Trend Study 29-2-08

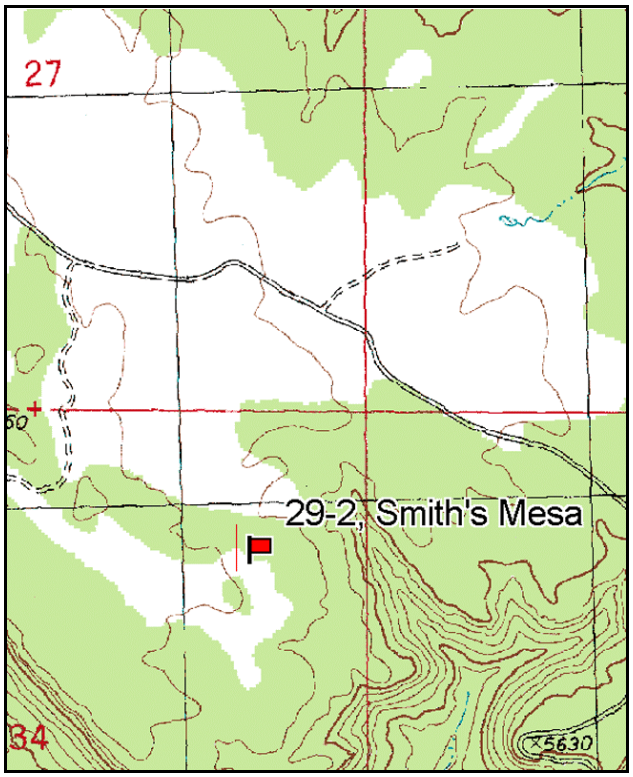
Study site name: Smith's Mesa . Vegetation type: Big Sagebrush-Grass .

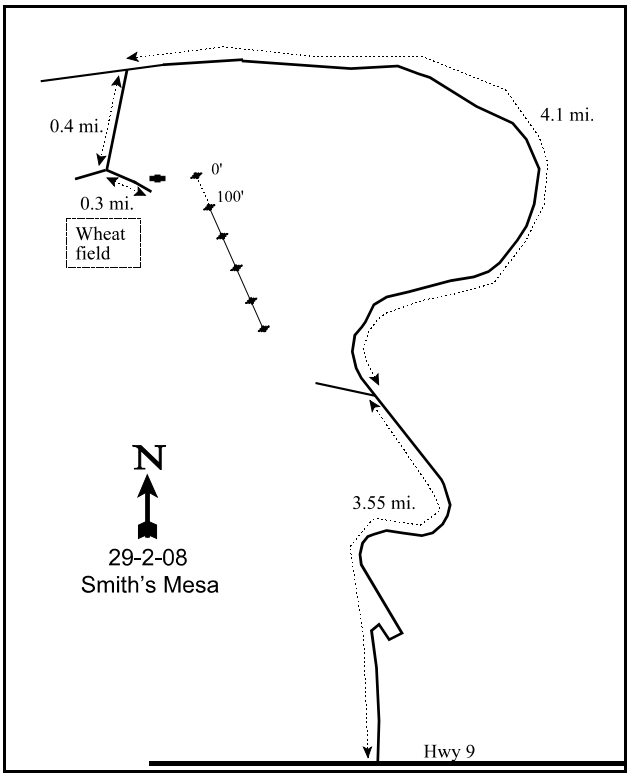
Compass bearing: frequency baseline 145 degrees magnetic.

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

LOCATION DESCRIPTION

At mile marker 17 on Hwy 9, turn north onto Mesa Road. Drive up the old paved road up to the mesa top for 3.35 miles to a fork. Turn right and continue 4.1 miles to a small dirt road next to a wheat field on the left side of the main road. Turn left and follow this road 0.4 miles to a fork next to another wheat field. Turn left and follow the edge of the field 0.3 miles and stop. Walk east over a small P-J covered hill to a sage opening. The 0-foot stake is on the north end of the opening near some *Quercus turbinella.* The baseline runs at 145 degrees magnetic and is marked by half-high green fenceposts.





Map Name: Smith Mesa

Diagrammatic Sketch

Township 40S , Range 12W , Section 34

GPS: NAD 83, UTM 12S 306102 E, 4127054 N

DISCUSSION

Smith's Mesa - Trend Study No. 29-2

Study Information

This trend study was established in a mixed big sagebrush (*Artemisia tridentata*) stand in 1998 on a clearing on Smith's Mesa on BLM land [elevation: 5,700 feet (1,737 m), slope: 2-3%, aspect: southwest]. The study site is surrounded on three sides by singleleaf pinyon (*Pinus monophyllus*) and Utah juniper (*Juniperus osteosperma*) trees, and dryland wheat fields on the west. The large mesa is three miles north of the town of Virgin. It rises approximately 2,000 feet above the town and supports many sagebrush openings surrounded by pinyon and juniper woodland. Some dryland wheat fields are also found on the south end of the mesa on private land. A cattle pond is located about one-third of a mile east of the site but it appears to contain water only in the early spring. Smith's Mesa provides important winter range for deer which summer in Zion National Park. Pellet group data from the site estimated 38 deer days use/acre in 1998 (94 ddu/ha). Some cattle sign was also encountered with an estimated 7 cow days use/acre (17 cdu/ha). Pellet group data from 2003 indicated much lighter use at 16 deer days use/acre (40 ddu/ha). No cattle sign was noted in 2003. Pellet group data from 2008 estimated 32 deer days use/acre (78 ddu/ha) and 3 cow days use/acre (7 cdu/ha).

Soils

Soils on the site are very sandy and deep with the effective rooting depth estimated at 23 inches. Soil texture is a sandy loam which is slightly acidic (pH 6.2). Phosphorus is marginally available for plant growth and development at 8.1 ppm (Tiedemann and Lopez 2004). Rock is absent on the surface and in the profile. Herbaceous plants, mostly in the form of winter annuals, are common and provide adequate soil protection. In addition, cryptogamic crusts are abundant. There appears to be some pedestalling of soil around shrubs, possibly caused as much by wind as by water. Erosion is not a problem due to the gentle terrain and the erosion condition class was rated as stable in 2003 and 2008.

Browse

The site supports a fair stand of big sagebrush with a few antelope bitterbrush (*Purshia tridentata*). Some sagebrush plants exhibit characteristics of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*). There also appears to be some hybridization with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since a few sagebrush sampled fluoresced under a black light. Since most of the sagebrush appeared to be more like basin big sagebrush, all sagebrush were classified as basin big sagebrush. Sagebrush density was estimated at 2,200 plants/acre in 1998, declining to 1,500 plants/acre by 2003, then rebounding slightly to 1,640 plants/acre in 2008. The stand is mostly mature, light to moderately utilized, in good vigor, and shows low to moderate decadence. Young recruitment was good in 1998 with 10% of the population consisting of young plants. No seedlings or young were encountered in 2003. Recruitment improved in 2008 with 4,680 young/acre. Only a few bitterbrush plants occur on the site. Broom snakeweed (*Gutierrezia sarothrae*), was the most abundant shrub on the site with a population estimated at 5,380 plants/acre in 1998. Drought conditions in 2003 caused a 61% decline in density to an average of 2,080 plants/acre in 2003 and 2008. Pinyon and juniper trees appeared to be slowly encroaching into the clearing, but density was still low. Point-quarter data from 1998 estimated 6 juniper and 6 pinyon trees/acre that increased in 2008 to 20 juniper and 27 pinyon trees/acre, average basal diameter was 4.8 inches for pinyon and 13.8 inches for juniper.

Herbaceous Understory

Grasses provided 30% and 19% of vegetation cover in 1998 and 2003, respectively, then dropped to 2% in 2008. The herbaceous understory was very poor with two annual grasses, cheatgrass (*Bromus tectorum*) and six weeks fescue (*Vulpia octoflora*), providing 100% of the grass cover in 1998 and 88% in 2003. By 2008, only three grass species were found on the site, cheatgrass, sixweeks grass, and rattail fescue (*Festuca myuros*), all annuals. Few perennial species occur on this site and none were sampled in 2008. The forb component was composed mostly of annuals. Forb cover decreased from 4% in 2003 to less than 1% in 2008,

while sum of nested frequency decreased 40%.

1998 DESIRABLE COMPONENTS INDEX

Winter range condition (DCI) - very poor (11) Mid-level potential

2003 TREND ASSESSMENT

Trend for sagebrush is slightly down. Density of sagebrush declined 32% from 2,200 plants/acre in 1998 to 1,500 plants/acre. Vigor was poor on 15% of the sagebrush plants sampled and decadence increased from 13% in 1998 to 33%. No seedlings or young plants were encountered. Drought conditions likely caused the 61% decline in the density of broom snakeweed. Trend for the herbaceous understory is difficult to determine due to the lack of perennial species. Sum of nested frequency of the few perennial grasses found on the site declined slightly while sum of nested frequency of perennial forbs increased slightly. Annual grasses and forbs dominate the understory. Sum of nested frequency of annual grasses and forbs increased slightly but cover dropped from 33% in 1998 to 23% in 2003. Trend is considered stable and in very poor condition.

Winter range condition (DCI) - very poor (3) Mid-level potential scale
browse - slightly down (-1) grasses - stable (0) forbs - stable (0)

2008 TREND ASSESSMENT

Browse trend is stable. Basin big sagebrush has increased in density from 1,500 to 1,640 plants/acre. Decadence has increased from 33% to 41%. Young plants account for only 1% of the population. The grass and forb trends are stable as perennial species are almost nonexistent on the site. Annual grasses have decreased from 19% to 2% of cover while the sum of nested frequency has declined 28%. Perennial forbs have decreased slightly in cover since 2003, and sum of nested frequency of perennial forbs has decreased slightly. Perennial forbs have likewise been rare on this site. The desirable components index improved due to an increase in basin big sagebrush density and recruitment while cheatgrass cover declined.

Winter range condition - poor (18) Mid-level potential scale
browse - stable (0) grasses - stable (0) forbs - stable (0)

HERBACEOUS TRENDS --
Management unit 29 , Study no: 2

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Bromus tectorum (a)	$_{c}$436	$_{b}$333	$_{a}$196	22.90	8.58	.60
G	Festuca myuros (a)	$_{a}$-	$_{b}$105	$_{b}$140	-	2.18	.50
G	Poa secunda	15	4	-	.05	.03	-
G	Sitanion hystrix	-	-	-	.00	-	-
G	Sporobolus cryptandrus	2	-	-	.03	-	-
G	Vulpia octoflora (a)	$_{b}$304	$_{b}$348	$_{a}$226	7.54	8.48	.89
Total for Annual Grasses		740	786	562	30.45	19.25	1.99
Total for Perennial Grasses		17	4	0	0.08	0.03	0
Total for Grasses		757	790	562	30.53	19.29	1.99
F	Castilleja linariaefolia	-	-	5	-	-	.06
F	Draba sp. (a)	$_{b}$25	$_{a}$-	$_{a}$4	.05	-	.01

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
F	Erodium cicutarium (a)	$_{c}$78	$_{b}$55	$_{a}$7	1.95	2.74	.04
F	Eriogonum racemosum	-	3	2	-	.00	.00
F	Eriogonum umbellatum	4	3	4	.03	.06	.16
F	Gilia sp. (a)	$_{a}$-	$_{b}$20	$_{a}$-	-	.17	-
F	Lappula occidentalis (a)	$_{b}$32	$_{a}$15	$_{a}$41	.11	.11	.22
F	Lygodesmia grandiflora	-	3	-	-	.03	-
F	Microsteris gracilis (a)	$_{b}$17	$_{a}$-	$_{a}$2	.06	-	.00
F	Navarretia intertexta (a)	$_{a}$5	$_{b}$39	$_{b}$48	.03	.30	.09
F	Oenothera pallida	4	8	-	.01	.04	-
F	Orobanche fasciculata	1	-	-	.00	-	-
F	Plantago patagonica (a)	$_{a}$11	$_{b}$26	$_{a}$5	.39	.08	.01
F	Polygonum douglasii (a)	3	-	3	.00	-	.01
F	Senecio multilobatus	$_{b}$17	$_{c}$39	$_{a}$-	.05	.32	-
F	Sisymbrium altissimum (a)	-	-	5	-	-	.01
F	Unknown forb-perennial	2	-	-	.00	-	-
Total for Annual Forbs		171	155	115	2.60	3.41	0.40
Total for Perennial Forbs		28	56	11	0.11	0.47	0.22
Total for Forbs		199	211	126	2.71	3.88	0.62

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

BROWSE TRENDS --
Management unit 29 , Study no: 2

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata tridentata	54	44	47	11.80	9.38	11.46
B	Chrysothamnus viscidiflorus viscidiflorus	0	1	0	-	.00	-
B	Gutierrezia sarothrae	51	28	38	3.29	1.75	2.95
B	Juniperus osteosperma	0	1	0	.78	1.48	3.05
B	Opuntia sp.	3	2	2	.18	.18	.38
B	Pinus monophylla	1	2	4	1.70	1.29	.68
B	Purshia tridentata	1	0	1	.00	-	.53
B	Salvia dorrii	1	2	4	.00	.15	.38
Total for Browse		111	80	96	17.76	14.23	19.46

CANOPY COVER, LINE INTERCEPT --
Management unit 29 , Study no: 2

Species	Percent Cover		
	'98	'03	'08
Artemisia tridentata tridentata	-	10.66	14.63
Gutierrezia sarothrae	-	.96	3.03
Juniperus osteosperma	-	3.20	3.50
Opuntia sp.	-	.03	.03
Pinus monophylla	1.39	2.03	1.75
Purshia tridentata	-	-	.15
Salvia dorrii	-	.53	1.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 29 , Study no: 2

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata tridentata	1.5	1.4
Purshia tridentata	3.1	0.6

POINT-QUARTER TREE DATA --
Management unit 29 , Study no: 2

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	6	<18	20
Pinus monophylla	6	<18	27

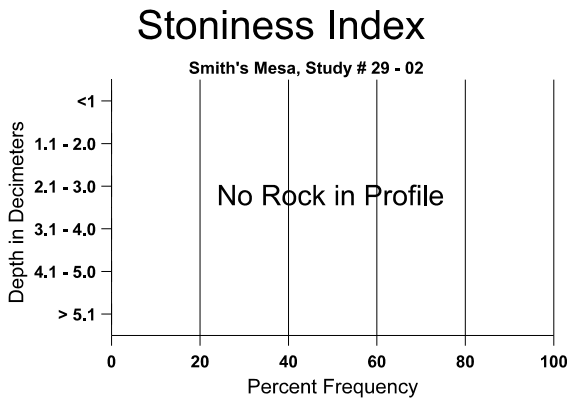
Average diameter (in)		
'98	'03	'08
5.7	-	13.8
10.4	-	4.8

BASIC COVER --
Management unit 29 , Study no: 2

Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	46.12	38.27	22.45
Rock	.03	.00	.02
Pavement	.04	.05	.29
Litter	39.47	24.39	50.94
Cryptogams	12.36	10.87	1.53
Bare Ground	33.09	41.97	40.14

SOIL ANALYSIS DATA --
Management unit 29, Study no: 2, Study Name: Smith's Mesa

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
23.2	71.3 (11.7)	6.2	72.7	17.4	9.8	0.7	8.1	3.2	0.2



PELLET GROUP DATA --
Management unit 29 , Study no: 2

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	23	25	64
Elk	-	-	-
Deer	44	2	17
Cattle	1	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	1 (2)	-
38 (94)	16 (40)	32 (78)
7 (17)	-	3 (7)

BROWSE CHARACTERISTICS --
Management unit 29 , Study no: 2

		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 tridentata tridentata												
98	**2200**	20	220	1700	280	340	28	4	13	5	5	28/39
03	**1500**	-	-	1000	500	520	5	0	33	15	15	30/40
08	**1640**	38500	20	940	680	640	3	0	41	16	34	34/50
Ceanothus greggii												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	76/121
08	**0**	-	-	-	-	-	0	0	-	-	0	73/143

		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)
Chrysothamnus viscidiflorus viscidiflorus												
98	**0**	-	-	-	-	-	0	0	-	-	0	7/13
03	**180**	-	-	180	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
98	**5380**	20	440	4840	100	220	0	0	2	.37	.37	9/11
03	**2100**	200	120	1800	180	300	0	0	9	4	7	9/13
08	**2060**	580	20	1200	840	180	0	0	41	14	22	10/18
Juniperus osteosperma												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**20**	-	-	20	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Opuntia sp.												
98	**60**	-	-	60	-	-	0	0	0	-	0	6/16
03	**40**	-	-	40	-	-	0	0	0	-	0	7/15
08	**60**	-	-	20	40	20	0	0	67	-	67	6/14
Pinus monophylla												
98	**20**	-	-	20	-	-	0	0	-	-	0	-/-
03	**40**	20	20	20	-	-	0	0	-	-	0	-/-
08	**80**	40	60	20	-	-	0	0	-	-	0	-/-
Purshia tridentata												
98	**20**	-	20	-	-	-	0	0	-	-	0	23/99
03	**0**	-	-	-	-	-	0	0	-	-	0	17/46
08	**20**	-	-	20	-	-	0	0	-	-	0	20/47
Quercus turbinella												
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	129/216
08	**0**	-	-	-	-	-	0	0	-	-	0	113/227
Salvia dorrii												
98	**20**	-	-	20	-	-	0	0	0	-	0	13/46
03	**40**	-	20	20	-	-	0	0	0	-	0	15/36
08	**80**	-	-	60	20	-	25	0	25	25	50	15/33