

Trend Study 11A-4-05

Study site name: Cottonwood Canyon .

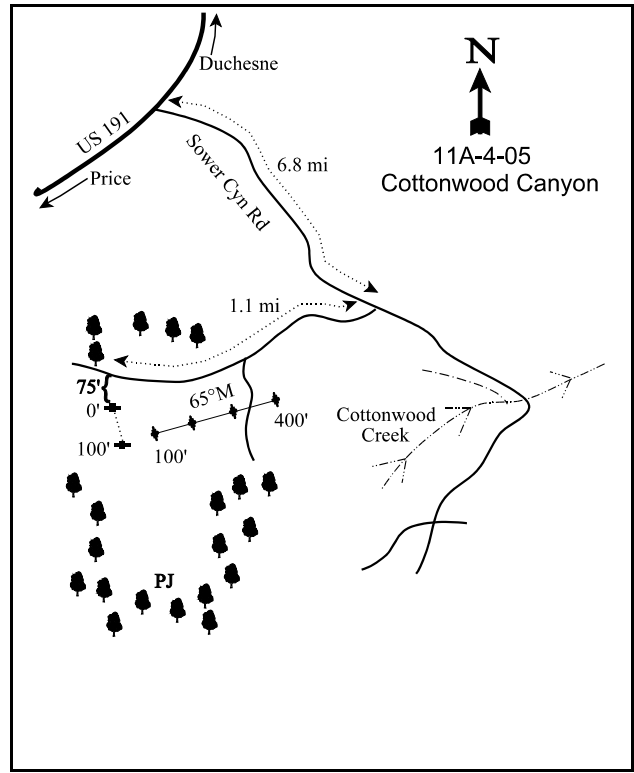
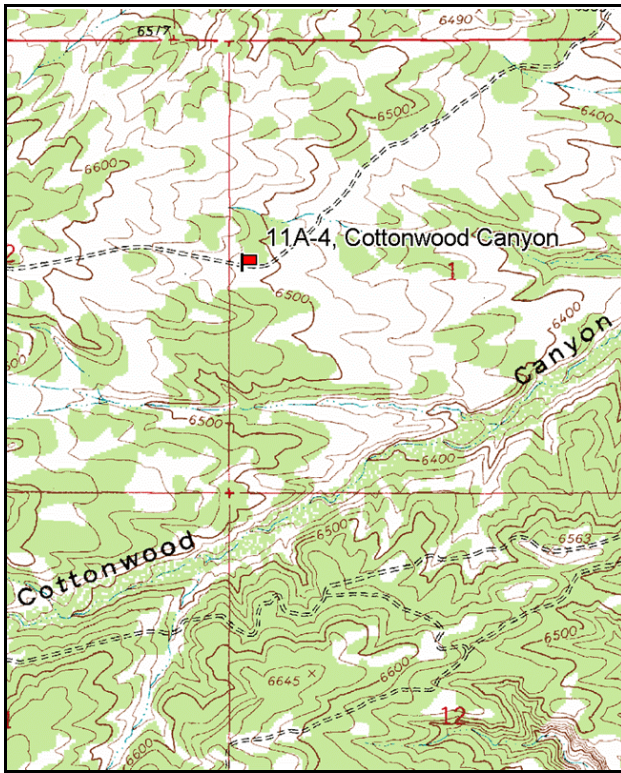
Vegetation type: Desert Shrub .

Compass bearing: frequency baseline 151 degrees magnetic (line 2-4 is 65°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Belt 4 no rebar.

LOCATION DESCRIPTION

From Duchesne, go up Indian Canyon (U.S. 191) approximately 2.5 miles to the Cottonwood-Sowers Canyon Road. Turn left and to southeast on the main road 6.4 miles to a jeep trail on top of the ridge just before Cottonwood Creek. Turn right on the jeep trail and drive 1 mile west to a fork. Continue approximately 0.1 miles up the right fork to the study site. The 0-foot baseline stake is 15 paces south of the road in the sage/grass type. The study is marked with 12 inch tall fenceposts. The 0-foot baseline stake is marked with browse tag #9037. The baseline is interrupted between the first and second lines.



Map Name: Duchesne SW

Diagrammatic Sketch

Township 5S, Range 5W, Section 1

GPS: NAD 27, UTM 12S 4436058 N, 550778 E

## DISCUSSION

### Cottonwood Canyon - Trend Study No. 11A-4

The Cottonwood Canyon trend study samples winter range on the long slope down from Anthro Mountain and the Badland Cliffs to the Duchesne River. The study is in a mixed shrub/grass community on a 2% east-facing slope surrounded by pinyon-juniper woodland. It is located on the DWR Cottonwood wildlife management area at an elevation of 6,500 feet. The unit is surrounded by BLM and Ute tribal lands. The pellet group data estimates in 2000 were 59 elk and 15 deer days use/acre (146 edu/ha and 37 ddu/ha). No cattle pats were sampled in 2000. Antelope also utilize the site, but sign was relatively infrequent. In 2005, pellet group data estimates were 35 elk and 1 deer days use/acre (86 edu/ha and 2 ddu/ha). Most pellets were from winter and most of the utilization was on grasses.

The soil is a moderately deep clay loam with an estimated effective rooting depth of over 27 inches. The soil reaction is slightly alkaline (pH of 7.5). The sum of relative rock and pavement cover values were estimated at 9% in 1995, 8% in 2000, and 7% in 2005. Relative vegetation cover was estimated at 34% in 1995, 27% in 2000, and 28% in 2005. The main negative factor influencing the soil is the constant increase of bare ground cover. In 1995, the relative bare ground cover was 22%. It increased to 37% in 2000 and 52% by 2005. This increase in bare ground has been a product of decreasing relative litter cover from 31% in 1995, to 27% in 2000, down to 12% in 2005. Soil erosion is not a significant problem due to the high grass frequency, although some soil loss is evident in the interspaces, resulting in pedestalling around shrubs. Erosion is more severe in the surrounding pinyon-juniper woodland type. The soil erosion index in 2005 rated soil erosion as stable.

Historically, fringed sagebrush was the most abundant browse species, with 11,933 plants/acre in 1988 and 14,260 in 1995. In 2000, the population decreased to 8,680 plants/acre, then decreased again to 960 plants/acre in 2005. Fringed sagebrush cover averaged 1.5% cover in 1995 and 2000, but decreased to less than 1% in 2005. With the dieoff of fringed sagebrush, shadscale and winterfat have become the key browse species.

Shadscale density has been declining since 1995 from 2,100 plant/acre, to 1,740 in 2000, and to 1,420 in 2005. Vigor was good in 1995, but in 2000 53% of the population displayed poor vigor. In 2005, this improved to only 7% of the population with poor vigor. Decadence was low in 1995 at 10%, this drastically increased to 70% in 2000 (due to dry conditions), then returned to 10% in 2005. Use was light in 1995, moderate to heavy in 2000, and returned to light in 2005.

Winterfat also decreased in density from 1988 to 1995, but showed a substantial increase in 2005. The winterfat population was 4,266 plants/acre in 1988, 1,420 in 1995, 1,080 in 2000, and 4,500 in 2005. In 2005, young plants constituted 54% of the population and mature plants made up 46% of the population. The decadent plants increased from 0% of the population in 1995 to 63% in 2000, then returned to 0% in 2005. Also, 52% of the population was classified as having heavy use in 2000, but returned to mostly light use in 2005. The level of use may have been overestimated in 2000 due to the dry conditions yielding very little annual growth. These downward changes in the key browse components were mostly due to the drought experienced in 2000 and improved with better precipitation in 2004 and the spring of 2005. Other browse species present in low densities include: bud sage, black sagebrush, basin big sagebrush, Wyoming big sagebrush, fourwing saltbush, rabbitbrush, broom snakeweed, and prickly pear.

Perennial grasses averaged 18% cover in 1995, 21% in 2000, and 19% in 2005. Needle-and-thread, thickspike wheatgrass, and blue grama are the dominant species and provide nearly all of the grass cover. Needle-and-thread and thickspike remained at stable frequencies in 2000, while blue grama significantly decreased. Blue grama is a warm season species and this decrease is not surprising with the extremely dry conditions in 2000, especially in the summer. In 2005, blue grama continued to decrease significantly as did thickspike

wheatgrass, but needle-and-thread increased significantly. Cheatgrass was sampled in one quadrat in 1995, but was not sampled in 2000 or 2005. The sum of nested frequency for grasses has decreased gradually over the years, but decreased substantially between 2000 to 2005. In 1995, forbs were dominated by annual species which included woolly navarretia, Fremont goosefoot, slimleaf goosefoot, annual stickweed, and tansy mustard. No annual forbs were sampled in 2000 due to drought, but in 2005 the annual forbs had nearly completely recovered. Total cover for forbs has never exceeded 4% in any year. Perennial forbs have been very scarce in all years.

#### 1988 APPARENT TREND ASSESSMENT

The grasses are quite competitive. Forb density and diversity is predictably low. The grasses provide significant ground cover. Most of the vegetation cover is provided by mats of blue grama and numerous western wheatgrass stems which together provide excellent erosion control. There is also a significant amount of pavement cover (25%).

#### 1995 TREND ASSESSMENT

The soil shows little sign of erosion due to the abundance of herbaceous vegetation and litter cover. Soil trend is stable. Fringed sagebrush density is high and the plants have become more robust since 1988. The most preferred forage species are found in moderate densities with mostly moderate hedging and nearly the same height and crown measurements. The exception is winterfat which doubled in size (height and crown). Other invasive species are in low abundance and do not appear to be increasing. The browse trend is stable, although there is a dense population of fringed sagebrush. Sum of nested frequency for perennial grasses has stayed nearly the same with only a single occurrence of cheatgrass. Perennial forb sum of nested frequency has increased, but the forbs are still proportionally dominated by annual species. Grasses contribute the most to the herbaceous understory. This leads to a stable herbaceous understory at this time, although there is poor forb composition. The Desirable Components Index rated this site as good to excellent with a score of 63 due to excellent perennial grass cover, fair browse cover, and low shrub decadence.

##### TREND ASSESSMENT

soil - stable (0)

browse - stable (0)

herbaceous understory - stable (0)

winter range condition (DC Index) - good to excellent (63) Lower Potential scale

#### 2000 TREND ASSESSMENT

Trend for soil is slightly down with a large increase of bare ground and evident soil loss in the interspaces. The ratio of protective ground cover to bare soil decreased as well. The large increase in bare ground is the result of the drought experienced in 2000. Trend for browse is down as shadscale and winterfat show drastic increases in poor vigor and percent decadency. Estimated use increased on these species in 2000, but this may be overestimated due to these species appearing heavily used because of low annual growth caused by drought. Although the sum of nested frequency for perennial grasses and forbs slightly decreased in 2000, trend is considered stable. Most of the loss in frequency is from perennial forbs which have been in low abundance in all years. Currently, forbs only contribute 0.1% cover. Perennial grasses are the dominant component in the herbaceous understory and remained at nearly the same sum of nested frequency as the previous reading. The Desirable Components Index rated this site as fair with a score of 41 due to excellent perennial grass cover.

TREND ASSESSMENT

soil - slightly down (-1)

browse - down (-2)

herbaceous understory - stable (0)

winter range condition (DC Index) - fair (41) Lower Potential scale

2005 TREND ASSESSMENT

The trend for soil is slightly down. The ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground decreased from 2.3:1 in 2000 to 1.9:1 in 2005. This decrease is due to a decrease in the nested frequency of cryptogamic crust and a decrease in the nested frequency of litter. The trend for browse is up. Fringed sagebrush, historically the most dominant browse species, decreased ninefold from 2000 to 2005. This loss made way for an increase of winterfat. From 2000 to 2005, winterfat density increased from 1,080 plants/acre to 4,500, an increase of 76%. Winterfat is far more palatable and nutritious for elk than fringed sagebrush and therefore this increase has helped improve this elk winter range. The winterfat decadence decreased from 63% in 2000 to 0% in 2005 and 54% of the winterfat population consisted of young individuals. Shadscale, also an important winter range species, density decreased 18% from 2000 to 2005, but this is minor in comparison to the large increase in winterfat. Shadscale decadence decreased from 70% in 2000 to 10% in 2005. The dying individuals decreased from 44% of the population to 7%. In the case of both winterfat and shadscale, the height and crown both increased between 2 and 3 times that of 2000. The herbaceous understory trend is slightly down. The nested frequency of perennial grasses decreased 19%. The nested frequency of thickspike wheatgrass decreased significantly and that of needle-and-thread increased significantly. The most preferred forage species on this site had been thickspike wheatgrass and being replaced by needle-and-thread is not a good replacement when considering the preferences of elk. The nested frequency of forbs increased, but were in small numbers and are of little importance to big game on this winter range. The Desirable Components Index rated this site as excellent with a score of 73 due to excellent perennial grass cover, high recruitment for shrubs, and low shrub decadence.

TREND ASSESSMENT

soil - slightly down (-1)

browse - up (+2)

herbaceous understory - slightly down (-1)

winter range condition (DC Index) - excellent (73) Lower Potential scale

HERBACEOUS TRENDS --

Management unit 11A, Study no: 4

T y p e	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Agropyron dasystachyum	a179	b255	b279	a164	6.46	5.86	4.64
G	Agropyron spicatum	-	4	-	-	.04	-	-
G	Bouteloua gracilis	d298	c190	b152	a82	4.76	4.83	2.42
G	Bromus tectorum (a)	-	1	-	-	.00	-	-
G	Oryzopsis hymenoides	a12	b44	ab21	a18	1.10	.51	.47
G	Sitanion hystrix	15	15	36	14	.09	.84	.34
G	Sporobolus cryptandrus	-	-	-	5	-	-	.21
G	Stipa comata	a190	a167	a172	b251	5.62	9.39	11.31

T y p e	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
	Total for Annual Grasses	0	1	0	0	0.00	0	0
	Total for Perennial Grasses	694	675	660	534	18.08	21.44	19.42
	Total for Grasses	694	676	660	534	18.09	21.44	19.42
F	Astragalus purshii	-	6	-	-	.01	-	-
F	Chenopodium fremontii (a)	-	<sub>c</sub> 77	<sub>a</sub> -	<sub>b</sub> 16	.55	-	.03
F	Chenopodium leptophyllum(a)	-	<sub>c</sub> 66	<sub>a</sub> -	<sub>b</sub> 19	.23	-	.19
F	Cryptantha sp.	5	4	-	-	.01	-	-
F	Descurainia pinnata (a)	-	<sub>b</sub> 38	<sub>a</sub> -	<sub>a</sub> 3	.39	-	.01
F	Halogeton glomeratus (a)	-	-	-	4	-	-	.01
F	Lappula occidentalis (a)	-	<sub>b</sub> 32	<sub>a</sub> -	<sub>c</sub> 111	.32	-	.84
F	Machaeranthera grindelioides	-	3	-	-	.00	-	-
F	Navarretia intertexta (a)	-	<sub>c</sub> 135	<sub>a</sub> -	<sub>b</sub> 61	1.06	-	.19
F	Orthocarpus luteus (a)	3	-	-	-	-	-	-
F	Phlox austromontana	3	-	5	-	-	.03	-
F	Schoenocrambe linifolia	<sub>a</sub> 1	<sub>b</sub> 48	<sub>a</sub> 5	<sub>a</sub> 6	.31	.01	.09
F	Sphaeralcea coccinea	<sub>a</sub> 9	<sub>a</sub> 15	<sub>a</sub> 8	<sub>b</sub> 30	.09	.04	2.17
F	Taraxacum officinale	-	2	-	-	.00	-	-
F	Townsendia incana	-	4	4	2	.01	.01	.03
F	Tragopogon dubius	2	-	-	-	-	-	-
	Total for Annual Forbs	3	348	0	214	2.56	0	1.29
	Total for Perennial Forbs	20	82	22	38	0.45	0.10	2.28
	Total for Forbs	23	430	22	252	3.02	0.10	3.58

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 11A, Study no: 4

Type	Species	Strip Frequency			Average Cover %		
		'95	'00	'05	'95	'00	'05
B	Artemisia frigida	93	87	30	1.34	1.63	.49
B	Artemisia nova	5	3	3	-	.15	.03
B	Artemisia spinescens	15	1	1	.19	.18	.15
B	Artemisia tridentata wyomingensis	1	1	0	-	-	-
B	Atriplex confertifolia	62	49	45	4.85	1.62	4.58
B	Ceratoides lanata	29	27	61	1.56	.30	3.60
B	Chrysothamnus viscidiflorus stenophyllus	1	2	0	-	-	-
B	Gutierrezia sarothrae	4	2	1	.15	-	.03
B	Opuntia sp.	1	0	1	-	-	-
B	Pediocactus simpsonii	2	0	0	-	-	-
Total for Browse		213	172	142	8.10	3.89	8.89

CANOPY COVER, LINE INTERCEPT --

Management unit 11A, Study no: 4

Species	Percent Cover
	'05
Artemisia frigida	1.04
Artemisia nova	.40
Atriplex confertifolia	8.86
Ceratoides lanata	4.11
Gutierrezia sarothrae	.10

BASIC COVER --

Management unit 11A, Study no: 4

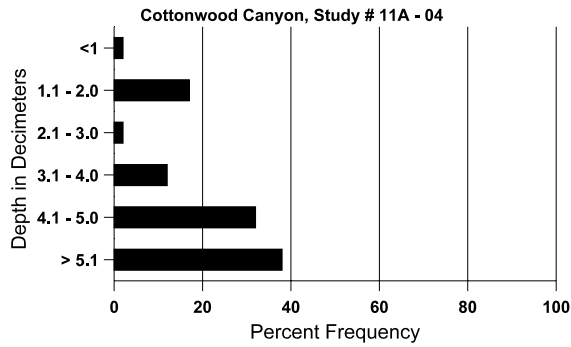
Cover Type	Average Cover %			
	'88	'95	'00	'05
Vegetation	23.50	31.20	28.95	30.33
Rock	0	.91	.08	.07
Pavement	24.75	7.81	8.63	8.12
Litter	30.50	28.26	29.41	13.60
Cryptogams	.25	4.27	1.81	.33
Bare Ground	21.00	20.09	39.95	57.65

SOIL ANALYSIS DATA --

Herd Unit 11A, Study # 4, Study Name: Cottonwood Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	ppm P	ppm K	dS/m
27.3	60.0 (18.1)	7.5	36.9	34.8	28.3	1.9	8.7	233.6	0.7

Stoniness Index



PELLET GROUP DATA --

Management unit 11A, Study no: 4

Type	Quadrat Frequency		
	'95	'00	'05
Rabbit	26	36	48
Elk	15	28	39
Deer	13	7	14
Cattle	2	-	-

Days use per acre (ha)	
'00	'05
-	-
59 (146)	35 (86)
15 (37)	1 (2)
-	-

BROWSE CHARACTERISTICS --

Management unit 11A, Study no: 4

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia frigida												
82	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
88	<b>11933</b>	466	4600	6333	1000	-	0	0	8	.50	10	6/4
95	<b>14260</b>	2920	9700	4560	-	-	2	0	0	-	0	15/9
00	<b>8680</b>	20	1460	5380	1840	200	21	.46	21	11	42	2/4
05	<b>960</b>	160	-	960	-	-	4	8	0	-	0	16/14

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Artemisia nova</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	266	-	200	-	66	-	0	0	25	8	25	-/-
95	160	-	-	160	-	20	63	0	0	-	0	13/18
00	160	-	-	-	160	-	13	63	100	100	100	6/21
05	100	80	-	40	60	40	0	0	60	60	60	10/18
<b>Artemisia spinescens</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	2333	-	333	1400	600	-	0	0	26	3	14	5/6
95	440	-	20	420	-	-	27	73	0	-	0	6/12
00	20	-	-	20	-	-	0	0	0	-	0	4/13
05	20	20	-	-	20	-	0	0	100	100	100	6/14
<b>Artemisia tridentata wyomingensis</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	0	-	-	-	-	-	0	0	0	-	0	-/-
95	20	-	-	20	-	-	100	0	0	-	0	17/26
00	40	-	-	20	20	-	0	100	50	50	100	21/40
05	0	-	-	-	-	-	0	0	0	-	0	-/-
<b>Atriplex canescens</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
88	0	-	-	-	-	-	0	0	-	-	0	-/-
95	0	-	-	-	-	-	0	0	-	-	0	18/31
00	0	-	-	-	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Atriplex confertifolia</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	4198	333	866	1666	1666	-	10	0	40	.47	2	13/18
95	2100	60	40	1860	200	340	10	2	10	5	5	13/23
00	1740	-	-	520	1220	520	31	48	70	44	53	8/17
05	1420	300	60	1220	140	280	0	0	10	7	7	15/32
<b>Ceratoides lanata</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	4266	133	2400	1200	666	-	13	3	16	.93	5	6/6
95	1420	-	60	1360	-	40	38	1	0	-	0	12/11
00	1080	-	40	360	680	140	30	52	63	33	63	3/5
05	4500	1660	2420	2060	20	-	25	2	0	-	0	11/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Chrysothamnus viscidiflorus stenophyllus</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
88	2000	-	1400	600	-	-	0	0	-	-	0	7/4
95	20	-	-	20	-	-	0	0	-	-	0	10/12
00	40	-	-	40	-	-	0	0	-	-	0	2/4
05	0	-	-	-	-	-	0	0	-	-	0	9/23
<b>Gutierrezia sarothrae</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	266	-	66	-	200	-	0	0	75	8	25	-/-
95	120	40	-	120	-	-	0	0	0	-	0	10/12
00	60	-	-	20	40	-	0	0	67	-	0	4/6
05	20	-	-	20	-	-	0	0	0	-	0	9/11
<b>Opuntia sp.</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
88	66	-	-	66	-	-	0	0	0	-	0	4/12
95	20	-	-	-	20	-	0	0	100	100	100	6/14
00	0	-	-	-	-	-	0	0	0	-	0	3/10
05	20	-	20	-	-	-	0	0	0	-	0	4/12
<b>Pediocactus simpsonii</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
88	0	-	-	-	-	-	0	0	-	-	0	-/-
95	60	-	-	60	-	-	0	0	-	-	0	1/2
00	0	-	-	-	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Sarcobatus vermiculatus</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
88	0	-	-	-	-	-	0	0	-	-	0	-/-
95	0	-	-	-	-	-	0	0	-	-	0	-/-
00	0	-	-	-	-	-	0	0	-	-	0	-/-
05	0	-	-	-	-	-	0	0	-	-	0	28/37