Trend Study 29R-3-08

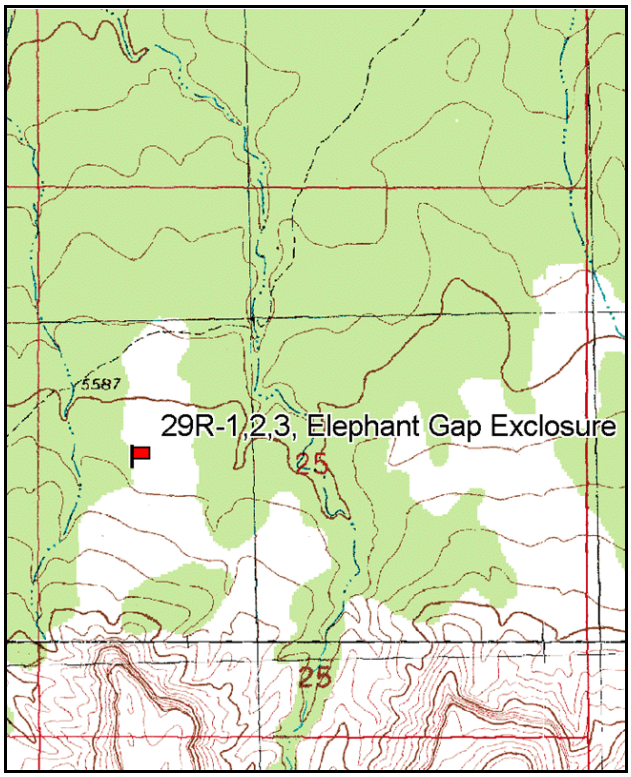
Study site name: Elephant Gap Exclosure-Outside . Vegetation type: Pinyon-Juniper .

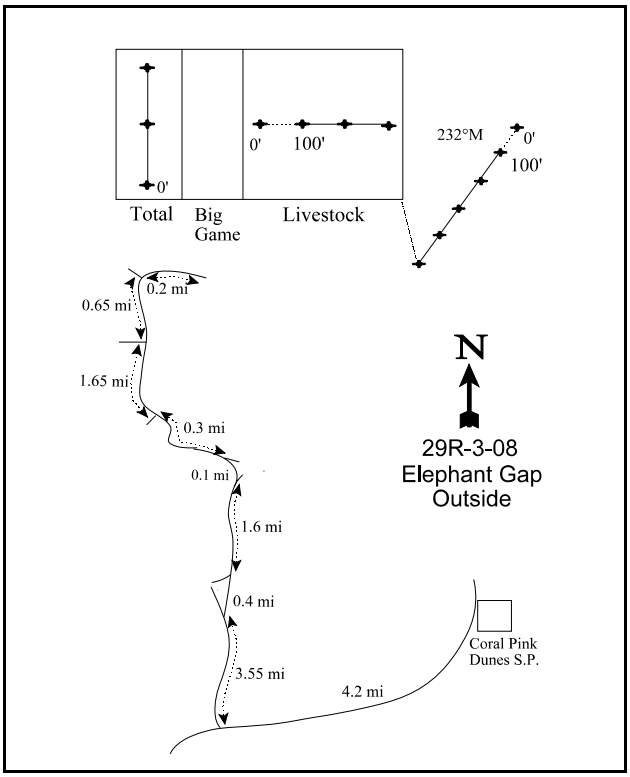
Compass bearing: frequency baseline 232 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park off of Hwy 89. From the entry of the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 2.7 miles to a cattleguard. Continue on main road for another 0.65 miles to another cattleguard. Drive another 1.75 miles to a faint road to the right (south). Drive on this road for 0.2 miles to the exclosure. From the southeast corner of the livestock exclosure, the 500 foot stake of the baseline is located 25 paces away at an azimuth of 186°M. The 0 foot stake is located 500 feet to the northeast at a bearing of 128°M. Browse tag #117 is attached to the 0 foot stake.





Map Name: The Barracks

Diagrammatic Sketch

Township 42S , Range 9W , Section 25

GPS: NAD 83, UTM 12S 339768 E, 4110650 N

DISCUSSION

Elephant Gap Exclosure Outside - Trend Study No. 29R-3

Study information

This study was established in 1998 outside of the exclosure complex at Elephant Gap [elevation: 5,600 feet (1,707 m), slope: 7%, aspect: northwest aspect]. The Elephant Gap exclosure complex is located about 16 miles west-northwest of Kanab and about 9 miles northwest of the Coral Pink San Dunes State Park. This exclosure was built in the 1960's just north of Harris Point. The area is composed of an open pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland with a mixed shrub understory. Deer use this area as winter range. Pellet group data estimated deer use at 95 days use/acre (235 ddu/ha) in 1998, 46 days use/acre (114 ddu/ha) in 2003, and 54 deer days use/acre (134 ddu/ha) in 2008. Cattle use was estimated at only 2 days use/acre (5 cdu/ha) in 2003 and 2008.

Soils

Soils are very deep, sand in texture, and strongly acidic (pH of 5.4). Effective rooting depth was estimated at 26 inches. Phosphorus and potassium have a low availability for plant growth and development at 3.5 ppm and 51.2 ppm, respectively (Tiedemann and Lopez 2004). There is very little rock or pavement on the surface or within the profile. Relative bare ground cover was higher outside than in either the total or livestock exclosures at 36%-43% since 1998. Relative cryptogamic cover was similar to the livestock exclosure at 8% in 1998 and declining to 3% in 2008. There is some soil pedestalling around shrubs, but erosion does not appear to be a significant problem due to the gentle terrain and high infiltration capacity of the soil. The soil erosion condition was classified as stable is 2008.

Browse

The key browse species are basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), green ephedra (*Ephedra viridis*), and antelope bitterbrush (*Purshia tridentata*). Total sagebrush cover was 5% in 1998 declining to 1% in 2008. Sagebrush density numbered 1,520 plants/acre in 1998 and decreased over the next 10 years to 360 plants/acre in 2008. The number of dead and decadent plants has been high in all years the site was read, while recruitment has declined each year. Ephedra density was estimated at 320 plants/acre in 1998, then increased to an average of 490 plants/acre in 2003 and 2008. Bitterbrush is the most preferred species on the site, but it occurs in very low densities. Bitterbrush density was only 20 plants/acre, and displayed heavy use and poor vigor in 2003. No bitterbrush were sampled in 2008. Other shrubs occurring in limited numbers include sand sagebrush (*Artemisia filifolia*), rubber rabbitbrush (*Chrysothamnus nauseosus*), coin buckwheat (*Eriogonum nummulare*), prickly pear (*Opuntia sp.*), yucca (*Yucca sp.*), and gray horsebrush (*Tetrademia canescens*).

Juniper and pinyon trees are found scattered throughout the area. Point-quarter data estimated 29 Utah juniper and 24 pinyon pine trees/acre in 1998. Average basal diameter was 9.8 inches for juniper and 5.5 inches for pinyon. Combined overhead canopy cover for juniper and pinyon was 10% in 2003. Point-quarter data estimated 32 juniper and 22 pinyon trees/acre in 2008.

Herbaceous understory

The herbaceous understory is more abundant and diverse than the total exclosure and similar in composition and cover to the livestock exclosure. Grasses provided only 2% cover in 1998, and less than 1% in 2003 and 2008. Sixweeks fescue (*Vulpia octoflora*) was the most abundant grass in 1998 and 2003, although it had declined significantly in nested frequency in 2003. Sand dropseed (*Sporobolus cryptandrus*) was the most abundant perennial species in 1998, but it also significantly decreased in 2003. In 1998, the forb component was dominated by pale evening primrose (*Oenothera pallida*), prairie evening primrose (*Oenothera albicaulis*), and milkvetch (*Astragalus sp.*), as these species combined for 74% of the forb cover and 64% of the total herbaceous cover. Both of the primrose species significantly declined in 2003 in nested frequency with drought conditions, but milkvetch significantly increased in frequency and cover and now dominates the

understory. By 2008, only milkvetch remained of the dominant forb species and accounted for 87% of forb cover and 40% of total vegetative cover.

1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - very poor-poor (34) Mid-level potential scale

2003 TREND ASSESSMENT

Trend for browse is down. Basin big sagebrush is in very poor condition with a 64% decrease in population density, 74% of the remaining population being classified as decadent, and declining vigor and recruitment. Ephedra increased in density due to the high proportion of young in the population in 1998. This species also showed increases in decadence in poor vigor in 2003, but neither is considered high. Bitterbrush remains very limited with only one plant being sampled on the transect. This plant was heavily utilized and was classified as having poor vigor. The grass and forb trends are both down. Grasses were in low abundance in 1998, further decreasing in frequency and cover in 2003. Forbs had good production in 1998 and fair diversity. The nested frequency of evening primrose significantly decreased in 2003 while milkvetch significantly increased. With the drought in 2003, sum of nested frequency of perennial grasses and forbs declined by 35%. Nearly all of the herbaceous perennials showed significant declines in individual nested frequency values in 2003, and diversity was much lower as well.

Winter range condition (DCI) - very poor (22) Mid-level potential scale
browse - down (-2) grasses - down (-2) forbs - down (-2)

2008 TREND ASSESSMENT

Browse trend is down. Basin big sagebrush density is down 33% (360 plants/acre) and still has high decadence (67%). Recruitment is down as well with only 20 young/acre (6%). No bitterbrush plants were found this sample. Ephedra has maintained its density (480 plants/acre) while decadence has decreased. No young or seedlings were seen. Grass and forb trends are both stable. Herbaceous understory is dominated by forbs as grasses account for less than half a percent of cover. The sum of nested frequency of both perennial and annual grasses increased. There was a significant increase in the nested frequency of blue grama and cheatgrass. Overall, annual grass cover decreased and perennial grass cover increased since 2003. There was little change in the sum of nested frequency of perennial forbs. Milkvetch is the dominant forb accounting for 87% of forbs and 40% of vegetation cover.

Winter range condition (DCI) - very poor (23) Mid-level potential scale
browse - down (-2) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 29R, Study no: 3

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Bouteloua gracilis	$_{a}$10	$_{a}$7	$_{b}$41	.53	.02	.16
G	Bromus tectorum (a)	$_{b}$20	$_{a}$-	$_{c}$49	.10	.00	.15
G	Oryzopsis hymenoides	1	3	1	.03	.00	.01
G	Sitanion hystrix	1	-	-	.03	-	-
G	Sporobolus cryptandrus	$_{b}$40	$_{a}$7	$_{a}$7	.68	.01	.02
G	Vulpia octoflora (a)	$_{b}$106	$_{a}$43	$_{a}$28	.68	.72	.09
Total for Annual Grasses		126	43	77	0.79	0.72	0.24
Total for Perennial Grasses		52	17	49	1.27	0.04	0.19
Total for Grasses		178	60	126	2.06	0.76	0.43
F	Ambrosia sp.	-	-	-	.03	-	-
F	Artemisia dracunculus	$_{b}$14	$_{a}$-	$_{a}$-	.53	-	-
F	Astragalus sp.	$_{a}$40	$_{b}$118	$_{b}$135	1.77	6.56	6.22
F	Castilleja linariaefolia	-	-	1	.01	-	.00
F	Chaenactis douglasii	-	-	3	-	-	.00
F	Comandra pallida	$_{b}$40	$_{a}$20	$_{a}$20	.42	.14	.40
F	Cryptantha sp.	$_{b}$28	$_{a}$-	$_{a}$2	.25	-	.00
F	Descurainia pinnata (a)	$_{b}$26	$_{a}$-	$_{b}$31	.09	-	.11
F	Dithyrea wislizenii (a)	$_{b}$28	$_{a}$-	$_{a}$2	.89	-	.01
F	Draba sp. (a)	3	-	14	.01	-	.02
F	Eriogonum cernuum (a)	$_{c}$92	$_{a}$-	$_{b}$8	.63	-	.02
F	Euphorbia sp.	$_{b}$26	$_{a}$-	$_{a}$-	.05	-	-
F	Gilia sp. (a)	15	17	4	.13	.31	.01
F	Lappula occidentalis (a)	$_{a}$5	$_{a}$-	$_{b}$57	.01	-	.16
F	Linum kingii	-	-	1	-	-	.00
F	Machaeranthera canescens	$_{a}$-	$_{a}$-	$_{b}$21	-	-	.13
F	Oenothera albicaulis (a)	$_{b}$40	$_{a}$-	$_{a}$-	1.77	-	-
F	Oenothera pallida	144	73	-	5.56	1.60	-
F	Sphaeralcea coccinea	$_{a}$-	$_{a}$-	$_{b}$11	-	-	.02
F	Sphaeralcea parvifolia	7	-	-	.01	-	-
F	Stephanomeria exigua (a)	-	5	-	-	.16	-
Total for Annual Forbs		209	22	116	3.55	0.47	0.33
Total for Perennial Forbs		299	211	194	8.66	8.30	6.80
Total for Forbs		508	233	310	12.22	8.78	7.13

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

BROWSE TRENDS --
Management unit 29R, Study no: 3

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia filifolia	0	0	1	.15	-	.15
B	Artemisia frigida	0	0	0	-	-	.07
B	Artemisia tridentata tridentata	60	22	16	4.83	2.29	1.25
B	Chrysothamnus nauseosus hololeucus	1	3	4	.15	.03	.56
B	Ephedra viridis	9	11	12	1.50	2.75	2.40
B	Eriogonum nummulare	0	2	0	.00	.03	-
B	Juniperus osteosperma	1	2	1	4.40	1.79	3.50
B	Opuntia sp.	7	6	5	.03	.36	.00
B	Pinus edulis	0	0	0	.66	.63	.15
B	Purshia tridentata	1	1	0	.15	.15	.03
B	Tetradymia canescens	2	1	0	1.62	.66	-
Total for Browse		81	48	39	13.52	8.70	8.13

CANOPY COVER, LINE INTERCEPT --
Management unit 29R, Study no: 3

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata tridentata	-	1.43	.63
Chrysothamnus nauseosus hololeucus	-	-	.13
Ephedra viridis	-	2.84	3.91
Juniperus osteosperma	4.00	9.00	7.98
Opuntia sp.	-	-	.13
Pinus edulis	1.00	1.20	1.01
Tetradymia canescens	-	.41	-

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 29R, Study no: 3

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata tridentata	2.5	2.2
Purshia tridentata	5.7	2.7

POINT-QUARTER TREE DATA --
Management unit 29R, Study no: 3

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	29	32	32
Pinus edulis	24	24	22

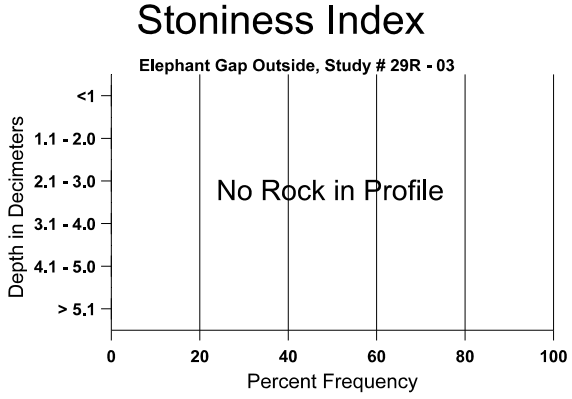
Average diameter (in)		
'98	'03	'08
9.8	9.8	10.8
5.5	7.2	6.8

BASIC COVER --
Management unit 29R, Study no: 3

Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	28.61	17.58	15.27
Rock	.01	.17	.23
Pavement	.08	.02	.16
Litter	38.06	33.89	39.16
Cryptogams	10.76	6.68	3.96
Bare Ground	46.34	54.31	52.88

SOIL ANALYSIS DATA --
Management unit 29R, Study no: 3, Study Name: Elephant Gap Outside

Effective rooting depth (in)	Temp °F (depth)	pH	sand			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
25.9	69.0 (17.7)	5.4	90.7	2.7	6.6	1.3	3.5	51.2	0.1



PELLET GROUP DATA --
Management unit 29R, Study no: 3

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	7	22	89
Deer	45	37	58
Cattle	1	1	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
95 (235)	46 (114)	54 (134)
-	2 (5)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 29R, Study no: 3

		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 filifolia												
98	**0**	20	-	-	-	-	0	0	-	-	0	32/32
03	**0**	-	-	-	-	-	0	0	-	-	0	48/47
08	**20**	-	20	-	-	-	0	0	-	-	0	38/37
Artemisia tridentata tridentata												
98	**1520**	80	220	620	680	980	28	3	45	28	28	42/44
03	**540**	-	60	80	400	1720	19	30	74	41	44	32/30
08	**360**	-	20	100	240	1500	6	0	67	44	72	34/35
Cercocarpus montanus												
98	**0**	-	-	-	-	-	0	0	-	-	0	24/25
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus hololeucus												
98	**20**	-	-	-	20	-	0	0	100	-	0	45/61
03	**60**	-	-	40	20	-	33	0	33	-	0	41/56
08	**80**	20	20	20	40	-	0	0	50	25	25	35/50
Ephedra viridis												
98	**320**	-	140	120	60	80	25	0	19	6	6	41/83
03	**500**	-	80	260	160	-	28	0	32	12	12	38/53
08	**480**	-	40	360	80	-	8	0	17	-	0	35/49
Eriogonum nummulare												
98	**0**	20	-	-	-	-	0	0	-	-	0	36/49
03	**40**	-	-	40	-	80	50	0	-	-	0	21/29
08	**0**	-	-	-	-	-	0	0	-	-	0	26/38
Juniperus osteosperma												
98	**20**	-	-	20	-	-	0	0	-	-	0	-/-
03	**40**	-	-	40	-	-	0	0	-	-	0	-/-
08	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
98	**180**	-	20	140	20	-	0	0	11	11	11	4/12
03	**180**	-	-	160	20	20	0	0	11	-	0	4/11
08	**180**	-	40	120	20	20	0	0	11	-	44	4/14

		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)
Purshia tridentata												
98	**20**	-	-	20	-	-	0	100	0	-	0	11/26
03	**20**	-	-	-	20	-	0	100	100	100	100	-/-
08	**0**	-	-	-	-	-	0	0	0	-	0	9/11
Tetradymia canescens												
98	**40**	-	-	20	20	-	0	0	50	-	0	58/65
03	**20**	-	-	-	20	-	0	0	100	-	0	53/84
08	**0**	-	-	-	-	-	0	0	0	-	0	42/56
Yucca sp.												
98	**0**	-	-	-	-	-	0	0	-	-	0	29/28
03	**0**	-	-	-	-	-	0	0	-	-	0	27/31
08	**0**	-	-	-	-	-	0	0	-	-	0	35/37