

Plant Community Survey of Soapstone Prairie Natural Area



October 2018

CNHP's mission is to advance the conservation of Colorado's native species and ecosystems through science, planning, and education for the benefit of current and future generations.

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Front Cover: High quality grasslands and shrublands at Soapstone Prairie Natural Area.

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TABLE OF CONTENTS

Acknowledgements	i
Summary of Services.....	1
Soapstone Plant Communities.....	1
Recommendations/Further research needs	2
References	3
Appendix: Plant community characterization abstracts.....	4

SUMMARY OF SERVICES

We visited the Soapstone Prairie Natural Area on August 27 and 29 of 2018 to document the quality, condition, and landscape context of plant communities of interest in the area. We timed our visits to maximize the chance of observing weeds, which are often good indicators of community condition. Surveys consisted of walking and driving within and around the perimeter of the occurrences, and noting the size, species composition, landscape context, and management concerns. We sought to identify opportunities and constraints that may be pertinent to an upcoming management plan update for the Natural Area in 2019.

Soapstone Plant Communities

Prior to conducting fieldwork, we reviewed the plant community information that was documented in the area in 1996-2004 by CNHP Ecologists Steve Kettler, John Sanderson, Stephanie Neid, and Pam Smith (**Table 1**). None of the plant communities documented at Soapstone are endemic to Colorado, but the *Cercocarpus montanus/Hesperostipa comata* Mixed Foothills Shrublands and the *Atriplex canescens/Bouteloua gracilis* Shortgrass Prairie Shrublands are considered to be globally imperiled to vulnerable (G2-G3, reflecting the sparse range-wide distribution of these associations). Most of the communities listed in **Table 1** are considered to be imperiled or vulnerable in Colorado (S1-S3). The two wetland communities that are thought to be secure globally and in Colorado, *Carex nebrascensis* Wet Meadow (G4/S4), and *Carex utriculata* Wet Meadow (G5/S5); the Soapstone occurrences are good quality examples of these communities, and potentially significant to the shortgrass prairie ecoregion. For CNHP/NatureServe rank definitions please visit the CNHP website.

We visited all previously documented communities, and updated the mapped boundary of the *Atriplex canescens/Bouteloua gracilis* shrubland to show its occurrence on Soapstone. We did not modify the boundaries of any other communities because it was beyond the scope of this project. We also targeted all non-native plants that were evident on the dates of our visits, especially noxious weeds because of their potential management concerns.

We updated the ranks of all of the previously documented plant communities, updating three of the wetland communities to a B rank from a C. All other ranks stayed the same as what had been documented in previous years (**Table 1**). The wetland areas were ranked B because of their intact hydrological setting, high quality landscape context on Soapstone Prairie Natural Area, low cover of non-native plants, and good size for the Great Plains Ecoregion.

Table 1. List of significant plants communities documented by the Colorado Natural Heritage Program (CNHP) at the Soapstone Prairie Natural Area 1994-2018. Element occurrence ranks in **bold** indicate a 2018 rank change. Detailed records provided separately with GIS files.

Scientific Name	Common name	Pre 2018 occurrence rank	EORANK 2018	Global rank	State rank	First observed	Last observation prior to 2018 surveys	# of occurrences mapped in CO
<i>Bouteloua gracilis</i> - <i>Buchloe dactyloides</i> Grassland	Shortgrass Prairie	B	A	G4	S2?	2004-08-25	2004-09-08	8
<i>Hesperostipa comata</i> - <i>Bouteloua gracilis</i> - <i>Carex filifolia</i> Grassland	Montane Grasslands	A	A	G5	S2	2004-08-25	2004-09-08	10
<i>Atriplex canescens</i> / <i>Bouteloua gracilis</i> Shrubland	Shortgrass Prairie	A	A	G3	S2	1984-05-09	2004-09-08	6
<i>Krascheninnikovia lanata</i> / <i>Pascopyrum smithii</i> - <i>Bouteloua gracilis</i> Dwarf-shrub Grassland	Western Slope Grasslands	A	A	G4	S1	2004-09-10	2004-09-10	2
<i>Cercocarpus montanus</i> / <i>Elymus lanceolatus</i> Shrubland	Mountain Mahogany/Thickspike Wheatgrass Shrubland	B	B	GU	S2	1996-07-11	2012-08-10	5
<i>Cercocarpus montanus</i> / <i>Hesperostipa comata</i> Shrubland	Mixed Foothill Shrublands	B	B	G2	S2	1996-07-11	2012-08-09	25
<i>Carex simulata</i> Fen	Wet Meadow	C	B	G4	S3	1996-06-28	1996-06-28	23
<i>Carex nebrascensis</i> Wet Meadow	Wet Meadows	C	B	G4	S4	1996-06-28	1996-06-28	20
<i>Catabrosa aquatica</i> - <i>Mimulus</i> ssp. Spring Wetland	Spring Wetland	C	B	GU	S2	1996-07-08	2005-07-01	4
<i>Carex utriculata</i> Wet Meadow	Beaked Sedge Montane Wet Meadows	B	B	G5	S5	1996-07-08	1996-07-08	51

Recommendations/Further research needs

- Conduct further surveys at additional times of year to better understand how the plant community species composition changes during the year, including the presence of non-native plants, and plants that increase or decrease with grazing.
- Conduct more in-depth studies of the wetland areas using the 2015 Colorado Wetland Ecological Integrity Assessment methods.
- Update mapped community boundaries as needed. The mapping done to date is not precise.
- Monitor to detect incompatible grazing pressure on different plant communities, especially the wetlands.
- Monitor to detect the spread of non-native plants.
- Apply a Floristic Quality Assessment (FQA) to a full list of species known from the area to identify species and sites that may warrant extra conservation attention within the Natural Area. Much of this work has been done by Crystal Strouse, City of Fort Collins Botanist. The FQA method is used to calculate various indices that reflect the condition of a site based on the plant species present. The core of the FQA method is the use of “coefficients of conservatism” (C-values), which are assigned to all native species in a flora following the methods described by Swink and Wilhelm (1994). C-values range from 0 to 10 and represent an estimated probability that a plant is likely to occur in a landscape relatively unaltered from pre-European settlement conditions. High C-values are assigned to species likely to occur in high-quality natural areas, while low C-values are assigned to species that tolerate human disturbance. C-values for Colorado species were assigned by a panel of botanical experts, as described in Rocchio (2007). FQA indices provide consistent, quantitative measures of floristic integrity that can be used in any plant community, do not require extensive sampling equipment, and can be applied to existing data sets. **An FQA will likely confirm the high quality of the Natural Area.**
- Identify pollinators and other factors effecting the reproductive ecology and long-term viability of rare and uncommon plants as well as those with a high floristic quality index.
- Limit fragmentation and disturbance as much as possible. In particular, approach weed treatments with great caution. Monitor to see if weeds are a problem (i.e., are they expanding or stable). If necessary, spot treat and monitor to make sure the treatment is working. Please note that in some cases it is best to do nothing, especially when water quality or native species and soils could be threatened with the use of herbicides. Weed treatments in sensitive areas should include minimal and precise herbicide application and immediate follow-up replanting of native species if bare soil areas are created (Smith et al. 2015).
- Create local field guides specific to the Soapstone Prairie Natural Area including natural history information to help visitors connect with and appreciate plants,

plant communities, and other elements of biodiversity. Much work has already been done by Crystal Strouse, City of Fort Collins, Botanist.

- Continue to build collections of Soapstone plant specimens at local herbaria to support research, observations, and outreach materials.
- Prioritize conservation management of wetlands that may support rare plants and animals.

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Appendix: Plant community characterization abstracts

Please note that plant community characterization abstracts are only available for a few of the plant communities included in this report. Additional funding is needed to update the following, and to complete abstracts for the remaining community types.



Colorado Natural Heritage Program Community Characterization Abstract

Global Scientific Name: *Hesperostipa comata-Bouteloua gracilis-Carex filifolia*
Herbaceous Vegetation

Global Common Name: Needle-and-Thread Grass-Blue Grama - Threadleaf Sedge
Herbaceous Vegetation

State Scientific Name: *Hesperostipa comata-Bouteloua gracilis-Carex filifolia*
Herbaceous Vegetation

State Common Name: Needle-and-Thread-Blue Grama Mixedgrass Prairie

Global Element Code: CEG002037

Global Rank: G5

Global Rank Comments:

State Rank: S2S3

State Rank Comments:

Old State Element Code:

State: CO

USNVC Alliance: *Stipa comata-Bouteloua gracilis* herbaceous alliance

General Description

and Comments: This mixedgrass prairie type is one of the the most common plant associations in the Northern Great Plains. The *S. comata - Bouteloua gracilis - Carex filifolia* community occurs on coarse textured upland soils, but may also occur lower in the landscape, such as on coulee and draw bottoms, if soils are sufficiently coarse. Areas with heavy soils derived from shale and mudstone parent materials do not support this plant association. Elevations typically range between 5,300 ft and 7,700 ft. The average annual precipitation ranges from slightly less than 10 to slightly more than 20 inches.

Vegetation: *Stipa comata* is the tallest of the dominant species, sending seed heads to a maximum height of approximately 1 m. The rhizomatous graminoids, *Bouteloua gracilis* and *Carex filifolia*, the other two dominant/co-dominant species, do not usually exceed 0.5 meters. *Calamovilfa longifolia* is often found with high cover values on sandier soils and *Koeleria macrantha* cover increases on degraded sites. There are regional expressions of variability with *C. inops* var. *heliophila* surpassing *C. filifolia* in Colorado and *Calamagrostis*

montanensis being at least as important as the diagnostic species in north-central Montana. *Pascopyrum smithii* is consistently present and reaches the same height as *S. comata*. For woody species, subshrub forms (*Artemisia frigida*, *Gutierrezia sarothrae*, *Rosa arkansana*) have the highest cover and constancy but their total cover does not sum to more than 5%, except on overgrazed sites. Regardless of the geographic region of this broadly distributed type, cover values for forbs are low, though geographic setting does influence forb composition to some degree. In the northern distribution of this type, *Sphaeralcea coccinea*, *Phlox hoodii*, *Heterotheca villosa*, *Gaura coccinea*, and *Liatris punctata*, have high constancy values. The constancy of *Lygodesmia juncea*, *Opuntia polyacantha*, *Artemisia dracunculoides* and *Ratibida columnifera* seems to increase to the eastern and southern portions of the type's distribution. Total vegetative cover is moderately dense.

Successional and

Ecological Processes: Fire, both aboriginal and lightning-caused, was a regular part of this association. Fire-return intervals have been considerably lengthened since settlement by European-Americans. Vast prairie dog (*Cynomys ludovicianus*, *C. leucurus*) "towns" (singly and in the aggregate) once occurred on, and exploited the vegetation of this type. Prairie dog populations have undergone a decline since settlement, so much of this type could be in various states of secondary succession, returning from a somewhat denuded state and altered composition created by the prairie dogs. Many occurrences of this association receive significant grazing pressure, which combined with alien weed populations, pose a significant threat to its quality.

Related Literature

and Synonyms: *Bouteloua gracilis* – *Stipa comata* "type" (Wright and Wright 1948)| *Bouteloua gracilis* – *Stipa comata* – *Koeleria cristata* (syn. *K. macrantha*) "type" (Wright and Wright 1948)| *Stipa comata* / *Bouteloua gracilis* – *Stipa comata* community type (Producers 1978)| *Bouteloua gracilis* – *Carex filifolia* / *Stipa comata* community type (Producers 1978)| *Stipa comata* – *Bouteloua gracilis* habitat type, *Agropyron smithii* (syn. *Pascopyrum smithii*) phase (Mueggler and Stewart 1980)| *Bouteloua gracilis* – *Carex filifolia* sodgrass steppe (Thilenius et al. 1995)| *Stipa comata* – *Carex filifolia* – *Bouteloua gracilis* Seral Community Type (Jensen et al. 1992)| *Carex filifolia* – *Stipa comata* – *Bouteloua gracilis* Seral Community Type (Jensen et al. 1992)| *Stipa comata* – *Carex filifolia* Potential Natural Community Type (Jensen et al. 1992)| *Stipa comata* – *Carex filifolia* habitat type (Hansen and Hoffman 1988)| *Bouteloua gracilis* – *Stipa comata* – *Carex filifolia* type (Hansen and Whitman 1938)| *Stipa comata* – *Carex filifolia* – *Koeleria cristata* (syn. *K. macrantha*) "type" (Culwell and Scow 1982)

Similar Communities: In Colorado other similar communities include the *Stipa comata* - *Bouteloua gracilis* type, and the *Stipa comata* East type. The floristically and ecologically similar association, *Stipa comata* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001699), is generally most prominent south of the distribution of this association (from approximately northern Colorado southward and to the east). *Carex filifolia* is lacking or highly reduced in importance and the type tends to occur on steeper slopes. Weaver and Albertson (1956) also remark on the fact that low sedges are present as far south as Texas, but are important only north of Colorado. However, a phase of the *S. comata* – *B. gracilis* type of Mueggler and Stewart (1980) in western Montana is apparently quite similar to communities of the southern and southeastern portions or the Northern Great Plains (though it lacks *C. filifolia*). So that the distinction between *S. comata* – *B. gracilis* and *S. comata* – *B. gracilis* – *Carex filifolia* may not rest on geographic affinities alone. There is a welter of named community types, mostly seral representations of grazing or fire impacts, that vary by having one or another of the defining

species (or even other graminoids e.g. *Carex inops* ssp. *heliophila*) dominant. This assemblage of types is also defined by having relatively low cover of both *Pascopyrum smithii* (syn. *Agropyron smithii*) and *Elymus lanceolatus* (syn. *Agropyron dasystachyum*). To accommodate these permutations within the concept of the type (as lesser-ranked occurrences) or to recognize them as independent vegetation types recognized by existing vegetation composition is one question. Another is, what cover value or degree of dominance of *P. smithii* or *E. lanceolatus* will serve to establish the distinction between *A. smithii* – *Stipa comata* – *Carex filifolia* (and allied *A. smithii* “dominated” communities) from the community under consideration.

The *Stipa comata* East type occurs at lower elevations (5100 - 5760 feet) on the eastern slope of the Rocky Mountains in Colorado (Hanson 1955, Hanson and Dahl 1957, CNHP 1996). Several stands occur on soils derived from limestone and sandstones of the Morrison, Dakota, Lykins, and Lyons formations (Hanson 1955). This association is mainly found on east and west facing "hogback" slopes along the mountain front of Colorado (Hanson 1955), but may be found on rock outcrops in northeastern Colorado. The tallgrass *Andropogon gerardii* is a diagnostic species in this association that is rarely if ever present in the *Stipa comata* - *Bouteloua gracilis* - *Carex filifolia* type.

Colorado Distribution: Occurs in northeastern Colorado along the eastern flank of the Colorado Rocky Mountain Front Range.

Regional Distribution: This association is also confirmed for Alberta, Manitoba, Montana, Nebraska, North Dakota, South Dakota, Saskatchewan, and Wyoming.

Elevation Range

in Colorado: 5300 to 7710 feet

Site Geomorphology: This association occurs on upland sites with course textured soils, but may also occur lower in the landscape, such as on coulee and draw bottoms, if the soils are sufficiently coarse.

Soil: This association occurs on sites with course textured soils.

Management: Over portions of this type’s range, especially in north-central Montana and into Alberta and Saskatchewan, *Selaginella densa* has established very high ground cover (in excess of 90% in places). Ostensibly this sward of *S. densa* constitutes competition for the native grasses, decreasing their production. What exactly leads to this condition is currently a moot point but “chiseling” and grazing of domestic stock (to break up the cover with trampling [Coupland 1961]) are said to ameliorate the condition. *Bromus japonicus* and *B. tectorum* (winter annuals) are the major weedy species over the much of the northern and eastern portions. Their populations can be remarkably increased by summer and autumn fires, especially where grazing has been intensive. *Bromus inermis* (smooth brome) and *Melilotus officinalis* (yellow sweet clover), though not considered weeds, have been seeded as roadside stabilizers and to create dense nesting cover. They find these sites very conducive and they aggressively increase, out-competing native vegetation and leading to biodiversity impoverishment of the whole system.

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Colorado Natural Heritage Program Community Characterization Abstract

Global Scientific Name: *Cercocarpus montanus* / *Stipa comata* Shrubland
Global Common Name: Mountain mahogany/needle-and-thread grass shrubland

State Scientific Name: *Cercocarpus montanus* / *Stipa comata* Shrubland
State Common Name: Mountain mahogany/needle-and-thread grass shrubland

Global Element Code: C EGL001092
Global Rank: G2
Global Rank Comments:

State Rank: S2

State Rank Comments: Although numerous large stands exist, almost all are degraded to some extent by invasion of weedy species, lack of periodic fire, and intensive grazing. *Bromus tectorum*, has invaded many stands very heavily and almost all stands to some extent. This is thought to significantly alter community composition and ecological functions (Bock and Bock. 1988, Bedunah 1992). Suppression of periodic fires has probably decreased the cover of *Cercocarpus montanus* and allowed accumulation of additional light fuels. Disturbance from livestock grazing is likely to have reduced *Stipa comata* cover and increased cover of species such as *Artemisia frigida*, *Opuntia polyacantha*, and *Bromus tectorum*.

Old State Element Code: CPSACEMO2A
State: CO

USNVC Alliance: CERCOCARPUS MONTANUS SHRUBLAND ALLIANCE

General Description

and Comments: This association occurs in large stands along the northern Front Range of the Colorado Rocky Mountains (mainly Jefferson, Boulder, and Larimer counties), in small patches on the Chalk Bluffs along the Colorado-Wyoming line in Weld County, and on rock outcrops in southeastern Colorado. Lacking a tree canopy, the common montane shrub *Cercocarpus montanus* dominates the upper stratum. Other shrub species also typically present include *Rhus trilobata*, *Ribes cereum*, *Artemisia*

frigida, and *Opuntia polyacantha*. The understory is dominated by the mid grass *Stipa comata* with *Bouteloua gracilis* and other graminoids also typically present.

Climate on the eastern mountain front of Colorado is strongly continental in character with sudden extreme changes possible at any time. Temperatures are warm in summer and cool in winter. Along the mountain front from Fort Collins to Colorado Springs average annual precipitation ranges from 13-19 inches. On average, at least 60 percent of the precipitation falls during the growing season (May – September).

Vegetation: *Cercocarpus montanus* is the dominant species with around 25-40% canopy cover. *Rhus trilobata*, *Ribes cereum*, *Artemisia frigida*, and *Opuntia polyacantha* are common in low abundance. In good condition stands *Stipa comata* dominates the understory with 10-20% cover, while *Bouteloua gracilis* is commonly present with 1-5% cover. Other species usually present but in low abundance are *Elymus lanceolatus*, *Oryzopsis hymenoides*, *Helianthus pumilus*, *Heterotheca villosa* and *Eriogonum umbellatum*.

Related Literature and Synonyms:

Similar Communities: This community often intergrades with other *Cercocarpus montanus* communities (*Cercocarpus montanus/Pseudoroegneria spicata* (or *Elymus lanceolatus X Pseudoroegneria spicata*), *Cercocarpus montanus/Muhlenbergia montana*, *Cercocarpus montanus/Stipa scribneri*) or grasslands dominated by *Stipa comata*, *Bouteloua gracilis*, and *Pascopyrum smithii*. In northern Larimer County, the *Cercocarpus montanus/Stipa comata* association often occurs on warmer slopes (generally south facing) while the *Cercocarpus montanus/ Elymus lanceolatus X Pseudoroegneria spicata* community often occurs on cooler slopes (generally north facing). *Cercocarpus montanus* is known to provide winter browse for a variety of native ungulates and may provide habitat for birds.

Regional Distribution: CO

Colorado Distribution: The northern Front Range of the Colorado Rocky Mountains (mainly in Jefferson, Boulder, and Larimer counties), the Chalk Bluffs along the Colorado-Wyoming line in Weld County, and on rock outcrops on the Comanche National Grassland in southeastern Colorado.

**Elevation Range
in Colorado:** 5,000 to 7,000 feet

Site Geomorphology: This association typically occurs on rock outcrops of various geologic formations along the northern foothills of the Front Range of the Colorado Rocky Mountains. Most stands are on moderately steep slopes up to 20-30%,

usually facing from east to south to west. Surface exposure of bare ground and rock and gravel may be as much as 50%.

Soil: Soils are primarily entisols (Ustorthents) with a shallow A horizon and coarse texture. Parent material includes igneous and metamorphic rocks and colluvium derived from these rocks.

Successional and

Ecological Processes: Fire has probably been suppressed in most stands and would be expected to reduce the canopy cover of the *Cercocarpus montanus* but not totally eliminate it. In some stands, the lack of fire may have allowed *Juniperus scopulorum* or other woody tree species to form an open canopy woodland. *Cercocarpus montanus* will resprout following moderate intensity fires (FEIS 1998), however, many stands invaded by *Bromus tectorum* could burn very hot because of increased fuel loads.

Adjacent vegetation:

Management:

Literature Cited:

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***Carex simulata* Herbaceous Vegetation**

Common Name:

Analogue Sedge Herbaceous Vegetation

Western Vegetation Classification

Level	Category
V.	HERBACEOUS VEGETATION
V.A.	PERENNIAL GRAMINOID VEGETATION
V.A.5.	TEMPERATE OR SUBPOLAR GRASSLAND
V.A.5.m.	SATURATED TEMPERATE OR SUBPOLAR GRASSLAND

Alliance:

CAREX SIMULATA SATURATED HERBACEOUS ALLIANCE

System:

Palustrine

Hydrogeomorphic (HGM) Subclass:

Slope 1/2

Related Literature and Synonyms:

The *Carex simulata* (analogue sedge) plant association is well described from Idaho (Tuhy and Jensen 1982), Utah (Youngblood *et al.* 1985a, Padgett *et al.* 1989), Montana (Hansen *et al.* 1989), Oregon (Kovalchik 1987) and California (Nachlinger 1985).

Similar Communities:

Stands dominated by *Carex aquatilis* (water sedge), *Carex nebrascensis* (Nebraska sedge), or *Carex utriculata* (Northwest Territory sedge) with no *Carex simulata* (analogue sedge) present would not belong to the *Carex simulata* plant association.

Methodology:

Agglomerative cluster analysis programs were employed using Euclidean distance and average clustering to determine groups of plots with similar species abundance and percentage canopy cover. Associations derived from the cluster analyses were compared with riparian plant association stand data and descriptions from riparian classification work in Colorado, New Mexico, Arizona, Utah, Montana, Idaho, and Wyoming (Johnston 1987, Muldavin *et al.* 1996, Durkin *et al.* 1994, 1995, Szaro 1989, Padgett *et al.* 1989, Hansen *et al.* 1988, 1989, 1995, Youngblood *et al.* 1985a, 1985b). Associations were considered either 1) synonymous — when associations matched in species composition, constancy, average cover, and environmental setting, 2) similar — when canopy structure, genera, and physical setting were similar, but species composition was different, 3) a new type — not described in the literature, or 4) unclassifiable — when data were insufficient. Plots and transects were subjectively located within a homogeneous portion of each stand to best represent the vegetation of the site. Sampling

and data collection are designed to be representative, not statistically rigorous. Woody vegetation was quantitatively sampled for percent cover using 30-50 m long line-intercept transects, oriented parallel to the stream channel. Herbaceous vegetation was sampled using 10-20 micro-plots (0.10 m²), located about every third meter along the transect and 1 m to the side, alternating sides.

DISTRIBUTION

Regional Distribution:

This association is known from Colorado, Idaho, Montana, Nevada, Oregon, Utah, Wyoming, and may possibly occur in California (NVC 2001).

Distribution in Colorado:

Carex simulata (analogue sedge) fens are known from Larimer County south to the San Luis Valley, more or less restricted to the high mountain valleys in the central part of the state (CNHP 1999).

Distribution by Watersheds:

This plant association is based on thirty-three quantitative plots: seven from the Rio Grande Headwaters Basin (97EV32, 97GK18, 97GK19, VG-21, VG-24, VG-44, VG-47), twenty-five from the South Platte Basin (E26, FR169, HC87, HC90, HC92, HC96, HC97, HC127, HC139, SP6, SP13, SP18, SP22, SP35, SP43, SP91, SP147, SP157, SP174, SP177, SP198, SP203, SP235, SP240, SP258), and one from the Gunnison Basin (CB7).

STATUS

Reasons for Global Rank:

This association is widespread in the Pacific Northwest.

Global Rank:

Global rank is based on the status of a taxon throughout its range. This association is ranked G4, apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Reasons for State Rank:

This type is known from several watersheds in Colorado. Many of the plots used to describe the association occur near each other, so the actual number of occurrences is lower than the number of plots.

State Rank:

State rank is based on the status of a taxon in an individual state. In Colorado, this association is ranked S3, imperiled in state because of rarity (21 to 100 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state).

HABITAT

General Description and Comments:

Carex simulata (analogue sedge) is found only on quaking fens in Colorado. It is commonly found with many other sedge species, but its presence is associated with deep organic soils and a perennially high water table.

Elevation Range in Colorado:

5,600-11,700 ft (2,400-2,900 m).

Site Geomorphology:

This community is located on saturated organic soils in moderate to wide valleys (250 ft to >1 mi, 76 m to >1.6 km). The surface of the ground is hummocky, and “quakes” when walked or jumped on. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Streams are low gradient and highly sinuous (Rosgen Channel Type: E4) to broader, slightly more steep streams (Rosgen channel Type: B3).

Soils:

Soils are deep, dark brown to black, 100% organic peat, saturated to the surface. In two sampled pits, the water table settled at 18 in (45 cm) and 3.5 in (9 cm) below the surface.

MANAGEMENT

Management:

Carex simulata fens are concentrated in two high mountain parks, South Park and the San Luis Valley. Effective management will require a much better understanding of the hydrologic connections between surface, shallow, and deep groundwater resources of the of these areas as well as how they vary in time and space. Management of the valley bottom sites listed here will require not only local protection of on-site wetland elements, but secure water resources and greater understanding of how current and anticipated water uses within the watershed will affect the wetlands. More research is needed about the interactions between hydrology, vegetation, and wetland fauna before the effects of water development on the biodiversity of the Closed Basin and South Park are known.

Successional and Ecological Processes:

Groundwater pumping is one of the greatest threats to the biodiversity of the Closed Basin. Surface water impoundments and diversions present an equally widespread and allied threat, especially in South Park. The playa lake ecosystems of the San Luis Valley floor depends upon a complex interaction of surface and groundwater sources which undergo characteristic seasonal and inter-annual fluctuations. Extensive wetlands have developed where sources of fresh surface water, such as creeks or springs, build on the shallow water table to create seasonal groundwater mounds. Preliminary work has shown that not only are hydrologic dynamics in the valley complex, but that the differing water sources vary widely in water quality (Cooper and Severn 1992). Wetland

vegetation is strongly affected by water salinities, and valley wetlands have developed unique floristic patterns based on the quantity and quality of water they receive. Water uses which perturb the timing or magnitude of surface flows, or affect the water table, have the potential to negatively affect valley bottom wetlands. Even minor changes in the water depth or duration of inundation in the wetland basins can have profound effects on soil salinities, and consequently, on wetland vegetation. Cooper and Severn (1992) observed that the entire range of soil moisture and salinity, and associated plant communities, from permanently saturated wetland to saline flat to rain-rinsed upland, occurred over an elevation gradient of only 5 to 8 ft (1.5-2.4 m). Wetland dependent fauna, such as nesting waterbirds, amphibians, or invertebrates may be affected by even brief fluctuations in wetland hydrology.

VEGETATION

Vegetation:

Graminoids dominate this meadow association with 90-100% vegetative cover. *Carex simulata* (analogue sedge) (5-90% cover) may not be the most abundant species, but it is always present, and serves as the indicator species for this association (e.g., plot 97GK19). A variety of other *Carex* (sedge) species may be present, and even more abundant, including *Carex aquatilis* (water sedge) (1-50% cover), *C. utriculata* (Northwest Territory sedge) (1-45%), and *C. nebrascensis* (Nebraska sedge) (1-30%). *Juncus balticus* (Baltic rush) (1-30% cover) and other graminoids may also be present. A variety of forbs may be inconspicuously present (total cover >10%). A few scattered shrubs, usually in stunted form, contribute little cover when present. They may include *Salix geeyeriana* (Geyer's willow), *S. monticola* (mountain willow), and *Dasiphora floribunda* (shrubby cinquefoil).

Adjacent Riparian Vegetation:

Concentric rings or a mosaic of patches of other herbaceous wetland types can be adjacent and intermixed with *Carex simulata* (analogue sedge) fens. Herbaceous wetland types include *Carex nebrascensis* (Nebraska sedge), *C. utriculata* (Northwest Territory sedge), and *Juncus balticus* (Baltic rush). Shrublands of *Salix geeyeriana* (Geyer's willow) and forests of *Populus tremuloides* (quaking aspen) may be found nearby.

Adjacent Upland Vegetation:

Surrounding slopes can have *Picea pungens* (blue spruce) forests, *Pinus edulis* - *Juniperus* spp. (twoneedle pinyon-juniper) woodlands, or dry grasslands.

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By Kittel, G., Renée Rondeau

***Carex utriculata* Herbaceous Vegetation**

Common Name:

Northwest Territory Sedge Herbaceous Vegetation

Western Vegetation Classification

Level	Category
V.	HERBACEOUS VEGETATION
V.A.	PERENNIAL GRAMINOID VEGETATION
V.A.5.	TEMPERATE OR SUBPOLAR GRASSLAND
V.A.5.k.	SEASONALLY FLOODED TEMPERATE OR SUBPOLAR GRASSLAND

Alliance:

CAREX (ROSTRATA, UTRICULATA) SEASONALLY FLOODED HERBACEOUS ALLIANCE

System:

Palustrine

Hydrogeomorphic (HGM) Subclass:

Depressional 1, 2/3, Slope 3/4, Riverine 2

Related Literature and Synonyms:

The Colorado *Carex utriculata* (Northwest Territory sedge) association is synonymous with the *Carex rostrata* (beaked sedge) community types from Oregon (Kovalchik 1987), Nevada (Manning and Padgett 1995), Utah (Padgett *et al.* 1989), Montana (Hansen *et al.* 1995), Idaho, Wyoming (Youngblood *et al.* 1985a, Girard *et al.* 1997), and Colorado (Cooper and Cottrell 1990). Note that *Carex rostrata* is a synonym for *Carex utriculata* (Kartesz 1994).

Similar Communities:

Closely related communities are more broadly defined, and probably contain stands that match the Colorado *Carex utriculata* (Northwest Territory sedge) plant association. These closely related communities include the *Carex rostrata* - *Carex aquatilis* (beaked sedge-water sedge) habitat type (Hess and Wasser 1982), stands of *Carex aquatilis* - *Carex utriculata* plant association where *Carex aquatilis* is absent (Johnston 1987), and the *Carex aquatilis* - *Carex rostrata* - *Deschampsia cespitosa* (water sedge-beaked sedge-tufted hairgrass) plant association (Baker 1989). Note that *Deschampsia cespitosa* is an orthographic variant of *Deschampsia caespitosa* (as Kartesz 1994 is updated in USDA NRCS 2001).

Methodology:

Agglomerative cluster analysis programs were employed using Euclidean distance and average clustering to determine groups of plots with similar species abundance and percentage canopy cover. Associations derived from the cluster analyses were compared with riparian plant association stand data and descriptions from riparian classification work in Colorado, New Mexico, Arizona, Utah, Montana, Idaho, and Wyoming (Johnston 1987, Muldavin *et al.* 1996, Durkin *et al.* 1994, 1995, Szaro 1989, Padgett *et al.* 1989, Hansen *et al.* 1988, 1989, 1995, Youngblood *et al.* 1985a, 1985b). Associations were considered either 1) synonymous — when associations matched in species composition, constancy, average cover, and environmental setting, 2) similar — when canopy structure, genera, and physical setting were similar, but species composition was different, 3) a

new type — not described in the literature, or 4) unclassifiable — when data were insufficient. Plots and transects were subjectively located within a homogeneous portion of each stand to best represent the vegetation of the site. Sampling and data collection are designed to be representative, not statistically rigorous. Woody vegetation was quantitatively sampled for percent cover using 30-50 m long line-intercept transects, oriented parallel to the stream channel. Herbaceous vegetation was sampled using 10-20 micro-plots (0.10 m²), located about every third meter along the transect and 1 m to the side, alternating sides.

DISTRIBUTION

Regional Distribution:

This plant association is common and widely distributed in the western U.S. It occurs in Oregon (Kovalchik 1987), Nevada (Manning and Padgett 1995), Utah (Padgett *et al.* 1989), Idaho, Wyoming (Youngblood *et al.* 1985a, Jones and Walford 1995), Montana (Hansen *et al.* 1995), New Mexico, California, Washington (NS), Colorado (CNHP 1999), and possibly in Arizona.

Distribution in Colorado:

This plant association occurs in Rocky Mountain National Park, the Roosevelt, Arapaho, White River, Routt, Gunnison and San Juan National Forests (Johnston 1987, Kettler and McMullen 1996, Richard *et al.* 1996), and the Yampa, San Miguel/Dolores (Kittel and Lederer 1993), White, Colorado (Kittel *et al.* 1994), Gunnison (Kittel *et al.* 1995), Arkansas (Kittel *et al.* 1996), South Platte River Basins (Kittel *et al.* 1997) and the Rio Grande and Closed Basins (CNHP 1999).

Distribution by Watersheds:

This plant association is based on one hundred forty-three quantitative plots: eleven from the North Platte Basin (93K051, 93K111, 93K131, 98BG07, 98LT20, FR13, NP28, NP44, NP53, PR3, PR11), twenty-four from the South Platte Basin (96AM32, 96AM37, 96AM51, 96AM58, 96AM68, 96LS14, FR8, FR25, FR84, FR90, FR182, R3D, SP3, SP11, SP33, SP40, SP64, SP73, SP96, SP112, SP123, SP142, SP160, SP180), one from the Upper Arkansas Basin (95AM37), six from the Rio Grande Headwaters Basin (95RG74, 95RG77, 97EV13, VG-20, VG-29, VG-45), twenty-four from the Colorado Headwaters Basin (92GK24, 93DR01, 93GK32, 93GK42, 93K203, 93K302, 93RR10, 93RR15, 93RR35, 93RR38, 93RR66, 93SS13, 93SS31, FR186, HY32, HY41, HY48, HY51, HY55, JS9432A, JS9431A, JS9435A, JS9436E, JS9442A), twenty-nine from the Gunnison Basin (94GK19, 94JB28, 94JB49, 94RR36, CB1, CB6, CB12, CB32, CB38, CB39, CB52, CB55, CB64, CB81, CB90, CB102, CB107, CB119, CB126, CB141, CB156, CB163, JS9404B, JS9405B, JS9406B, JS9412B, JS9417B, 94JS23A, JS9423C), nine from the White-Yampa Basin (90MR76, 90MR83, 90MR84, 90MR97, 91GK12, 92GK26, 92NL64, 94R596, JS9427C), thirty-five from the Upper Colorado-Dolores Basin (91NL17, 91NL34, 91NL87, 93C163, 93C222, T11, T25, T29, T32, T36, T42, T49, T57, T70, T73, T95, T99, T106, T111, T112, T127, T131, T141, T144, T156, TE1, TE4, TE6, TE15, TE18, TE21, TE33, TE46, TE49, TE84) and four from the Upper San Juan Basin (93C562, 94DR07, 94MS07, 94MS15) (CNHP 1999).

STATUS

Reasons for Global Rank:

This association is well documented throughout the western states.

Global Rank:

Global rank is based on the status of a taxon throughout its range. This association is ranked G5, demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Reasons for State Rank:

This association is well documented throughout its habitat in Colorado.

State Rank:

State rank is based on the status of a taxon in an individual state. In Colorado, this association is ranked S4, apparently secure in the state with more than 100 occurrences.

HABITAT

General Description and Comments:

The *Carex utriculata* (Northwest Territory sedge) plant association is a common wet meadow community that occurs around the edges of montane lakes and beaver ponds, along the margins of slow-moving streams and rivers, and in marshy swales and overflow channels on broad floodplains. The water table is usually near the surface for most of the growing season.

Elevation Range in Colorado:

5,600-11,000 ft (2,300-2,900 m).

Site Geomorphology:

Carex utriculata (Northwest Territory sedge) grows in standing water or saturated soils of wet swales and overflow channels along low-gradient streams. It also occurs along the margins of lakes and beaver ponds. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are wide and slightly sinuous (Rosgen's Channel Type: B5 and B6), to wide and more sinuous (Rosgen's Channel Type: C6).

Soils:

Soils are saturated organics or fine silty clays to clays over cobbles and alluvium. Mottling often occurs within a few centimeters of the surface. In the Colorado River Basin, the soils classify as very-fine clayey to loamy skeletal calcareous Cumulic or Typic Cryaquolls, Aquepts, fine-loamy and sandy-skeletal Typic Cryaquepts, and Histic Cryaquepts.

MANAGEMENT

Management:

Carex utriculata (Northwest Territory sedge) generally occupies the wettest habitats in the riparian area. Soils are highly susceptible to compaction and churning. Heavy use by livestock can dry the site, increase non-native grass cover, and reduce the vigor of willow root structure. Even though *Carex utriculata* has low palatability, especially late in the season (Hermann 1970), livestock grazing should be deferred until soils dry, or productivity and vigor of the plants are lost and soils are damaged (Hansen *et al.* 1995).

Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing are not recommended because adjacent willow individuals are vulnerable to pruning damage due to limited regrowth before the end of the growing season (Hansen *et al.* 1995, Kovalchik and Elmore 1992).

Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams aid in controlling channel down cutting, streambank erosion, and downstream movement of sediment. Beaver dams raise the water table and provide water for hydrophytic plants including

willows and sedges. The trapping of sediment behind beaver dams, along with plant reproduction, raises the channel bed and creates a wetland environment. Land managers should consider maintaining beaver in an area rather than removing them (Hansen *et al.* 1995).

Burning of this plant association temporarily increases the productivity of *Carex utriculata* (Northwest Territory sedge) and *C. aquatilis* (water sedge). However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after burning. This is necessary in order to keep livestock from consuming young, palatable regrowth. Prescribed burning is also an effective method of rejuvenating decadent clumps of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow-burning fires can actually damage the plants (Hansen *et al.* 1995).

Successional and Ecological Processes:

The *Carex utriculata* (Northwest Territory sedge) plant association occurs on the wettest sites of the riparian or wetland area, such as low-lying swales, and shallow margins of lakes and ponds, often in standing water. It is an early-seral community and is known to invade margins of newly formed beaver ponds, as well as the freshly exposed silt beds of drained beaver ponds (Padgett *et al.* 1989). With time, the *Carex utriculata* plant association will grade into a *C. aquatilis* (water sedge) and *Calamagrostis canadensis* (bluejoint reedgrass) associations. *Calamagrostis canadensis* dominates the driest sites with the lowest water tables and colonizes drying stands of *Carex utriculata* and *C. aquatilis* (Cooper 1986).

Successional shifts in species composition can be initiated by a change in the physical environment of the riparian area. Flooding events can result in sediments deposited on the floodplain, raising the surface higher above the water table (Cooper 1986). As aggradation, or build up, of the floodplain proceeds, the site can become drier and the dominant graminoid cover changes.

Abandoned beaver ponds also go through a similar succession. With time, ponds become silted-in and *Carex utriculata* (Northwest Territory sedge) establishes on the new, saturated substrate. As the site becomes firm and raised above the old pond level, *Carex aquatilis* (water sedge) and willows may become established. With further aggradation and time, *Calamagrostis canadensis* (bluejoint reedgrass) may become established in the undergrowth. Depending on site characteristics, various willow species may become established in the overstory as well, creating the *Salix monticola* / *Carex utriculata* (mountain willow/Northwest Territory sedge) plant association and the *Salix geyeriana* / *Calamagrostis canadensis* (Geyer's willow/bluejoint reedgrass) plant association, for example.

Distance from the stream channel can also differentiate the graminoid dominance spatially within the riparian mosaic. *Carex utriculata* (Northwest Territory sedge) commonly occurs at the stream channel edge where the water table is close to or at the ground surface. As the floodplain surface becomes higher with increased distance from the channel edge, the ground becomes slightly less saturated and shifts to mesic meadows of *Carex aquatilis* (water sedge), or on higher surfaces, to slightly drier meadows of *Calamagrostis canadensis* (bluejoint reedgrass) (Kittel 1994).

VEGETATION

Vegetation:

This plant association is characterized by stands dominated by *Carex utriculata* (Northwest Territory sedge) (7-100% cover). Stands often appear to be nearly pure *Carex utriculata* (Northwest Territory sedge), but a variety of other graminoid species may be present as well. Other *Carex* (sedge) species present include *Carex lenticularis* (shore sedge) and *C. microptera* (small-wing sedge), but usually with low cover (1-30%) relative to the amount of *C. utriculata* (Northwest Territory sedge) present. Other graminoid species that may be present include: *Glyceria striata* (fowl mannagrass), *Calamagrostis canadensis* (bluejoint reedgrass), and *Juncus*

balticus (Baltic rush). Forb cover is very inconspicuous and can include: *Mentha arvensis* (wild mint), *Mimulus guttatus* (seep monkeyflower), and *Geum macrophyllum* (largeleaf avens) (1-20% cover). Willow carrs (*i.e.*, shrubland thickets) are often adjacent and a few scattered willows will occur within the *Carex utriculata* (Northwest Territory sedge) stand. Individual willows tend to be very short if present, either from limiting growth conditions (extremely cold and/or extremely wet), or because of heavy browsing by wildlife or livestock. The elevation of the site determines which willow species are in and adjacent to *Carex utriculata* (Northwest Territory sedge) stands. Willow species that are present may include: *Salix monticola* (mountain willow), *S. drummondiana* (Drummond's willow), *S. geyeriana* (Geyer's willow), *S. planifolia* (planeleaf willow), and *S. exigua* (coyote willow).

Adjacent Riparian Vegetation:

This association is often part of a wetland mosaic, with *Salix monticola* (mountain willow), *S. drummondiana* (Drummond's willow), and *S. geyeriana* (Geyer's willow) shrublands. It also occurs adjacent to, and intergrades with, *Carex aquatilis* (water sedge) or *Eleocharis palustris* (common spikerush) meadows. *Populus angustifolia* - *Picea pungens* (narrowleaf cottonwood-blue spruce), *Populus angustifolia* (narrowleaf cottonwood), and *Picea pungens* (blue spruce) riparian forests occur on adjacent stream terraces in narrower valleys.

Adjacent Upland Vegetation:

Abies lasiocarpa - *Picea engelmannii* (subalpine fir-Engelmann spruce) forests, *Populus tremuloides* (quaking aspen) woodlands at higher elevations; *Pinus ponderosa* (ponderosa pine) and *Populus tremuloides* forests and *Quercus gambelii* (Gambel's oak) shrublands occur on adjacent hillslopes at lower elevations.

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