

28. Black Sagebrush Ecological Series

Table 28-1. Full names and short names for the ecological types in the Black Sagebrush Ecological Series.

Ecological Type Code	Name	Plant Association Code	Short Name
SB2	Black sagebrush/muttongrass-pine needlegrass-Coarse Eutroboralfs-Westerly windward slopes and ridges, 8,000-9,200 ft	ARNO4/POFE-ACPI2	Black sagebrush/muttongrass-Coarse heavy-clay soils-Windward
SB3	Black sagebrush/Arizona fescue-Coarse Smectitic Eutroboralfs-Southwesterly windward low-angle slopes and mesas, 8,000-9,400 ft	ARNO4/FEAR2	Black sagebrush/Arizona fescue-Coarse heavy-clay soils-Windward

The *Artemisia nova* Series is described as new here, based on the *Artemisia arbuscula* Series of Hess and Wasser (1982). All five sites sampled by Hess are dominated by what he identified as *Artemisia arbuscula* var. *nova* (Harrington 1954), which is now called *Artemisia nova*. This series is also based on the *Artemisia nova* Series of Francis (1986).

Fautin (1946) called this the "*Artemisia nova-Atriplex-Neotoma* Fasciation." The *Artemisia* (Sagebrush) Series of Donart and others (1978) and Tweit and Houston (1980) is much too large.

Stands of this series occupy sites that are small to medium-sized, which often occur as patches within a matrix of big sagebrush. Other patches within the same matrix may be serviceberry shrublands or Montane windswept grasslands. Black sagebrush sites are sometimes large enough to be the matrix of a medium-sized site.

Vegetation, Climate, Soils

Plant Group	Value \pm SD, kg/ha/yr
Shrubs	364 \pm 194
Graminoids	43 \pm 32
Forbs	27 \pm 24
Total	434 \pm 191

Weeks and Little (1969) reported total above-ground production in grazed sites to be 333 lb/ac/yr (263-369 lb/ac/yr), and in sites protected from grazing, total above-ground production was 364 lb/ac/yr (317-400 lb/ac/yr), of which 52% (39-63%) was shrubs.

Hanson and others (1983) reported herbage production of 680 kg/ha/yr in southwestern Idaho. They derived an equation relating herbage production (P , kg/ha/yr) to precipitation (p , mm/yr):

$$P = 1.03p + 7.09$$

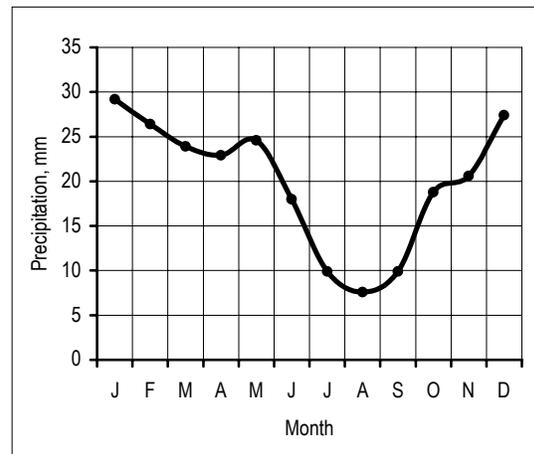


Figure 28-1. Average precipitation at a black sagebrush site in southern Idaho (Zamora and Tueller 1973).

Range and Wildlife Management

Deer, elk, antelope, and bighorn sheep frequent sites of this series in their winter ranges. Such sites are usually open in the winter.

Plants which increase with grazing include snakeweed (*GUSA2*) and prickly gilia (*LEPU*). Those which decrease with grazing include mountain muhly (*MUMO*), Arizona fescue (*FEAR2*), and junegrass (*KOMA*).

Black sagebrush is a permanent component of communities regardless of grazing (Francis 1986). Clary (1986) recommends moderate midwinter grazing or alternate-year midwinter grazing by cattle and sheep to maintain black sagebrush cover.

Management should emphasize maintaining cover, especially of shrubs and grasses palatable to wild herbivores, to prevent accelerated erosion, especially on sites with >10% slopes.

Spraying with 2,4-D increases grass production and total production, and almost completely eliminates shrubs temporarily (Weeks and Little 1969). Such methods as spraying with 2,4-D, ripping, disking, and seeding with exotic wheatgrasses have had poor success in eliminating shrubs and increasing grasses. Native grasses are

severely reduced by disking, and while shrubs initially decreased, they subsequently increased gradually as they became re-established (Weeks and Little 1969).

Fire Management

Black sagebrush is easily killed by fire, but the stands are difficult to burn because of low productivity and consequent scattered fuels. Black sagebrush stands can be effective firebreaks (Bunting and others 1987).

Insects and diseases are not documented for this series.

Recreation, Roads & Trails, Scenery

Sites of this series range from moderately suitable to unsuitable for roads and trails, depending on slope angle. Sites on >10% slopes are unsuitable for roads and trails. Gentler slopes may support a road or trail on the surface with no excavation, but such roads and trails must be closed during muddy seasons because of impassability or resource damage, so routes should be located elsewhere if possible.

Unsuitable for most recreation activities. Developments and campsites of any kind should be located elsewhere. This is just as well, as most sites are unattractive to people anyway.

Revegetation and Rehabilitation

Soil permeability is slight, so most water runs off, and erosion is great on slopes during any storm. In this dry, warm environment, the only moisture available to plants is the little trapped by the sparse vegetation and litter. Soils are extremely droughty, and rooting depths are very shallow, though the soil is technically considered deep. Erosion is accelerated by the exposure of any bare soil, and is a major limitation to revegetation on slopes. The best practice on these sites is to prevent the need for revegetation by maintaining cover and avoiding disturbance.



A black sagebrush/pine needlegrass site (Community Type A). Notice the *very* low stature and low cover of the vegetation (10 cm orange bands on the pole). Black sagebrush 34% cover, Eaton fleabane 16%, threadleaf sedge 4%, pine needlegrass 4%. Coarse Fragments Cover = 64%, Total Live Cover = 118%, Coarse Fragments in Soil = 56. Soil sampled as a Typic Eutroboralf. Almont Quadrangle, elevation 8,900 ft, 13% 193° (S) slope. June 4, 1993.

Characteristic	Value	Reference
Annual Precipitation	278 mm/yr (185-410 mm/yr) 11 in/yr (7-16 in/yr)	Fautin (1946), Fisser (1964), Weeks and Little (1969), Zamora and Tueller (1973), Hanson and others (1983)
Air temperature	Annual: 8.9°C (48.0°F) July-August: 20.8°C (69.4°F)	Zamora and Tueller (1973)

Key to the Ecological Types in the Black Sagebrush Series

- 1. Arizona fescue present and >1% cover. Coarser (average 67%), shallower (average 50 cm) soils, with more gravel on surface (average 56% cover).....SB3
- 1. Arizona fescue absent. Somewhat less coarse (average 46%), deeper (average 62 cm) soils, with less gravel on surface (average 38% cover)SB2

Code Short Name	No. Samples	Elevation, ft	Avg. Aspect, °M (r) Slope, %	Soil Coarse, %	Depth, cm Mollic, cm	Surface: Coarse, % Bare, %	Cover, %: Trees Shrubs Graminoids Forbs	Total Live Cover, % No. Species TLC/NS, %
SB2 Black sagebrush/ muttongrass-Coarse heavy-clay soils-Windward	36	8,393 (8,040-9,180)	286 (0.39) 17 (0-50)	46 (15-68)	62 (18-200) 11 (2-25)	35 (5-64) 19 (6-31)	0 (0-1) 33 (21-50) 32 (4-100) 11 (3-49)	75.9 (39.0-131.5) 27 (12-41) 3.0 (1.5-5.7)
SB3 Black sagebrush/ Arizona fescue-Coarse heavy clay soils-Windward	13	8,819 (8,080-9,340)	250 (0.47) 18 (2-53)	67 (48-87)	50 (25-85) 14 (8-19)	57 (31-90) 9 (1-25)	0 (0-1) 31 (11-44) 27 (14-43) 12 (3-30)	69.3 (41.5-91.8) 30 (18-41) 2.4 (1.7-3.5)



Looking northeast across a typical black sagebrush/muttongrass-pine needlegrass site near Razor Creek Dome (Community Type B). Grasses are often taller than shrubs. This site was used as a sage grouse lek in recent years. Black sagebrush averages 11.9 cm (4.7 in) tall and 24% cover. Aspect 356° mag. (N), 6% slope. Note the close, patchwork alternation of big sagebrush and black sagebrush on the hill in the left middleground. Razor Creek Dome Quadrangle, elevation 8,700 ft, 6% 346° (NNW) slope. June 30, 1998.

BLACK SAGEBRUSH/MUTTONGRASS–COARSE HEAVY-CLAY SOILS–WINDWARD

Black sagebrush/muttongrass-pine needlegrass–Coarse Eutroboralfs–
Westerly windward slopes and ridges, 8,000-9,200 ft

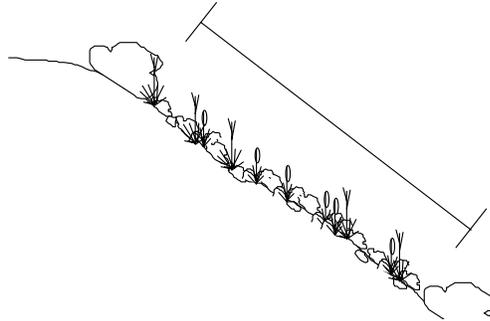


Figure 28-2. Cross-section of vegetation structure of *Black sagebrush/muttongrass–Coarse heavy-clay soils–Windward*; the black sagebrush patch/stand is shown by a bracket. The tallest shrub layer typically averages 0.5 ft tall. Aspects are westerly, windward, and slope angles average 18%.

Black sagebrush/muttongrass–Coarse heavy-clay soils–Windward is a very common type heavy-clay slopes in the bottom of the UGB, often alternating with Wyoming big sagebrush (ARTRW8) sites or patches. It occurs on benches and gentle slopes in the lower part of the Gunnison Basin. This type probably also occurs in southwestern and central-western Colorado, perhaps also in eastern Utah. *Black sagebrush/ muttongrass–Coarse heavy-clay soils–Windward* is characterized by black sagebrush (ARNO4), muttongrass (POFE), and pine needlegrass (ACPI2). Douglas rabbitbrush (CHVI8) and mat beardtongue (PECA4) are also common. See Table 28-8 for common species names and codes. Other distinguishing features include Indian ricegrass, needle-and-thread, locations on foothills, short sparse shrubland stand structure, and Alfisols.

Black sagebrush/muttongrass–Coarse heavy-clay soils–Windward is closely related to *Black sagebrush/Arizona fescue–Coarse heavy clay soils–Windward*, which occurs at somewhat higher elevations on shallower, coarser soils, and has prominent Arizona fescue. The plant association *Artemisia nova/Poa fendleriana-Achnatherum pinetorum* is described as new here.

The soils of *Black sagebrush/muttongrass–Coarse heavy-clay soils–Windward* are morphologically similar to the soils of *Low sagebrush/Idaho fescue–Heavy clay soils*, but the vegetation, soil temperature, and climate are very different. These two types have often been confused in the past, as evidenced by the local place name Black Sage Pass, where there is no black sagebrush (ARNO4) anywhere nearby, but plenty of low sagebrush (ARAR8)! The two species and associated ecological types are easily distinguished. The soils of *Black sagebrush/Arizona fescue–Coarse heavy-clay soils–Windward* could be described as “concrete.” These

soils feature coarse to very coarse fragments with very fine-textured, sticky (Smectite) clay between them. The clay glues the coarse fragments together in a very tight, water-impermeable substance that resembles concrete.

Grazing by herbivores reduces shrub, grass, and forb cover, and increase bare ground. These sites make poor livestock range, and several of the community types are not suitable for grazing at all.

Any of the big sagebrush (except mountain) types may occur on deeper, somewhat less clayey soils adjacent to this type. Serviceberry shrublands border this type on more protected sites with deeper-soils. Windswept Montane grasslands adjoin this type on more exposed sites. *Black sagebrush/ muttongrass–Coarse heavy-clay soils–Windward* is never adjacent to riparian sites.

Horizontal obstruction is very low; hiding cover for deer and elk is nonexistent. These sites are nonetheless often heavily used by elk and deer within their critical winter ranges, because they are open during part of most winters. In spring and fall, however, the heavy clay soil surface turns to sticky mud. Sites in better condition support some low shrubs that are palatable enough to herbivores to be used in the winter, including green rabbitbrush (CHVIP5), gray horsebrush (TECA2), winterfat (KRLA2), and dwarf rabbitbrush (CHDE2). Management should plan to increase these palatable species.

Elk and deer use of community types A, B, and C is moderate for browse during both mild and severe winters, and low spring through fall. Deer and elk use of community types D, E, and F is moderately low for browse during all winters, and low during spring through fall.

In most of the larger sage grouse leks in the UGB, this type serves as the drumming ground component of the lek, with an adjacent Wyoming big sagebrush stand serving as hiding cover during the season. Sage Grouse use of communities A and B is high to very high for leks in spring, but very

low for nesting and during the summer. Sage grouse use of community type C is high for leks in spring, low for nesting, and very low during the summer. Use of community types D, E, and F is moderate for leks in spring, low for nesting and very low in summer.

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NUMBER OF SAMPLES	31, soil descriptions from 14; 1 not assigned to a CT (total 32)
ELEVATION	8,380 ft (8,040-9,180 ft); 2,554 m (2,450-2,800 m)
ASPECT	Usually westerly, windward
LITHOLOGY	Mostly sedimentary: sandstone [35%] or shale [30%] predominate. Also represented are fine-textured gneiss, granite, and breccia [35%]
FORMATIONS ¹	Km-Kdb-KJdm-Kd [67%] or Tpl-Tos-Taf [28%] or Xfh [6%]
LANDFORMS	Mostly soil creep slopes [53%], with some ridges and mesas [40%]
SLOPE POSITIONS	Mostly backslopes, shoulders, and summits [93%] highly exposed to wind
SLOPE SHAPES	Mostly convex [64%] or linear [29%] horizontally, Convex [57%] to linear [43%] vertically.
SLOPE ANGLE	18% (0-50%)
SOIL PARENT MATERIAL	Mostly colluvium [50%] or colluvium over residuum [29%]
COARSE FRAGMENTS	38% (26-64%) cover on surface, mostly gravelly [81%]; Coarse fragments 46% (15-68%) by volume in soil
SOIL DEPTH	62 cm (18-200 cm); 24 in (7-79 in)
MOLLIC THICKNESS	11 cm (2-25 cm); 4 in (0.5-9 in)
TEXTURE	<i>surface</i> : Mostly clay loam, clay, or sandy clay loam [92%]. <i>subsurface</i> : Mostly clay, sandy clay, or sandy clay loam [92%]
SOIL CLASSIFICATION	Eutroboralfs [86%] or less commonly Haploborolls [14%]. Clay is mostly Smectitic (Montmorillonitic)
TOTAL LIVE COVER	76.4% (39-132%)
NUMBER OF SPECIES	26 (12-41)
TOTAL LIVE COVER/NO. SPECIES	3.1% (1.7-5.7%)
CLIMATE	Usually in partial rainshadow. Submontane (foothills) or semidesert climate, warm, very dry, exposed to sun, very exposed to wind
WATER	No permanent water on or near sites

CT	Sage Grouse	Mule Deer	Elk
	Season-Preference	Season-Preference	Season-Preference
A, B	Spring- High to Very High (Lek) Nesting- Very Low Summer- Very Low	Winter, Mild- Moderate (Browse) Winter, Severe- Moderate Spring/Fall- Low	Winter, Mild- Moderate (Browse) Winter, Severe- Moderate Spring/Fall- Low
C	Spring- High (Lek) Nesting- Low Summer- Very Low	I	I
D, E, F	Spring- Moderate (Lek) Nesting- Low Summer- Very Low	Winter, Mild- Mod. Low (Browse) Winter, Severe- Mod. Low Spring/Fall- Low	Winter, Mild- Mod. Low (Browse) Winter, Severe- Mod. Low Spring/Fall- Low

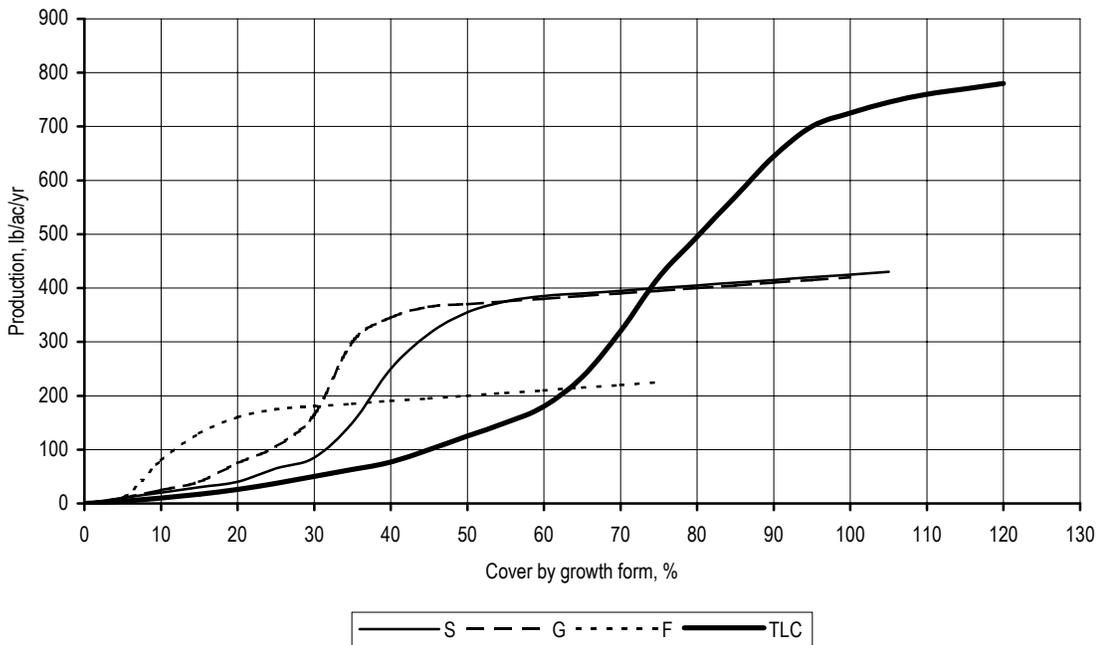


Figure 28-3. Relationship of cover by growth form and production. This is the ARNOACPI (ARNO4-ACPI2) model. S = shrubs, G = graminoids, F = forbs, and TLC = Total live cover.

Table 28-6. Resource Values for <i>Black sagebrush/muttongrass-Coarse heavy-clay soils-Windward</i> . Resource values were calculated from the numbers in Table 28-6, relative to the whole UGB.						
The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.						
Resource Value	Community Type					
	A	B	C	D	E	F
Potential Cattle Forage Production	2	1-2	1	1-2	0-1	0
Grazing Suitability	2 ¹	2 ¹	1 ¹	2 ¹	1 ¹	0
Wetland	No	No	No	No	No	No
Riparian Area	No	No	No	No	No	No
Developed Recreation	0 ¹					
Dispersed Recreation	1 ¹					
Scenic	0-1	0-1	0-1	0	0	0
Road & Trail Stability	2 ¹					
Construction Suitability	ns ¹					
Deer & Elk Hiding Cover	0	0-1	1	0-1	0-1	0-1
Deer & Elk Forage & Browse	3-4	3	2-3	2-3	1-2	1
Sage Grouse Cover	2	1-2	4	1-2	1-3	1-2
Sage Grouse Nesting/Brood Potential	0	0	0	0	0-1	0
Need for Watershed Protection	3-4	3-4	3-4	3-4	3-4	3-4
Soil Stability	2	2	2	2	1-2	2
Risk of Soil Loss-Natural	2	2	2	2	2-3	2
Risk of Soil Loss-Management	4	4	4	4	4-5	4
Risk of Permanent Depletion-Range	3-4	3-4	3-4	3-4	4-5	3-4
Risk of Permanent Depletion-Wildlife	3-4	3-4	3-4	3-4	4-5	3-4
Resource Cost of Management	4	4	4	4	5	4
Cost of Rehabilitation	3-4	3-4	3-4	3-4	3-4	3-4

1. Not suitable in spring and fall, when the soil turns to sticky mud.

Key to Community Types

- 1. Cheatgrass prominent, >40% cover. Total graminoid cover >60%..... **D**
- 1. Cheatgrass usually absent, sometimes <10%. Total graminoid cover <60%..... (2)
- 2. Total graminoid cover 45-60%..... **A**
- 2. Total graminoid cover <45%..... (3)
- 3. Total graminoid cover 30-45%..... **B**
- 3. Total graminoid cover <30%..... (4)
- 4. Total graminoid cover 10-20%..... **E**
- 4. Total graminoid cover <10%..... **F**

Description of Community Types

- A** *Black sagebrush-pine needlegrass* is dominated by black sagebrush, 10-40% cover. Total graminoid cover is 45-60%, and graminoid production is 300-400 lb/ac/yr.
- B** *Black sagebrush-bottlebrush-pine needlegrass* is dominated by black sagebrush, 10-35% cover. Total graminoid cover is 30-40%, and graminoid production is 200-320 lb/ac/yr.
- C** *Black sagebrush-sparse* is dominated by black sagebrush, 20-30% cover. Total graminoid cover is 20-30%, and graminoid production is 150-200 lb/ac/yr.
- D** *Cheatgrass-black sagebrush* is dominated by cheatgrass, >40% cover, with black sagebrush subdominant, 10-35% cover. Total graminoid cover is 60-110%, most of that cheatgrass. Graminoid production is >350 lb/ac/yr.
- E** *Black sagebrush-big sagebrush-bottlebrush* has big sagebrush (ARTR2 or ARTRW8) evident, 1-15% cover, with black sagebrush codominant, 10-35% cover. Total graminoid cover is 10-20%, and graminoid production is 75-150 lb/ac/yr.
- F** *Black sagebrush-rabbitbrush-sparse* is dominated by black sagebrush, 15-45% cover. Total graminoid cover is <10%, and graminoid production is <75 lb/ac/yr.

Communities Not Assigned to a Community Type

- A community dominated by black sagebrush with the exotic species crested wheatgrass (AGCR) and smooth brome (BRIN7). Crested wheatgrass was seeded on the sites in the 1930's and 1940's; smooth brome was used to revegetate some nearby sites (perhaps a roadway), and invaded into these sites.

Table 28-7. Community types within *Black sagebrush/muttongrass-Coarse heavy-clay soils-Windward*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Serai Stage	Layer Height, m	Avg Layr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod. ¹ , lb/ac/yr Shrubs Gramin. Forbs	Obstruct'n %:	
										1.5-2.0 m	1.0-1.5 m
A. Black sagebrush-pine needlegrass	5	8,504 (8,180-8,760) 9.8 (5-13)	56 (29-68) 69 (37-132) 7 (2-10)	34 (26-42) 17 (13-22) LS-LM	GF 0.27 (0.0-1.1) S 0.17 (0.0-0.4) L 0.00	57.1 27.2 9.2	0 (0-0) 34 (25-46) 50 (46-54) 20 (12-27)	36 (30-41) 104 (83-111) 2.9 (2.7-3.2)	100-290 346-383 71-167	0 (0-0) 0 (0-0) 0 (0-0) 28 (25-35) 7 (6-9)	
B. Black sagebrush-bottlebrush squirreltail-pine needlegrass	6	8,732 (8,040-9,180) 12.3 (5-22)	41 (15-58) 45 (26-91) 15 (2-25)	38 (22-64) 13 (6-28) LM	GF 0.20 (0.0-0.5) S 0.15 (0.0-0.3) L 0.00	45.5 23.8 5.0	0 (0-0) 34 (26-40) 35 (31-39) 17 (6-49)	32 (22-41) 86 (73-118) 2.8 (2.0-3.6)	105-230 214-298 39-201	0 (0-0) 0 (0-0) 0 (0-0) 23 (10-45) 6 (3-11)	
C. Black sagebrush-pine needlegrass	9	8,372 (8,080-8,840) 14.3 (0-30)	37 (25-49) 40 (18-62) 14 (10-18)	30 (5-48) 26 (18-31) MS	GF 0.05 (0.0-0.3) S 0.10 (0.0-0.2) L 0.00	30 30 10	0 (0-1) 36 (30-45) 26 (23-29) 8 (3-17)	27 (17-34) 70 (61-89) 2.7 (2.1-3.6)	121-284 155-200 15-103	0 (0-0) 0 (0-0) 0 (0-0) 41 (25-60) 10 (6-15)	
D. Cheatgrass-black sagebrush	4	8,248 (8,140-8,320) 30.3 (6-50)	* * *	* * ES-EM	*	*	1 (1-1) 26 (22-33) 77 (69-100) 4 (4-5)	21 (19-23) 108 (96-132) 5.2 (4.8-5.7)	87-153 399-418 21-31	*	
E. Black sagebrush-big sagebrush-bottlebrush squirreltail	7	8,284 (8,080-8,549) 19.4 (2-35)	42 (38-47) 109 (18-200) 10 (2-18)	38 (31-49) 21 (16-29) MS	S1 0.5 (0.3-0.7) GF 0.21 (0.0-0.5) S 0.15 (0.0-0.3) L 0.00	16 31 30 1	0 (0-1) 29 (21-50) 17 (13-20) 12 (4-25)	28 (16-41) 58 (40-71) 2.3 (1.5-4.4)	84-328 86-134 24-152	5 (0-15) 0 (0-0) 2 (0-5) 25 (10-55) 8 (3-14)	
F. Black sagebrush-rabbitbrush-sparse	5	8,178 (8,120-8,240) 19.4 (7-25)	* * *	* * EM-ES	*	*	0 (0-1) 36 (31-43) 6 (4-8) 4 (3-4)	17 (12-20) 46 (39-54) 2.9 (2.2-4.2)	127-261 31-52 18-24	*	

*. Unknown: measurements were not taken in this CT.

Table 28-8. Common Species in *Black sagebrush/muttongrass-Coarse heavy-clay soils-Windward*, where Characteristic cover > 10% or Constancy > 20%. "-" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula $Avc = Ccv \cdot 100\% / Con$.

Code	Community Type Species	A		B		C		D		E		F		Common Name
		Ccv(Con)	N =											
TREES														
JUSC2	Juniperus scopulorum	-	-	-	-	1 (44)	9	1(100)	4	T (43)	7	1 (40)	5	Rocky Mountain juniper
SHRUBS														
ARNO4	Artemisia nova	21(100)	5	26(100)	6	25(100)	9	18(100)	4	18(100)	7	26(100)	5	black sagebrush
ARTR2	Artemisia tridentata	1 (40)	5	T (50)	6	5 (78)	9	5 (25)	4	7 (71)	7	7 (60)	5	big sagebrush
CHDE2	Chrysothamnus depressus	4 (60)	5	3 (50)	6	5 (44)	9	-	-	4 (43)	-	-	-	dwarf rabbitbrush
CHVI8	Chrysothamnus viscidiflorus	10 (40)	5	2 (67)	6	2 (56)	9	3(100)	4	2 (71)	-	3(100)	5	Douglas rabbitbrush
CHVIP5	Chrysothamnus viscidiflorus ssp. pumilus	5 (60)	5	10 (33)	6	1 (22)	9	-	-	T (14)	-	-	-	green rabbitbrush
GUSA2	Gutierrezia sarothrae	-	-	1 (33)	6	3 (22)	9	1 (25)	4	1 (29)	-	1 (20)	5	broom snakeweed
SYRO	Symphoricarpos rotundifolius	T (40)	5	1 (50)	6	T (22)	9	-	-	T (14)	-	1 (20)	5	mountain snowberry
TECA2	Tetradymia canescens	1 (80)	5	1 (50)	6	1 (33)	9	-	-	3 (29)	-	-	-	gray horsebrush
GRAMINOIDS														
ACHY	Achnatherum hymenoides	1 (20)	5	2 (17)	6	1 (22)	9	1 (50)	4	T (14)	-	1 (60)	5	Indian ricegrass
ACPI2	Achnatherum pinetorum	9(100)	5	5(100)	6	6(100)	9	5 (25)	4	7 (57)	-	1(100)	5	pine needlegrass
ANTE6	Anisantha tectorum	-	-	-	-	-	-	57(100)	4	1 (14)	-	1 (40)	5	cheatgrass
CAGE	Carex geophila	3 (20)	5	1 (33)	6	2 (33)	9	1 (25)	4	1 (14)	-	1 (20)	5	dryland sedge
CHGR15	Chondrosium gracile	8 (80)	5	8 (50)	6	8 (44)	9	4(100)	4	3 (43)	-	1 (80)	5	blue grama
ELEL5	Elymus elymoides	3(100)	5	5(100)	6	2(100)	9	1 (50)	4	2(100)	-	1 (60)	5	bottlebrush squirreltail
HECO26	Hesperostipa comata	6 (80)	5	5 (33)	6	1 (44)	9	4(100)	4	3 (43)	-	-	-	needle-and-thread
KOMA	Koeleria macrantha	5 (40)	5	8 (50)	6	6 (33)	9	-	-	1 (29)	-	-	-	prairie junegrass
PASM	Pascopyrum smithii	7 (80)	5	-	-	4 (22)	9	5 (25)	4	1 (43)	-	-	-	western wheatgrass
POA	Poa	-	-	-	-	-	-	-	-	11 (14)	-	-	-	bluegrass
POFE	Poa fendleriana	10 (60)	5	18 (67)	6	6 (78)	9	3(100)	4	2 (71)	-	3(100)	5	muttongrass
POSE	Poa secunda	31 (20)	5	4 (33)	6	9 (44)	9	7 (75)	4	8 (43)	-	-	-	Sandberg bluegrass
FORBS														
AGGL	Agoseris glauca	-	-	1 (33)	6	1 (22)	9	1 (50)	4	1 (14)	-	1 (60)	5	false-dandelion
AMLA6	Amerosedum lanceolatum	-	-	4 (67)	6	1 (33)	9	1 (75)	4	T (29)	-	1 (20)	5	yellow stonewort
ANSE4	Androsace septentrionalis	1 (80)	5	1 (67)	6	1 (56)	9	1(100)	4	T (29)	-	1 (40)	5	northern rock-jasmine
ANPA4	Antennaria parvifolia	-	-	1 (17)	6	T (56)	9	1 (75)	4	1 (43)	-	1 (20)	5	smallleaf pussytoes
ARFR4	Artemisia frigida	1 (40)	5	1 (67)	6	2 (33)	9	-	-	1 (57)	-	-	-	fringed sagewort
BOCR3	Boechera crandallii	-	-	-	-	1 (44)	9	1 (75)	4	1 (29)	-	1 (80)	5	Crandall rock cress
CACH7	Castilleja chromosa	1 (20)	5	T (50)	6	-	-	-	-	T (43)	-	1 (40)	5	wavyleaf paintbrush
ERCO27	Erigeron concinnus	T (20)	5	1 (50)	6	1 (22)	9	-	-	1 (43)	-	1 (40)	5	Navajo fleabane
EREA	Erigeron eatonii	3(100)	5	5 (67)	6	1 (56)	9	1 (50)	4	T (57)	-	1 (40)	5	Eaton fleabane
ERRA3	Eriogonum racemosum	T (40)	5	T (33)	6	1 (33)	9	1 (25)	4	T (29)	-	-	-	redroot buckwheat
PECA4	Penstemon caespitosus	2 (60)	5	3 (67)	6	1 (67)	9	1(100)	4	1 (29)	-	1(100)	5	beardtongue
PHHO	Phlox hoodii	5(100)	5	4(100)	6	4 (67)	9	-	-	2 (57)	-	-	-	Hood's phlox
TRGY	Trifolium gymnocarpum	2(100)	5	1 (50)	6	T (33)	9	1 (25)	4	1 (57)	-	1 (60)	5	holly-leaf clover
GROUND COVER														
.BARESO	bare soil	17(100)	5	13(100)	6	26 (56)	9	-	-	21 (57)	-	-	-	
.LITTER	litter and duff	47(100)	5	48(100)	6	41 (56)	9	-	-	37 (57)	-	-	-	
.GRAVEL	gravel 0.2-10 cm	14	5	18	6	12	9	-	-	17	-	-	-	
.COBBLE	cobble 10-25 cm	5 (80)	5	8 (83)	6	10 (33)	9	-	-	6 (57)	-	-	-	
.STONES	stone > 25 cm	6 (40)	5	5 (33)	6	7 (22)	9	-	-	8 (43)	-	-	-	
.MOSSON	moss on soil	-	-	2 (33)	6	5 (33)	9	-	-	2 (14)	-	-	-	
LICHENS	lichens on soil	11	5	8	6	7	9	-	-	4	-	-	-	

BLACK SAGEBRUSH/ARIZONA FESCUE—COARSE HEAVY-CLAY SOILS—WINDWARD

Black sagebrush/Arizona fescue—Coarse Smectitic Eutroboralfs—
Southwesterly windward low-angle slopes and mesas, 8,000–9,400 ft

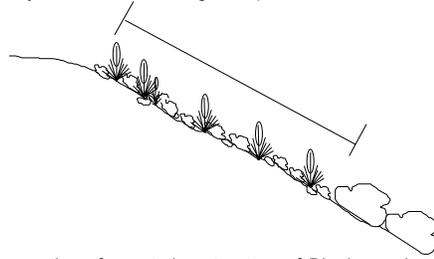


Figure 28-4. Cross-section of vegetation structure of *Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward* (the stand or patch shown by the bracket). The tallest shrub layer typically averages 0.6 ft tall. Aspects are southwesterly, and slope angles average 15%.

Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward is an uncommon type on slopes and mesas within partial rainshadows. In the Gunnison Basin it occurs on benches and flats at lower elevations. This type may also occur in southwestern and central-western Colorado, and perhaps in eastern Utah. *Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward* is characterized by black sagebrush (ARNO4) and Arizona fescue (FEAR2); muttongrass (POFE) or pingue (PIR16) may be usually common as well. See Table 28-12 for common species names and codes. “Concrete” subsoil is another distinguishing feature.

Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward is related to *Black sagebrush/muttongrass—Coarse heavy-clay soils—Windward*, which occurs at somewhat lower elevations on deeper, less-coarse soils, and less often in rainshadows.

The plant association *Artemisia nova/Festuca arizonica* is described as new here. This is apparently the first description of this plant association.

Big sagebrush-bitterbrush/Arizona fescue-Parry oatgrass types occur on adjacent soils which are deeper and somewhat less clayey. Serviceberry shrublands adjoin this type on more protected sites with deeper soils. Montane windswept grassland occurs on adjacent, more exposed sites. Aspen, Douglas-fir, spruce-fir forests border this type on more inclined, better-drained sites. *Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward* is never adjacent to riparian sites.

The soils of *Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward* are morphologically similar to the soils of *Low sagebrush/Idaho fescue—Heavy clay soils*, but the vegetation, soil temperature, and climate are very different. These two types have often been confused in the past, as evidenced by the local place name Black Sage Pass, where there is no

sagebrush (ARNO4) nearby, but plenty of low sagebrush (ARAR8)! The two species and associated ecological types are easily distinguished. The soils of *Black sagebrush/Arizona fescue—Coarse heavy-clay soils—Windward* could be described as “concrete.” Coarse to very coarse fragments have very fine-textured, sticky Smectite clay between them. The clay glues the coarse fragments together in a very tight, water-impermeable substance that resembles concrete.

Grazing by herbivores reduces shrub, grass, and forb cover, and increases bare ground. These sites make poor livestock range, and several community types are unsuitable for grazing. Horizontal obstruction is very low to low; hiding cover for deer and elk is nonexistent. Sites are sometimes heavily used by elk and deer within their critical winter ranges because they remain open during part of most winters. However, the heavy clay soil surface turns to sticky mud in spring and fall. On sites in better condition, some low shrubs are palatable enough to herbivores for winter food, including green rabbitbrush (CHVIP5), gray horsebrush (TECA2), winterfat (KRLA2), and dwarf rabbitbrush (CHDE2). Management should plan to increase these palatable species. Deer and elk use of community types A, B, and C is moderate for browse in mild and severe winters, but low during spring through fall. Both deer and elk use of community types D, E, and F is low to moderately low for browse in mild winters, moderately low in severe winters, and low spring through fall.

This ecological type meets the criteria for the drumming ground component of sage grouse leks, with adjacent Wyoming big sagebrush stands suitable for hiding cover during the season, but no sites are adjacent to any currently active leks. The reason for this is not clear. Sage grouse use of community types A, B, and C is high to very high for leks in spring very low in summer, and very low for nesting in A and B; low in C. Sage grouse use of community types D, E, and F is moderate for leks in spring, low for nesting and very low in summer.

Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NO. SAMPLES	11, soil descriptions from 7 (total 11)
ELEVATION	8,824 ft (8,080-9,340 ft); 2,689 m (2,460-2,845 m)
ASPECT	Typically southwesterly, from south to west
LITHOLOGY	Mostly tuff [64%], some shale [18%] or breccia [18%]
FORMATIONS ¹	Mostly Taf [56%], some Tpl [22%] or Km [22%]
LANDFORMS	Mostly soil creep slopes and mesas [78%]
SLOPE POSITIONS	Predominantly shoulders, backslopes, and summits [90%]. These sites are highly exposed to wind
SLOPE SHAPES	Mostly convex [78%] horizontally, Convex [67%] to linear [33%] vertically.
SLOPE ANGLE	15% (2-25%)
SOIL PARENT MATERIAL	Mostly colluvium, some residuum or alluvium
COARSE FRAGMENTS	56% (35-78%) cover on surface, all gravelly; Coarse fragments are 67% (48-87%) by volume in soil
SOIL DEPTH	50 cm (25-85 cm); 20 in (9-33 in)
MOLLIC THICKNESS	14 cm (8-19 cm); 5 in (2-7 in)
TEXTURE	Predominantly sandy: sandy loam or sandy clay loam [71%] surface; Clay, sandy loam, sandy clay, or clay loam [86%] subsurface
SOIL CLASSIFICATION	Eutroboralfs, usually moderately deep
TOTAL LIVE COVER	68.6% (41-92%)
NUMBER OF SPECIES	30 (18-41)
TOTAL LIVE COVER/NO. SPECIES	2.4% (1.7-3.5%)
CLIMATE	Within partial rainshadow. Montane climate, warm, dry, exposed to sun, very exposed to wind
WATER	No permanent water on or near sites

CT	Sage Grouse	Mule Deer	Elk
	Season-Preference	Season-Preference	Season-Preference
A, B	Spring- High to Very High (Lek) Nesting- Very Low Summer- Very Low	Winter, Mild- Moderate (Browse) Winter, Severe- Moderate Spring/Fall- Low	Winter, Mild- Moderate (Browse) Winter, Severe- Moderate Spring/Fall- Low
C	Spring- High (Lek) Nesting- Low Summer- Very Low		

Resource Value	Community Type			Resource Value	Community Type		
	A	B	C		A	B	C
Potential Cattle Forage Production	1-2	1	0-1	Sage Grouse Cover	2-3	1-2	1
Grazing Suitability	1 ¹	1 ¹	1 ¹	Sage Grouse Nesting/Brood Potential	0	0	0
Wetland	No	No	No	Need for Watershed Protection	3-4	3-4	3-4
Riparian Area	No	No	No	Soil Stability	2	2	2
Developed Recreation	0 ¹	0 ¹	0 ¹	Risk of Soil Loss-Natural	2	2	2
Dispersed Recreation	1 ¹	1 ¹	1 ¹	Risk of Soil Loss-Management	4	4	4
Scenic	0-1	0-1	0-1	Risk of Permanent Depletion-Range	3-4	3-4	2-3
Road & Trail Stability	2 ¹	2 ¹	2 ¹	Risk of Permanent Depletion-Wildlife	3-4	3-4	2-3
Construction Suitability	ns ¹	ns ¹	ns ¹	Resource Cost of Management	4	4	4
Deer & Elk Hiding Cover	0-1	0-1	1	Cost of Rehabilitation	3-4	3-4	3-4
Deer & Elk Forage & Browse	1-2	1-2	1				

1. Not suitable in spring and fall, when the soil turns to sticky mud.

Key to Community Types

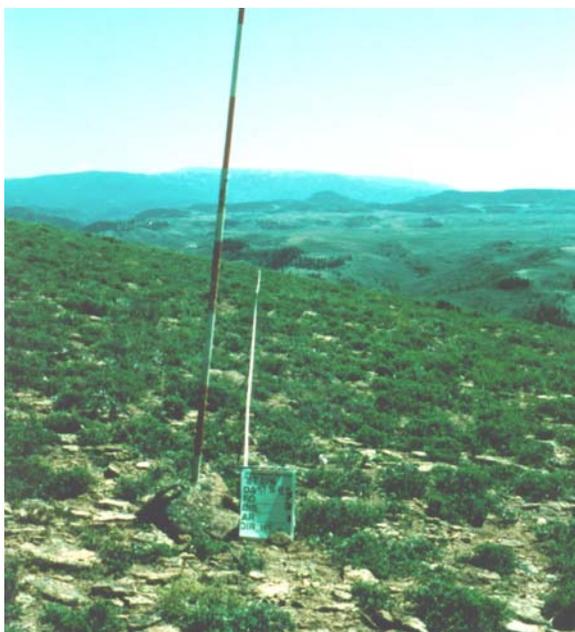
- 1. Total graminoid cover >30%. Arizona fescue >10% cover. Muttongrass (POFE) always present, 3-20% cover . **A**
- 1. Total graminoid cover <30%. Arizona fescue <10% cover. Muttongrass usually absent, rarely up to 5% cover **(2)**
- 2. Total graminoid cover 20-30%. Sandberg bluegrass present, 5-15% cover **B**
- 2. Total graminoid cover <20%. Sandberg bluegrass absent or <10% cover **C**

Description of Community Types

- A** *Black sagebrush-Arizona fescue-muttongrass* is dominated by black sagebrush with 10-40% cover. Arizona fescue is prominent, 10-30% cover. Total graminoid cover ranges from 30 to 50%. Graminoid production ranges from 200 to 400 lb/ac/yr.
- B** *Black sagebrush-Sandberg bluegrass-Arizona fescue* is dominated by black sagebrush, at 20-35% cover. Arizona fescue is always present, 4-10% cover. Total graminoid cover ranges from 20 to 30%. Graminoid production ranges from 150 to 225 lb/ac/yr
- C** *Black sagebrush-big sagebrush-sparse* is dominated by black sagebrush, with 5-40% cover, and big sagebrush (ARTR2), Trace-10% cover. Arizona fescue is always present, 1-10% cover. Total graminoid cover ranges from 10 to 20%. Graminoid production ranges from 50 to 150 lb/ac/yr.

Table 28-9. Community types within *Black sagebrush/Arizona fescue-Coarse heavy-clay soils-Windward*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Layer Height, m			Cover, %: Trees Shrubs Gramin. Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod. ¹ , lb/ac/yr Shrubs Gramin. Forbs	Obstruct'n %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
					Lr	GF	S2				
A. Black sagebrush-Arizona fescue-junegrass-pingue	5	9,037 (8,625-9,340) 25.6 (16-53)	60 (48-83) 60 (41-85) 16 (14-19)	58 (35-78) 8 (1-22) LS	S1 0.30 (0.2-0.4) GF 0.23 (0.0-1.2) S2 0.15 (0.0-0.3) L 0.0	2.4 34.2 34.8 15.3	0 (0-0) 31 (20-39) 35 (32-43) 5 (3-8)	34 (30-40) 72 (67-78) 2.1 (1.8-2.6)	79-223 227-331 20-46	3 (0-15) 3 (0-15) 4 (0-20) 33 (10-50) 11 (8-15)	
B. Black sagebrush-Sandberg bluegrass-Arizona fescue-pingue	4	8,874 (8,610-9,150) 14.0 (7-20)	62 40 15	43 (31-56) 12 (1-25) LM	S1 Missing GF 0.15 (0.0-0.3) S2 0.10 (0.0-0.3) L 0.0	M 49 38 11	0 (0-0) 33 (28-44) 27 (22-30) 16 (8-30)	28 (24-33) 76 (65-92) 2.8 (2.4-3.5)	114-268 151-207 51-184	0 0 25 6	
C. Black sagebrush-big sagebrush-sparse Arizona fescue	4	8,490 (8,080-9,120) 11.2 (2-20)	82 (77-87) 36 (25-46) 11 (8-14)	75 (58-90) 7 (5-9) MS	S1 0.30 (0.2-0.5) GF 0.18 (0.0-0.6) S2 0.17 (0.0-0.4) L 0.0	2.0 26.6 36.4 6.8	0 (0-1) 29 (11-38) 15 (14-18) 15 (5-24)	28 (18-41) 60 (42-78) 2.2 (1.7-2.6)	45-209 93-126 27-148	0 0 5 55 15	



A black sagebrush/Arizona fescue site (Community Type C) on Sapinero Mesa, in an area traditionally grazed by sheep. That may explain why Arizona fescue is found here, and not in other areas traditionally grazed by cattle. This suggests that we may have only one black sagebrush type in the Upper Gunnison Basin. Note the low Total Live Cover even though condition is relatively good for this type. Black sagebrush 37%, Arizona fescue 7%. Coarse Fragments Cover = 78%, Total Live Cover = 68%, Coarse Fragments in Soil = 43. Soil sampled as a Lithic Argiboroll, Loamy-Skeletal over Fragmental, Mixed. Sapinero Quadrangle, elevation 8,460 ft, 13° 249° (WSW) slope. July 30, 1992.

Table 28-12. Common Species in *Black sagebrush/Arizona fescue-Coarse heavy-clay soils-Windward*, where Characteristic cover > 10% or Constancy > 20%. "-" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula $Avc = Ccv \cdot 100\% / Con$.

Code	Community Type Species	A Ccv(Con) N = 5	B Ccv(Con) 4	C Ccv(Con) 4	Common Name
SHRUBS					
ARNO4	<i>Artemisia nova</i>	23(100)	26(100)	23(100)	black sagebrush
ARTR2	<i>Artemisia tridentata</i>	2 (20)	- -	3(100)	big sagebrush
CHDE2	<i>Chrysothamnus depressus</i>	- -	3 (50)	2 (50)	dwarf rabbitbrush
CHNA2	<i>Chrysothamnus nauseosus</i>	6 (20)	T (50)	- -	rubber rabbitbrush
CHVI8	<i>Chrysothamnus viscidiflorus</i>	2 (20)	T (50)	1 (50)	Douglas rabbitbrush
CHVIP5	<i>Chrysothamnus viscidiflorus</i> ssp. <i>pumilus</i>	T (80)	1 (50)	1 (25)	green rabbitbrush
LEPU	<i>Leptodactylon pungens</i>	1 (60)	- -	T (50)	granite gilia
PIRI6	<i>Picradenia richardsonii</i>	5(100)	4(100)	1 (50)	pingue
SYRO	<i>Symphoricarpos rotundifolius</i>	T (40)	- -	1 (50)	mountain snowberry
TECA2	<i>Tetradymia canescens</i>	T (60)	1 (75)	- -	gray horsebrush
GRAMINOIDS					
ACPI2	<i>Achnatherum pinetorum</i>	1 (60)	3 (75)	2(100)	pine needlegrass
CAGE	<i>Carex geophila</i>	T (60)	T (25)	1 (25)	dryland sedge
CASTE3	<i>Carex stenophylla</i> ssp. <i>eleocharis</i>	2 (40)	- -	T (25)	needleleaf sedge
CHGR15	<i>Chondrosium gracile</i>	3 (60)	- -	T (25)	blue grama
ELEL5	<i>Elymus elymoides</i>	5 (60)	T (25)	T (75)	bottlebrush squirreltail
FEAR2	<i>Festuca arizonica</i>	16(100)	8(100)	3(100)	Arizona fescue
HECO26	<i>Hesperostipa comata</i>	3 (60)	1 (25)	4 (50)	needle-and-thread
KOMA	<i>Koeleria macrantha</i>	1(100)	7(100)	3 (50)	prairie junegrass
POFE	<i>Poa fendleriana</i>	9 (80)	- -	5 (25)	muttongrass
POSE	<i>Poa secunda</i>	2 (20)	12 (75)	6 (50)	Sandberg bluegrass
FORBS					
ALGE	<i>Allium geyeri</i>	T (40)	1 (25)	- -	Geyer onion
ANSE4	<i>Androsace septentrionalis</i>	1 (80)	T (50)	3 (50)	northern rock-jasmine
ANRO2	<i>Antennaria rosea</i>	T (40)	T (50)	4 (25)	rose pussytoes
ARFR4	<i>Artemisia frigida</i>	1 (80)	1 (50)	T (50)	fringed sagewort
BOCR3	<i>Boechera crandallii</i>	- -	2 (50)	T(100)	Crandall rock cress
BOFE	<i>Boechera fendleri</i>	T (40)	T (25)	- -	false-arabis
BOOX	<i>Boechera oxylobula</i>	T (60)	- -	- -	false-arabis
CHDO	<i>Chaenactis douglasii</i>	T (80)	- -	- -	pincushion
ERFE3	<i>Eremogone fendleri</i>	T (20)	T (50)	- -	desert sandwort
ERCO27	<i>Erigeron concinnus</i>	T (20)	1 (25)	1 (25)	Navajo fleabane
EREA	<i>Erigeron eatonii</i>	T (20)	4 (75)	5 (75)	Eaton fleabane
GIPI	<i>Gilia pinnatifida</i>	T (60)	- -	- -	sticky gilia
PECA4	<i>Penstemon caespitosus</i>	T (80)	2 (25)	4 (75)	beardtongue
PHHO	<i>Phlox hoodii</i>	1 (40)	10 (75)	1 (25)	Hood's phlox
GROUND COVER					
.BARESO	bare soil	8(100)	12(100)	7 (50)	
.LITTER	litter and duff	30(100)	44(100)	27 (50)	
GRAVEL	gravel 0.2-10 cm	27	21	26	
.COBBLE	cobble 10-25 cm	5 (60)	2 (75)	23 (25)	
.STONES	stone > 25 cm	2 (60)	1 (25)	8 (25)	
.MOSSON	moss on soil	T (40)	1 (75)	- -	
LICHENS	lichens on soil	9	16	7	