quality occurrences on these two forests may be found with additional inventory. High-quality occurrences apparently have not been documented on the Bighorn National Forest.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

**GENERAL COMMENTS**

This vegetation type is included within the *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (Reid et al. 1999) of the National Vegetation Classification (Anderson et al. 1998).

**REPRESENTATION ON THE THREE FORESTS**

The *Calamagrostis canadensis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Calamagrostis canadensis</i> ecological type	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q
Welp et al. (1998)	Bluejoint wheatgrass community	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	Bluejoint reedgrass ( <i>Calamagrostis canadensis</i> ) Community Type	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q
Jankovsky-Jones et al. (1996)	<i>Calamagrostis canadensis</i> Community Type	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q
<b>SHOSHONE NATIONAL FOREST</b>			
Jones and Fertig (1998)	Bluejoint reedgrass ( <i>Calamagrostis canadensis</i> ) Herbaceous Vegetation	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q
Walford et al. (1997)	<i>Calamagrostis canadensis</i> Community Type	<i>Calamagrostis canadensis</i> Western Herbaceous Vegetation	G4Q

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Calamagrostis canadensis* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Calamagrostis canadensis* vegetation type does not correspond to any SRM rangeland cover type.

## REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON05WYUS>
- Marriott, Hollis, Don Faber-Langendoen, Amanda McAdams, Diane Stutzman, and Beth Burkhart. 1999. Black Hills community inventory final report. The Nature Conservancy, Midwest Conservation Science Center, Minneapolis MN. 175 pp. <N99MAR02WYUS>
- Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. <U84MAT01WYUS>
- Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. <U89POT01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential Poison Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL06WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Carex aquatilis* Vegetation Type  
Water Sedge Vegetation Type**

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**SUMMARY**

This is a widespread, common wet meadow vegetation type found in stream valleys throughout the western United States, including most of the mountain ranges of Wyoming. It occupies some of the wettest riparian sites and typically occurs in a mosaic with other herbaceous vegetation or with willow shrublands. *Carex aquatilis* (water sedge) dominates the species-poor vegetation, and several other graminoids may contribute substantial cover. Shrubs and may also occur in the stand but they contribute little cover.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This widespread vegetation type occurs in the northern Midwest and in the mountains of the West. It is known from Washington east into Montana and south to Nevada, Arizona, and New Mexico. Stands form large meadows in montane valleys or as narrow borders around ponds and along streams (Reid et al. 1999). In Wyoming, it is found on the Yellowstone Plateau (Mattson 1984), the mountain ranges of the Overthrust Belt (Youngblood et al. 1985), the western side of the Wind River Mountains (Potkin and Munn 1989), the northeastern Wind River Mountains (Walford et al. 1997), the Absaroka Mountains (Walford et al. 1997, Jones and Fertig 1999), the Beartooth Plateau (Walford et al. 1997), the Bighorn Mountains (Girard et al. 1997, Welp et al. 1997), the Medicine Bow Mountains (Jankovsky-Jones et al. 1995), and the Sierra Madre (Jones 1992). It has been documented from the Bighorn, Medicine Bow, Shoshone, and Bridger-Teton National Forests.

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) review information on the physical environment of this type. In the western U.S., stands grow along streams and around lake margins, where water tables are at or near the soil surface throughout the year. The soils typically contain large amounts of organic matter, and range in texture from clay to sandy loam. *C. aquatilis* stands occupy sites where standing water is absent or shallower than on sites supporting *C. rostrata* stands.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have summarized the vegetation for this type throughout its range in the western U.S. The vegetation is a dense stand of the rhizomatous *Carex aquatilis*, usually with few other species. Scattered shrubs (especially willows) may occur in the stand. Forbs are present but contribute little cover. Common species include *Calamagrostis canadensis*, *Deschampsia cespitosa*, *Carex utriculata* (with up to 30% cover), *Pedicularis groenlandica*, *Caltha leptosepala*, *Aster foliaceus*, *Urtica dioica*, *Epilobium* spp., and *Equisetum* spp.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1999) review evidence that stands of this association may replace *Carex rostrata* (*C. utriculata*) vegetation if standing water becomes shallower. This type may be converted to willow shrublands if the water table drops sufficiently to allow growth of shrubs. Hansen et al. (1995) note that *C. aquatilis* is a pioneer species on bare sediment. The dense vegetation is stable in the absence of changes in the water table.

**STATUS AND TRENDS**

All plant associations within this vegetation type are considered common (global conservation rank G3G4) or abundant (G5) (Anderson et al. 1998). Information apparently has not been compiled to show changes in the status of this type.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

*Carex aquatilis* stands in narrow riparian zones provide forage for cattle, but in wider areas, cattle often select more palatable forage. This strongly rhizomatous sedge is valuable in protecting streambanks from erosion (Hansen et al. 1995).

### Effects of Management Practices

The high water table in this vegetation type generally discourages livestock use. Heavy grazing decreases the cover of *Carex aquatilis* and *Deschampsia cespitosa* and increases the cover of less palatable or more resistant species, especially *Juncus balticus*, *Carex nebrascensis*, *Taraxacum* spp., *Geum macrophyllum*, and *Poa pratensis*. Heavy livestock or recreational use compacts the soil, decreasing productivity and increasing the rate of erosion (Hansen et al. 1995).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

*Carex aquatilis* vegetation is found throughout the Bighorn Mountains at middle elevations (above 8,100 feet), but it may be more common in the southeastern half of the Range than in the northwestern half (Girard et al. 1997).

#### Physical environment

Stands of this type occupy valley bottoms along low-gradient, meandering streams, and often occur behind sediment-filled beaver ponds (Girard et al. 1997). It often is part of a riparian mosaic, in which it grows on the wetter sites (Girard et al. 1997, Welp et al. 1998). Soils are developed in alluvium and are saturated for most of the growing season; water may stand on the soil surface (Girard et al. 1997).

#### Vegetation description

*Carex aquatilis* dominates or co-dominates the dense herbaceous vegetation. Sedges and grasses contribute the bulk of the canopy cover; a variety of forbs may be present, as may scattered willows, but neither growth form contributes substantial cover. Species present in many stands, but usually in small amounts, are *Deschampsia cespitosa*, *Carex microptera*, *Carex rostrata*, *Juncus balticus*, *Phleum alpinum*, *Poa pratensis*, and *Aster foliaceus*.

#### Management

No specific information was found about the management of this type on the forest.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This type has been documented on the Sierra Madre (Jones 1992) and on the western slope of the Medicine Bow Mountains (Jankovsky-Jones et al. 1995). It should be expected elsewhere on the Forest. Stands of this type may be mixed with narrowleaf cottonwood woodland, silver sagebrush shrubland (Jones 1992), and Booth's willow shrubland (Jankovsky-Jones et al. 1995).

#### Physical environment

*Carex aquatilis* stands occupy riparian sites along low-gradient streams, on surfaces at about the same height as the stream channel.

#### Vegetation description

In the two stands described from the Forest, *Carex aquatilis* dominated the vegetation and *Potentilla gracilis*, *Epilobium* spp., *Deschampsia cespitosa*, *Carex rostrata* were present. *Hordeum brachyantherum* was a major species in one stand, and *Juncus balticus* and *Carex* sp. (*C. pensylvanica*?) in another.

### Management

No specific information was found about the management of this type on the forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This type has been documented from the Beartooth Plateau, Carter Mountain in the eastern Absaroka Mountains, the Bonneville Pass area of the southern Absaroka Mountains, the Warm Springs Creek drainage in the northern Wind River Mountains (Walford et al. 1997), and the valley of the North Fork of the Shoshone River (Jones and Fertig 1999). It is also known from the western slope of the Wind River Mountains in the Bridger-Teton National Forest (Potkin and Munn 1989), and probably occurs on the eastern slope in the Shoshone National Forest as well. Stands of the *Carex aquatilis* type may be found with *Salix* spp. shrublands, *Carex scopulorum* vegetation, and *Calamagrostis canadensis* vegetation (Walford et al. 1997).

### Physical environment

This type occurs in riparian zones along ephemeral and perennial streams. Of the eight stands sampled by Walford et al. (1997), seven were within two feet above the stream channel, and all eight occurred on sites with the water table at or near soil surface for part of the year. Soil texture was fine loamy to coarse loamy.

### Vegetation description

*Carex aquatilis* dominates or co-dominates the herbaceous vegetation. Shrubs may be present (*Salix bebbiana*, *Rosa sayi* at low elevation, *Salix planifolia* at higher elevations) but contribute little cover. Associated species include other sedges (*Carex rostrata*, *C. lanuginosa*, *C. microptera*, *C. praeceptorum*), *Deschampsia cespitosa*, and *Aster foliaceus*. In higher-elevation stands, moss may cover 50% of the ground.

### Management

No specific information was found about the management of this type on the forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

This is a widespread vegetation type, but none of the documented occurrences have been identified as being of especially high-quality.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

Vegetation in this type fits within the *Carex aquatilis* Seasonally Flooded Herbaceous Alliance of the National Vegetation Classification System (Anderson et al. 1998). Reid et al. (1999) note that this alliance is poorly defined at present.

### REPRESENTATION ON THE THREE FORESTS

The *Carex aquatilis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. (1997)	<i>Carex aquatilis</i> ecological type	<i>Carex aquatilis</i> Herbaceous Vegetation	G5
Girard et al. (1997)	<i>Carex aquatilis-Deschampsia cespitosa</i> community type	<i>Carex aquatilis</i> Herbaceous Vegetation	G5
Welp et al. (1998)	Water sedge/beaked sedge community type	<i>Carex aquatilis-Carex rostrata</i> Herbaceous Vegetation	G3G4
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1995)	Water sedge-beaked sedge ( <i>Carex aquatilis-C. rostrata</i> ) community	<i>Carex aquatilis</i> Herbaceous Vegetation	G5

Johnston (1987)	<i>Carex aquatilis</i> / <i>Carex utriculata</i> plant association	<i>Carex aquatilis</i> Herbaceous Vegetation?	G5
Jones (1992)	<i>Carex aquatilis</i> community	<i>Carex aquatilis</i> Herbaceous Vegetation	G5
<b>SHOSHONE NATIONAL FOREST</b>			
Jones and Fertig (1999)	Water sedge-beaked sedge plant community type	<i>Carex aquatilis</i> - <i>Carex rostrata</i> Herbaceous Vegetation	G3G4
Walford et al. (1997)	<i>Carex aquatilis</i> Community Type	<i>Carex aquatilis</i> Herbaceous Vegetation	G5

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)  
The *Carex aquatilis* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)  
The *Carex aquatilis* vegetation type does not correspond to any SRM rangeland cover type.

### REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS>
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. < U99JON04WYUS>
- Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. <U84MAT01WYUS>

Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. <U89POT01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL08WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. <N85YOU01WYUS>



**CHARACTERIZATION ABSTRACT FOR**  
***Carex rostrata* Vegetation Type**  
**Beaked Sedge Vegetation Type**

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**SUMMARY**

This vegetation type includes stands of wet meadow vegetation in which *Carex rostrata* (also known as *C. utriculata*, beaked sedge) generally dominates and few other species are present. Associated species are usually other sedges or grasses; forbs and shrubs (especially willows) often are present but they contribute little canopy cover. Sites occupied by this type are wetlands and riparian zones with saturated soils (often with standing water) along streams and around ponds.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation type is widely distributed in the western U.S., primarily in the mountains from Washington east to Montana and south to Nevada, Arizona, and New Mexico. It also occurs in California, at sea level. *C. rostrata* vegetation is widespread in the upper Midwest (Reid et al. 1999). In Wyoming, this type occurs on the Yellowstone Plateau (Mattson 1984), the mountains of the Overthrust Belt (Youngblood et al. 1985), Wind River Mountains (Potkin and Munn 1989, Jones 1994, Walford et al. 1997), Absaroka Mountains (Fertig and Jones 1992, Fertig and Bynum 1994, Walford et al. 1997), Beartooth Plateau (Walford et al. 1997), Bighorn Mountains (Girard et al. 1997), Laramie Mountains (Jankovsky-Jones et al. 1995a and 1995c), Medicine Bow Mountains (Jankovsky-Jones et al. 1995b, 1995d, 1996), and Sierra Madre (Jones 1992, Jankovsky-Jones et al. 1995e).

**PHYSICAL ENVIRONMENT**

In the western U.S. (Reid et al. 1997), this vegetation type occupies wet sites around lakes and springs and along low-gradient streams and rivers. These sites have standing water for at least part of the growing season. Soils are saturated, range in texture from loamy clay to sandy loam, and usually have a large proportion of organic matter. Stands typically occur with willow shrub vegetation, *Carex aquatilis* meadows, and *Eleocharis* spp. meadows.

**VEGETATION DESCRIPTION**

*Carex rostrata* (syn. *C. utriculata*) usually dominates the species-poor vegetation. Common associated species are other sedges (*C. aquatilis*, *C. vesicaria*, *C. lenticularis*, *C. atherodes*, *C. microptera*), several grasses (*Deschampsia cespitosa*, *Glyceria striata*, *Calamagrostis canadensis*), and other graminoids (especially *Juncus balticus*). Forbs contribute little cover; the most common species are *Epilobium ciliatum*, *Polygonum amphibium*, and *Potentilla palustris*. Willows sometimes are present but contribute little cover.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1997) review information suggesting that *Carex rostrata* invades bare, wet sediment and continues to dominate the vegetation as long as the physical environment remains unchanged. If sediment deposition raises the ground surface, then this vegetation may give way to other herbaceous vegetation types (especially *C. aquatilis* or *Calamagrostis canadensis* meadows) or to willow shrub vegetation. Similar changes may result from down-cutting of the stream and lowering of the water table.

*C. rostrata* is said to occupy wetter sites than *C. aquatilis* vegetation, but Padgett et al. (1989) suggest that dominance by *C. rostrata* or *C. aquatilis* may depend on which species first colonizes the site.

**STATUS AND TRENDS**

One *Carex rostrata* plant association has been identified in the National Vegetation Classification (Anderson et al. 1998), and it is considered abundant (global conservation rank of G5). Information apparently has not been compiled on changes in the status of this type

## MANAGEMENT CONSIDERATIONS

### Economic Uses

*Carex rostrata* stands in narrow riparian zones provide forage for cattle, but in wider areas, cattle often select more palatable forage. This strongly rhizomatous sedge is valuable in protecting streambanks from erosion (Hansen et al. 1995).

### Effects of Management Practices

The high water table in this vegetation type generally discourages livestock use. Heavy grazing decreases the cover of *Carex rostrata* and increases the cover of less palatable or more resistant species, especially *Juncus* spp., *Carex nebrascensis*, *Potentilla palustris*, and *Equisetum arvense*. Heavy livestock or recreational use compacts the soil, decreasing productivity and increasing the rate of erosion (Hansen et al. 1995).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Girard et al. (1997) sampled 17 stands of this vegetation type throughout the forest from 7,500 to 9,360 feet elevation. It occurs as narrow bands along stream channels bordered by willow or conifer vegetation, and also in swales in willow shrub vegetation.

#### Physical environment

Soils are developed in granitic and sedimentary substrates. They generally are saturated and often have water standing on the surface.

#### Vegetation description

*Carex rostrata* dominates the vegetation. Other species present in small amounts are *Phleum alpinum*, *Deschampsia cespitosa*, *Carex aquatilis*, and *Aster foliaceus*. Drier stands have more *Deschampsia cespitosa*, and often contain *Achillea millefolium*, *Antennaria* spp., and *Salix planifolia*.

#### Management

No specific information was found about the management of this type on the forest.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation type is widespread in the forest. In the Sierra Madre, it has been documented in riparian zones at elevations of 8,000 to 10,500 feet growing with *Deschampsia cespitosa* vegetation and *Picea engelmannii* forest (Jones 1992, Jankovsky-Jones et al. 1995e). In the Medicine Bow Mountains, stands have been documented at elevations ranging from ca. 9,000 feet to 10,500 feet. On Sheep Mountain (Jankovsky-Jones et al. 1996) and the South Fork of the Little Laramie River drainage (Jankovsky-Jones et al. 1995b), they occur around abandoned beaver ponds. Near timberline in the Snowy Range (Jankovsky-Jones et al. 1995d), they occupy ponds with *Salix planifolia* shrub stands, *Calamagrostis canadensis* herbaceous vegetation, and *Eleocharis quinqueflora* herbaceous vegetation. In the Laramie Peak area, stands also grow in abandoned beaver ponds, at elevations of 7,200 feet to 7,800 feet (Jankovsky-Jones et al. 1995a and 1995e).

#### Physical environment

Stands occur in wet soil, often with standing water. Many of the sites are abandoned beaver ponds.

#### Vegetation description

*Carex rostrata* dominates the herbaceous vegetation, and *Carex aquatilis* often is present. In drier stands, the associated species include *Geum macrophyllum*, *Calamagrostis canadensis*, *Epilobium ciliatum*, and *Deschampsia cespitosa*. Low elevation stands in the Sierra Madre and Laramie Mountains contain *Agrostis stolonifera* and *Phleum pratense*. Scattered willows may be present.

### Management

No specific information was found about the management of this type on the forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation type has been documented from the Beartooth Plateau, Clark's Fork Valley (Fertig and Jones 1992, Jones and Fertig 1998, Walford et al. 1997), eastern Absaroka Mountains (Walford et al. 1997), southern Absaroka Mountains (Fertig and Bynum 1994, Walford et al. 1997), northeastern Wind River Mountains (Walford et al. 1997), and southeastern Wind River Mountains (Jones 1994). Elevations range from 6,100 to 9,400 feet. It usually occurs with various types of herbaceous and willow shrub vegetation. In the Lake Creek area of the Beartooth Plateau (Jones and Fertig 1998), stands occur with *Calamagrostis canadensis* herbaceous vegetation in small (<20 acre) wetlands in potholes on the glaciated landscape.

### Physical environment

This vegetation type occurs along streams and around ponds, often in the wettest part of the riparian zone. Soils are saturated and often contain a high proportion of organic matter (Walford et al. 1997).

### Vegetation description

*Carex rostrata* dominates or co-dominates the depauperate vegetation. Common associates include several other sedges (*Carex aquatilis*, *C. vesicaria*, *C. atherodes*, *C. simulata*, *C. lanuginosa*) and *Deschampsia cespitosa*. A few forbs may be present but they contribute very little cover. Scattered shrubs (especially willows) may also be present.

### Management

No specific information was found about the management of this type on the forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

Swamp Lake in the Clark's Fork River Valley on the Shoshone National Forest contains a reasonably large area of *Carex rostrata* vegetation that apparently has been little disturbed by livestock or wildlife. The water level, though, is maintained at an artificially high level by a dam (Fertig and Jones 1992).

Girard et al. (1997) mention that this vegetation type is common on North Tongue River in the Bighorn National Forest, but they do not discuss the quality of the stands.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

Johnston's (1987) *Carex aquatilis/Carex utriculata* plant association encompasses stands dominated by either species of sedge.

### REPRESENTATION ON THE THREE FORESTS

The *Carex (rostrata, utriculata)* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Girard et al. (1997)	<i>Carex rostrata</i> ecological type	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Girard et al. (1997)	<i>Carex rostrata-Carex aquatilis</i> ecological type	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Girard et al. (1997)	<i>Carex rostrata-Carex limosa</i> ecological type	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Girard et al. (1997)	<i>Carex rostrata-Deschampsia cespitosa</i> community type	<i>Carex rostrata</i> Herbaceous Vegetation	G5

MEDICINE BOW NATIONAL FOREST			
Jankovsky-Jones et al. (1995a)	Water sedge-beaked sedge ( <i>Carex aquatilis</i> - <i>C. rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jankovsky-Jones et al. (1995b)	Water sedge-beaked sedge ( <i>Carex aquatilis</i> - <i>C. rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jankovsky-Jones et al. (1995c)	Water sedge-beaked sedge ( <i>Carex aquatilis</i> - <i>C. rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jankovsky-Jones et al. (1995d)	Baked sedge ( <i>Carex rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jankovsky-Jones et al. (1995e)	Water sedge-beaked sedge ( <i>Carex aquatilis</i> - <i>C. rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jankovsky-Jones et al. (1996)	Water sedge-beaked sedge ( <i>Carex aquatilis</i> - <i>C. rostrata</i> ) plant community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jones (1992)	<i>Carex rostrata</i> community	<i>Carex rostrata</i> Herbaceous Vegetation	G5
SHOSHONE NATIONAL FOREST			
Fertig and Bynum (1994)	Pond vegetation	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Fertig and Jones (1992)	<i>Carex rostrata</i> (beaked sedge) vegetation type	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Jones and Fertig (1998)	Beaked sedge ( <i>Carex rostrata</i> ) Herbaceous Vegetation	<i>Carex rostrata</i> Herbaceous Vegetation	G5
Walford et al. (1997)	<i>Carex rostrata</i> Community Type	<i>Carex rostrata</i> Herbaceous Vegetation	G5

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Carex (rostrata, utriculata)* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Carex (rostrata, utriculata)* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Pickett's Knob research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER12WYUS>

Fertig, Walter and George Jones. 1992. Plant communities and rare plant species of the Swamp Lake botanical area, Clark's Fork Ranger District, Shoshone National Forest. Report prepared for the Shoshone National Forest by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92FER05WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b Ecological evaluation for the potential Many Ponds research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN08WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d Ecological evaluation for the potential Ribbon Forest research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN06WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e Ecological evaluation for the potential Standard Park and Bogs research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN03WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS>
- Jones, George. 1994. Field notes from survey of the Red Canyon Ranch. Unpublished.
- Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON05WYUS>
- Mattson, David J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow ID. <U84MAT01WYUS>
- Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. <N89PAD01WYUS>
- Potkin, Michele and Dr. Larry Munn. 1989. Subalpine and alpine plant communities in the Bridger Wilderness, Wind River Range, Wyoming. Report submitted to Bridger-Teton National Forest, USDA Forest Service. Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie WY. 217 pp. Unpublished. <U89POT01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Youngblood, Andrew P., Wayne G. Padgett, and Alma H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. USDA Forest Service Intermountain Region, R4-Ecol-85-01. 78 pp. <N85YOU01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Deschampsia cespitosa* Vegetation Type  
Tufted Hairgrass Vegetation Type**

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**SUMMARY**

This is a herbaceous vegetation type of subalpine and alpine sites where melting snow and streams provide plentiful soil water. The perennial bunchgrass *Deschampsia cespitosa* (tufted hairgrass) dominates or co-dominates the vegetation, and various graminoids and forbs of wet or mesic sites are present. Scattered shrubs may grow in the vegetation but they contribute little cover. This type is widespread throughout the mountains of the western U.S., including the Bighorn, Medicine Bow, Shoshone, and Bridger-Teton National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

Herbaceous vegetation dominated or co-dominated by *Deschampsia cespitosa* is found throughout the mountains of the western United States, and probably extends into western Canada and the highlands of Mexico. In the Rocky Mountain region, this vegetation type occurs in the subalpine and alpine zones in Wyoming, Montana, Idaho, Utah, Colorado, and New Mexico (Reid et al. 1999). It has been documented from the Bighorn, Medicine Bow, and Shoshone National Forests (various references, described below).

**PHYSICAL ENVIRONMENT**

Reid et al. (1999) have summarized the information on this vegetation type by identifying two groups of stands from different environmental settings. Vegetation in their *D. cespitosa* Saturated Herbaceous Alliance occurs in shallow depressions and flats, where soils are fine-textured, poorly drained, and saturated throughout the growing season. Vegetation in their *D. cespitosa* Temporarily Flooded Herbaceous Alliance and *D. cespitosa* Seasonally Flooded Herbaceous Alliance grow in basins and valleys (often around the margins of wetlands) where melting snow and flowing streams provide enough water that the soils are saturated into the summer. In wet environments, the soils are generally sand or gravel, and in drier environments, the soils are finer-textured.

This difference between saturated and seasonally or temporarily flooded conditions has been recognized on the Shoshone National Forest by Tweit and Houston (1980), and is common for stands in all of the Wyoming national forests.

**VEGETATION DESCRIPTION**

Reid et al. (1999) have summarized the information for this type throughout its range. This is herbaceous vegetation in which the perennial bunchgrass *Deschampsia cespitosa* dominates or co-dominates the vegetation. Shrubs (especially *Salix planifolia*) may be present but are scattered and contribute little cover. Stands on drier sites (the seasonally flooded or temporarily flooded stands) usually contain *Juncus balticus*, *Phleum alpinum*, *Danthonia intermedia*, *Geum rossii*, *Polygonum bistortoides*, and *Potentilla gracilis* as co-dominant or secondary species. Wet-site sedges (*Carex nebrascensis*, *C. microptera*, *C. aquatilis*) and forbs (especially *Caltha leptosepala*) may be present but generally contribute less cover than do the species typical of drier sites. On saturated soils, the wet-site sedges and forbs contribute substantial cover and often co-dominate.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Reid et al. (1999) report that stands on drier sites tolerate ground fires of moderate intensity and late-season livestock grazing. Johnson and Billings (1964) suggest that pocket gophers create a cycle in which dense *D. cespitosa* meadows alternate with barren sites containing only a few relict plants and invading species.

**STATUS AND TRENDS**

Within Wyoming, this vegetation type includes some plant associations from the National Vegetation Classification (Anderson et al. 1998) considered rare (global ranks of G2G3 and G3Q) and some associations considered abundant (G4 and G5 ranks). These ranks may change as the classification of *D. cespitosa* stands into associations becomes clearer.

Information apparently has not been summarized on changes in the distribution, abundance, and condition of this type.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

This vegetation type includes some of the most productive stands for cattle grazing in the subalpine and alpine zones (Mueggler and Stewart 1980, Tweit and Houston 1980), although stands typically cover small areas.

### Effects of Management Practices

Grazing of this vegetation when soils are wet can lead to soil compaction and other changes in the physical environment that reduce productivity (Mueggler and Stewart 1980). Changes in the composition of the vegetation have not been definitively studied, but Mueggler and Stewart (1980) and Hansen et al. (1995) suggest that repeated heavy grazing decreases *D. cespitosa* and *Phleum alpinum* and increases *Juncus* spp., *Danthonia intermedia*, *Poa pratensis*, *Poa palustris*, *Agrostis stolonifera*, *Taraxacum officinale*, *Aster occidentalis*, *Antennaria* spp., and *Achillea millefolium*. Mueggler and Stewart (1980) note that cattle tend to concentrate on *D. cespitosa* meadows and graze them heavily before they move to the nearby uplands. Hansen et al. (1995) suggest that the extent of *D. cespitosa* vegetation has been reduced by long-term heavy grazing.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

*D. cespitosa* vegetation has been described from the northern and the central parts of the Bighorn Mountains (Girard et al. 1997). It is most common as meadow vegetation in subalpine stream valleys (Beetle 1956, Girard et al. 1997). Girard et al. (1997) give an elevation range of 7700 to 9300 feet, but Welp et al. (1997a) also describe stands from moist swales and talus slopes in the alpine zone.

#### Physical environment

*D. cespitosa* vegetation grows on sedimentary and crystalline bedrock (Girard et al. 1997). Soils on floodplains and stream terraces and in swales may be saturated most or all of the growing season, while soils on gentle upland slopes are saturated for shorter periods following snowmelt.

#### Vegetation description

In both of the types named by Girard et al. (1997) and the stand sampled at Pheasant Creek (Welp et al. 1997b), *D. cespitosa* and *Carex microptera* are the two species with the most canopy cover, and the vegetation contains substantial amounts of riparian plants. Beetle's (1956) description is vague but suggests similar species composition. At McLain Lake (Welp et al. 1997a), the major species with *D. cespitosa* are upland species.

#### Management

Girard et al. (1997) state that concentrated livestock use has caused the soil to dry and species composition to change in many areas supporting *D. cespitosa* vegetation. They distinguish an undisturbed, uncommon type (Tufted Hairgrass ecological type) from a disturbed, more common type (Tufted Hairgrass/Forb community type). The latter has less total canopy cover and with more forbs characteristic of non-riparian areas. They hypothesize that *D. cespitosa* vegetation replaces sedge-dominated vegetation as the soil dries.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation type has been documented from the Sierra Madre (Jankovsky-Jones et al. 1997a, 1997e), the Medicine Bow Mountains (Jankovsky-Jones et al. 1997b, 1997d, 1997f; Johnson 1961; Starr 1974), and the northern Laramie Mountains (Jankovsky-Jones et al. 1997c). In riparian meadows, this vegetation occurs in a mosaic with wetland graminoid and shrub vegetation types. In the subalpine zone, this type occurs on slopes and ridges in the subalpine forest matrix. This vegetation also occurs in the alpine zone of the Medicine Bow Mountains (Johnson 1961).



### Physical environment

Stands occur on soils developed in Precambrian crystalline rock and in alluvium. In the subalpine meadows, the soils are saturated early in the growing season and remain moist throughout the season (Starr 1974).

### Vegetation description

Stands in wet meadows have substantial canopy cover of *D. cespitosa* and wet-soil species such as *Carex illota*, *Caltha leptosepala*, *Ranunculus alismaefolius*, and *Pedicularis groenlandica* (the *D. cespitosa*-*Caltha leptosepala* plant association of the national classification). On stream terraces, common sub-dominant species are *Carex microptera*, *Juncus balticus*, *Phleum alpinum*, and *Carex scopulorum* (the *D. cespitosa*-*Carex microptera* plant association). Upland slopes support vegetation with substantial amounts of mesic-soil sedges (*Carex paysonis*, *C. pelocarpa*, *C. scopulorum*) and *Geum rossii* (the *D. cespitosa*-*Geum rossii* and the *D. cespitosa*-*Carex* spp. plant associations).

### Management

The area of the Snowy Range in which this plant association occurs was grazed by domestic livestock (primarily sheep) from the late 19th century through the 20th century (Regan et al. 1997).

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation can be found in wet meadows of valley bottoms in the montane and subalpine zones throughout the forest (Tweit and Houston 1980). It occurs in mosaics with willow shrub stands and wet sedge meadows (Walford et al. 1997). It also occurs in the alpine zone of the Beartooth Plateau, within the matrix of *Geum rossii* turf (Johnson and Billings 1964) and at timberline at the southern end of the Wind River Mountains (Jones and Fertig 1999b).

### Physical environment

In riparian zones, this type occurs on terraces near the channel with organic-rich soils saturated for much of the growing season (Walford et al. 1997). Substrates in these sites are alluvium and moraine deposits (Walford et al. 1997). In the alpine zone, stands grow on well-drained soils of lower slopes and basins where snow cover ameliorates the harsh winter weather (Johnson and Billings 1964). The substrates there are granitic and metamorphic rocks.

### Vegetation description

In riparian sites, the major species are *D. cespitosa*, *Carex aquatilis*, *C. scopulorum*, *Calamagrostis canadensis*, *Caltha leptosepala*, *Agrostis* spp., or *Juncus* spp.). This vegetation may contain *Salix planifolia* and often merges into shrublands dominated by that species, into *C. aquatilis* stands, or into other herbaceous wetland types. Drier sites often contain substantial amounts of *Carex scopulorum*, *Phleum alpinum*, *Phleum pratense*, *Poa pratensis*, *Antennaria corymbosa*, *Aster foliaceus*, *Polygonum bistortoides*, *Trifolium parryi*, *Poa alpina*, or *Potentilla diversifolia*. These stands lie within a matrix of *Geum rossii* turf.

Johnson and Billings (1964) describe sites disturbed by pocket gophers, where the *D. cespitosa* vegetation has been reduced to gravel mulch with a few relict plants and invading species (*Lewisia pygmaea*, *Cerastium beeringianum*, *Selaginella densa*, *Geum rossii*). They suggest that pocket gophers may cause the vegetation to cycle between *D. cespitosa* meadows and barren ground.

### Management

Information on management of this type in the Shoshone National Forest comes from Tweit and Houston (1980). *D. cespitosa* vegetation is among the most productive of the range types, although stands of this vegetation type cover only small parts of the landscape. *D. cespitosa* vegetation in riparian sites (their *D. cespitosa*/*Carex* spp. habitat type) often receives heavy grazing because cattle congregate on these types to eat the green forage. Overuse may lead to stream erosion.

## AREAS WITH HIGH-QUALITY OCCURRENCES

Although this vegetation type is widespread, no sites have been documented with unusually high-quality occurrences. Tweit and Houston (1980) mentioned that "good examples" of their *D. cespitosa*/*Carex* spp. habitat

type could be found at several places on the Shoshone National Forest (Muddy Creek Meadows on the Clark's Fork District, spring/seep area of Sawmill Park on the Wapiti Ranger District, wet meadows of upper Salt Creek on the Wind River Ranger District, and the wet area of Snow Creek on the Lander Ranger District). They did not, however, define "good example".

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

This vegetation type includes three *Deschampsia cespitosa* alliances from the National Vegetation Classification (Anderson et al. 1998), all of which are described by Reid et al. (1999). Vegetation on sites with soils saturated throughout the growing season is placed within the *D. cespitosa* Saturated Herbaceous Alliance. Vegetation on soils that are unsaturated at least part of the growing season is placed in the *D. cespitosa* Seasonally Flooded Herbaceous Alliance or the *D. cespitosa* Temporarily Flooded Herbaceous Alliance. These three alliances contain six plant associations.

#### REPRESENTATION ON THE THREE FORESTS

The *Deschampsia cespitosa* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Beetle (1956)	Wet meadows	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
Girard et al. (1997)	Tufted Hairgrass ecological type	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
Girard et al. (1997)	Tufted Hairgrass/Forb community type	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
Welp et al. (1998a)	Tufted hairgrass/sedge species community types	<i>Deschampsia cespitosa</i> - <i>Carex</i> spp. plant association?	G3Q
Welp et al. (1998b)	Tufted hairgrass/sedge species community types	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
<b>MEDICINE BOW NATIONAL FOREST</b>			
Jankovsky-Jones et al. (1999a)	Tufted hairgrass-marsh marigold ( <i>Deschampsia cespitosa</i> - <i>Caltha leptosepala</i> ) community type	<i>Deschampsia</i> - <i>Caltha leptosepala</i> plant association	G4
Jankovsky-Jones et al. (1999b)	Tufted hairgrass-marsh marigold ( <i>Deschampsia cespitosa</i> - <i>Caltha leptosepala</i> ) community type	<i>Deschampsia</i> - <i>Caltha leptosepala</i> plant association	G4
Jankovsky-Jones et al. (1999b)	Tufted hairgrass/Ross's avens ( <i>Deschampsia cespitosa</i> / <i>Geum rossii</i> ) community type	<i>Deschampsia cespitosa</i> - <i>Geum rossii</i> plant association?	G5
Jankovsky-Jones et al. (1999c)	Tufted hairgrass-sedge ( <i>Deschampsia cespitosa</i> - <i>Carex</i> spp.) community type	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
Jankovsky-Jones et al. (1999d)	Tufted hairgrass-marsh marigold ( <i>Deschampsia cespitosa</i> - <i>Caltha leptosepala</i> ) community type	<i>Deschampsia</i> - <i>Caltha leptosepala</i> plant association	G4
Jankovsky-Jones et al. (1999e)	Tufted hairgrass-sedge ( <i>Deschampsia cespitosa</i> - <i>Carex</i> spp.) community type and Tufted hairgrass-marsh marigold ( <i>Deschampsia cespitosa</i> - <i>Caltha leptosepala</i> ) community type	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3
Jankovsky-Jones et al. (1999f)	Tufted hairgrass-sedge ( <i>Deschampsia cespitosa</i> - <i>Carex</i> spp.) community type	<i>Deschampsia cespitosa</i> - <i>Carex microptera</i> plant association?	G2G3

Johnson (1961)	Subalpine <i>Carex-Deschampsia</i> Community	<i>Deschampsia cespitosa-Carex</i> spp plant association OR <i>Deschampsia cespitosa-Geum triflorum</i> plant association?	G4Q OR G5
Johnston (1987)	<i>Deschampsia cespitosa-Acomastylis rossii</i> plant association	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Johnston (1987)	<i>Deschampsia cespitosa-Carex</i> spp. plant association	<i>Deschampsia cespitosa-Carex</i> spp. plant association?	G4Q
Starr (1974)	Wet meadow	<i>Deschampsia-Caltha leptosepala</i> plant association	G4
<b>SHOSHONE NATIONAL FOREST</b>			
Fertig and Bynum (1994)	<i>Deschampsia cespitosa-Carex scopulorum</i> community type	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Johnson and Billings (1962)	<i>Deschampsia</i> Meadow Vegetation	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Johnson (1961)	Alpine <i>Carex-Deschampsia</i> Community	<i>Deschampsia cespitosa-Carex</i> spp plant association OR <i>Deschampsia cespitosa-Geum triflorum</i> plant association?	G4Q OR G5
Jones and Fertig (1999a)	Tufted hairgrass-alpine timothy plant community type	<i>Deschampsia cespitosa-Phleum alpinum</i> plant association?	G3?
Jones and Fertig (1999b)	<i>Deschampsia cespitosa-Caltha leptosepala</i> vegetation	<i>Deschampsia-Caltha leptosepala</i> plant association	G4
Johnston (1987)	<i>Deschampsia cespitosa-Acomastylis rossii</i> plant association	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Johnston (1987)	<i>Deschampsia cespitosa-Carex</i> spp. plant association	<i>Deschampsia cespitosa-Carex</i> spp. plant association?	G4Q
Tweit and Houston (1980)	<i>Deschampsia cespitosa</i> Meadow community type	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Tweit and Houston (1980)	<i>Deschampsia cespitosa/Carex</i> habitat type	<i>Deschampsia cespitosa-Carex microptera</i> plant association?	G2G3
Walford et al. (1997)	<i>Deschampsia cespitosa</i> Community Type	<i>Deschampsia cespitosa-Carex</i> spp. plant association	G4Q
Walford et al. (1997)	<i>Deschampsia cespitosa</i> Community Type	<i>Deschampsia cespitosa-Potentilla diversifolia</i> plant association	G5
Walford et al. (1997)	<i>Deschampsia cespitosa</i> Community Type	<i>Deschampsia cespitosa-Carex microptera</i> plant association?	G2G3

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Deschampsia cespitosa* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)**

The *Deschampsia cespitosa* vegetation type that we're describing falls within the Tufted Hairgrass-Sedge Rangeland Cover Type (313).

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Beetle, Alan A. 1956. Range survey in Wyoming's Big Horn Mountains. Wyoming Agricultural Experiment Station Bulletin 341. University of Wyoming, Laramie WY. 40pp. <N56BEE01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Twin Lakes research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER11WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential East Fork Encampment River research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN05WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Ground Moraine research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN04WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN08WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d. Ecological evaluation for the potential Ribbon Forest research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN06WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e. Ecological evaluation for the potential Standard Park and Bogs research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN03WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995f. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN11WYUS>

Johnson, Philip L. and W.D. Billings. 1962. The alpine vegetation of the Beartooth Plateau in relation to cryopedogenic processes and patterns. Ecological Monographs 32(2): 105-135. <A62JOH02WYUS>

Johnson, Wallace M. 1961. The ecology of alpine and subalpine ranges in Wyoming as related to use by game and domestic sheep. Ph.D. Thesis, Division of Plant Science, University of Wyoming, Laramie WY. 79 pp. <U61JOH01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Roaring Fork Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON07WYUS>

Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service General Technical Report INT-66. Intermountain Forest and Range Experiment Station, Ogden UT. <B80MUE01WYUS >

Regan, Claudia M., Robert C. Musselman, and June D. Haines. 1997. Vegetation of the Glacier Lakes ecosystem experiments site. USDA Forest Service Research Paper RMRS-RP-1. Rocky Mountain Research Station, Fort Collins CO. 36 pp. <U97REG01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Starr, Charles Richard. 1974. Subalpine meadow vegetation in relation to environment at Headquarters Park, Medicine Bow Mountains, Wyoming. M.S. Thesis, Botany Department, University of Wyoming, Laramie WY. 94 pp. <U74STA01WYUS>

Tweit, Susan J. and Kent E. Houston. 1980. Grassland and shrubland habitat types of the Shoshone National Forest. USDA Forest Service Rocky Mountain Region. 143 pp. <B80TWE01WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL08WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential Pheasant Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL04WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Pinus ponderosa* Vegetation Type**  
**Ponderosa Pine Vegetation Type**

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**SUMMARY**

*Pinus ponderosa* vegetation is found at lower elevations on the eastern slopes of the Bighorn and Medicine Bow National Forests. These areas have a considerable amount of summer precipitation promoting the growth of this vegetation. Soils are typically well drained with a coarse-texture. Stands have a tree-dominated overstory and either grass-dominated or shrub-dominated understory. Fire suppression and overgrazing have apparently altered the structure of this vegetation.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Pinus ponderosa* vegetation occurs throughout the Rocky Mountains. In Wyoming, stands are prevalent in the eastern half of the state including the eastern fringes of the Medicine Bow and Bighorn National Forests (Peet 1988, Knight 1994, Merrill et al. 1996).

**PHYSICAL ENVIRONMENT**

This vegetation typically occurs below 8,500 feet on the eastern slopes of the Bighorn and Laramie Ranges. Both summer rainfall and warmer temperatures favor this vegetation type (Knight 1994). It is a fairly drought tolerant species occurring on drier forest sites (Hoffman and Alexander 1976, Eyre 1980). Stands are not found at higher elevations because *Pinus ponderosa* seedlings are apparently not well adapted to extremely cold temperatures (Knight 1994). Soils are usually coarse-textured with good drainage. Stands grow on all slope aspects and grades, but are more common on moderate to steep slopes and ridge tops (Reid et al. 1999).

**VEGETATION DESCRIPTION**

Stands can form open woodlands or closed forest with a tree-dominated canopy and a shrub- or grass-dominated understory. Tree cover ranges from 25 to 60%, depending on elevation and fire (Reid et al. 1999). Stands have a more closed canopy with increasing elevation due to moister conditions (Peet 1988). Fire also plays a role in stand density by naturally thinning tree cover and maintaining stands as more open woodlands (Fischer and Clayton 1983, Peet 1988, Knight 1994). Shrub-dominated understories grow to one meter in height and have up to 25% cover, while grass-dominated understories also grow to one meter in height but can have greater cover ranging up to 60% (Reid et al. 1999). The overstory is dominated by *Pinus ponderosa* but *Populus tremuloides* may be present (Hoffman and Alexander 1976). Sites with closed canopies may be co-dominated by *Pseudotsuga menziesii*, and *Pinus ponderosa* is likely be seral to *Pseudotsuga menziesii* vegetation (Reid et al. 1999). The understory is dominated by such species as *Arctostaphylos uva-ursi*, *Cornus sericea*, *Carex geyeri*, *Carex rossii*, *Elymus spicatus*, *Festuca idahoensis*, *Juniperus communis*, *Physocarpus monogynus*, and *Spiraea betulifolia* (Hoffman and Alexander 1976, Alexander et al. 1986).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Fire and grazing are important agents shaping the form of this vegetation. Prior to intensive grazing and fire suppression, stands are thought to have been mostly open and even-aged (Knight 1994). However, it has become more common to find stands with a more closed appearance and a second growth of trees in the understory (Fischer and Clayton 1983). *Pinus ponderosa* is well adapted to fire because of its fire-resistant bark and few low branches that could spread fire into the canopy (Fischer and Clayton 1983). Surface fires can thin the understory while not affecting the older trees. In addition, overgrazing can lead to denser tree growth because of more successful seedling establishment due to reduced competition from grasses (Knight 1994). Stand-replacing fires are a larger threat in stands with a dense layer of trees (Fischer and Clayton 1983). Stands can be altered by mountain pine beetle outbreaks. Beetles girdle trees and introduce a blue stain fungus that eventually stops vascular flow in the trunk and kills the trees. Older trees tend to be more susceptible to the beetles because they are not able to protect

themselves by producing resins (Knight 1994). Patches of dead trees are common around Laramie Peak as a result of outbreaks (Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b).

This type is generally considered climax grading into shrubland or grassland vegetation at low elevations and into stands of other forest types at high elevations (Reid et al. 1999). However, it can be seral to *Pseudotsuga menziesii* vegetation in upper elevation transition zones (Despain 1973, Fischer and Clayton 1983). *Pinus ponderosa* is not as shade tolerant as *Pseudotsuga menziesii*, which allows the latter species to establish and eventually replace this vegetation on more mesic sites (Knight 1994).

#### STATUS AND TRENDS

For this vegetation, there are several plant associations with ranks suggesting that they are rare or uncommon. The *Pinus ponderosa* / *Spiraea betulifolia* plant association has a G2(?) conservation rank, meaning it is rare. The *Pinus ponderosa* / *Physocarpus monogynus* and *Pinus ponderosa* / *Cornus sericea* plant associations have G3 conservation ranks, meaning they are uncommon. In addition, the *Pinus ponderosa* / *Carex geyeri* plant association has a G3/G4 conservation rank, meaning that it could be uncommon or abundant. More information is needed about this association to resolve its rank. All other associations are considered abundant (Anderson et al. 1998). See the section entitled "Representations on the Three Forests" for a complete list of associations and ranks. In general, the structure of this vegetation has been altered from pre-settlement by fire suppression and overgrazing (Knight 1994), resulting in denser stands and even second layers of trees in the understory (Fischer and Clayton 1983).

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

This vegetation can be important an important source of forage for livestock and wildlife, depending on the understory growth. Stands provide cover for wildlife, particularly in mosaics with grassland vegetation. Wood production is considered moderate to poor with limited amounts of harvesting being supported on the more productive sites (Hoffman and Alexander 1976, Alexander et al. 1986). Some of the more productive stands also have deep snow packs that supply water to larger watersheds during snowmelt (Alexander et al. 1986). Stands can be important for recreation, including picnic and campground areas (Hoffman and Alexander 1976).

##### Effects of Management Practices

Stands have become more closed with fire suppression and overgrazing, including the development of a second tree layer in the understory. This change in canopy structure increases live fuels and the risk of stand-replacing fires (Fischer and Clayton 1983). Fischer and Clayton (1983) advocate fuel management or prescribed burns to reduce the risk of stand replacing fires. In addition, fire is necessary to maintain cover of seral stands that are replaced by *Pseudotsuga menziesii* vegetation at higher elevations (Jones and Fertig 1998, Welp et al. 1998a, Welp et al. 1998b). Managing stands as more open woodlands should promote the growth of understory vegetation on more productive sites. This effect would improve forage production for livestock and wildlife (Hoffman and Alexander 1976, Alexander et al. 1986). While stands are often climax vegetation, they can be seral to *Pseudotsuga menziesii* vegetation on more mesic sites (Fischer and Clayton 1983). Suppression of fires will reduce the potential cover of seral stands.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Stands are common along the eastern slopes of the Bighorns (Merrill et al. 1996), but can also be found on the southwestern slopes (Despain 1973).

#### Physical environment

This type occurs at the lowest elevation of the forest on coarse-textured soils (Hoffman and Alexander 1976).

#### Vegetation description

This vegetation is climax at lower elevations on the eastern slopes of the Bighorns, but seral to *Pseudotsuga menziesii* at the higher elevations (Despain 1973). *Pinus ponderosa* dominates the overstory, while the most common understory dominants are *Elymus spicatus*, *Festuca idahoensis*, *Spiraea betulifolia*, *Physocarpus monogynus*, or *Juniperus communis* (Hoffman and Alexander 1976).

#### Management

Hoffman and Alexander (1976) consider stands on the more mesic sites better for timber harvesting. They also suggest that stands be kept open for forage production, even though this may reduce the amount of timber. Stands can also be important for recreational purposes and as habitat for big game species (Hoffman and Alexander 1976).

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This vegetation is most prevalent around Laramie Peak, but also occurs at Pole Mountain and in the Snowy Range (Alexander et al. 1986, Merrill et al. 1996).

#### Physical environment

Stands occur on well-drained soils that are deep and coarse-textured (Alexander et al. 1986).

#### Vegetation description

*Pinus ponderosa* dominates the overstory while the typical understory dominants include *Arctostaphylos uva-ursi*, *Carex rossi*, and *Carex geyeri*. In addition, *Populus tremuloides* may be present in some stands (Alexander et al. 1986).

#### Management

For the most part, stands have low capability to sustain timber harvesting, while forage production can range from poor to moderate depending on the understory. *Carex geyeri* tends to provide the more moderate amounts of forage production. Grazing can stimulate or deter forage production, and presumably the net effect depends on the degree of usage. Stands with *Carex geyeri* have deeper snowpacks that provide water to regional watersheds during snowmelt. This vegetation provides cover for wildlife, particularly if stands occur in mosaics with grassland vegetation (Alexander et al. 1986).

### SHOSHONE NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

Few stands probably exist in the region that represent the open woodlands created by more frequent fires before settlement (Knight 1994). In addition, stands in the Ashenfelder Basin may have been relatively good representations in the past, but mountain pine beetles have killed many of the trees (Jones 1992). A few areas may be quality representations such as Tongue River (Welp et al. 1998a), Pheasant Creek (Welp et al. 1998b), Crazy



Woman (Welp et al. 1998c), and Mann Creek (Jones and Fertig 1998) Potential Research Natural Areas. However, the effect of fire suppression still needs to be assessed in stands from each of these locations.

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

*Pinus ponderosa* vegetation, as described here, falls within the *Pinus ponderosa* Forest, Woodland, and Temporarily Flooded Woodland Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

#### REPRESENTATION ON THE THREE FORESTS

The *Pinus ponderosa* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Despain 1973	<i>Pinus ponderosa</i> Forests	Unknown	
Hoffman and Alexander 1976	<i>Pinus ponderosa</i> / <i>Agropyron spicatum</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> Woodland Plant Association	G4
Hoffman and Alexander 1976	<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G4
Hoffman and Alexander 1976	<i>Pinus ponderosa</i> / <i>Spiraea betulifolia</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Spiraea betulifolia</i> Forest Plant Association	G2?
Hoffman and Alexander 1976	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G3
Hoffman and Alexander 1976	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Woodland Plant Association	G4?
Johnston 1987	<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Plant Association	<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G4
Johnston 1987	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Plant Association	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Woodland Plant Association	G4?
Johnston 1987	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Plant Association	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G3
Johnston 1987	<i>Pinus ponderosa</i> – <i>Juniperus scopulorum</i> / <i>Roegneria spicata</i> Plant Association	Unknown	
Johnston 1987	<i>Pinus ponderosa</i> / <i>Spiraea betulifolia</i> Plant Association	<i>Pinus ponderosa</i> / <i>Spiraea betulifolia</i> Forest Plant Association	G2?
Welp et al. 1998a	Ponderosa Pine / Mountain Ninebark Plant Community	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G3
Welp et al. 1998a, Jones and Fertig 1998	Ponderosa pine / Bluebunch Wheatgrass Plant Community	<i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> Woodland Plant Association	G4
Welp et al. 1998b	Ponderosa Pine / Common Juniper Plant Community	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Woodland Plant Association	G4?
Welp et al. 1998c	Ponderosa Pine / Idaho Fescue Plant Community	<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G4
Welp et al. 1998c	Ponderosa Pine / Red-Osier Dogwood Plant Community	<i>Pinus ponderosa</i> / <i>Cornus sericea</i> Woodland Plant Association	G3

MEDICINE BOW NATIONAL FOREST			
Alexander et al. 1986	<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i> Woodland Plant Association	G4
Alexander et al. 1986	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Forest Plant Association	G4G5
Alexander et al. 1986	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Habitat Type	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Woodland Plant Association	G3G4
Johnston 1987	<i>Pinus ponderosa</i> / <i>Arctostaphylos adenotricha</i> Plant Association	<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i> Woodland Plant Association	G4
Johnston 1987	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Plant Association	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Woodland Plant Association	G3G4
Johnston 1987	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Plant Association	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Forest Plant Association	G4G5
Jones 1989	<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i> Plant Community	<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i> Woodland Plant Association	G4
Jones 1989	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Plant Community	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Woodland Plant Association	G3G4
Jones 1989	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Plant Community	<i>Pinus ponderosa</i> / <i>Carex rossii</i> Forest Plant Association	G4G5
Jankovsky-Jones et al. 1995a	Ponderosa pine / Bluebunch Wheatgrass Plant Community	<i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> Woodland Plant Association	G4
Jankovsky-Jones et al. 1995b	Ponderosa Pine / Mountain Ninebark Plant Community	<i>Pinus ponderosa</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G3
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b	Ponderosa Pine / Elk Sedge Plant Community	<i>Pinus ponderosa</i> / <i>Carex geyeri</i> Woodland Plant Association	G3G4
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b	Ponderosa Pine / Common Juniper Plant Community	<i>Pinus ponderosa</i> / <i>Juniperus communis</i> Woodland Plant Association	G4?
Merrill et al. 1996	Ponderosa Pine GAP Cover Type (42010)	N/A	
SHOSHONE NATIONAL FOREST			
None			

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Pinus ponderosa* vegetation type that we're describing falls within the Interior Ponderosa Pine forest cover type (237).

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)**

The *Pinus ponderosa* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. < A73DES01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fischer, W.C. and B.D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experimental Station, Ogden, UT. <N83FIS41WYUS>

Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential LaBonte Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN10WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George. 1989. Report on the Ashenfelder Basin special interest area. Prepared for the U.S. Forest Service by the Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <R89JON01WYUS>

Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Pheasant Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL04WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Crazy Woman Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL05WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Pinus flexilis* Vegetation Type**  
**Limber Pine Vegetation Type**

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**SUMMARY**

*Pinus flexilis* vegetation is found on dry slopes and windswept ridges. Stands typically have an open woodland canopy, and an understory dominated by either shrubs or grasses. This vegetation occurs on the Bighorn, Shoshone, and Medicine Bow National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation occurs throughout the Rocky Mountains, Great Basin, Colorado Plateau, and northwestern Great Plains (Reid et al. 1999). It forms stands in the Bighorn, Medicine Bow, and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

Stands are found on the driest sites in the Rocky Mountain region, occurring mostly at low and mid-elevations (Steele et al. 1983, Peet 1988). They grow on windswept ridges and slopes that are some of the harshest sites with tree cover (DeVelice and Lesica 1993, Knight 1994, Reid et al. 1999). This vegetation occurs on such harsh sites presumably due to the poor competitive ability of *Pinus flexilis* seedlings (Knight 1994). Both *Pinus flexilis* and *Pinus albicaulis* vegetation is favored on dry sites. Steele et al. (1983) suggest that the two vegetation types are differentially distributed based on substrate. *Pinus flexilis* typically dominates on calcareous substrate, while *Pinus albicaulis* generally dominates on granitic substrate. In addition, DeVelice and Lesica (1993) found *Pinus flexilis* stands growing on calcareous substrates. The soil surface in this type often has exposed bedrock and a considerable amount of bare ground (Reid et al. 1999), in addition to the substrate being extremely erodible (Steele et al. 1983).

**VEGETATION DESCRIPTION**

This vegetation has a tree-dominated layer that forms an open canopy. Height of the canopy is between 10 to 30 feet with cover ranging from 10 to 60%. Understory vegetation can be either shrub- or grass-dominated. Shrubs grow to heights of one to three meters while the grass understory rarely exceeds one meter in height (Reid et al. 1999). *Pinus flexilis* is the characteristic dominant of the tree layer although in some stands it codominates with *Pseudotsuga menziesii* (Steele et al. 1983). In addition, stands occurring on granitic substrates may also contain *Pinus contorta* (WYNDD 1998). Understory vegetation can be dominated by shrubs such as *Juniperus communis*, *Cercocarpus ledifolius*, or *Arctostaphylos uva-ursi*, or by grasses such as *Festuca idahoensis* or *Leucopoa kingii* (Steele et al. 1983, Jankovsky-Jones et al. 1995b, Welp et al. 1998d).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Pinus flexilis* trees are adapted to surface fires because they have a thick layer of bark at the base of the trunk protecting the cambium. This species also produces a tight cluster of needles around terminal buds for protection against high temperatures (Fischer and Clayton 1983). Fischer and Clayton (1983) place this vegetation in fire group one of their classification which has a long fire return interval of 50-100 years. Stands are not subjected to more frequent fires because of low productivity and subsequent fuel accumulation (Steele et al. 1983). However, Fischer and Clayton (1983) concede that fires may be more frequent if grasses dominate the understory. Of course, such fires would be of low intensity and probably not destroy the tree vegetation. As for other disturbances, *Pinus flexilis* is susceptible to white pine blister rust which has destroyed many stands in the Northern Rockies (Kendall 1998). Clark's nutcracker and other small mammals disperse the seed of *Pinus flexilis* and are thought to influence the local distribution of stands. At the dry forest boundaries, the mosaic pattern of *Pseudotsuga menziesii* and *Pinus flexilis* vegetation may be the result of past seed caching (Steele et al. 1983).

This vegetation is considered both climax and seral. It is the climax on the extremely harsh sites occurring on windswept ridges and steep slopes, but in slightly more mesic areas it can be seral to *Abies* or *Picea* as well as

*Pseudotsuga menziesii*. At the arid forest margins, climax stands of *Pinus flexilis* vegetation can include some cover of *Pseudotsuga menziesii* (Steele et al. 1983).

#### STATUS AND TRENDS

For this vegetation, one association is considered uncommon based on the conservation rank of the National Vegetation Classification. That association is *Pinus flexilis* / *Festuca idahoensis* with a G3 conservation rank. *Pinus flexilis* / *Cercocarpus ledifolius* woodland plant association has a G3G4 conservation rank, meaning it could be uncommon or abundant. More information is needed to better clarify its rank. All other associations have G4 or G5 conservation ranks, meaning they are abundant (Anderson et al. 1998). See the section entitled “Representations on the Three Forests” for a complete list associations and ranks. In the Northern Rockies, white pine blister rust has killed virtually all of the *Pinus flexilis* in many stands. Heavy mortality is expected to south at some point in the future, which will make this type less common on the three forests (Kendall 1998).

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

Stands have such low productivity that they do not support timber harvesting. However, they can provide forage for livestock, and are an important habitat for elk and deer (Steele et al. 1983).

##### Effects of Management Practices

This type grows on such harsh sites that other species are not able to displace it, even after disturbance (Reid et al. 1999). Fischer and Clayton (1983) mention that recovery of this type can be slow following stand-replacing fires, but fortunately high severity burns are uncommon in this vegetation. High mortality is expected from white pine blister rust in the future for the regions that include the three forests (Kendall 1998). To date, no plans have been developed that can deal with this disease.

### SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

#### BIGHORN NATIONAL FOREST

##### Distribution

Stands are evidently not common in the Bighorn National Forest and according to Hoffman and Alexander (1976) they are seral to *Pseudotsuga-Abies* vegetation type. However, several stands have been identified in potential research natural areas (Jones and Fertig 1998, Welp et al. 1998a, Welp et al. 1998b, Welp et al. 1998c, and Welp et al. 1998d).

##### Physical environment

No additional information is known about the physical environment beyond that given in the general information section.

##### Vegetation description

As with the physical environment, no additional information is known about the vegetation beyond that provided in the general information section.

##### Management

No specific information is known about the management of this vegetation in the Bighorn National Forest.

#### MEDICINE BOW NATIONAL FOREST

##### Distribution

*Pinus flexilis* vegetation is most common in the Laramie Range of the Medicine Bow National Forest (Merrill et al. 1996).

##### Physical environment

This vegetation typically occurs as small stands on windswept ridges throughout the forest (Jankovsky-Jones et al. 1995c).

### Vegetation description

Based on potential RNA evaluations, it is common to find the understory dominated by *Arctostaphylos uva-ursi*, *Trifolium dasyphyllum*, *Juniperus communis*, or *Festuca idahoensis* (Jankovsky-Jones et al. 1995a, 1995b, 1995c, 1996).

### Management

No specific information is known about the management of this vegetation in the Medicine Bow National Forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This type is found at lower elevations and particularly on the eastern side of the Shoshone National Forest (Merrill et al. 1996).

### Physical environment

No additional information is known about the physical environment beyond that provided in the general information section.

### Vegetation description

Stands are most likely to have understory vegetation dominated by *Juniperus communis*, *Festuca idahoensis*, or *Leucopoa kingii* (Steele et al. 1983). Stands with an understory of *Juniperus communis* often have *Arnica cordifolia* which is a forb species requiring more mesic conditions. Apparently, these stands occur on less arid sites (Steele et al. 1983, WYNDD 1998).

### Management

No specific information is known about the management of this vegetation in the Shoshone National Forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

Quality representations of this vegetation occur at Devil Canyon (Welp et al. 1998b) and Mann Creek (Jones and Fertig 1998) Potential Research Natural Areas in the Bighorn National Forest. For the Medicine Bow, quality stands occur at Sheep Mountain (Jankovsky-Jones et al. 1996), Threemile (Jankovsky-Jones et al. 1995c), and Old Maid's Draw (Jankovsky-Jones et al. 1995b) Potential Research Natural Areas. In addition, quality representations occur at Arrow Mountain (Jones and Fertig 1999) and Bald Ridge (Fertig and Bynum 1994) Potential Research Natural Areas in the Shoshone National Forests. Of course, these stands may not be persist in the future if outbreaks of white pine blister become common in the region (Kendall 1998).

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Pinus flexilis* vegetation, as described here, falls within the *Pinus flexilis* Woodland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Pinus flexilis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Johnston 1987	<i>Pinus flexilis</i> / <i>Cercocarpus ledifolius</i> Plant Association	<i>Pinus flexilis</i> / <i>Cercocarpus ledifolius</i> Woodland Plant Association	G3G4
Welp et al. 1998a, Jones and Fertig 1998	Limber Pine / Common Juniper Plant Community	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5

Welp et al. 1998b, Welp et al. 1998c	Limber Pine / Curl-Leaf Mountain Mahogany Plant Community	<i>Pinus flexilis</i> / <i>Cercocarpus ledifolius</i> Woodland Plant Association	G3G4
Welp et al. 1998d	Limber Pine / Idaho Fescue Plant Community	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G5
<b>MEDICINE BOW NATIONAL FOREST</b>			
Johnston 1987	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Plant Association	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5
Johnston 1987	<i>Pinus flexilis</i> / <i>Leucopoa kingii</i> Plant Association	<i>Pinus flexilis</i> / <i>Festuca kingii</i> Woodland Plant Association	G3
Alexander et al. (1986)	<i>Pinus flexilis</i> / <i>Hesperochloa kingii</i> Habitat Type	<i>Pinus flexilis</i> / <i>Festuca kingii</i> Woodland Plant Association	G3
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b	Limber Pine / Idaho Fescue Plant Community	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G5
Jankovsky-Jones et al. 1995c	Limber Pine / Common Juniper Plant Community	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5
Jankovsky-Jones et al. 1995c	Limber Pine / Alpine Clover Plant Community	Not included	
Jankovsky-Jones et al. 1996	Limber Pine / Kinnikinnick Plant Community	<i>Pinus flexilis</i> / <i>Arctostaphylos uva ursi</i> Woodland Plant Association	G4
Merrill et al. 1996	Limber Pine Woodland and Scrub GAP Cover Type (42009)	N/A	
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston 1987	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Plant Association	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5
Steele et al. 1983	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Habitat Type	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5
Johnston 1987	<i>Pinus flexilis</i> / <i>Leucopoa kingii</i> Plant Association	<i>Pinus flexilis</i> / <i>Festuca kingii</i> Woodland Plant Association	G3
Steele et al. 1983	<i>Pinus flexilis</i> / <i>Hesperochloa kingii</i> Habitat Type	<i>Pinus flexilis</i> / <i>Festuca kingii</i> Woodland Plant Association	G3
Johnston 1987	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Plant Association	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G5
Steele et al. 1983	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Habitat Type	<i>Pinus flexilis</i> / <i>Festuca idahoensis</i> Woodland Plant Association	G5
Fertig and Bynum 1994, Jones and Fertig 1999	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Plant Community	<i>Pinus flexilis</i> / <i>Juniperus communis</i> Woodland Plant Association	G5
Merrill et al. 1996	Limber Pine Woodland and Scrub GAP Cover Type (42009)	N/A	

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Pinus flexilis* vegetation type that we're describing falls within the Limber Pine forest cover type (219).

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)**

The *Pinus flexilis* vegetation type does not correspond to any SRM rangeland cover type.

**REFERENCES**

Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>



Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

DeVelice, Robert L. and Peter Lesica. 1993. Plant community classification for vegetation on BLM lands, Pryor Mountains, Carbon County, Montana. Montana Natural Heritage Program, Helena MT. 78 pp. <U93DEV01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Bald Ridge research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER13WYUS>

Fischer, W.C. and B.D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experimental Station, Ogden, UT. <N83FIS41WYUS>

Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN02WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN08WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN11WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished.

Jones, G.P. and W. Fertig. 1999. Ecological Evaluation of the Potential Arrow Mountain Research Natural Area within the Shoshone National Forest, Fremont County, Wyoming. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U99JON02WYUS>

Kendall, Katherine C. 1998. Limber pine. Page 486 in: Mac, Michael J. (project director). Status and trends of the nation's biological resources. Volume 2. USDI Geological Survey.

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>
- Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister. 1983. Forest Habitats of Eastern Idaho-Western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. <N83STE01WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL07WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Pete's Hole research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL09WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998d. Ecological evaluation of the potential Dry Fork research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL10WYUS>
- Wyoming Natural Diversity Database. 1998. Characterization abstract for *Pinus flexilis* / *Juniperus communis* Plant Association <cegl000807>, *Pinus flexilis* / *Festuca idahoensis* Plant Association <cegl000805>, *Pinus flexilis* / *Leucopoa kingii* Plant Association <cegl000807>. University of Wyoming, Laramie, WY. Unpublished.

**CHARACTERIZATION ABSTRACT FOR  
*Pseudotsuga menziesii* Vegetation Type  
Douglas-fir Vegetation Type**

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**SUMMARY**

*Pseudotsuga menziesii* vegetation is a forest type that occurs below 8,500 feet in the montane zone. Soils are often derived from limestone, andesite, or basalt, and are well drained and aerated. Stands have an overstory dominated by trees and an understory dominated by shrubs or grasses. Management concerns include the effects of fire suppression. This type is found in the Bighorn and Shoshone National Forests and to a limited extent in the Medicine Bow National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is distributed along mountain ranges from southern Canada to northern New Mexico (Reid et al. 1999). In Wyoming, it is found throughout the state but is considered to be more common in the west (Knight 1994). This type is found on the Shoshone, Bighorn, and Medicine Bow National Forests.

**PHYSICAL ENVIRONMENT**

Stands occur below 8,500 feet in Wyoming in the montane zone (Knight 1994). This vegetation occurs on mesic north-facing aspects or ravines at lower elevations while being found on south-facing aspects or ridgetops at higher elevations (Reid et al. 1999). Soils are typically derived from limestone, andesite, or basalt, that form substrates with a basic pH (Eyre 1980, Steele et al. 1983, Knight 1994). Soils are mostly well drained and aerated (Reid et al. 1999).

**VEGETATION DESCRIPTION**

This vegetation occurs as open woodlands and closed forests depending on site productivity and fire. Less productive sites on dry slopes are more open, while mesic sites typically have a more closed canopy. Fires also influence canopy structure by naturally thinning stands (Reid et al. 1999). In fact, a second layer of trees can form without fire (Fischer and Clayton 1983). This vegetation type grades into *Abies* or *Picea* vegetation at higher elevation while grading into *Pinus ponderosa* vegetation at lower elevations (Reid et al. 1999). *Pseudotsuga menziesii* is the characteristic overstory dominant but the overstory may include *Pinus ponderosa*, *Populus tremuoides*, *Pinus contorta*, or *Pinus flexilis* (Hoffman and Alexander 1976, Steele et al. 1983). Understory vegetation in closed stands is dominated by species such as *Acer glabrum*, *Juniperus communis*, *Mahonia repens*, *Physocarpus malvaceus*, *Physocarpus monogynus*, *Spiraea betulifolia*, *Symphoricarpos albus*, *Symphoricarpos oreophilus*, *Arnica cordifolia*, *Calamagrostis rubescens*, or *Carex geyeri*. Understory vegetation of open stands is dominated by *Festuca idahoensis*, *Pseudoroegneria spicata*, or *Purshia tridentata* (Hoffman and Alexander 1976, Steele et al. 1983, Reid et al. 1999).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Fire has an important influence in shaping this vegetation according to several reviews and reports (Fischer and Clayton 1983, Peet 1988, Knight 1994, Jones and Fertig 1998, Jones and Fertig 1999a-d). In fact, maintaining stands in a more pre-settlement condition is thought to require occasional fire (Knight 1994). *Pseudotsuga menziesii* is adapted to surface fires at maturity since it has a thick layer of bark that protects the trunk. However, it also has lower limbs near the base of the trunk that can carry flames into the crown (Fischer and Clayton 1983). This architecture is not as adaptive for surface fires as trees with no lower limbs such as *Pinus ponderosa*. Based on this information, *Pseudotsuga menziesii* vegetation is no doubt adapted to high-frequency, low-intensity burns, but probably not to the degree of *Pinus ponderosa* vegetation. *Pseudotsuga menziesii* is susceptible to damage caused by dwarf mistletoe, western spruce budworm, and Douglas-fir beetle (Eyre 1980, Knight 1994). Dwarf mistletoe reduces growth while Douglas-fir beetle kills mature trees. The western spruce budworm reduces growth and with repeated defoliation eventually kills the tree (Eyre 1980).

This type can be seral or climax vegetation (Reid et al. 1999). Seral stands occur in transition zones to *Abies lasiocarpa* and *Picea engelmannii* vegetation types. In addition, *Pseudotsuga menziesii* vegetation may never reach dominance on some sites due to disturbance. For example, short fire intervals can maintain *Pinus ponderosa* on some sites at lower elevations that would otherwise be replaced by *Pseudotsuga menziesii* (Fischer and Clayton 1983). At higher elevations, *Pinus contorta* vegetation can persist on a site if *Pseudotsuga menziesii* seedlings are continually destroyed by fire (Fischer and Clayton 1983).

#### STATUS AND TRENDS

For this vegetation, most of the plant associations found in the three forests are considered abundant. However, the *Pseudotsuga menziesii* / *Purshia tridentata* plant association has a G3Q conservation rank, meaning it is uncommon (Anderson et al. 1998). See the section entitled "Representations on the Three Forests" for a complete list of associations and ranks. In general, suppression of fires has led to changes in the structure of this vegetation from pre-settlement conditions that tended to be more open and possibly park-like in appearance (Fischer and Clayton 1983, Knight 1994, Jones and Fertig 1999a-d).

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

Stands are low to moderately productive for timber harvesting. This vegetation may provide some forage depending on the productivity of the undergrowth, and it tends to be used more by wildlife than livestock (Hoffman and Alexander 1976, Steele et al. 1983).

##### Effects of Management Practices

Fire is the main management concern for this vegetation. Without fire, dense thickets of *Pseudotsuga menziesii* saplings can develop below the canopy, increasing live fuels load and the danger of stand-replacing fires. Prescribed fires can reduce the risk of catastrophic wildfires by removing understory fuels (Fischer and Clayton 1983). Fire return intervals have been estimated at 5-20 years for dry sites and 42 years for moist sites (Fischer and Clayton 1983). However, fire return intervals that are too short may lead to maintenance of seral vegetation such as *Pinus ponderosa* (Fischer and Clayton 1983).

### SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

#### BIGHORN NATIONAL FOREST

##### Distribution

This vegetation occurs at lower elevations on the eastern and western slopes of the Bighorn Mountain Range (Hoffman and Anderson 1976, Merrill et al. 1996). Despain (1973) considered this vegetation to extend the full length of the eastern and western slopes as well as the southern third of summit.

##### Physical environment

Stands are found between 6,100 and 8,600 feet on soils derived from limestone or dolomite. On the eastern slopes, this type grows on more mesic sites than those dominated by *Pinus ponderosa* vegetation. In contrast, this vegetation occurs on the drier sites of the western slopes while stands of *Picea engelmannii* grow on the moister sites (Hoffman and Alexander 1976).

##### Vegetation description

*Pseudotsuga menziesii* dominates the overstory, but *Pinus ponderosa* and *Pinus flexilis* may be present in lower-elevation stands while *Abies lasiocarpa* and *Picea engelmannii* may be found in the high-elevation stands. The most common understory dominants are *Mahonia repens*, *Juniperus communis*, *Physocarpus monogynus*, and *Spiraea betulifolia* (Hoffman and Alexander 1976, Welp et al. 1998a, Welp et al. 1998b, Welp et al. 1998c, Welp et al. 1998d, Welp et al. 1998e).

##### Management

Stands can be harvested for timber, but Hoffman and Anderson (1983) consider site indexes to be relatively low. Despain (1973) noted that most stands with merchantable timber were cut during the time of settlement. For the most part, this vegetation does not support livestock grazing but can provide browse for wildlife. Stands

accumulate some snow in the winter that provides runoff for the regional watersheds. However, the snowpack is much smaller than that found in higher elevation forest (Hoffman and Alexander 1976).

## MEDICINE BOW NATIONAL FOREST

### Distribution

This vegetation is uncommon in the Medicine Bow National Forest only occurring in localized areas such as Pole Mountain and western edge of the Snowy Range (Alexander et al. 1986).

### Physical environment

No additional information is known about the physical environment beyond that provided in the general information section.

### Vegetation description

The overstory is dominated by *Pseudotsuga menziesii*, while a variety of species dominate the understory including *Arctostaphylos uva-ursi*, *Juniperus communis*, *Physocarpus monogynus*, *Pushia tridentata*, *Mahonia repens*, *Festuca idahoensis*, *Carex geyeri*, or *Spiraea betulifolia* (Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b, Jankovsky-Jones et al. 1995c, Jankovsky-Jones et al. 1996, Jones and Fertig 1998).

### Management

No specific information is known about the management of this vegetation beyond that provided in the general information section.

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation is distributed throughout the Shoshone National Forest (Merrill et al. 1996).

### Physical environment

Stands often occur at lower elevations on soils derived from limestone, andesite, or basalt (Steele et al. 1983).

### Vegetation description

This vegetation type grades into shrub or grassland vegetation at lower elevations, while it grades into *Picea engelmannii* or *Abies lasiocarpa* vegetation at higher elevations. The overstory is dominated by *Pseudotsuga menziesii* but other trees may be present such as *Pinus contorta*, *Pinus flexilis*, and *Populus tremuloides* (Steele et al. 1983). At Sheep Mesa Potential Research Natural Area, Jones and Fertig (1999d) found stands with a mixture of *Pseudotsuga menziesii*, *Picea engelmannii*, *Pinus albicaulis*, and *Pinus contorta*. Such a mixture of overstory trees may represent a seral stage in succession, but Jones and Fertig (1999d) did not speculate on this possibility. Understory dominants include *Arnica cordifolia*, *Physocarpus malvaceus*, *Acer glabrum*, *Symphoricarpos albus*, *Spiraea betulifolia*, *Juniperus communis*, and *Symphoricarpos oreophilus*. In addition, less common understory dominants include *Calamagrostis rubescens*, *Mahonia repens*, and *Festuca idahoensis* (Steele et al. 1983).

### Management

This vegetation has low to moderate timber production with the exception of stands having an understory of *Mahonia repens*. *Mahonia repens* dominates the understory of stands that have moderate to high timber production. Regeneration can be problematic following timber harvesting if there is a thick growth of shrubs or grasses. Therefore, some site preparation may be necessary for tree regeneration. *Pinus contorta* can be the first trees to establish if there is a seed source. Sites are typically frequented more by wildlife for cover and forage than by livestock (Steele et al. 1983).

## AREAS WITH HIGH-QUALITY OCCURRENCES

The effect of fire suppression is an important consideration for evaluating the quality of a stand. However, this assessment is rarely made and so the following list of areas is tentative. Possible quality representations of this vegetation include Bald Mountain (Fertig and Bynum 1994), Arrow Mountain (Jones and Fertig 1999a), Lake Creek (Jones and Fertig 1999c), and Sheep Mesa (Jones and Fertig 1999d) Potential Research Natural Areas in the

Shoshone National Forest. In the Bighorn National Forest, possible quality representations include Shell Canyon Research Natural Area (Ryan et al. 1994) as well as Mann Creek (Jones and Fertig 1998), Tongue River (Welp et al. 1998a), Elephant Head (Welp et al. 1998b), and Devil Canyon (Welp et al. 1998d) Potential Research Natural Areas. In the Medicine Bow National Forest, possible quality representations include Platte Ridge and North Platte River Canyon (Jankovsky-Jones et al. 1995a), Old Maid's Draw (Jankovsky-Jones et al. 1995b), Threemile (Jankovsky-Jones et al. 1995c), and Sheep Mountain (Jankovsky-Jones et al. 1996) Potential Research Natural Areas. The effect of fire suppression needs to be evaluated for specific stands in each location.

### RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

#### GENERAL COMMENTS

*Pseudotsuga menziesii* vegetation, as described here, falls within the *Pseudotsuga menziesii* Forest and Woodland Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

#### REPRESENTATION ON THE THREE FORESTS

The *Pseudotsuga menziesii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Despain 1976	<i>Pseudotsuga menziesii</i> Forests	Unknown	
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Forest Plant Association	G4
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Hoffman and Alexander 1976	<i>Pseudotsuga menziesii</i> / <i>Berberis repens</i> Habitat Type	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Forest Plant Association	G5
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Forest Plant Association	G5
Hoffman and Alexander 1976, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Physocarpus monogynus</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G4
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest Plant Association	G5
Welp et al. 1998d	Douglas-fir / Oregon Grape – Common Juniper Plant Community	Unknown	
Jones and Fertig 1998, Welp et al. 1998a, Welp et al. 1998e	Douglas-fir / Common Juniper Plant Community	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Jones and Fertig 1998, Ryan et al. 1994, Welp et al. 1998b, Welp et al. 1998e	Douglas-fir / Mountain Ninebark Plant Community	<i>Pseudotsuga menziesii</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G4
Jones and Fertig 1998, Welp et al. 1998c, Welp et al. 1998e	Douglas-fir / Shinyleaf Spiraea Plant Community	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest Plant Association	G5
Merrill et al. 1996	Douglas fir Gap Cover Type (42003)	N/A	

MEDICINE BOW NATIONAL FOREST			
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Physocarpus monogynus</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Physocarpus monogynus</i> Forest Plant Association	G4
Jankovsky-Jones et al. 1995a	Douglas-fir / Antelope Bitterbrush Plant Community	<i>Pseudotsuga menziesii</i> / <i>Purshia tridentata</i> Woodland Plant Association	G3Q
Jankovsky-Jones et al. 1995a	Douglas-fir / Kinnikinnick-Common Juniper Plant Community	Unknown	
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1995b, Jankovsky-Jones et al. 1995c	Douglas-fir / Elk Sedge Plant Community	<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Forest Plant Association	G4?
Jankovsky-Jones et al. 1996	Douglas-fir / Common Juniper Plant Community or Association	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Jankovsky-Jones et al. 1996	Douglas-fir / Oregon Grape Plant Community	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Forest Plant Association	G5
Jankovsky-Jones et al. 1996	Douglas-fir / Idaho Fescue Plant Community	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Forest Plant Association	G4
Merrill et al. 1996	Douglas fir Gap Cover Type (42003)	N/A	
SHOSHONE NATIONAL FOREST			
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Arnica cordifolia</i> Forest Plant Association	G4
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest Plant Association	G4?
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Forest Plant Association	G4?
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Calamagrostis rubescens</i> Forest Plant Association	G5
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Forest Plant Association	G4
Steele et al. 1983, Johnston 1987, Fertig and Bynum 1994, Jones and Fertig 1999a	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Habitat Type, Plant Association, or Plant Community	<i>Pseudotsuga menziesii</i> / <i>Juniperus communis</i> Forest Plant Association	G4
Steele et al. 1983	<i>Pseudotsuga menziesii</i> / <i>Berberis repens</i> Habitat Type	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Forest Plant Association	G5
Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Plant Association	<i>Pseudotsuga menziesii</i> / <i>Mahonia repens</i> Forest Plant Association	G5
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Physocarpus malvaceus</i> Forest Plant Association	G5
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest Plant Association	G5
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos albus</i> Forest Plant Association	G5
Steele et al. 1983, Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Habitat Type or Plant Association	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest Plant Association	G5

Johnston 1987	<i>Pseudotsuga menziesii</i> / <i>Vaccinium globulare</i> Plant Association	Unknown	
Jones and Fertig 1999b	Douglas-fir / Idaho Fescue Plant Community	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Forest Plant Association	G4
Jones and Fertig 1999b	Douglas-fir / Bluebunch Wheatgrass Plant Community	<i>Pseudotsuga menziesii</i> / <i>Pseudoroegneria spicata</i> Woodland Plant Association	G4
Jones and Fertig 1999c	Douglas-fir / Idaho Fescue? Plant Community	<i>Pseudotsuga menziesii</i> / <i>Festuca idahoensis</i> Forest Plant Association	G4
Jones and Fertig 1999d	Douglas-fir / Shiny Leaf Spiraea Plant Community	<i>Pseudotsuga menziesii</i> / <i>Spiraea betulifolia</i> Forest Plant Association	G5
Jones and Fertig 1999b, Jones and Fertig 1999d	Douglas-fir / Common Snowberry Plant Community	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest Plant Association	G5
Jones and Fertig 1999d	Douglas-fir / Rocky Mountain Maple Plant Community	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest Plant Association	G4?
Merrill et al. 1996	Douglas fir Gap Cover Type (42003)	N/A	

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Pseudotsuga menziesii* vegetation type that we're describing falls within the Interior Douglas-Fir forest cover type (210).

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Pseudotsuga menziesii* vegetation type does not correspond to any SRM rangeland cover type.

### REFERENCES

- Alexander, Robert R., George R. Hoffman, and John M. Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-217. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 39 pp. <N86ALE02WYUS>
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. <A73DES01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Bald Ridge research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER13WYUS>
- Fischer, W.C. and B.D. Clayton. 1983. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experimental Station, Ogden, UT. <N83FIS41WYUS>
- Hoffman, George R. and Robert R. Alexander. 1976. Forest vegetation of the Bighorn Mountains, Wyoming: a habitat type publication. USDA Forest Service Research Paper RM-170. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 38 pp. <B76HOF01WYUS>



Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN08WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential Threemile research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN11WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>

Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>

Jones, G.P. and W. Fertig. 1999a. Ecological Evaluation of the Potential Arrow Mountain Research Natural Area within the Shoshone National Forest, Fremont County, Wyoming. Report Prepared for the Shoshone National Forest, USDA Forest Service. Unpublished. <U99JON02WYUS>

Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON04WYUS>

Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Lake Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON05WYUS>

Jones, George P. and Walter Fertig. 1999d. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <N99JON08WYUS>

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Ryan, Michael G., Linda A. Joyce, Tom Andrews, and Kate Jones. 1994. Research natural areas in Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 57 pp. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Steele, R., S.V. Cooper, D.M. Ondov, D.W. Roberts, and R.D. Pfister. 1983. Forest Habitats of Eastern Idaho-Western Wyoming. USDA Forest Service General Technical Report INT-144. Intermountain Forest and Range Experiment Station, Ogden, UT. <N83STE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Elephant Head research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL02WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Tensleep Canyon research natural area within the Bighorn National Forest, Washakie County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL03WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998d. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL07WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998e. Ecological evaluation of the potential Dry Fork research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL10WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Populus angustifolia* Vegetation Type  
Narrowleaf Cottonwood Name Vegetation Type**

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**SUMMARY**

*Populus angustifolia* vegetation is a forest or woodland type in riparian areas. Stands typically grow on sandbars, alluvial terraces, and floodplains. Soils are coarse-textured with a large amount of gravel and cobbles. Stands have a tree-dominated overstory and shrub- or herbaceous-dominated understory. Understory vegetation can be browsed or grazed, but overuse can open sites to exotic plant invasion. This type is found in the Bighorn, Medicine Bow, and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is known from the Rocky Mountains and Great Basin Region, occurring in mid to lower elevations in the montane zone (Reid et al. 1999). This type is found in the Bighorn, Medicine Bow, and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

Stands grow along streams and rivers on terraces, floodplains, and sandbars, one to three meters above the moving water (Reid et al. 1999). The dominant tree, *Populus angustifolia*, typically establishes on sandbars which are affected by the meandering of the river or stream (Hansen et al. 1995). Akashi (1988) demonstrated that the placement of a dam on the Bighorn River has diminished its meandering and reduced establishment of *Populus deltoides* (Akashi 1988). Soils are sandy loams to silty clays with a large proportion of cobbles and gravel (Hansen et al. 1995, Reid et al. 1999). The profiles are well drained and aerated due to rapid flushing of water through the coarse textured soils (Hansen et al. 1995).

**VEGETATION DESCRIPTION**

Stands have a tree-dominated overstory and a shrub- or herbaceous- dominated understory. The overstory trees grow to 30 feet in height and produce canopy cover ranging from 60 to 100% (Reid et al. 1999). The characteristic tree is *Populus angustifolia* contributing up to 70% of the cover (Reid et al. 1999). Other trees may be present including *Populus deltoides*, *Acer negundo*, *Pinus ponderosa*, *Juniperus scopulorum*, and *Pseudotsuga menziesii* (Hansen et al. 1995, WYNDD 1998). The understory can be dominated by a variety of species including *Cornus sericea*, *Betula occidentalis*, *Alnus incana*, *Prunus virginiana*, *Rosa* spp., *Salix* spp., *Symphoricarpos* spp., and *Actaea rubra* (Jones 1992, Girard et al. 1997, WYNDD 1998). In addition, an exotic plant *Poa pratensis* often dominates the understory in this vegetation (Padgett et al. 1989, Jones 1992, Hansen et al. 1995, Girard et al. 1997). Other exotic plants can be present including *Agrostis stolonifera*, *Bromus inermis*, and *Phleum pratense* (Hansen et al. 1995). Hansen et al. (1995) consider these stands degraded examples, resulting from disturbance. *Elymus glaucus*, *Maianthemum stellatum*, *Galium* spp., *Equisetum arvense*, and *Clematis ligusticifolia* may also be present (WYNDD 1998).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

This vegetation colonizes recently formed sandbars and is an early to mid-successional sere in primary succession (Hansen et al. 1995, Reid et al. 1999). Evidently, *Populus angustifolia* seedlings are most successful establishing in moist, sunny environments (Hansen et al. 1995). Initially, seedlings and saplings of *Populus angustifolia* form stands with grasses and forbs. Such young stands are not particularly stable and may be destroyed by severe flooding (Jones 1992, Hansen et al. 1995, Walford et al. 1997). However, some stands escape severe floods and continue to mature. The surface level of stands rises further above the moving water over time due to stream downcutting and sediment deposition from minor flooding (Akashi 1988). This reduces the amount of flooding, and is accompanied by establishment of understory plants such as *Salix* spp., *Cornus sericea*, or *Betulis occidentalis* (Hansen et al. 1995). Late in succession, *Populus angustifolia* trees begin to die and are replaced by coniferous, grassland, or shrub vegetation (Padgett et al. 1989, Jones 1992, Hansen et al. 1995). Stands are

susceptible to plant invasion because of the high degree of disturbance in riparian areas from flooding, livestock/wildlife use, and recreation (Jones 1992, Hansen et al. 1995, Jankovsky-Jones et al. 1995a, Welp et al. 1998a, Welp et al. 1998c, Walford et al. 1997). In addition, fires can lead to catastrophic disturbances that completely destroy mature stands. However, younger stands can withstand some burning since trees in sapling to early mature stages regenerate by sprouting (Hansen et al. 1995). Stands can be browsed or grazed depending on the understory vegetation as well as provide habitat for birds and small mammals (Padgett et al. 1989, Hansen et al. 1995). Beavers also use the trees for forage and as building materials (Jones 1992).

This vegetation is a seral stage in succession (Hansen et al. 1995). Padgett et al. (1989) suggest that succession occurs in the understory as the *Populus angustifolia* overstory is aging. Shifting of the meandering stream or river channel away from the stand leads to drier conditions. In turn, this causes successional replacement of understory dominants (Padgett et al. 1989). Hansen et al. (1995) consider changes in the understory to result from disturbance including overgrazing and heavy browsing. Both mechanisms probably have the same effect on understory composition but for different reasons. Eventually, grass, shrub, or coniferous vegetation replaces this type in succession.

#### STATUS AND TRENDS

For this vegetation, several plant associations in the three forests have conservation ranks from G1 to G3, meaning they are rare to uncommon. Those associations include *Populus angustifolia* / *Betula occidentalis*, *Populus angustifolia* / *Rosa woodsii*, and *Populus angustifolia* / *Prunus virginiana* forest types. In contrast, the *Populus angustifolia* / *Cornus sericea* plant association has a G4 conservation rank, meaning it is abundant. There are plant associations occurring in the three forests that are not recognized by the National Vegetation Classification. No information is available about their conservation ranks (Anderson et al. 1998). See the section “Representations on the Three Forests” for a complete list of associations.

#### MANAGEMENT CONSIDERATIONS

##### Economic Uses

Depending on the understory, stands can be used for grazing or browsing by livestock and wildlife (Padgett et al. 1989, Hansen et al. 1995). Stands may also provide cover for large ungulates (Padgett et al. 1989). Birds including blue herons and osprey are known to nest in the overstory of this vegetation. Smaller birds and mammals use shrub-dominated understories for forage and cover (Hansen et al. 1995). Timber harvesting is possible in this vegetation, but regeneration of tree cover is fairly limited following maturity, making this practice unsustainable (Hansen et al. 1995).

##### Effects of Management Practices

Moderate forage production is possible in this vegetation, and can be enhanced by limiting early spring grazing (Hansen et al. 1995). Heavy browsing can lead to dominance by *Symphoricarpos occidentalis* and *Rosa* spp., as well as increasing abundance of grasses. Hansen et al. (1995) suggest that *Cornus sericea* is the main decreaser because it is thought to be excellent forage for livestock and wildlife. Padgett et al. (1989) do not share this view and suggest *Cornus sericea* is only lightly browsed. They consider replacement of *Cornus sericea* just part of succession as a stream or river shifts away from the stand. However, both mechanisms may cause the shifts in understory dominants, and it just depends on the circumstances. Jones (1992) recommends that managers carefully consider any plans to create dams or divert water from the streams and rivers. Such activities can reduce flooding that is necessary for the creation of sandbars and the subsequent colonization of *Populus angustifolia*. This vegetation eventually stabilizes banks of streams which reduces erosion during floods (Hansen et al. 1995). Hansen et al. (1995) advocate fire for restoration of degraded understories if the trees are in the sapling to early-mature stages of development. If stands are burned for restoration purposes, managers should closely monitor grazing pressure for five years after burning (Hansen et al. 1995).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This type is common at lower elevations in the Bighorns (Girard et al. 1997).

#### Physical environment

This vegetation is mostly found along high-gradient streams in narrow canyons. However, some stands also occur on low to medium gradient streams (Girard et al. 1997).

#### Vegetation description

While the overstory is dominated by *Populus angustifolia*, common understory dominants include *Prunus virginiana*, *Actaea rubra*, and *Rosa woodsii*. Common associates in the overstory include *Acer glabrum*, *Juniperus scopulorum*, *Pseudotsuga menziesii*, *Populus tremuloides*, and *Acer negundo*. Additional understory dominants include *Symphoricarpos* spp, *Mahonia repens*, *Aster* spp., *Poa pratensis*, *Cornus sericea*, *Ribes* spp. Disturbance opens stands to invasion by *Poa pratensis*, *Cynoglossum officinale*, and *Bromus inermis* (Girard et al. 1997).

#### Management

Girard et al. (1997) consider this vegetation an important part of the mosaic in the calving ground for elk in Tensleep Canyon.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

Merrill et al. (1996) mapped this vegetation type as part of the Forest-Dominated Riparian GAP Cover Type (61001). These areas occur along the streams at lower elevations in the Medicine Bow National Forest (Jones 1992, Merrill et al. 1996).

#### Physical environment

Stands are found in valleys that are moderately wide with low gradient streams (Jones 1992).

#### Vegetation description

*Populus angustifolia* can be the sole dominant of the overstory, but it may share dominance with successional species such as *Picea pungens* or *Juniperus communis*. Common shrubs include *Salix* spp., *Alnus incana*, and *Artemisia cana*. Understory cover is typically sparse and often dominated by the exotic plant *Poa pratensis* (Jones 1992).

#### Management

The future of this vegetation is dependent upon dynamic streams and rivers that occasionally flood the surrounding areas (Jones 1992). Jones (1992) recommends careful consideration of any management plans to dam or divert water from rivers. Alteration of natural flooding regimes will have consequences for this vegetation.

### SHOSHONE NATIONAL FOREST

#### Distribution

Merrill et al. (1996) mapped this vegetation as part of the Forest-Dominated GAP Cover Type (61001). Such areas occur in isolated pockets on low elevation streams in the Shoshone National Forest (Merrill et al. 1996).

#### Physical environment

Stands are found on floodplains, terraces, and sandbars (Walford et al. 1997).

#### Vegetation description

Stands can have two layers of trees in any of the forest. A case example from the Shoshone National Forest is a stand of *Populus angustifolia* with a subcanopy dominated by *Juniperus scopulorum*. Walford et al. (1997)

speculate that this is a case of succession in which *Juniperus scopulorum* is replacing *Populus angustifolia* as the canopy dominant. The understory of this stand is dominated by *Betula occidentalis* (Walford et al. 1997).

Management

No specific information is known about the management of this vegetation in the Shoshone National Forest.

**AREAS WITH HIGH-QUALITY OCCURRENCES**

Riparian areas are often disturbed by recreational activities in addition to heavy use from livestock and wildlife (Jankovsky-Jones et al. 1995a, Welp et al. 1998a). Such activities are common and unfortunately may degrade the vegetation. However, some areas have quality stands, which have presumably not been subject to heightened disturbance. Those areas include Elephant Head Potential Research Natural Area in the Bighorn National Forest (Welp et al. 1998b), Sheep Mountain Potential Research Natural Area in the Medicine Bow National Forest (Jankovsky-Jones et al. 1996), as well as the Grizzly Creek and Arrow Mountain Potential Research Natural Areas in the Shoshone National Forest (Jones and Fertig 1999a, Jones and Fertig 1999b). Stands in these areas are small, but this is probably typical for the three forests.

**RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

**GENERAL COMMENTS**

*Populus angustifolia* vegetation, as described here, falls within the *Populus angustifolia* Temporarily Flooded Forest and Woodland Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

**REPRESENTATION ON THE THREE FORESTS**

The *Populus angustifolia* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Johnston 1987	<i>Populus angustifolia</i> / <i>Betula fontinalis</i> – <i>Ribes</i> spp. Plant Association	Unknown	
Johnston 1987	<i>Populus angustifolia</i> / <i>Physocarpus monogynus</i> – <i>Padus virginiana</i> Plant Association	Unknown	
Johnston 1987	<i>Populus angustifolia</i> / <i>Salix exigua</i> – <i>Betula fontinalis</i> Plant Association	Unknown	
Girard et al. 1997	Narrowleaf Cottonwood / Common Chokecherry Ecological Type	<i>Populus angustifolia</i> / <i>Prunus virginiana</i> Forest Plant Association	G2G3
Girard et al. 1997	Narrowleaf Cottonwood / Red Baneberry Ecological Type	Unknown	
Girard et al. 1997	Narrowleaf Cottonwood / Wood’s Rose Ecological Type	<i>Populus angustifolia</i> / <i>Rosa woodsii</i> Forest Plant Association	G2G3
Welp et al. 1998a	Narrow-leaved Cottonwood / Red-Osier Dogwood Plant Community	<i>Populus angustifolia</i> / <i>Cornus sericea</i> Woodland Plant Association	G4
Welp et al. 1998b	Narrowleaf Cottonwood / Wood’s Rose? Plant Community	<i>Populus angustifolia</i> / <i>Rosa woodsii</i> Forest Plant Association	G2G3
Welp et al. 1998c	Narrowleaf Cottonwood / Red-Osier Dogwood Plant Community	<i>Populus angustifolia</i> / <i>Cornus sericea</i> Woodland Plant Association	G4
Welp et al 1998a, Welp et al. 1998d	Narrow-leaved Cottonwood / Mountain Ninebark – Common Chokecherry Plant Community	Unknown	
Merrill et al. 1996	Forest-Dominated Riparian GAP Cover Type (61001)	N/A	

MEDICINE BOW NATIONAL FOREST			
Johnston 1987	<i>Populus angustifolia</i> / <i>Salix exigua</i> – <i>Betula fontinalis</i> Plant Association	Unknown	
Jones 1992	<i>Populus angustifolia</i> Series	N/A	
Jones 1992	<i>Populus angustifolia</i> / <i>Poa pratensis</i> Plant Community	Unknown	
Jones 1992	<i>Populus angustifolia</i> seedlings and saplings Series	N/A	
Jones 1992	<i>Populus angustifolia</i> / Recent Alluvial Bar Plant Community	Unknown	
Jankovsky-Jones et al. 1995c	Narrowleaf Cottonwood / Sandbar Willow – River Birch Plant Community	Unknown	
Jankovsky-Jones et al. 1995c	Narrowleaf Cottonwood / Thinleaf Alder – Redosier Dogwood Plant Community	Unknown	
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1996	Narrowleaf Cottonwood / Sandbar Willow-Water Birch Plant Community	Unknown	
Merrill et al. 1996	Forest-Dominated Riparian GAP Cover Type (61001)	N/A	
SHOSHONE NATIONAL FOREST			
Johnston 1987	<i>Populus angustifolia</i> / <i>Salix exigua</i> – <i>Betula fontinalis</i> Plant Association	Unknown	
Walford et al. 1997	<i>Populus angustifolia</i> / <i>Betula occidentalis</i> Plant Community	<i>Populus angustifolia</i> / <i>Betula occidentalis</i> Forest Plant Association	G1G3
Walford et al. 1997	<i>Populus angustifolia</i> / Recent Alluvial Bar Plant Community	Unknown	
Jones and Fertig 1999a	<i>Populus angustifolia</i> / <i>Rosa woodsii</i> Plant Community	<i>Populus angustifolia</i> / <i>Rosa woodsii</i> Forest Plant Association	G2G3
Jones and Fertig 1999b	Narrowleaf Cottonwood – Douglas-fir Plant Community	Unknown	
Merrill et al. 1996	Forest-Dominated Riparian GAP Cover Type (61001)	N/A	

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Populus angustifolia* vegetation type that we're describing falls within the Cottonwood-Willow forest cover type (235).

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Populus angustifolia* vegetation type that we're describing falls within the Riparian Rangeland Cover Type (SRM 422).

### REFERENCES

Akashi, Y. 1988. Riparian vegetation dynamics along the Bighorn River. Master's Thesis, University of Wyoming, Laramie, Wyoming. <U88AKA01WYUS>

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

- Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>
- Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential LaBonte Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN10WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George. 1992. A preliminary classification of riparian vegetation types of the Medicine Bow Range and Sierra Madre. A report prepared in fulfillment of cost-share agreement number 0206-90-01 between the Medicine Bow National Forest and The Nature Conservancy. Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U92JON02WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished.
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON04WYUS>
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. <N89PAD01WYUS>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>



Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Elephant Head research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL02WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Tensleep Canyon research natural area within the Bighorn National Forest, Washakie County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL03WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998d. Ecological evaluation of the potential Pheasant Creek research natural area within the Bighorn National Forest, Johnson County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL04WYUS>

Wyoming Natural Diversity Database. 1998. Characterization abstract for the *Populus angustifolia* / *Prunus virginiana* Woodland (cegl000651), *Populus angustifolia* / *Betula occidentalis* Forest (cegl000648), *Populus angustifolia* / *Cornus sericea* Forest (cegl000649), and *Populus angustifolia* / *Rosa* spp. Forest (cegl000653). University of Wyoming, Laramie, WY. Unpublished.

**CHARACTERIZATION ABSTRACT FOR**  
***Betula occidentalis* Vegetation Type**  
**Water Birch Vegetation Type**

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**SUMMARY**

*Betula occidentalis* vegetation is a shrubland type, occurring along fast moving streams in the mountains and foothills. Soils are comprised of alluvial material with a coarse to fine texture. Stands potentially have three layers, designated the tall shrub, short shrub and herbaceous layers. Trees may contribute sparse cover in some stands. Exotic plants can readily invade this vegetation, particularly if overgrazed. This type is known to occur in the Bighorn and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation occurs in western United States including the Rocky Mountain Region (Reid et al. 1999). It is known to occur in the Bighorn and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

Stands are found at low elevations in the foothills and mountains, occurring along fast moving streams on banks, alluvial terraces, and floodplains (Hansen et al. 1995). Soils are comprised of alluvial material with coarse to fine textures and large amounts of rock fragments (Padgett et al. 1989, Hansen et al. 1995). Surface layers can contain 50 to 90% organic matter (Reid et al. 1999).

**VEGETATION DESCRIPTION**

Stands have a tall shrub layer that can reach heights of 6 to 16 feet with 60 to 100% cover. In addition, stands have shorter layers of shrubs and herbaceous plants as well as sparse cover of trees (Reid et al. 1999). The characteristic species is *Betula occidentalis* but other shrubs may be present or even co-dominate, including *Cornus sericea*, *Alnus incana*, *Rosa* spp., *Ribes* spp., and *Salix* spp (Padgett et al. 1989, Walford et al. 1997). A variety of species occur in the herbaceous layer, such as *Carex rostrata*, *Calamagrostis canadensis*, *Juncus balticus*, and *Equisetum arvense* (Chadde et al. 1988, Hansen et al. 1995, Walford et al. 1997). Exotic plants may also be present, particularly *Poa pratensis* and *Agrostis stolonifera* (Hansen et al. 1995).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

This vegetation provides forage for grazers, but overuse can open stands to invasion by exotic plants. In fact, the exotic plant *Poa pratensis* is a common species in the understory of this vegetation (Hansen et al. 1995). Wildlife use stands for cover and may browse *Betula occidentalis* if other forage is scarce. *Betula occidentalis* reprints after fires or other disturbances as long as the basal buds are not damaged (Hansen et al. 1995). Stands are also beneficial for stabilizing stream banks (Hansen et al. 1995). This vegetation is a seral stage in succession eventually being replaced by conifers or *Salix* spp. vegetation (Hansen et al. 1995). Hansen et al. (1995) suggest that overuse favors succession to *Salix* spp. vegetation.

**STATUS AND TRENDS**

For this vegetation, only the *Betula occidentalis* / *Cornus sericea* plant association is known to occur in the three forests. It has a G2/G3 conservation rank, meaning it is rare or uncommon (Anderson et al. 1998).

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Stands provide forage for grazers but the shrubs can become too dense for livestock to feasibly navigate. Wildlife use this vegetation as cover and may browse *Betula occidentalis* if there is low cover of other shrub species (Hansen et al. 1995).

### Effects of Management Practices

Overgrazing can be problematic opening stands to invasion by exotic plants. Hansen et al. (1995) suggest limiting grazing at least in the spring to increase forage production.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

This vegetation is a minor type occurring at low elevations in the Bighorn National Forest (Girard et al. 1997).

#### Physical environment

Stands mostly grow in narrow valleys on alluvium derived from granitic bedrock (Girard et al. 1997).

#### Vegetation description

According to Girard et al. (1997), stands are dominated by *Betula occidentalis* but there is also relatively high cover of *Cornus sericea*, *Rosa* spp., and *Spiraea betulifolia*.

#### Management

No specific information is known about the management of this vegetation in the Bighorn National Forests.

### **MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **SHOSHONE NATIONAL FOREST**

#### Distribution

Only one stand has been described from the forest (Walford et al. 1997). However, this type has been mapped as part of the Shrub-Dominated Riparian GAP Cover Type (62001) along low to mid-elevation streams, suggesting that it might be common in those areas (Merrill et al. 1996).

#### Physical environment

Stands have been found in moderately wide valleys growing next to streams in floodplains (Walford et al. 1997).

#### Vegetation description

Walford et al. (1997) sampled a stand in the Shoshone National Forest that contained sparse cover of *Populus angustifolia*. The overstory shrub layer was co-dominated by *Betula occidentalis* and *Alnus incana*. The shorter shrub layer was dominated by *Cornus sericea*, while *Carex rostrata* dominated the herbaceous layer.

#### Management

No specific information is known about the management of this vegetation in the Shoshone National Forest.

### **AREAS WITH HIGH-QUALITY OCCURRENCES**

No areas have been identified as quality representations of this vegetation. Riparian areas are often invaded by exotic plants, presumably due to disturbances caused by heavy use. Lack of quality occurrences may be partly linked to this phenomenon. In addition, this type appears to be relatively rare in the three forests further reducing the chance that quality stands exist.

## **RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

### **GENERAL COMMENTS**

*Betula occidentalis* vegetation, as described here, is not recognized by Johnston (1987). However, Johnston (1987) does describe an association that may be representative of this vegetation, labelled the *Alnus incana*

ssp. *tenuifolia* – *Betula fontinalis* / *Salix* spp. Plant Association. *Betula occidentalis* vegetation falls within the *Betula occidentalis* Temporarily Flooded Shrubland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

**REPRESENTATION ON THE THREE FORESTS**

The *Betula occidentalis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Girard et al. 1997	Water Birch – Red-Osier Dogwood Community Type	<i>Betula occidentalis</i> / <i>Cornus sericea</i> Shrubland Plant Association	G2G3
Jones and Fertig 1998	Water Birch / Red-Osier Dogwood Plant Community	<i>Betula occidentalis</i> / <i>Cornus sericea</i> Shrubland Plant Association	G2G3
<b>MEDICINE BOW NATIONAL FOREST</b>			
None			
<b>SHOSHONE NATIONAL FOREST</b>			
Walford et al. 1997	<i>Betula occidentalis</i> / <i>Cornus sericea</i> Plant Community	<i>Betula occidentalis</i> / <i>Cornus sericea</i> Shrubland Plant Association	G2G3

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Betula occidentalis* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Betula occidentalis* vegetation type that we're describing falls within the Riparian Rangeland Cover Type (SRM 422).

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Chadde, S.W., P.L. Hansen, and R.D. Pfister. 1988. Wetland plant communities of the Northern Range, Yellowstone National Park. <B88CHA01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Girard, Michele, David L. Wheeler, and Stephanie B. Mills. 1997. Classification of riparian communities on the Bighorn National Forest. USDA Forest Service, Rocky Mountain Region, R2-RR097-02. <N97GIR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1998. Ecological evaluation of the Mann Creek potential research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the Bighorn National Forest, USDA Forest Service by the Wyoming Natural Diversity Database, Laramie WY. Unpublished. <U98JON01WYUS>

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. <N89PAD01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Cornus sericea* Vegetation Type  
Red-Osier Dogwood Vegetation Type**

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**SUMMARY**

*Cornus sericea* vegetation is a shrubland type, occurring along streams in the Rocky Mountains and Pacific Northwest. Soils are coarse-textured with cobbles scattered throughout the profile. Stands have a dense shrub layer and sparse herbaceous layer. This vegetation is excellent for stabilizing stream banks and reducing erosion. It is known to occur in the Bighorn National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is found in the Rocky Mountains and Pacific Northwest (Reid et al. 1999). It is apparently rare in the three forests, having been described from only the Bighorn National Forest (Welp et al. 1998).

**PHYSICAL ENVIRONMENT**

This vegetation occurs along streams in the montane zone, growing on alluvial terraces that are occasionally flooded. In addition, stands may occur near seeps. Soils are coarse textured with cobbles scattered throughout the profile and little or no horizonation (Hansen et al. 1995, Reid et al. 1999). The water table is at one to over three feet below the surface of the ground (Padgett et al. 1989). The rooting zone is well aerated since water is continually flushed through the soil (Hansen et al. 1995).

**VEGETATION DESCRIPTION**

Stands have a shrub layer and a herbaceous layer. The shrub layer is 3 to 13 feet in height and cover ranging from 50 to 90%. The herbaceous layer typically has low cover unless the shrubs have been thinned by disturbance (Hansen et al. 1995, Reid et al. 1999). *Cornus sericea* dominates the shrub layer, but other common species include *Betula occidentalis*, *Alnus incana*, *Ribes inerme*, *Acer glabrum*, *Lonicera involucrata*, and *Salix* spp. The herbaceous layer can include *Phalaris arundinacea*, *Poa palustris*, *Heracleum sphondylium*, and *Galium triflorum* (Reid et al. 1999).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Stands are occasionally flooded (Reid et al. 1999), but the role of this disturbance is not clarified. The shrubs are considered excellent forage by Hansen et al. (1995), and may be heavily browsed by wildlife and livestock. However, Padgett et al. (1989) suggest the shrubs are not browsed unless other forage is scarce. Birds and small mammals use this habitat for cover, and beavers use the shrubs for dams and forage (Hansen et al. 1995). *Cornus sericea* has large stolons and rhizomes that allow it to resprout after disturbances, such as fire, as long as these vegetative structures are not destroyed (Hansen et al. 1995). This type stabilizes stream banks, reducing erosion during floods (Padgett et al. 1989, Hansen et al. 1995). This vegetation is a seral type that is replaced by *Picea* or *Pseudotsuga menziesii* stands (Hansen et al. 1995).

**STATUS AND TRENDS**

This type contains one plant association in the National Vegetation Classification that is relevant to the three forests. The *Cornus sericea* shrubland plant association (provisional) has a G4Q conservation rank, meaning it is abundant (Anderson et al. 1998).

**MANAGEMENT CONSIDERATIONS**

Economic Uses

This vegetation may be used as browse, but there is some disagreement as to its usage. Hansen et al. (1995) consider the shrubs quality forage and heavily browsed by wildlife and livestock, while Padgett et al. (1989) suggest stands are only lightly used for forage.

### Effects of Management Practices

Livestock movement through stands is restricted because of the thick growth (Padgett et al. 1989). This vegetation may not be subject to the disturbances generated by congregating herds due to the thick growth in addition to sparse herbaceous cover. Hansen et al. (1995) suggest *Cornus sericea* is an excellent shrub for restoration of degraded streamside environments.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

Merrill et al. (1996) consider *Cornus sericea* vegetation as part of the Shrub-Dominated Riparian GAP Cover Type (62001). Such riparian areas are found in isolated pockets, mainly in the southern portion of the Bighorn National Forest (Merrill et al. 1996).

#### Physical environment

Welp et al. (1998) found this vegetation along narrow riparian corridors surrounding Leigh and Tensleep Creeks.

#### Vegetation description

*Cornus sericea* dominates this vegetation but other shrubs may be present including *Prunus virginiana*, *Ribes cereum*, and *Acer glabrum*. Welp et al. (1998) observed this vegetation grading into stands of *Pseudotsuga menziesii* and *Cercocarpus ledifolius*.

#### Management

No specific information is known about management of this vegetation in the Bighorn National Forest.

### **MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **SHOSHONE NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **AREAS WITH HIGH-QUALITY OCCURRENCES**

Welp et al. (1998) found stands growing around Leigh Creek in the Bighorns. The stands may be good representation since Leigh Canyon is not noticeably disturbed by human activity. However, Welp et al. (1998) raise serious questions about the quality of the vegetation in the general area due to exotic plant invasion and recreational use.

## **RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

### **GENERAL COMMENTS**

*Cornus sericea* vegetation, as described here, is not considered to occur in the three forests according to Johnston (1987). However, Johnston (1987) does describe *Cornus sericea* (syn. *Swida cericea*) associations from other forests in Region 2. *Cornus sericea* vegetation falls within the *Cornus sericea* Temporarily Flooded Shrubland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### **REPRESENTATION ON THE THREE FORESTS**

The *Cornus sericea* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Welp et al. 1998	Red-Osier Dogwood Riparian Shrubland Plant Community	<i>Cornus sericea</i> Shrubland Plant Association (Provisional)	G4Q
Merrill et al. 1996	Shrub-Dominated Riparian GAP Cover Type (62001)	N/A	
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
None			

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Cornus sericea* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Cornus sericea* vegetation type falls within the Riparian Rangeland Cover Type (SRM 422).

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Hansen, Paul L., Robert D. Pfister, Keith Boggs, Bradley J. Cook, John Joy, and Dan K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station Miscellaneous Publication No. 54. 646 pp. <B95HAN16WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Padgett, Wayne G., Andrew P. Youngblood, and Alma H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region, R4-Ecol-89-01. 191 pp. <N89PAD01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential Tensleep Canyon research natural area within the Bighorn National Forest, Washakie County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL03WYUS>



**CHARACTERIZATION ABSTRACT FOR  
*Festuca idahoensis* Vegetation Type  
Idaho Fescue Vegetation Type**

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**SUMMARY**

*Festuca idahoensis* vegetation is a grassland type occurring in mountain meadows at high elevations. Meadows exist in areas that are more favorable for grasses than trees or where the forest cover has been removed. Stands have two strata, a grass-dominated layer and a forb-dominated layer. This type is known to occur in the Bighorn, Medicine Bow, and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation type occurs in the Pacific Northwest south to the Modoc Plateau in California, and east to the northwestern portion of the Great Plains and southern Rocky Mountain Region (Reid et al. 1999). In Wyoming, stands occur in the mountain ranges of the Rockies (Knight 1994), including areas within the Shoshone, Medicine Bow, and Bighorn National Forests.

**PHYSICAL ENVIRONMENT**

This type grows in mountain meadows found on a wide variety of topographic positions, including gentle to steep slopes, ridgetops, and flats (Beetle 1956, Hurd 1961, Tweit and Houston 1980, Peet 1988, Knight 1994). Meadows often occur on sites that are not conducive for tree establishment. Treeless areas below timberline are the result of several phenomena, including soils too saturated with water near streams, lakes, and snow packs; soils too thin with low water holding capacities on steep slopes and ridgetops; as well as cold air drainage, frost pockets, and deep snow. Any of these areas could be dominated by *Festuca idahoensis*. In addition, disturbances such as fire or avalanches can destroy forest cover leading to meadow vegetation. Forest regeneration can take up to 500 years at high elevations, so grass vegetation can persist for long periods in burns (See Peet 1988 and Knight 1994 for further discussion). In the montane zone, precipitation falls mainly in the winter forming deep snow packs. In the spring, the snow fields melt and water seeps into the soil providing an important source of moisture for plant growth (Reid et al. 1999). Coincidentally, stands of *Festuca idahoensis* have well-developed litter layers that buffer evaporative losses of water from the soil, allowing plants to utilize more of the moisture stored in the soil from snow melt (Beetle 1956).

**VEGETATION DESCRIPTION**

Stands are divided into two strata, a grass-dominated layer and a forb-dominated layer. The grass layer grows to about three feet in height and has cover ranging from 25 to 100%. The forb layer can also reach about three feet in height with cover ranging from 0 to 60% (Reid et al. 1999). *Festuca idahoensis* is the characteristic species for the grass layer, but other possible codominants include *Carex filifolia*, *Carex inops ssp. heliophila*, *Carex obusata*, *Danthonia intermedia*, *Deschampsia cespitosa*, *Elymus smithii*, *Elymus spicatus*, *Elymus trachycaulus*, *Festuca thurberi*, *Geranium caespitosum*, *Koeleria macrantha*, *Leucopoa kingii*, *Potentilla diversifolia*, or *Stipa richardsonii* (Hurd 1961, DeVelice and Lesica 1993, Shiflet 1994, Jones and Fertig 1999b, Reid et al. 1999). Degraded stands can be invaded by *Bromus tectorum* and *Poa pratensis* (Reid et al. 1999). Species composition varies from stand to stand depending on factors such as elevation, soil characteristics, and topography.

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Festuca idahoensis* stands are an important source of forage for wildlife and livestock (Beetle 1956, Hurd 1961, Tweit and Houston 1980, Shiflet 1994). As for fire, Comer et al. (1999) report that *Festuca idahoensis* is not fire-tolerant and can be severely damaged by late summer and fall burns. However, Reid et al. (1999) report that fire is necessary to prevent replacement by trees. This vegetation is considered both climax and seral. This means fire is only necessary for regeneration in areas where *Festuca idahoensis* is not the climax type. Such areas can arise from any disturbance capable of removing the forest cover. As mentioned previously, it is climax vegetation in areas that favor grass cover over trees in the montane zone (Peet 1988, Knight 1994).

## STATUS AND TRENDS

For this vegetation, several associations have conservation ranks suggesting they are uncommon or rare. The *Festuca idahoensis* herbaceous vegetation and *Festuca idahoensis* - *Festuca kingii* plant associations have G2(?) conservation ranks, meaning they are considered rare. *Festuca idahoensis* – *Carex obtusata*, *Festuca idahoensis* – *Deschampsia cespitosa*, *Festuca idahoensis* – *Potentilla diversifolia*, and *Festuca idahoensis* – *Carex inops* ssp. *heliophila* plant associations have G3 conservation ranks, meaning they are uncommon. The remaining plant associations on the three forests have G4 conservation ranks, meaning they are abundant (Anderson et al. 1998). See the section entitled “Representations on the Three Forests” for a complete list of associations and ranks.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands are important sources of forage for livestock and wildlife (Beetle 1956, Hurd 1961, Tweit and Houston 1980, Shiflet 1994, Reid et al. 1999).

### Effects of Management Practices

Overgrazing is the chief management concern. Grazing reduces cover of the characteristic dominant, *Festuca idahoensis*, among other species (Beetle 1956, Hurd 1961, Tweit and Houston 1980). Since livestock and wildlife graze this vegetation, Tweit and Houston (1980) suggested that managers coordinate usage to prevent conflicts and overgrazing. Degraded stands lead to management problems because they are susceptible to invasion by exotic plants, such as *Bromus tectorum* and *Poa pratensis* (Reid et al. 1999).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Stands are widespread in meadows throughout the montane zone (Beetle 1956, Hurd 1961).

#### Physical environment

Meadows occur on soils overlying granitic and sedimentary rock, and the climate is humid to sub-humid. Interestingly, boundaries between the forest and meadow vegetation are easily delineated due to abrupt transition zones (Beetle 1956).

#### Vegetation description

Hurd (1961) estimated cover for stands ranging from 65% to 91%; grasses and sedges comprised 54% of the total aboveground biomass by weight. *Festuca idahoensis* is the characteristic dominant of the grass layer. In comparing stands on soils derived from sedimentary and granitic rock, Beetle (1956) found *Festuca idahoensis* constituted a larger portion of the plant cover on granitic soils than sedimentary soils. *Selagnella densa* is a characteristic associate in the stands on granitic soils (Despain 1973). Despain (1973) considered the *Festuca idahoensis* vegetation of the Bighorns unique because it lacks species commonly found in other areas. Common grasses include *Elymus trachycaulus*, *Elymus lanceolatus*, *Poa secunda*, *Koeleria macrantha*, *Danthonia intermedia*, *Carex phaeocephala*, and *Carex obtusata*. In addition, other grasses that may found in stands include *Poa interior*, *Poa fendleriana*, *Poa juncifolia* ssp. *ampla*, *Phleum alpinum*, *Leucopoa kingii*, *Stipa lettermanii*, *Trisetum spicatum*, *Trisetum wolfii*, and *Agrostis scabra* (Beetle 1956, Hurd 1961). Common forbs include *Agoseris glauca*, *Lupinus sericeus*, *Geum ciliatum*, *Achillea millefolium* ssp. *lanulosa*, *Arenaria congesta*, *Campanula rotundifolia*, *Cerastium arvense*, *Galium boreale*, and *Polygonum bistortoides* (Hurd 1961).

#### Management

Beetle (1956) considered this vegetation type the most important source of forage for grazers in the Bighorn Mountain Range. Grazing decreases the cover of *Festuca idahoensis*, *Elymus* spp., *Bromus pumpellianus*, and *Poa interior*, while it increases the cover of *Carex obtusata*, *Koeleria macrantha*, *Poa cusickii*, *Poa secunda*, and *Stipa columbiana* (Hurd 1961). Interestingly, sheep grazing at the highest elevations increases the cover of *Festuca idahoensis*, presumably due to their preference for forbs (Beetle 1956). Overgrazing can be problematic since it opens stands to invasion by exotic plants. For example, Beetle (1956) reported that overuse of moister

bottomlands by cattle had caused decreases in the cover of *Deschampsia cespitosa*, while it had increased the cover of the exotic species, *Poa pratensis*.

## MEDICINE BOW NATIONAL FOREST

### Distribution

Stands are known to occur in the Deep Creek Potential Research Natural Area (Jones and Fertig 1996) and Platte Ridge and North Platte River Canyon Potential Research Natural Area (Jankovsky et al. 1995).

### Physical environment

No additional information is known about the physical environment beyond that given in the general information section.

### Vegetation description

As with the physical environment, no additional information is known about the vegetation beyond that given in the general information section.

### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation is the most common grassland type in the montane zone, occurring on all ranger districts of the Shoshone National Forest (Tweit and Houston 1980).

### Physical environment

Stands occur in open areas that are not conducive for tree establishment. They are mostly found on gently sloping terrain, south or west facing aspects, and ridgetops (Tweit and Houston 1980).

### Vegetation description

*Festuca idahoensis* dominates the grass layer with other species including *Elymus spicatus*, *Elymus trachycaulis*, *Elymus smithii*, or *Deschampsia cespitosa*. Additional common species include *Achillea millefolium*, *Agoseris glauca*, *Antennaria rosea*, *Arenaria congesta*, *Artemisia frigida*, *Bromus ciliatus*, *Campanula rotundifolia*, *Carex* spp., *Danthonia intermedia*, *Geum triflorum*, *Leucopoa kingii*, *Koeleria macrantha*, *Luzula spicata*, *Phleum alpinum*, *Phlox hoodii*, *Poa secunda*, *Potentilla gracilis*, *Stipa comata*, and *Stipa occidentalis*. Degraded stands are invaded by *Bromus tectorum*, *Cirsium vulgare*, *Psoralea lanceolata*, *Taraxicum officinale*, and *Tragopogon dubius*. Species composition varies among stands depending on substrate, elevation, and topography (Tweit and Houston 1980).

### Management

Stands are an important source of forage for livestock and wildlife. Stands are used throughout much of the season at lower elevations while use is restricted to shorter periods at mid and high elevations. Grazing decreases the cover of dominant species including *Festuca idahoensis*, *Elymus spicatus*, and *Elymus trachycaulis*, and it increases the cover of many species including *Artemisia frigida*, *Carex* spp., *Danthonia intermedia*, *Koeleria macrantha*, *Poa cusickii*, *Poa secunda*, *Stipa comata*, and *Stipa occidentalis*. Shrub cover can also increase with grazing, depending on the amount of browsing. See Tweit and Houston (1980) for a more extensive list of increasers and decreasers. Since livestock and wildlife need this vegetation for forage, Tweit and Houston (1980) suggested that managers coordinate its usage to prevent conflicts and overgrazing. Degraded stands are problematic since they are subject to invasion by exotic plants (Tweit and Houston 1980).

## AREAS WITH HIGH-QUALITY OCCURRENCES

Quality representations occur at Sheep Mesa (Jones and Fertig 1999d), Pat O'Hara (Jones and Fertig 1999c), and Arrow Mountain (Jones and Fertig 1999a) Potential Research Natural Areas in the Shoshone National Forest. Additional quality representations occur at Bull Elk Park Research Natural Area (Ryan et al. 1994) and Devil Canyon Potential Research Natural Area (Welp et al. 1998b) in the Bighorn National Forest, as well as the Deep Creek Potential Research Natural Area (Jones and Fertig 1996) in the Medicine Bow National Forest.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Festuca idahoensis* vegetation, as described here, falls within the *Festuca idahoensis* Herbaceous Alliance, *Festuca idahoensis* Alpine Herbaceous Alliance, and *Deschampsia cespitosa* Temporarily Flooded Herbaceous Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Festuca idahoensis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Despain (1973)	<i>Festuca idahoensis</i> communities	Unknown	
Johnston 1987	<i>Festuca idahoensis</i> / <i>Roegneria spicata</i> Plant Association	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4
Hurd 1961, Johnston 1987	<i>Festuca idahoensis</i> / <i>Lupinus sericeus</i> Plant Association	<i>Festuca idahoensis</i> – <i>Carex obtusata</i> Herbaceous Vegetation Plant Association?	G3
Johnston 1987	<i>Festuca idahoensis</i> / <i>Leucopoa kingii</i> Plant Community	<i>Festuca idahoensis</i> – <i>Festuca Kingii</i> Herbaceous Vegetation Plant Association	G2?
Welp et al. 1998a	Idaho Fescue / Bluebunch Wheatgrass Plant Community	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4
Welp et al. 1998b	Idaho Fescue Grassland Plant Community	<i>Festuca idahoensis</i> Herbaceous Vegetation Plant Association	G2?
Welp et al. 1998c	Idaho Fescue / Tufted Hairgrass Plant Community	<i>Festuca idahoensis</i> – <i>Deschampsia cespitosa</i> Herbaceous Vegetation Plant Association	G3
Ryan et al. 1994	Idaho Fescue – Spike Fescue Plant Association	<i>Festuca idahoensis</i> – <i>Festuca Kingii</i> Herbaceous Vegetation Plant Association	G2?
<b>MEDICINE BOW NATIONAL FOREST</b>			
Johnston 1987	<i>Festuca idahoensis</i> / <i>Carex obtusata</i> Plant Association	<i>Festuca idahoensis</i> – <i>Carex inops</i> ssp. <i>heliophila</i> Herbaceous Vegetation Plant Association	G3
Johnston 1987	<i>Festuca idahoensis</i> / <i>Carex heliophila</i> Plant Association	<i>Festuca idahoensis</i> – <i>Carex obtusata</i> Herbaceous Vegetation Plant Association	G3
Jankovsky-Jones et al. 1995, Jones and Fertig 1996	Idaho Fescue / Bluebunch Wheatgrass Plant Community	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4

SHOSHONE NATIONAL FOREST			
Johnston 1987	<i>Festuca idahoensis</i> / <i>Trisetum spicatum</i> Plant Association	Unknown	
Johnston 1987	<i>Festuca idahoensis</i> / <i>Roegneria spicata</i> Plant Association	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4
Johnston 1987	<i>Festuca idahoensis</i> / <i>Lupinus sericeus</i> Plant Association	Unknown	
Johnston 1987	<i>Festuca idahoensis</i> / <i>Elytrigia smithii</i> Plant Association	<i>Festuca idahoensis</i> – <i>Pascopyrum smithii</i> Herbaceous Vegetation Plant Association	G4
Johnston 1987	<i>Festuca idahoensis</i> / <i>Deschampsia cespitosa</i> Plant Association	<i>Festuca idahoensis</i> – <i>Deschampsia cespitosa</i> Herbaceous Vegetation Plant Association	G3
Tweit and Houston 1980	<i>Festuca idahoensis</i> / <i>Agropyron spicatum</i> Habitat Type	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4
Tweit and Houston 1980	<i>Festuca idahoensis</i> / <i>Agropyron smithii</i> Habitat Type	<i>Festuca idahoensis</i> – <i>Pascopyrum smithii</i> Herbaceous Vegetation Plant Association	G4
Tweit and Houston 1980	<i>Festuca idahoensis</i> / <i>Agropyron caninum</i> Habitat Type	<i>Festuca idahoensis</i> – <i>Elymus trachycaulus</i> Herbaceous Vegetation Plant Association	G4
Tweit and Houston 1980	<i>Festuca idahoensis</i> / <i>Deschampsia caespitosa</i> Habitat Type	<i>Festuca idahoensis</i> – <i>Deschampsia caespitosa</i> Herbaceous Vegetation Plant Association	G3
Fertig and Bynum 1994	<i>Festuca idahoensis</i> – <i>Agropyron spicatum</i> Plant Community	<i>Festuca idahoensis</i> – <i>Pseudoroegneria spicata</i> Herbaceous Vegetation Plant Association	G4
Jones and Fertig 1999a	Idaho Fescue Plant Community	<i>Festuca idahoensis</i> Herbaceous Vegetation Plant Association	G2?
Jones and Fertig 1999b	Idaho Fescue – Slender Wheatgrass Plant Community	<i>Festuca idahoensis</i> – <i>Elymus trachycaulus</i> Herbaceous Vegetation Plant Association	G4
Jones and Fertig 1999b	Idaho Fescue meadow Plant Community	<i>Festuca idahoensis</i> Herbaceous Vegetation Plant Association	G2?
Jones and Fertig 1999c	Idaho Fescue – Tufted Hairgrass Plant Community	<i>Festuca idahoensis</i> – <i>Deschampsia caespitosa</i> Herbaceous Vegetation Plant Association	G2?
Jones and Fertig 1999d	Idaho Fescue – King Spikefescue Plant Community	<i>Festuca idahoensis</i> – <i>Festuca Kingii</i> Herbaceous Vegetation Plant Association	G2?

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Festuca idahoensis* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Festuca idahoensis* vegetation type that we're describing includes the Idaho Fescue – Bluebunch Wheatgrass range cover type (SRM 304), Idaho Fescue – Slender Wheatgrass range cover type (SRM 306), Idaho Fescue – Tufted Hairgrass range cover type (SRM 308), and Idaho Fescue – Western Wheatgrass range cover type (SRM 309).

## REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Beetle, A.A. 1956. Range survey in Wyoming's Big Horn Mountains. Wyoming Agricultural Experiment Station Bulletin 341. <N56BEE01WYUS>
- Comer, P., L. Allen, S. Cooper, D. Faber-Langendoen, and G. Jones. 1999. Selected shrubland and grassland communities of the northern Great Plains. A report to the Nebraska National Forest. The Nature Conservancy. Unpublished. <U99COM01WYUS>
- Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. <A73DES01WYUS>
- DeVelve, Robert L. and Peter Lesica. 1993. Plant community classification for vegetation on BLM lands, Pryor Mountains, Carbon County, Montana. Montana Natural Heritage Program, Helena MT. 78 pp. <U93DEV01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Bald Ridge research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER13WYUS>
- Hurd, R.M. 1961. Grassland vegetation in the Big Horn Mountains, Wyoming. Ecology 42:459-467. <A61HUR01RMUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Jones, George P. and Walter Fertig. 1996. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U96JON03WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Beartooth Butte research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON03WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Pat O'Hara Mountain research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON06WYUS>

Jones, George P. and Walter Fertig. 1999d. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON08WYUS>

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Ryan, Michael G., Linda A. Joyce, Tom Andrews, and Kate Jones. 1994. Research natural areas in Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 57 pp. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Elephant Head research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL02WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL07WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential McLain Lake research natural area within the Bighorn National Forest, Big Horn and Johnson Counties, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL08WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Artemisia nova* Vegetation Type  
Black Sagebrush Vegetation Type**

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**SUMMARY**

*Artemisia nova* vegetation is a dwarf shrubland type, occurring at elevations between 4500 and 7700 feet on south and west facing exposures. It occurs on shallow coarse-textured soils that are often calcareous. *Artemisia nova* grows in the most arid conditions of any *Artemisia* shrub species. Stands have shrub-dominated and grass-dominated layers; the grass layer can be more productive, exceeding the shrub layer in height. Management concerns include overgrazing and possibly heavy browsing. This type is known to occur in the Shoshone and Bighorn National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Artemisia nova* vegetation is widespread throughout the western United States (Reid et al. 1999), including the basins of Wyoming (Knight 1994). It is found in the Bighorn and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

This type occurs between 4500 and 7700 feet on windswept ridges with south and west facing exposures (Knight 1994, Shiflet 1994). Soils may be derived from calcareous substrate and are typically coarse-textured and shallow in depth (Knight 1994, Reid et al 1999). The vegetation experiences extreme drought in the summer due to low amounts of precipitation and low water holding capacity of the soils. In fact, this type grows in more arid conditions than any other *Artemisia* vegetation type (Reid et al. 1999).

**VEGETATION DESCRIPTION**

Stands are divided into two strata, a shrub-dominated layer and a grass-dominated layer (Reid et al. 1999). The shrub layer is less than 1.5 feet tall (Knight 1994, Reid et al. 1999) with cover ranging from 20 to 60% (Reid et al. 1999). The grass layer will supersede the shrub layer in height during the growing season, ranging from 1.5 to 3 feet tall. Cover of the grass layer ranges from 10 to 25% (Reid et al. 1999). In stands east of the continental divide, *Artemisia nova* dominates the shrub layer while *Elymus spicatus* dominates the grass layer (Shiflet 1994). Other common species include *Oryzopsis hymenoides*, *Stipa comata*, *Koeleria macrantha*, *Krascheninnikovia lanata*, *Gutierrezia sarothrae*, *Chrysothamnus viscidiflorus*, *Poa sandbergii*, *Phlox hoodii*, *Calochortus* spp., and *Haplopappus* spp. (Shiflet 1994, Wyoming Natural Diversity Database 1998).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Fires are not common in this type because the shrubs do not form a dense growth pattern (Reid et al. 1999). Stands are utilized by antelope, mule deer, and sage grouse (Shiflet 1994), in addition to being grazed and browsed by livestock (Reid et al. 1999). No information was available on the successional status of this type.

**STATUS AND TRENDS**

This vegetation forms a single association in the three forests. *Artemisia nova* / *Pseudoroegneria spicata* (syn. *Elymus spicatus*) plant association has a G4G5 conservation rank, meaning it is abundant (Anderson et al. 1999).

**MANAGEMENT CONSIDERATIONS**

Economic Uses

Stands provide habitat for several wildlife species in addition to forage for livestock (Shiflet 1994, Reid et al. 1999).



### Effects of Management Practices

Stands can be grazed and browsed too heavily. Overgrazing decreases the cover of *Elymus spicatus* and *Oryzopsis hymenoides* and increases the cover of *Stipa comata* and *Koeleria macrantha*. Shrub cover can increase with overgrazing, and may require thinning to stimulate re-establishment of the herbaceous plants. However shrub cover will decline without thinning in stands that are intensively browsed. *Artemisia nova* shrub cover is desirable winter browse for wildlife occurring in snow-free areas for part of the winter (Tweit and Houston 1980). In fact, livestock browse *Artemisia nova* to a greater extent than other types of *Artemisia* shrubs (Reid et al. 1999).

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

#### Distribution

This vegetation is a major cover type at the Shell Canyon Research Natural Area (Ryan et al. 1994) and at the Elephant Head Potential Research Natural Area (Welp et al. 1998). According to Welp et al (1998), stands are commonly found on the western slopes of the Bighorn Mountain Range in a mosaic with several other types of vegetation.

#### Physical environment

This type occurs on benches and gentle to steep slopes (Ryan et al. 1994, Welp et al. 1998). Stands have 10-50% exposed rock and bare soil at the surface (Welp et al. 1998).

#### Vegetation description

*Artemisia nova* dominates the shrub layer while *Elymus spicatus* dominates the grass layer. Other species include *Koeleria macrantha*, *Arenaria hookeri*, *Haplopappus acaulis*, *Gutierrezia sarothrae*, *Artemisia tridentata* ssp. *vaseyana*, and *Krascheninnikovia lanata* (Ryan et al. 1994, Welp et al. 1998).

#### Management

No specific information is known about the management of this vegetation in the Bighorn National Forest.

### **MEDICINE BOW NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **SHOSHONE NATIONAL FOREST**

#### Distribution

This type is found in the Wapiti and Clarks Fork Ranger Districts (Tweit and Houston 1980). It is a minor vegetation type in the Grizzly Creek Potential Research Natural Area (Jones and Fertig 1999).

#### Physical environment

Stands occur below 7,000 feet on shallow soils that are derived from granitic or calcareous substrates. The climate is very arid with annual precipitation of less than 15 inches (Tweit and Houston 1980).

#### Vegetation description

*Artemisia nova* dominates the shrub layer while *Elymus spicatus* and *Poa sandbergii* dominate the grass layer. Other common species include *Artemisia tridentata* ssp. *wyomingensis*, *Stipa comata*, *Oryzopsis hymenoides*, *Phlox* spp., and *Oxytropis* spp. *Opuntia polyacantha* is found in extremely xeric stands (Tweit and Houston 1980).

#### Management

No additional information is known about the management of this vegetation beyond that given in the general information section.

### **AREAS WITH HIGH-QUALITY OCCURRENCES**

No specific locations have been identified as quality occurrences.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Artemisia nova* vegetation, as described here, falls within the *Artemisia nova* Dwarf-Shrubland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Artemisia nova* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Ryan et al. 1994, Welp et al. 1994	Black Sage Brush/Bluebunch Wheatgrass Plant Community	<i>Artemisia nova</i> / <i>Pseudoroegneria spicata</i> Dwarf Shrubland Plant Association	G4G5
<b>MEDICINE BOW NATIONAL FOREST</b>			
None			
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston 1987	<i>Artemisia nova</i> / <i>Roegneria spicata</i> Plant Association	<i>Artemisia nova</i> / <i>Pseudoroegneria spicata</i> Dwarf Shrubland Plant Association	G4G5
Tweit and Houston 1980	<i>Artemisia nova</i> / <i>Agropyron spicatum</i> Habitat Type	<i>Artemisia nova</i> / <i>Pseudoroegneria spicata</i> Dwarf Shrubland Plant Association	G4G5
Jones and Fertig 1999	Black Sagebrush / Bluebunch Wheatgrass Plant Community	<i>Artemisia nova</i> / <i>Pseudoroegneria spicata</i> Dwarf Shrubland Plant Association	G4G5

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Artemisia nova* vegetation type does not correspond to any SAF forest cover type.

### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Artemisia nova* vegetation type that we're describing falls within the Black Sagebrush-Bluebunch Wheatgrass range cover type (SRM 320).

## REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, G.P., and W. Fertig. 1999. Ecological Evaluation of the Potential Grizzly Creek Research Natural Area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming. Unpublished.

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Ryan, M.G., L.A. Joyce, T. Andrews, and K. Jones. 1994. Research Natural Areas in Colorado, Nebraska, North Dakota, South Dakota, and Parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>

Welp, L., W. Fertig, and G. Jones. 1998. Ecological Evaluation of the Potential Elephant Head Research Natural Area within the Bighorn National Forest, Big Horn County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming. Unpublished. <U98WEL02WYUS>

Wyoming Natural Diversity Database. 1998. Characterization Abstract for *Artemisia nova* / *Elymus spicatus* (Black Sagebrush / Bluebunch Wheatgrass) in Wyoming <cegl001424>. University of Wyoming, Laramie, Wyoming. Unpublished.

**CHARACTERIZATION ABSTRACT FOR  
*Artemisia tridentata* ssp. *tridentata* Vegetation Type  
Basin Big Sagebrush Vegetation Type**

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**SUMMARY**

*Artemisia tridentata* ssp. *tridentata* vegetation is a shrubland type occurring at lower elevations in ravines and floodplains. This type typically grows on the deeper soils and is more productive than the surrounding vegetation. Stands are divided into a shrub-dominated overstory and a grass-dominated understory. Management concerns include overgrazing, fire, and exotic plant invasion. This type is found in the Shoshone National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Artemisia tridentata* ssp. *tridentata* vegetation is distributed throughout much of the western United States and southwestern Canada (Shiflet 1994, Reid et al. 1999), including the Bighorn Basin and the southwestern portion of Wyoming (Knight 1994). This type occurs in the Shoshone National Forest along the drainages of North and South Forks of the Shoshone River (Tweit and Houston 1980).

**PHYSICAL ENVIRONMENT**

This vegetation grows in ravines and floodplains at lower elevations ranging from around 4000 to 7500 feet (Tweit and Houston 1980, Knight 1994). Soils are derived from alluvial material and considerably deeper than surrounding soils that often support stands of *Artemisia tridentata* ssp. *wyomingensis* (Faber-Langendoen 1997). Most precipitation is in the form of snow, and summer droughts are common (Reid et al. 1999).

**VEGETATION DESCRIPTION**

This type is typically more productive than surrounding vegetation such as *Artemisia tridentata* ssp. *wyomingensis* (Faber-Langendoen et al. 1997). Stands are divided into two strata, a shrub-dominated overstory and a grass-dominated understory. The shrub layer grows from three to over six feet in height (Knight 1994), and cover typically ranges from 10 to 25% (Faber-Langendoen 1997). The grass layer is one and half to three feet in height with cover ranging from 10 to 25% (Reid et al. 1999). *Artemisia tridentata* ssp. *tridentata* dominates the shrub layer, but several other shrubs are common including *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus nauseosus*, and *Chrysothamnus viscidiflorus*. *Elymus spicatus* dominates the grass layer; other common species include *Artemisia frigida*, *Gutierrezia sarothrae*, *Stipa comata*, and *Bouteloua gracilis*. Degraded stands are invaded by *Bromus tectorum* (Faber-Langendoen 1997).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

The understory provides forage for grazers while the overstory creates shelter for livestock and wildlife along riparian areas (Tweit and Houston 1980). Fires destroy the shrub layer because *Artemisia tridentata* ssp. *tridentata* is not fire-tolerant and must re-establish from seed following burns (Knight 1994, Reid et al. 1999). The time needed for re-establishment of the shrubs depends on many factors such as precipitation, surface litter, grazing, and a seed source (Knight 1994). Fires and overgrazing increase invasibility of stands by exotic plants, including *Bromus tectorum* (Hironaka et al. 1983, Knight 1994, Reid et al. 1999). See Knight (1994) or Reid et al. (1999) for further discussion on the effects of fire and grazing. This type is climax vegetation in the absence of fire (Reid et al. 1999).

**STATUS AND TRENDS**

This type contains one plant association in the National Vegetation Classification that is relevant to the three forests. *Artemisia tridentata* ssp. *tridentata* / *Pseudoroegneria spicata* (syn. *Elymus spicatus*) plant association has a G2G4 conservation rank, meaning it is rare to abundant (Anderson et al. 1998). More information is needed to clarify this rank. Overgrazing and fire are of special concern because they promote the invasion and dominance of stands by exotic plants, particularly *Bromus tectorum* (Knight 1994, Reid et al. 1999).

## MANAGEMENT CONSIDERATIONS

### Economic Uses

The grass layer provides forage for livestock grazing and the shrub layer creates shelter habitat for livestock and wildlife along riparian areas (Mueggler and Stewart 1980, Tweit and Houston 1980, Hironaka et al. 1983).

### Effects of Management Practices

The main management concerns include overgrazing, fire, and exotic plant invasion (Reid et al. 1999). Grazing can be problematic in these stands because this vegetation commonly occurs in narrow swales where livestock tend to congregate (Tweit and Houston 1980, Hironaka et al. 1983). Livestock preferentially graze *Elymus spicatus*, causing increases in the abundance of *Bouteloua gracilis*, *Poa secunda*, *Artemisia frigida*, *Gutierrezia sarothrae*, and *Bromus tectorum* (Mueggler and Stewart 1980). Tweit and Houston (1980) also consider *Artemisia tridentata* ssp. *tridentata* an increaser with overgrazing. Restoration of overgrazed stands requires eradication of *Bromus tectorum*, and occasionally thinning of the shrub cover to stimulate grass production. However, too much thinning of shrubs could diminish the overall value of stands as shelter for wildlife and livestock (Mueggler and Stewart 1980, Tweit and Houston 1980, Hironaka et al. 1983). As for fire, *Artemisia tridentata* ssp. *tridentata* is fire-intolerant. Fires reduce shrub cover and enhance the growth of herbaceous plants. This may sound appealing for livestock grazing, but burned stands lose their value as shelter habitat and are more vulnerable to invasion and dominance by exotic plants, particularly *Bromus tectorum* (Knight 1994, Reid et al. 1999).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### MEDICINE BOW NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### SHOSHONE NATIONAL FOREST

#### Distribution

This vegetation type is known to occur at the lowest elevations of the Clark's Fork and Wapiti Ranger Districts, including the North Fork Valley, South Fork Valley, and the Face of the Mountain Allotment (Tweit and Houston 1980).

#### Physical environment

Stands occur between 4000 and 6000 feet on deep alluvial soils in swales, riparian areas, and alluvial fans (Tweit and Houston 1980).

#### Vegetation description

This vegetation is more productive with greater cover than other local shrub vegetation, particularly *Artemisia tridentata* ssp. *wyomingensis*. Cover values range from 15 to 35%. However, this vegetation typically grows as small stands within larger stands of other vegetation types (Tweit and Houston 1980, Jones and Fertig 1999).

#### Management

No other information is known about the management of this vegetation beyond that given in the general information section.

## AREAS WITH HIGH-QUALITY OCCURRENCES

No specific locations have been identified as quality occurrences. Exotic plants readily invade this vegetation, presumably due to overgrazing. This reality reduces the chance that high-quality stands exist in the region.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Artemisia tridentata* ssp. *tridentata* vegetation, as described here, falls within the *Artemisia tridentata* ssp. *tridentata* Shrubland and Shrub Herbaceous Alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Artemisia tridentata* ssp. *tridentata* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
None			
<b>MEDICINE BOW NATIONAL FOREST</b>			
None			
<b>SHOSHONE NATIONAL FOREST</b>			
Tweit and Houston 1980	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Agropyron spicatum</i> Habitat Type	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation Plant Association	G2G4
Johnston 1987	<i>Artemisia tridentata</i> / <i>Roegneria spicata</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation Plant Association	G2G4
Johnston 1987	<i>Artemisia tridentata</i> / <i>Leymus cinereus</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Leymus cinereus</i> Shrubland Plant Association	G2
Jones and Fertig 1999	Basin Big Sagebrush / Bluebunch Wheatgrass Plant Community	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Leymus cinereus</i> Shrubland Plant Association	G2G4

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Artemisia tridentata* ssp. *tridentata* vegetation type does not correspond to any SAF forest cover type.

### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Artemisia tridentata* ssp. *tridentata* vegetation type that we're describing falls within the Basin Big Sagebrush range cover type (SRM 401).

## REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Faber-Langendoen, D., J. Drake, G. Jones, D. Lenz, P. Lesica, and S. Rolfsmeier. 1997. Rare plant communities in the Northern Great Plains. A Report to the Nebraska National Forest. Unpublished. <U97FAB01WYUS>

Hironaka, M., M.A. Fosberg, and A.H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Forest, Wildlife, and Range Experiment Station Bulletin 35. University of Idaho, Moscow, Idaho.

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, G.P., and W. Fertig. 1999. Ecological Evaluation of the Potential Grizzly Creek Research Natural Area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming. Unpublished.

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service General Technical Report INT-66. Intermountain Forest and Range Experiment Station, Ogden, Utah.

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Artemisia tridentata* ssp. *vaseyana* Vegetation Type  
Mountain Big Sagebrush Vegetation Type**

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**SUMMARY**

*Artemisia tridentata* ssp. *vaseyana* is a shrubland type, occurring in foothill and mountainous terrain. Soils are deep with a loamy texture. Stands are divided into a shrub-dominated overstory and a grass-dominated understory. Each layer can be about equal in height, but the shrub layer contributes more cover. Management concerns include overgrazing, fire, and exotic plant invasion. This type is found in the Bighorn, Medicine Bow, and Shoshone National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This type occurs throughout much of the foothill and mountainous terrain of the western United States and southwestern Canada (Shiflet 1994), including all ranges in Wyoming except the Black Hills (Knight 1994). It is known to occur in the Bighorn, Medicine Bow, and Shoshone National Forests.

**PHYSICAL ENVIRONMENT**

This vegetation typically occurs at elevations between 6500 and 9000 feet in the foothills (Comer et al. 1999). Stands occur on a variety of topographic positions from mountain slopes to stony flats, in addition to being found on all slope aspects (Reid et al. 1999). However, stands are more common on south or west facing slopes (Comer et al. 1999). Soils are deep with a loamy texture, and in some cases they are unstable leading to mass movements of soil (Reid et al. 1999). The foothills are cooler and less arid than the basins where stands of *Artemisia tridentata* ssp. *tridentata* and *Artemisia tridentata* ssp. *wyomingensis* are more common (Knight 1994). Most of the precipitation is in the form of snow (Reid et al. 1999).

**VEGETATION DESCRIPTION**

Stands often form mosaics with other types of shrub and grass vegetation. Stands have two strata, a shrub-dominated layer and a grass-dominated layer. The shrub layer typically grows between 1.5 and 3 feet in height (Knight 1994, Reid et al. 1999), while cover ranges from 25 to 70%. The grass layer is also 1.5 to 3 feet in height, but has less cover ranging from 10 to 25% (Reid et al. 1999). *Artemisia tridentata* ssp. *vaseyana* dominates the shrub layer. Other shrubs may be present and even co-dominate the layer, including *Amelanchier alnifolia*, *Artemisia arbuscula*, *Artemisia tridentata* ssp. *wyomingensis*, *Ceanothus velutinus*, *Chrysothamnus nauseosus*, *Chrysothamnus viscidiflorus*, *Purshia tridentata*, *Ribes cereum*, *Rosa woodsii*, and *Symphoricarpos oreophilus* (Wyoming Natural Diversity Database 1998, Reid et al. 1999). The grass layer is dominated by a variety of species, but the most common dominants are *Elymus spicatus* or *Festuca idahoensis*. Other grass species include *Elymus cinereus*, *Elymus lanceolatus*, *Koeleria macrantha*, *Stipa occidentalis*, *Stipa comata*, and *Stipa nelsonii* (Wyoming Native Diversity Database 1998, Reid et al. 1999).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

Stands provide forage for livestock and habitat for wildlife (Tweit and Houston 1980, Reid et al. 1999). The shrubs are browsed by large ungulates (Comer et al. 1999). Tweit and Houston (1980) consider this vegetation a seral type at the higher elevations, eventually being replaced by *Pseudotsuga menziesii* or *Abies lasiocarpa* vegetation in the absence of fire. In fact, Jones and Fertig (1999a, 1999b) found stands that appeared to be in a seral stage. Authors rarely mention succession, but stands are probably climax vegetation at least in some areas.

**STATUS AND TRENDS**

For this vegetation, all plant associations that are relevant to the three forests and in the National Vegetation Classification have G4 or G5 conservation rank, meaning they are abundant (Anderson et al. 1998). See the table in the section entitled "Representations on the Three Forests" for a complete list of the associations and ranks.



## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands support livestock grazing and are important habitat for mule deer and sage grouse (Tweit and Houston 1980). Shrubs can be browsed by large ungulates (Comer et al. 1999).

### Effects of Management Practices

Overgrazing can reduce the herbaceous layer and increase shrub cover, depending on the amount of browsing (Tweit and Houston 1980). Reid et al. (1999) report that there is considerable debate about whether this type represents degraded steppe due to overgrazing. Fire suppression leads to a loss of this vegetation type where it is seral, particularly to *Pseudotsuga menziesii* vegetation (Fischer and Clayton 1983). Jones and Fertig (1999c) observed trees of *Pinus flexilis* in stands of *Artemisia tridentata* ssp. *vaseyana* suggesting that succession is proceeding to forest vegetation. In addition, Jones and Fertig (1999b) observed areas where *Artemisia tridentata* ssp. *vaseyana* and *Pseudotsuga menziesii* vegetation formed a mosaic, indicating that these areas may be closed forest at some point without fire. At the other extreme, fire return intervals of less than five years can cause the conversion of shrub-dominated vegetation into stands of exotic annual grasses, dominated by *Bromus tectorum* (Reid et al. 1999). Reid et al. (1999) suggest fire return intervals of 30-70 years will maintain this vegetation type. Regardless of the return interval, fire is necessary to maintain some stands of this vegetation in locations where it is seral to forest types.

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This vegetation type is known to occur along the central portion of the western slopes of the Bighorn National Forest. It is also found in isolated areas within the southeastern and northwestern portion of this forest (Merrill et al. 1996).

#### Physical environment

A considerable amount of bare ground and gravel can be common in stands (Welp et al. 1998e). Stands occur in open meadows, dry slopes, and near drainages (Welp et al. 1998d).

#### Vegetation description

Stands may be fragmented forming a mosaic of shrub-dominated and grass-dominated vegetation (Welp et al. 1998b). In areas with *Artemisia nova* vegetation, *Artemisia tridentata* ssp. *vaseyana* occupies the more mesic areas (Welp et al. 1998a). *Juniperus* ssp. and *Pseudotsuga menziesii* may be found growing in this vegetation type (Welp et al. 1998a-b), as well as the exotic plant *Poa pratensis* (Welp et al. 1998e).

#### Management

*Pseudotsuga menziesii* are sometimes found in stands (Welp et al. 1998b), suggesting that this type may be seral. Fire is needed for eventual regeneration of this vegetation at those locations.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This type is known to occur along the Medicine Bow National Forest boundaries in the upland portions of the basins (Merrill et al. 1996).

#### Physical environment

No additional information is known about the physical environment beyond that given in the general information section.

### Vegetation description

Jones and Fertig (1996b) observed that sagebrush stands are generally fragmented in the Deep Creek Potential Research Natural Area. They consider this to be common on the Medicine Bow National Forest as opposed to the more continuous stands found elsewhere. Based on reports for the potential research natural areas (Jankovsky-Jones et al. 1995a-e, Jankovsky-Jones 1996, Jones and Fertig 1996a-b), stands in the Medicine Bow area contain a wide variety of dominants in the grass layer besides just *Festuca idahoensis* and *Elymus spicatus*. This forest also has stands in which the shrub layer is co-dominated by *Artemisia tridentata* ssp. *vaseyana* and *Purshia tridentata* or *Amelanchier alnifolia*.

### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This type occurs on all five ranger districts (Tweit and Houston 1980), and is particularly prevalent along the eastern boundaries of the Shoshone National Forest (Merrill et al. 1996).

### Physical environment

This vegetation grows between 6,000 and 9,500 feet on slopes with less than 40% grade. Stands are generally productive with a full canopy of shrubs and grasses and a litter layer that leaves no exposed soil.

### Vegetation description

*Artemisia tridentata* ssp. *vaseyana* dominates the shrub layer and *Festuca idahoensis* dominates the grass layer. Other common species include *Artemisia tridentata* ssp. *wyomingensis*, *Elymus spicatus*, *Koeleria macrantha*, *Danthonia intermedia*, *Bromus carinatus*, *Stipa occidentalis*, and *Stipa richardsonii*. *Geranium viscosissimum* is common in the most mesic stands at higher elevations while *Chrysothamnus* spp. and *Artemisia frigida* are common in the driest stands (Tweit and Houston 1980). In some areas, this vegetation forms a mosaic with *Pseudotsuga menziesii* vegetation (Jones and Fertig 1999c).

### Management

Stands provide excellent forage from late spring to early fall, but productivity can differ by two-fold difference depending on site potential. The most productive stands occur at the highest elevations. Overgrazing reduces the cover of *Elymus spicatus*, *Festuca idahoensis*, *Agropyron caninum*, *Bromus carinatus*, *Carex raynoldsii*, and probably *Stipa occidentalis* (Tweit and Houston 1980).

## AREAS WITH HIGH-QUALITY OCCURRENCES

Exotic plants readily invade this vegetation, presumably due to overgrazing. This reality reduces the chance that high-quality stands exist in the region. However, the following places are considered quality representations based on information from the cited reports. For the Medicine Bow National Forest, quality stands occur in Labonte Canyon (Jankovsky-Jones et al. 1995c), Battle Mountain (Jankovsky-Jones et al. 1995e), Deep Creek (Jones and Fertig 1996b), and Sheep Mountain (Jankovsky-Jones et al. 1996) Potential Research Natural Areas. In the Bighorn National Forest, quality representations occur in Devil's Canyon Potential Research Natural Area (Welp et al. 1998c). In addition, Sheep Mesa (Jones and Fertig 1999b) and Arrow Mountain (Jones and Fertig 1999c) Potential Research Natural Areas have quality stands in the Shoshone National Forest.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Artemisia tridentata* ssp. *vaseyana* vegetation, as described here, falls within the *Artemisia tridentata* ssp. *vaseyana* Shrubland and Shrub-Herbaceous alliances of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

## REPRESENTATION ON THE THREE FORESTS

The *Artemisia tridentata* ssp. *vaseyana* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
<b>BIGHORN NATIONAL FOREST</b>			
Johnston 1987	<i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Welp et al. 1998a, Welp et al. 1998e	Mountain Big Sagebrush / Bluebunch Wheatgrass Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5
Welp et al. 1998b, Welp et al. 1998c, Welp et al. 1998d, Welp et al. 1998e	Mountain Big Sagebrush / Idaho Fescue Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Merrill et al. 1996	Mountain Big Sagebrush GAP Cover Type (32006)	N/A	
<b>MEDICINE BOW NATIONAL FOREST</b>			
Johnston 1987	<i>Artemisia tridentata</i> - <i>Purshia tridentata</i> / <i>Elytrigia dasystachya</i> Plant Association	Unknown	
Johnston 1987	<i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Johnston 1987	<i>Artemisia tridentata</i> / <i>Roegneria spicata</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5
Jankovsky-Jones et al. 1995a, Jankovsky-Jones et al. 1996	Big Sagebrush / Bluebunch Wheatgrass Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5
Jankovsky-Jones et al. 1995b, Jankovsky-Jones et al. 1995c, Jankovsky-Jones et al. 1995d, Jankovsky-Jones et al. 1995e, Jones and Fertig 1996a, Jones and Fertig 1996b	Big Sagebrush / Idaho Fescue Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Jones and Fertig 1996b	Mountain Big Sagebrush / Nelson's Needlegrass Plant Community	Unkown	
Merrill et al. 1996	Mountain Big Sagebrush GAP Cover Type (32006)	N/A	
<b>SHOSHONE NATIONAL FOREST</b>			
Johnston 1987	<i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Johnston 1987	<i>Artemisia tridentata</i> / <i>Leymus cinereus</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Leymus cinereus</i> Shrubland Plant Association	G4?
Johnston 1987	<i>Artemisia tridentata</i> / <i>Roegneria spicata</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5

Tweit and Houston 1980	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Habitat Type	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Tweit and Houston 1980	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Symphoricarpos oreophilus</i> Community Type	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> – <i>Symphoricarpos oreophilus</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5?
Jones and Fertig 1999a	Mountain Big Sagebrush / Bluebunch Wheatgrass Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5
Jones and Fertig 1999a, Jones and Fertig 1999b	Mountain Big Sagebrush / Idaho Fescue Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Plant Association	G5
Jones and Fertig 1999c	<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pseudoroegneria spicata</i> Plant Community	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G5
Merrill et al. 1996	Mountain Big Sagebrush GAP Cover Type (32006)	N/A	

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Artemisia tridentata* ssp. *vaseyana* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Artemisia tridentata* ssp. *vaseyana* vegetation type that we're describing falls within the Mountain Big Sagebrush range cover type (SRM 402).

### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Comer, P., L. Allen, S. Cooper, D. Faber-Langendoen, and G. Jones. 1999. Selected shrubland and grassland communities of the northern Great Plains. A report to the Nebraska National Forest. The Nature Conservancy. Unpublished. <U99COM01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fischer, William C. and Bruce D. Clayton. 1983. Fire ecology of Montana forest habitat types east of the Continental Divide. USDA Forest Service General Technical Report INT-141. Intermountain Forest and Range Experiment Station, Ogden UT. 83 pp. <N83FIS41WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995a. Ecological evaluation for the potential Platte Ridge and North Platte River Canyon research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN07WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995b. Ecological evaluation for the potential Big Bear Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN09WYUS>

- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995c. Ecological evaluation for the potential LaBonte Canyon research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN01WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995d. Ecological evaluation for the potential Old Maid's Draw research natural area within the Medicine Bow National Forest, Converse County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN08WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995e. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN02WYUS>
- Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>
- Jones, George P. and Walter Fertig. 1996a. Ecological evaluation of the potential Cedar Pass research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U96JON02WYUS>
- Jones, George P. and Walter Fertig. 1996b. Ecological evaluation of the potential Deep Creek research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U96JON03WYUS>
- Jones, George P. and Walter Fertig. 1999a. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON04WYUS>
- Jones, George P. and Walter Fertig. 1999b. Ecological evaluation of the potential Sheep Mesa research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON08WYUS>
- Jones, George P. and Walter Fertig. 1999c. Ecological evaluation of the potential Arrow Mountain research natural area within the Shoshone National Forest, Fremont County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON02WYUS>
- Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. < N99REI01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>
- Twit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>
- Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Elephant Head research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest

Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL02WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998b. Ecological evaluation of the potential Tensleep Canyon research natural area within the Bighorn National Forest, Washakie County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL03WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Devil Canyon research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL07WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998d. Ecological evaluation of the potential Pete's Hole research natural area within the Bighorn National Forest, Big Horn County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL09WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998e. Ecological evaluation of the potential Dry Fork research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL10WYUS>

Wyoming Natural Diversity Database. 1998. Characterization abstract for *Artemisia tridentata* ssp. *vaseyana* – *Symphoricarpos oreophilus* Shrubland <cegl001036> and *Artemisia tridentata* ssp. *vaseyana* – *Symphoricarpos oreophilus* / *Pseudoroegneria spicata* Shrubland <cegl001038>. University of Wyoming, Laramie, WY. Unpublished.

**CHARACTERIZATION ABSTRACT FOR**  
***Artemisia tridentata* ssp. *wyomingensis* Vegetation Type**  
**Wyoming Big Sagebrush Vegetation Type**

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**SUMMARY**

*Artemisia tridentata* ssp. *wyomingensis* vegetation is a shrubland type, occurring at lower elevations on gentle to steep terrain. Soils are shallow to moderately deep with loamy texture and low salinity. Stands are divided into a shrub-dominated layer and a grass-dominated layer. Both layers may attain the same heights in wetter years. Management concerns include overgrazing, fire, and exotic plant invasion. This type is known to occur in the Bighorn, Medicine Bow, and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is distributed throughout much of western United States (Shiflet 1994, Reid et al. 1999), including the basins of Wyoming (Knight 1994). It occurs in Medicine Bow, Shoshone, and Bighorn National Forests.

**PHYSICAL ENVIRONMENT**

This type is found from 5500 to 9000 feet on sloping terrain (Knight 1994). The soils are shallow to moderately deep (Tweit and Houston 1980) with low salt accumulation (Knight 1994) and a loamy texture (Reid et al. 1999). Soil moisture availability is particularly important in this arid climate. Interestingly, the redistribution of snow into stands of this vegetation provides some of the needed moisture for spring growth (Knight 1994).

**VEGETATION DESCRIPTION**

Stands are divided into two strata, a shrub-dominated layer and a grass-dominated layer. The shrub layer is typically less than two feet tall (Knight 1994) with canopy cover ranging from 25 to 40% (Reid et al. 1999, Comer et al. 1999). The grass layer can reach heights comparable to the shrub layer in wet years with cover from 5 to 60% (Reid et al. 1999). *Artemisia tridentata* ssp. *wyomingensis* dominates the shrub layer while *Elymus spicatus* dominates the grass layer. Other common species include *Chrysothamnus* spp., *Gutierrezia sarothrae*, *Artemisia frigida*, *Bouteloua gracilis*, and *Koeleria macrantha*. *Bromus tectorum* is common in degraded stands (Tweit and Houston 1980, Reid et al. 1999).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

The grass and shrub layers provide forage for livestock and wildlife (Tweit and Houston 1980). Fires destroy the shrub layer because *Artemisia tridentata* ssp. *wyomingensis* is not fire-tolerant and must re-establish from seed following burns (Knight 1994, Reid et al. 1999). The time needed for re-establishment depends on many factors such as precipitation, surface litter, grazing, and seed source (Knight 1994). Fires and overgrazing cause stands to be vulnerable to invasion by exotic plants, including *Bromus tectorum* (Hironaka et al. 1983, Knight 1994, Reid et al. 1999). See Knight (1994) or Reid et al. (1999) for further discussion on the effects of fire and grazing. Stands are considered climax vegetation in the absence of fire (Reid et al. 1999).

**STATUS AND TRENDS**

This type contains one plant association in the National Vegetation Classification that is relevant to the three forests. *Artemisia tridentata* ssp. *tridentata*/*Pseudoroegneria spicata* (syn. *Elymus spicatus*) plant association has a G4 conservation rank, meaning it is abundant (Anderson et al. 1999). Overgrazing and fires are problematic in this vegetation because they promote invasion and dominance of stands by exotic plants, particularly *Bromus tectorum* (Knight 1994, Reid et al. 1999).

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands are important winter browse for big game species and as habitat for sage grouse. This vegetation also provides forage for livestock grazing, particularly in the early spring and late fall (Tweit and Houston 1980).

### Effects of Management Practices

Overgrazing, fire, and exotic plant invasion are the main management concerns (Reid et al. 1999). Overgrazing leads to decreases in *Elymus spicatus* since it is preferred forage while stimulating the growth of less palatable grasses (Tweit and Houston 1980). Mueggler and Stewart (1980) suggests shrubs also increase with overgrazing, but Tweit and Houston (1980) point out that this may not occur if shrubs are heavily browsed. In addition, overgrazing can facilitate invasion by exotic plants, particularly *Bromus tectorum*. Fire affects this vegetation type by destroying the shrubs and enhancing herbaceous growth (Knight 1994). While this might be desirable for raising livestock, fire reduces the amount of winter browse for big game species and makes stands more vulnerable to invasion and dominance by exotic plants, particularly *Bromus tectorum* (Knight 1994, Reid et al. 1999).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

This type is found along the eastern boundary of the Bighorn National Forest (Merrill et al. 1996).

#### Physical environment

No additional information is known about the physical environment beyond that given in the general information section.

#### Vegetation description

As with the physical environment, no additional information is known about the vegetation that differs from that given in the general information section.

#### Management

No specific information is known about management of this vegetation in the Bighorn National Forest.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This type is known to occur along the Medicine Bow National Forest boundaries in the upland portions of the surrounding basins (Merrill et al. 1996).

#### Physical environment

No additional information about the physical environment is known beyond that given in the general information section.

#### Vegetation description

As with the physical environment, no additional information is known about the vegetation that differs from that given in the general information section.

#### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.



## SHOSHONE NATIONAL FOREST

### Distribution

This type is known to occur along the National Forest boundaries in the upland portions of the surrounding basins (Merrill et al. 1996). It is known to occur in Clark's Fork, Wapiti, and Lander Ranger Districts. It is particularly widespread on the low elevation range allotments and the North Fork Big Game Winter Range (Tweit and Houston 1980).

### Physical environment

Stands are found between 4000 and 6000 feet on gentle to steep slopes. Soils have a large portion of exposed rock and bare ground at the surface, and depths range from shallow to moderately deep. This vegetation type can grow on the deepest soils in upland basins except in the areas with *Artemisia tridentata* ssp. *tridentata* (Tweit and Houston 1980).

### Vegetation description

*Artemisia tridentata* ssp. *wyomingensis* dominates the shrub layer while *Elymus spicatus* dominates the grass layer. Other common species include *Artemisia tridentata* ssp. *tridentata*, *Artemisia frigida*, *Gutierrezia sarothrae*, *Koeleria macrantha*, *Poa sandbergii*, *Stipa comata*, *Antennaria* spp., and *Phlox* spp. (Tweit and Houston 1980).

### Management

Overgrazing leads to decreases in *Elymus spicatus* and increases in less palatable species including *Poa sandbergii*, *Artemisia frigida*, *Gutierrezia sarothrae*, *Psorelea lanceolata*, *Opuntia polyacantha*, and at least initially *Stipa comata*. *Artemisia tridentata* ssp. *wyomingensis* may also increase depending on the effect of winter browsing. In addition, overgrazing can facilitate the invasion of exotic plants, particularly *Bromus tectorum* (Tweit and Houston 1980).

## AREAS WITH HIGH-QUALITY OCCURRENCES

No specific locations have been identified as quality occurrences. Exotic plants readily invade this vegetation, presumably due to overgrazing. This reality reduces the chance that high-quality stands exist in this region.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Artemisia tridentata* ssp. *wyomingensis* vegetation, as described here, falls within the *Artemisia tridentata* ssp. *wyomingensis* Shrub-Herbaceous Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Artemisia tridentata* ssp. *wyomingensis* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Johnston 1987	<i>Artemisia tridentata</i> / <i>Festuca idahoensis</i> Plant Association	Unknown	
Merrill et al. 1996	Wyoming Big Sagebrush GAP Cover Type (32007)	N/A	
MEDICINE BOW NATIONAL FOREST			
Johnston 1987	<i>Artemisia tridentata</i> / <i>Roegneria spicata</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria</i> Shrub Herbaceous Plant Association	G2G4

SHOSHONE NATIONAL FOREST			
Tweit and Houston 1980	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Agropyron spicatum</i> Habitat Type	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria</i> Shrub Herbaceous Plant Association	G2G4
Johnston 1987	<i>Artemisia tridentata</i> / <i>Festuca</i> <i>idahoensis</i> Plant Association	Unknown	
Johnston 1987	<i>Artemisia tridentata</i> / <i>Roegneria</i> <i>spicata</i> Plant Association	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria</i> Shrub Herbaceous Plant Association	G2G4
Merrill et al. 1996	Wyoming Big Sagebrush GAP Cover Type (32007)	N/A	

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Artemisia tridentata* ssp. *wyomingensis* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Artemisia tridentata* ssp. *wyomingensis* vegetation type that we're describing falls within the Wyoming Big Sagebrush range cover type (SRM 403).

### REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Comer, P., L. Allen, S. Cooper, D. Faber-Langendoen, and G. Jones. 1999. Selected Shrubland and Grassland Communities of the Northern Plains. Report to the Nebraska National Forest. The Nature Conservancy. Unpublished.
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Hironaka, M., M.A. Fosberg, and A.H. Winward. 1983. Sagebrush-grass habitat types of southern Idaho. Forest, Wildlife, and Range Experiment Station Bulletin 35. University of Idaho, Moscow, Idaho.
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>
- Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service General Technical Report INT-66. Intermountain Forest and Range Experiment Station, Ogden, Utah.
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>

**CHARACTERIZATION ABSTRACT FOR  
*Cercocarpus ledifolius* Vegetation Type  
Curl-Leaf Mountain Mahogany Vegetation Type**

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**SUMMARY**

*Cercocarpus ledifolius* vegetation is a shrubland type occurring on steep slopes and rock outcrops below 7,800 feet. This vegetation occurs on shallow, rocky soils derived from limestone. Stands have shrub- and grass-dominated layers and are an important source of forage for wildlife on winter ranges. This type is known to occur in the Bighorn National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is found throughout the Great Basin from California to Wyoming (Reid et al. 1999). It is known to occur in the Bighorn National Forest.

**PHYSICAL ENVIRONMENT**

Stands occur in the basins and foothills below 7,800 feet on landforms such as escarpments and rock outcrops (Knight 1994, Reid et al. 1999). It can be found on very steep slopes up to a 100% grade (Shiflet 1994). Soils are rocky and shallow, being derived from sandstones, limestones, and shales (Knight 1994), but stands have mostly been found in areas with limestone bedrock across this region (Shiflet 1994, Welp et al. 1998a-c). The substrate is considered nutrient poor, which is thought to give the symbiotic nitrogen-fixing *Cercocarpus ledifolius* an advantage over other competitors (Knight 1994). Much of the precipitation falls in the late winter or early spring (Shiflet 1994, Reid et al. 1999).

**VEGETATION DESCRIPTION**

Stands have a shrub-dominated layer ranging in height from 6 to 16 feet with 25 to 60% cover. Grasses and shorter shrubs dominate other layers (Reid et al. 1999). The characteristic shrub is *Cercocarpus ledifolius*, but often other shrubs are present including *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia nova*, *Chrysothamnus nauseosus*, *Rhus trilobata*, *Ribes cereum*, *Ribes setosum*, *Amelanchier alnifolia*, *Prunus virginiana*, *Symphoricarpos oreophilus*, and *Physocarpus monogynus* (WYNDD 1998). Isolated trees are sometimes found growing in stands, including *Juniperus scopulorum*, *Pinus ponderosa*, *Pinus flexilis*, and *Pseudotsuga menziesii* (Reid et al. 1999). *Elymus spicatus* is the most common grass, but *Stipa comata*, *Oryzopsis hymenoides*, and *Koeleria macrantha* are often present (Shiflet 1994).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Cercocarpus ledifolius* is not adapted to fire (Reid et al. 1999), which is part of the reason stands are thought to occur on rocky soils. Such areas are not very productive so little fuel accumulates, reducing the risk of fire (Knight 1994). *Cercocarpus ledifolius* is browsed by wildlife, particularly in the winter. Interestingly, overbrowsing causes a herbivore-induced response in the shrub that leads to new limbs having more spines. The adaptation presumably limits future browsing and lowers the risk of death for the shrub (Knight 1994). The most important characteristic of *Cercocarpus ledifolius* is probably its capability of symbiotic nitrogen-fixation. By increasing the supply of nitrogen, this shrub gains a competitive advantage over other species on nutrient-poor soils (Knight 1994). No information was available on the successional status of this type.

**STATUS AND TRENDS**

This vegetation contains one plant association in the National Vegetation Classification that is relevant to the three forests. *Cercocarpus ledifolius* / *Pseudoroegneria spicata* (syn. *Elymus spicatus*) plant association has a G4Q conservation rank, meaning it is abundant (Anderson et al. 1998).

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands are important winter browse for wildlife (Shiflet 1994, Reid et al. 1999).

### Effects of Management Practices

Overbrowsing is a management concern for this vegetation (Reid et al. 1999). Although shrubs have thorns to protect against excessive use, wildlife species still heavily browse stands on winter ranges. Livestock overgrazing can also be problematic, decreasing cover of *Elymus spicatus*, while increasing cover of *Stipa comata* and *Koeleria macrantha* (Shiflet 1994).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Merrill et al (1996) have mapped this vegetation as part of the Xeric Upland Shrub GAP Cover Type (32002). These areas are found along the eastern and western boundaries of the Bighorn National Forest.

#### Physical environment

Stands occur on steep, dry slopes with shallow soils derived from limestone. In addition, they are found on limestone cliffs (Welp et al. 1998c). Stands are common on south facing aspects, but are not restricted to slopes facing this direction (Welp et al. 1998a-b).

#### Vegetation description

Species composition is similar to that provided in the general description with *Cercocarpus ledifolius* ssp. *ledifolius* dominating the stands. However, *Bromus japonicus* and *Poa pratensis* have also been found in stands indicating exotic plants invade this vegetation in the Bighorn National Forest (Welp et al. 1998b-c).

#### Management

No specific information is known about the management of this vegetation in the Bighorn National Forest.

### MEDICINE BOW NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### SHOSHONE NATIONAL FOREST

This vegetation type is not known to occur on this forest.

### AREAS WITH HIGH-QUALITY OCCURRENCES

Quality representations of this type are found in the Tongue River (Welp et al. 1998a), Elephant Head (Welp et al. 1998b), and Tensleep (Welp et al. 1998c) Potential Research Natural Areas.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Cercocarpus ledifolius* vegetation, as described here, falls within the *Cercocarpus ledifolius* Shrubland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Cercocarpus ledifolius* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Johnston 1987	<i>Cercocarpus ledifolius</i> / <i>Roegneria spicata</i> Plant Association	<i>Cercocarpus ledifolius</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G4Q
Ryan et al. 1994	Curl-Leaf Mountain Mahogany / Bluebunch Wheatgrass Plant Association	<i>Cercocarpus ledifolius</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G4Q
Welp et al. 1998a, Welp et al. 1998b, Welp et al. 1998c	Curl-Leaf Mountain Mahogany / Bluebunch Wheatgrass Plant Community	<i>Cercocarpus ledifolius</i> / <i>Pseudoroegneria spicata</i> Shrubland Plant Association	G4Q
Merrill et al. 1996	Xeric Upland Shrub GAP Cover Type (32002)	N/A	
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
None			

**CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)**

The *Cercocarpus ledifolius* vegetation type does not correspond to any SAF forest cover type.

**CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)**

The *Cercocarpus ledifolius* vegetation type that we're describing falls within the Curlleaf Mountain Mahogany-Bluebunch Wheatgrass Rangeland Cover Type (SRM 322).

**REFERENCES**

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Ryan, M.G., L.A. Joyce, T. Andrews, and K. Jones. 1994. Research Natural Areas in Colorado, Nebraska, North Dakota, South Dakota, and Parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998a. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>

Welp, L., W. Fertig, and G. Jones. 1998b. Ecological Evaluation of the Potential Elephant Head Research Natural Area within the Bighorn National Forest, Big Horn County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming. Unpublished. <U98WEL02WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998c. Ecological evaluation of the potential Tensleep Canyon research natural area within the Bighorn National Forest, Washakie County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL03WYUS>

Wyoming Natural Diversity Database. 1998. Characterization Abstract for *Cercocarpus ledifolius* var. *ledifolius* / *Elymus spicatus* (Curl-Leaf Mountain Mahogany / Bluebunch Wheatgrass Plant Association) in Wyoming <cegl000967>. University of Wyoming, Laramie, Wyoming. Unpublished.

**CHARACTERIZATION ABSTRACT FOR**  
***Quercus gambelii* Vegetation Type**  
**Gambel's Oak Vegetation Type**

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**SUMMARY**

*Quercus gambelii* vegetation is a shrubland type that occurs on sloping terrain in the foothills of the Rocky Mountains. This type reaches the northern extent of its distribution in south central Wyoming. Stands have two layers with one dominated by tall shrubs and a second dominated by short shrubs. This vegetation is resilient, resprouting vigorously following disturbances such as fire and herbicide treatments. It is known to occur in the Sierra Madre of the Medicine Bow National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation is found on the foothills of the Rocky Mountains from south-central Wyoming to northern Mexico (Shiflet 1994), including the Sierra Madre of the Medicine Bow National Forest (Knight 1994)

**PHYSICAL ENVIRONMENT**

Stands are mostly found on upland slopes, but can also occur on lowland slopes near streams. Soils have been classified as gravelly loamy sands to clayey with high organic matter and water holding capacity (Shiflet 1994, Reid et al. 1999). In Wyoming, this vegetation is limited to the south-central portion of the state. Evidently, seedlings of *Quercus gambelii* are not able to successfully establish further north because of late spring frost and lack of summer precipitation (Knight 1994, Shiflet 1994).

**VEGETATION DESCRIPTION**

Stands consist of tall shrub layers with an understory of shorter shrubs (Shiflet 1994). The tall shrubs range in height from 2-5 meters and may attain 80% cover (Reid et al. 1999). The characteristic dominant is *Quercus gambelii*. The understory shrub layer can be dominated by a wide variety of species such as *Amelanchier alnifolia*, *Amelanchier utahensis*, *Artemisia tridentata* ssp. *vaseyana*, *Ceanothus* spp., *Cercocarpus* spp., *Paxistima myrsinites*, *Prunus virginiana*, *Purshia tridentata*, *Sambucus caerulea*, and *Symphoricarpos oreophilus*. Grasses and forbs are also present but are rarely dominants (Shiflet 1994).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

*Quercus gambelii* is well adapted to fire, resprouting from belowground roots and rhizomes (Shiflet 1994). In fact, *Juniperus scopulorum* or *Pinus ponderosa* may establish and eventually dominate stands that are not subject to an occasional fire (Knight 1994). The shrubs may be browsed by large ungulates, particularly in the winter. In addition, *Quercus gambelii* produces acorns that are an important source of food for a variety of wildlife species (Knight 1994). This vegetation is generally considered a seral stage in succession, but on some sites it is apparently the climax. In addition, it can be maintained as a fire climax due to its resprouting capability (Shiflet 1994).

**STATUS AND TRENDS**

Only one plant association in the National Vegetation Classification (Anderson et al. 1998) is known to occur in Wyoming. The *Quercus gambelii* / *Symphoricarpos oreophilus* plant association has a G5 conservation rank, meaning it is abundant. However, this vegetation is rare in the state because it is at the northern edge of its distribution along the border between Wyoming and Colorado.

**MANAGEMENT CONSIDERATIONS**

Economic Uses

This vegetation provides winter browse for big game species. In addition, *Quercus gambelii* produces acorns that are used as a food source by a wide variety of wildlife species (Knight 1994).



### Effects of Management Practices

Evidently, there is not much known about the management of this vegetation. In order to increase grass cover for livestock grazing, attempts have been made to destroy the shrubs by burning or herbicide application. However, stands are fairly resilient and regenerate quickly after the treatments (Knight 1994, Reid et al. 1999). Reid et al. (1999) mention that such practices can modify stands, but even those impacts have not been sufficiently evaluated to make generalizations.

## **SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

### **BIGHORN NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **MEDICINE BOW NATIONAL FOREST**

#### Distribution

Stands occur in the Sierra Madre of the Medicine Bow National Forest (Knight 1994). This vegetation is a minor cover type.

#### Physical environment

No additional information is known about the physical environment beyond that given in the general information section.

#### Vegetation description

For stands in the Medicine Bow National Forest, *Symphoricarpos oreophilus* is the only shrub that has been reported as a co-dominant with *Quercus gambelii* (Johnston 1987).

#### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.

### **SHOSHONE NATIONAL FOREST**

This vegetation type is not known to occur on this forest.

### **AREAS WITH HIGH-QUALITY OCCURRENCES**

No information is known about the quality of specific stands in the Medicine Bow National Forest.

## **RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS**

### **GENERAL COMMENTS**

*Quercus gambelii* vegetation, as described here, falls within the *Quercus gambelii* Shrubland Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### **REPRESENTATION ON THE THREE FORESTS**

The *Quercus gambelii* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

<b>Reference</b>	<b>Name Used in Reference</b>	<b>NVC Equivalent</b>	<b>Rank</b>
<b>BIGHORN NATIONAL FOREST</b>			
None			
<b>MEDICINE BOW NATIONAL FOREST</b>			
Johnston 1987	<i>Quercus gambelii</i> / <i>Symphoricarpos oreophilus</i> Plant Association	<i>Quercus gambelii</i> / <i>Symphoricarpos oreophilus</i> Shrubland Plant Association	G5
<b>SHOSHONE NATIONAL FOREST</b>			
None			

CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Quercus gambelii* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGELAND COVER TYPE (SHIFLET 1994)

The *Quercus gambelii* vegetation type that we're describing falls within the Gambel Oak Rangeland Cover Type (SRM 413).

#### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press, New Haven, Connecticut.

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

**CHARACTERIZATION ABSTRACT FOR**  
***Elymus cinereus* Vegetation Type**  
**Great Basin Wildrye Vegetation Type**

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**SUMMARY**

*Elymus cinereus* vegetation is a grassland type that occurs at lower elevations. It occurs on mesic sites such as foothill ravines, bottomlands, and along streams. This type is apparently rare on the three forests, having been described from only one area in the Shoshone National Forest.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

*Elymus cinereus* vegetation is distributed throughout much of the Intermountain West and Great Basin including California, Colorado, Idaho, Oregon, Montana, Washington, and Wyoming (Faber-Langendoen et al. 1997). This type has been documented to occur in the Shoshone National Forest (Walford et al. 1997).

**PHYSICAL ENVIRONMENT**

This type occurs on mesic sites such as swales (Thilenius et al. 1995), foothill ravines (Knight et al. 1976), bottomlands (Stoddart 1941), and along streams (Mueggler and Stewart 1980). Soils are relatively moist compared to those supporting other vegetation types in the surrounding area (Faber-Langendoen et al. 1997).

**VEGETATION DESCRIPTION**

*Elymus cinereus* (syn. *Leymus cinereus*) is a cespitose grass that forms a canopy ranging from three to five feet tall (Faber-Langendoen et al. 1997). A second stratum occurs in the subcanopy with the growth of other herbaceous plant species such as *Elymus smithii*, *Achillea millefolium*, and *Castilleja* spp. (Walford et al. 1997). Scattered shrubs are sometimes present including *Symphoricarpos oreophilus*, *Artemisia tridentata*, *Ribes* spp., *Chrysothamnus viscidiflorus*, *Chrysothamnus nauseosus*, and *Rosa* spp. (Faber-Langendoen et al. 1997).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

This vegetation provides forage for livestock grazing. Nothing is known about the successional status of this type.

**STATUS AND TRENDS**

This type contains one plant association in the National Vegetation Classification that is relevant to the three forests. The *Leymus cinereus* (syn. *Elymus cinereus*) herbaceous (provisional) plant association has a G2/G3Q conservation ranking, meaning it is rare to uncommon (Anderson et al. 1998). This type was apparently more widespread prior to livestock grazing, particularly in the valley bottoms of the Great Basin (USDA Forest Service 1937).

**MANAGEMENT CONSIDERATIONS**

Economic Uses

*Elymus cinereus* vegetation is used as forage for livestock grazing.

Effects of Management Practices

This vegetation type is thought to have been much more common prior to intensive livestock grazing, particularly in valley bottoms of the Great Basin (USDA Forest Service). *Elymus cinereus* is known to be a decreaser with early spring overgrazing (Krall et al. 1971 as referenced in Tweit and Houston 1980), and this is a special concern for conservation of the remaining stands.

**SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS**

## BIGHORN NATIONAL FOREST

This vegetation type has not been documented in the Bighorns, however a grassland patch at the Shell Canyon Research Natural Area does contain a minor component of *Elymus cinereus* (Ryan et al. 1994).

## MEDICINE BOW NATIONAL FOREST

This vegetation type is not known to occur on this forest.

## SHOSHONE NATIONAL FOREST

### Distribution

This vegetation type is known to occur in the northern Absarokas along the North Fork of the Shoshone River (Walford 1997).

### Physical environment

*Elymus cinereus* vegetation grows at lower elevations on stream terraces and alluvial fans. Walford et al. (1997) sampled a stand in the northern Absarokas in which the soil type was a Typic Cryaquoll and the water table was at a depth of 22 inches.

### Vegetation description

Stands are typically small and contain mainly grasses and forbs with some scattered shrubs (Walford et al. 1997). A stand sampled by Walford et al. (1997) had two strata, an overstory dominated by *Elymus cinereus* and an understory dominated by *Poa pratensis* and *Achillea millefolium*. This stand also contained other grasses and forbs that are characteristic of mesic areas.

### Management

No specific information is known about the management of this vegetation in the Shoshone National Forest.

## AREAS WITH HIGH-QUALITY OCCURRENCES

No specific locations have been identified as quality stands, presumably due its rarity across the region.

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Elymus cinereus* vegetation is not recognized by Johnston (1987), although he does recognize a similar plant association, *Artemisia tridentata* / *Leymus cinereus*, that occurs in the Shoshone National Forest. This vegetation, as described in this abstract, falls within the *Leymus cinereus* Herbaceous Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Elymus cinereus* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
None			
MEDICINE BOW NATIONAL FOREST			
None			
SHOSHONE NATIONAL FOREST			
Walford et al. 1997	<i>Elymus cinereus</i> Community Type	<i>Leymus cinereus</i> Herbaceous Vegetation Plant Association (Provisional)	G2G3Q

### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Elymus cinereus* vegetation type does not correspond to any SAF forest cover type.

CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)  
The *Elymus cinereus* vegetation type does not correspond to any SRM rangeland cover type.

#### REFERENCES

- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>
- Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>
- Faber-Langendoen, D., J. Drake, G. Jones, D. Lenz, P. Lesica, and S. Rolfsmeier. 1997. Rare plant communities in the Northern Great Plains. A Report to the Nebraska National Forest. Unpublished. <U97FAB01WYUS>
- Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>
- Knight, D.H., R.J. Hill, and A.T. Harrison. 1976. Potential Natural Landmarks in the Wyoming Basin. Department of Botany, University of Wyoming, Laramie, WY.
- Krall, J.L., J.R., C.S. Cooper, and S.R. Chapman. 1971. Effects of time and extent of harvesting wildrye. Journal of Range Management 24:414-418.
- Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA Forest Service General Technical Report INT-66. Intermountain Forest and Range Experiment Station, Ogden, Utah.
- Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado.
- Ryan, M.G., L.A. Joyce, T. Andrews, and K. Jones. 1994. Research Natural Areas in Colorado, Nebraska, North Dakota, South Dakota, and Parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. <N94RYA01WYUS>
- Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>
- Stoddart, L.A. 1941. The Palouse Prairie Association in Northern Utah. Ecology 22:158-163.
- Thilenius, J.F., G.R. Brown, A.L. Medina. 1995. Vegetation and semi-arid rangelands, Cheyenne River Basin, Wyoming. USDA Forest Service General Technical Report RM-GTR-263. Rocky Mountain Forest and Range Experiment Station, Ogden, Utah.
- Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>
- Walford, Gillian, George Jones, Walt Fertig, and Kent Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U97WAL01WYUS>
- USDA Forest Service. 1937. Range Plant Handbook.

**CHARACTERIZATION ABSTRACT FOR**  
***Elymus spicatus* Vegetation Type**  
**Bluebunch Wheatgrass Vegetation Type**

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**SUMMARY**

*Elymus spicatus* vegetation is a grassland type occurring on gentle to steep slopes and windswept ridges. Soils are mostly shallow with a loamy texture. Stands are characterized by a conspicuous grass-dominated layer, but may also include secondary layers dominated by shrubs and forbs. Management concerns include overgrazing and exotic plant invasion. This type occurs in the Bighorn, Medicine Bow, and Shoshone National Forests.

**GENERAL INFORMATION FOR VEGETATION TYPE**

**GEOGRAPHIC DISTRIBUTION**

This vegetation occurs throughout northern portions of the United States including the Pacific Northwest, Northern and Central Rocky Mountains, and Colorado Plateau. It may also occur on the Modoc Plateau of California and in southwestern Canada (Reid et al. 1999). In Wyoming, it is found on the foothills of the Rockies including the Bighorn, Medicine Bow, and Shoshone National Forests (Merrill et al. 1996).

**PHYSICAL ENVIRONMENT**

Stands occur between 3,000 and 7,500 feet on gentle to steep slopes and windswept ridges. They can be found on slopes facing any direction. Soils are mostly shallow in depth and rocky with a loamy to fine texture (Peet 1988, Comer et al. 1999). In Wyoming, most of the precipitation falls during the growing season (Reid et al. 1999), and sites are considered moderately arid (Shiflet 1994).

**VEGETATION DESCRIPTION**

Stands typically have a conspicuous grass-dominated stratum that is about three feet high and has cover ranging from 25 to 90% (Reid et al. 1999). In addition, stands also have two secondary strata, a shrub-dominated layer and a forb-dominated layer. *Elymus spicatus* can be the sole dominant of the grass layer, but more often it is found codominating with *Stipa comata*, *Elymus smithii*, or *Poa secunda* (Comer et al. 1999, Reid et al. 1999). Stands in northwestern Wyoming usually include species such as *Achillea millefolium*, *Artemisia frigida*, *Festuca idahoensis*, *Gutierrezia sarothrae*, *Haplopappus acaulis*, and *Phlox hoodii*. Stands in central and northeastern Wyoming usually include *Boutelous gracilis*, *Carex filifolia*, and *Rhus trilobata*. *Bromus tectorum*, *Tragopogon* spp., and *Alyssum* spp. are common in degraded stands (Comer et al. 1999). On windswept ridges and slopes of outwash plains, the understory can include cushion plants such as *Arenaria hookeri*, *Hymenoxys acaulis*, *Phlox hoodii*, *Phlox muscoides*, *Cryptantha cana*, *Eriogonum mancum*, *Haplopappus nuttallii*, *Townsendia spathulata*, and *Astragalus spatulatus* (DeVelice and Lesica 1993).

**ADDITIONAL ECOLOGICAL RELATIONSHIPS**

This vegetation provides forage for livestock and wildlife (Tweit and Houston 1980, Comer et al. 1999). It is considered climax in the Rocky Mountain region, where stands occur on finely textured soils in bottomlands. Grasses are better adapted for colonizing and maintaining dominance in such areas. However, trees can eventually establish in some of these areas if there are no disturbances (Peet 1988). Overgrazing can also facilitate the replacement of this vegetation (Comer et al. 1999).

**STATUS AND TRENDS**

For this vegetation, one plant association occurring in the three forests is considered rare, and that is the *Pseudoroegneria spicata* (syn. *Elymus spicatus*) herbaceous vegetation plant association. The others are considered abundant (Anderson et al. 1998). See the section entitled "Representations on the Three Forests" for a complete list of associations and ranks.

## MANAGEMENT CONSIDERATIONS

### Economic Uses

Stands can provide forage for livestock and wildlife (Tweit and Houston 1980, Comer 1999).

### Effects of Management Practices

Overgrazing is problematic in this vegetation type. Initially, overgrazing decreases the cover of *Elymus spicatus* while it increases the cover of *Stipa comata*, *Bromus tectorum*, and associated shrub species. In fact, Comer et al. (1999) suggest that codominance of some stands by *Stipa comata* is a product of overgrazing and not representative of the climax type. Continual overgrazing eventually causes declines in *Poa secunda* and *Stipa comata*, and may lead to the conversion of herbaceous vegetation into a shrub-dominated type (Tweit and Houston 1980, Comer et al. 1999).

## SPECIFIC INFORMATION FOR THREE REGION 2 FORESTS

### BIGHORN NATIONAL FOREST

#### Distribution

Merrill et al. (1996) have mapped this vegetation as part of the Great Basin Foothills Grassland Cover Type (31003), along the western boundary of the forest. Despain (1973) also considers this type more common on the western slopes but also noted the occurrence of stands on the eastern slopes.

#### Physical environment

No additional information is known beyond that provided in the general information section.

#### Vegetation description

Despain (1973) lists several species as important associates with *Elymus spicatus* on the western slopes, including *Carex filifolia*, *Stipa comata*, *Opuntia polyacantha*, *Phlox hoodii*, along with several other graminoids and forbs. On the eastern slopes, Despain (1973) considers the most important associates to be *Andropogon scoparius* and *Yucca glauca*.

#### Management

Welp et al. (1998) found stands of this type dominated by the exotic plant *Phleum pratense* in the Tongue River Potential Research Natural Area. This may be a rare case, but does raise some management concerns regarding exotic plant invasion and loss of native vegetation.

### MEDICINE BOW NATIONAL FOREST

#### Distribution

This type is known to occur in the Sheep Mountain Potential Research Natural Area (Jankovsky-Jones et al. 1996) and in the Cedar Pass Potential Research Natural Area (Jones and Fertig 1996).

#### Physical environment

Stands occur on sloping terrain and ridgetops (Jankovsky-Jones et al. 1995, Jankovsky-Jones et al. 1996, Jones and Fertig 1996).

#### Vegetation description

This vegetation can form a mosaic with stands of sagebrush (Jankovsky-Jones 1996, Jones and Fertig 1996).

#### Management

No specific information is known about management of this vegetation in the Medicine Bow National Forest.

## SHOSHONE NATIONAL FOREST

### Distribution

Merrill et al. (1996) have mapped this vegetation as part of the Great Basin Foothills Grassland GAP Cover Type (31003). This type occurs in isolated areas within the northeastern portion of the Shoshone National Forest (Merrill et al. 1996), including the Clark's Fork and Wapiti Ranger Districts (Tweit and Houston 1980).

### Physical environment

Stands occur on gentle to steep slopes facing any direction (Tweit and Houston 1980, Fertig and Bynum 1994, Jones and Fertig 1999).

### Vegetation description

This vegetation usually occurs in mosaics with other forest and non-forest types (Tweit and Houston 1980). In fact, Jones and Fertig (1999) found it growing in mosaics with stands of *Artemisia tridentata* ssp. *vaseyana* and *Artemisia nova*. *Elymus spicatus* dominates the grass layer with *Poa secunda*, *Elymus smithii*, or *Elymus trachycaulus*. Other common species include *Poa sandbergii*, *Koeleria macrantha*, *Poa cusickii*, *Stipa comata*, *Artemisia frigida*, *Chrysopsis villosa*, *Phlox hoodii*, *Sphaeralcea coccinea*, *Tragopogon dubius*, *Gutierrezia sarothrae*, *Chrysothamnus nauseosus*, *Chrysothamnus viscidiflorus*, and *Artemisia tridentata* ssp. *wyomingensis* (Tweit and Houston 1980).

### Management

Overgrazing is problematic in this vegetation. Initially, it decreases the abundance of *Elymus spicatus* while it increases the abundance of *Stipa comata*, *Elymus smithii*, *Elymus trachycaulus*, *Koeleria macrantha*, *Poa fendleriana*, and *Poa secunda* (depending on which species are present in a stand). Continual overgrazing increases the cover of *Artemisia frigida*, *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus nauseosus*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, and *Opuntia polyacantha*. Eventually a stand can be converted into *Artemisia tridentata* ssp. *wyomingensis* vegetation (Tweit and Houston 1980). Tweit and Houston (1980) recommend that sprouts not be grazed until they are four inches tall. In addition, they suggest that grazing should not remove more than 50% of aboveground shoot material at peak biomass (Tweit and Houston 1980).

## AREAS WITH HIGH-QUALITY OCCURRENCES

Quality representations of this type occur in the Bald Ridge Potential Research Natural Area of the Shoshone National Forest (Fertig and Bynum 1994), Sheep Mountain Potential Research Natural Area of the Medicine Bow National Forest (Jankovsky-Jones et al. 1996), and Bull Elk Park Research Natural Area of the Bighorn National Forest (Ryan et al. 1994).

## RELATIONSHIP TO OTHER TYPES ON THE THREE NATIONAL FORESTS

### GENERAL COMMENTS

*Elymus spicatus* vegetation, as described here, falls within the *Pseudoroegneria spicata* Herbaceous Alliance of the National Vegetation Classification (Anderson et al. 1998), as described by Reid et al. (1999).

### REPRESENTATION ON THE THREE FORESTS

The *Elymus spicatus* vegetation type is represented on the three national forests by the following communities, habitat types, or other units. Correspondence of each of these units to plant associations from the National Vegetation Classification (NVC; Anderson et al. 1998) is shown if it is known.

Reference	Name Used in Reference	NVC Equivalent	Rank
BIGHORN NATIONAL FOREST			
Ryan et al. 1994	Bluebunch Wheatgrass Dominated Vegetation	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation?	G2?
Welp et al. 1998	Bluebunch Wheatgrass Plant Community	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation?	G2?
Merrill et al. 1996	Great Basin Foothills Grassland GAP Cover Type	N/A	



MEDICINE BOW NATIONAL FOREST			
Johnston 1987	<i>Roegneria spicata</i> / <i>Poa secunda</i> Plant Association	<i>Pseudoroegneria spicata</i> / <i>Poa secunda</i> Herbaceous Vegetation	G4?
Janokovsky-Jones et al. 1995, Janokovsky-Jones et al. 1996, Jones and Fertig 1996	Bluebunch Wheatgrass – Sandberg Bluegrass Plant Community	<i>Pseudoroegneria spicata</i> / <i>Poa secunda</i> Herbaceous Vegetation	G4?
SHOSHONE NATIONAL FOREST			
Tweit and Houston 1980	<i>Agropyron spicatum</i> / <i>Poa sandbergii</i> Habitat Type	<i>Pseudoroegneria spicata</i> / <i>Poa secunda</i> Herbaceous Vegetation	G4?
Tweit and Houston 1980	<i>Agropyron spicatum</i> / <i>Agropyron smithii</i> Habitat Type	<i>Pseudoroegneria spicata</i> / <i>Pascopyrum smithii</i> Herbaceous Vegetation	G4
Johnston 1987	<i>Roegneria spicata</i> / <i>Stipa comata</i> Plant Association	<i>Pseudoroegneria spicata</i> / <i>Stipa comata</i> Herbaceous Vegetation	G4
Johnston 1987	<i>Roegneria spicata</i> / <i>Poa secunda</i> Plant Association	<i>Pseudoroegneria spicata</i> / <i>Poa secunda</i> Herbaceous Vegetation	G4?
Johnston 1987	<i>Roegneria spicata</i> / <i>Elytrigia smithii</i> Plant Association	<i>Pseudoroegneria spicata</i> / <i>Pascopyrum smithii</i> Herbaceous Vegetation	G4
Fertig and Bynum 1994	<i>Agropyron spicatum</i> - <i>Poa secunda</i> Plant Community	<i>Pseudoroegneria spicata</i> / <i>Poa secunda</i> Herbaceous Vegetation	G4?
Jones and Fertig 1999	Bluebunch Wheatgrass Plant Community	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation?	G2?
Merrill et al. 1996	Great Basin Foothills Grassland GAP Cover Type	N/A	

#### CORRESPONDING SOCIETY OF AMERICAN FORESTERS COVER TYPE (EYRE 1980)

The *Elymus spicatus* vegetation type does not correspond to any SAF forest cover type.

#### CORRESPONDING SOCIETY FOR RANGE MANAGEMENT RANGE COVER TYPE (SHIFLET 1994)

The *Elymus spicatus* vegetation type that we're describing includes the Bluebunch Wheatgrass – Sandberg Bluegrass and Bluebunch Wheatgrass – Western Wheatgrass range cover types (SRM 302 and SRM 303).

#### REFERENCES

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakly. 1998. International Classification of Ecological Communities: Terrestrial Vegetation of the United States, Volume II The National Vegetation Classification System: List of Types. The Nature Conservancy. <N98AND01WYUS>

Comer, P., L. Allen, S. Cooper, D. Faber-Langendoen, and G. Jones. 1999. Selected shrubland and grassland communities of the northern Great Plains. A report to the Nebraska National Forest. The Nature Conservancy. Unpublished. <U99COM01WYUS>

Despain, Don G. 1973. Vegetation of the Big Horn Mountains, Wyoming, in relation to substrate and climate. Ecological Monographs 43:329-355. <A73DES01WYUS>

DeVelice, Robert L. and Peter Lesica. 1993. Plant community classification for vegetation on BLM lands, Pryor Mountains, Carbon County, Montana. Montana Natural Heritage Program, Helena MT. 78 pp. <U93DEV01WYUS>

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington D.C. <B89EYR01WYUS>

Fertig, Walter and Mike Bynum. 1994. Biological report on the proposed Bald Ridge research natural area. Report prepared for the USDA Forest Service, Shoshone National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U94FER13WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1995. Ecological evaluation for the potential Battle Mountain research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U95JAN02WYUS>

Jankovsky-Jones, Mabel, George P. Jones, and Walter Fertig. 1996. Ecological evaluation for the potential Sheep Mountain research natural area within the Medicine Bow National Forest, Albany County, Wyoming. Wyoming Natural Diversity Database, The Nature Conservancy, Laramie WY. Unpublished. <U96JAN01WYUS>

Johnston, B.C. 1987. Plant Associations of Region Two. Edition 4. USDA Forest Service Rocky Mountain Region. R2-ECOL-87-2. <N87JOH01WYUS>

Jones, George P. and Walter Fertig. 1996. Ecological evaluation of the potential Cedar Pass research natural area within the Medicine Bow National Forest, Carbon County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U96JON02WYUS>

Jones, George P. and Walter Fertig. 1999. Ecological evaluation of the potential Grizzly Creek research natural area within the Shoshone National Forest, Park County, Wyoming. Wyoming Natural Diversity Database, University of Wyoming, Laramie WY. Unpublished. <U99JON04WYUS>

Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report, Wyoming Cooperative Fishery and Wildlife Research Unit, University of Wyoming, Laramie WY. <N96MER>

Peet, Robert K. 1988. Forests of the Rocky Mountains. Chapter 3 in: Barbour, Michael and William Dwight Billings (editors). 1988. Terrestrial vegetation of North America. Cambridge University Press. 434 pp. <B88BAR01WYUS>

Reid, M.S., K.A. Schulz, P.J. Comer, M.H. Schindel, D.R. Culver, D.A. Sarr, and M.C. Damm. 1999. An Alliance Level Classification of the Vegetation of the Conterminous western United States. A Report to the University of Idaho Cooperative Fish and Wildlife Research Unit and the National Gap Analysis Program. The Nature Conservancy, Western Conservation Science Department, Boulder, Colorado. <N99REI01WYUS>

Ryan, Michael G., Linda A. Joyce, Tom Andrews, and Kate Jones. 1994. Research natural areas in Colorado, Nebraska, North Dakota, South Dakota, and parts of Wyoming. USDA Forest Service General Technical Report RM-251. Rocky Mountain Forest and Range Experiment Station, Fort Collins CO. 57 pp. <N94RYA01WYUS>

Shiflet, T.N. (editor). 1994. Rangeland Cover Types of the United States. Society of Range Management, Denver, Colorado. <B94SHI16WYUS>

Tweit, S.J. and K.E. Houston. 1980. Grassland and Shrubland Habitat Types of the Shoshone National Forest. USDA Forest Service, Rocky Mountain Region. Unpublished. <B80TWE01WYUS>

Welp, Laura, Walter Fertig, and George Jones. 1998. Ecological evaluation of the potential Tongue River research natural area within the Bighorn National Forest, Sheridan County, Wyoming. Prepared for the USDA Forest Service, Bighorn National Forest by the Wyoming Natural Diversity Database, The Nature Conservancy. Unpublished. <U98WEL01WYUS>