Trend Study 22-13-08

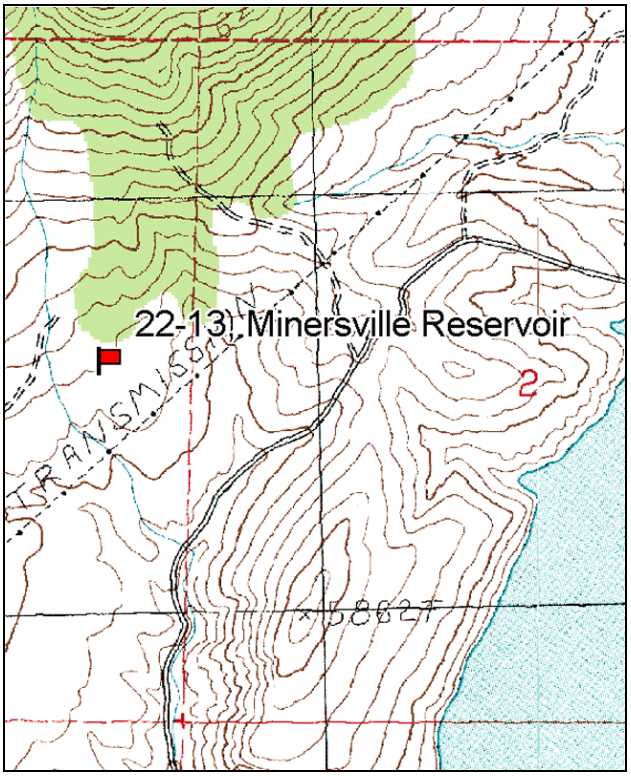
Study site name: Minersville Reservoir . Vegetation type: Big Sagebrush-Grass .

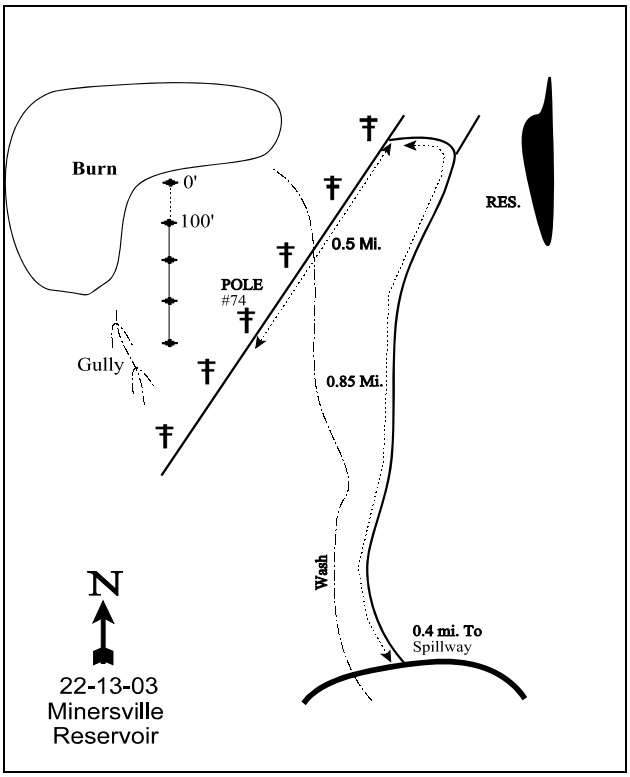
Compass bearing: frequency baseline 172 degrees magnetic.

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

LOCATION DESCRIPTION

From Beaver go west on SR 21 to Minersville Reservoir. From the Minersville Reservoir sign south of the reservoir, drive 1.35 miles further west on SR 21 to an intersection with a dirt road. Turn right and go 0.85 miles. Take a left onto the road that takes you under the powerlines. Go 0.4 miles down across a wash and up a small hill to powerpole #74 (single pole). From the pole, the 0' stake is ~600 feet at 317 degrees magnetic. The 0-foot baseline stake is marked by browse tag #7185. The 0', 100' and 200' stakes are rebar; the 300' and 400' stakes are green, half-high fenceposts.





Map Name: Minersville

Diagrammatic Sketch

Township 30S , Range 9W , Section 3

GPS: NAD 83, UTM 12S 338410 E, 4232776 N

DISCUSSION

Minersville Reservoir - Trend Study No. 22-13

Study Information

This study was established to monitor trend on deer winter range located about a mile west of Minersville Reservoir [elevation: 5,700 feet (1,737m), slope: 6-8%, aspect: south-southeast]. Historically, the site sampled an open sagebrush flat with scattered Utah juniper (*Juniperus osteosperma*). However, the site burned in 1998 soon after it was surveyed that summer. Following the burn, the site was aerially seeded and smooth-chained to cover the seed in October of 1998. The seed mix consisted of 9 grass and 4 forb species including several wheatgrass species (*Agropyron* sp.), Indian ricegrass (*Oryzopsis hymenoides*), small burnet (*Sanguisorba minor*), alfalfa (*Medicago sativa*), Lewis flax (*Linum lewisii*), and Palmer penstemon (*Penstemon palmeri*). A second aerial seeding was done in February 1999 which included 2 crested wheatgrass varieties, forage kochia (*Kochia prostrata*), and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Use by both livestock and mule deer was reported to be moderate in 1985. In 1991, 17 deer days use/acre (42 ddu/ha) was determined with little sign of livestock being observed. A pellet group transect read on site in 1998 estimated 62 deer days use/acre (153 ddu/ha) and 3 cow days use/acre (8 cdu/ha). Data from 2003 estimated 9 deer days use/acre (23 ddu/ha) and 20 cow days use/acre (50 cdu/ha). Decreasing deer use in 2003 is not surprising with the loss of most of the Wyoming big sagebrush population following the fire. In 2008, the pellet group transect estimated 15 deer days use/acre (36 ddu/ha) and 19 cow days use/acre (46 cdu/ha). Prior to the burn, thermal and escape cover for deer were provided by dense junipers on the hillside north of the study site, but only a few pockets of unburned trees remain in the area.

Soil

The site is within the Flowell series (USDA-NRCS 2007) which consists of very deep, well drained soils that formed in alluvium from igneous rocks and quartzite. The Flowell soils are on hills, alluvial fans and terraces. Soil analysis indicates a sandy clay loam texture with a slightly acidic pH (6.3). A caliche layer occurs at a depth of about 10-12 inches. Effective rooting depth averaged around 11 inches in 1998. Ground cover characteristics showed significant changes between 1998 and 2003. These changes are the result of the burn as well as very dry conditions in 2002 and 2003. The biggest change on the soil surface following the burn was the loss of litter cover and the corresponding increase in bare ground. Vegetation cover also declined in 2003, but not to the same magnitude as litter. Prior to the burn, some signs of erosion were apparent, but erosion did not appear to be accelerated. In 2003 and 2008, soils were rated as stable from an erosion condition class assessment. There are some moderately large active gullies near the site. In 2008, the large gully was observed as being well vegetated.

Browse

Wyoming big sagebrush was the key species prior to the 2003 survey. In 2003 and 2008, Wyoming big sagebrush density was only 40 plants/acre. Sagebrush density will likely remain very low on the site as no young were sampled in 2003 and 2008. A few scattered fourwing saltbush (*Atriplex canescens*) and ephedra (*Ephedra nevadaensis*) were also sampled on the site in 2003 and 2008.

Herbaceous Understory

At the time of the 1998 survey, the understory consisted almost exclusively of grasses. In 1998, cheatgrass (*Bromus tectorum*) provided two thirds of the grass cover and provided enough fine fuels to carry a fire which would wipe out the Wyoming big sagebrush population. Cheatgrass significantly declined in nested frequency and average cover on the site in 2003, likely due to the very dry conditions prior to sampling. Before the site burned, the most abundant perennial grasses were warm season species including purple three-awn (*Aristida purpurea*), galleta (*Hilaria jamesii*), and blue grama (*Bouteloua gracilis*). These species were again sampled after the burn in 2003, as well as several others including crested (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*), Indian ricegrass, bottlebrush squirreltail (*Sitanion hystrix*), and Russian

wildrye (*Elymus junceus*). Sum of nested frequency for perennial grasses declined between 1991 and 1998, but increased between 1998 and 2003. By 2008, perennial grass sum of nested frequency increased by over 50%. Forbs have been sparse in all readings. Alfalfa was sampled in 3 quadrats in 2003 as it was seeded on the site as part of the post-burn rehabilitation. Alfalfa was not sampled in 2008.

1991 TREND ASSESSMENT

The trend for the key browse species, Wyoming big sagebrush, is stable. Density increased by 8%, but decadence remains high and slightly increased to 45% and no young recruitment. Twenty-three percent of the population displays poor vigor. Even though the reproductive potential increased due to the number of seedlings counted in 1991, no young sagebrush were encountered. Grass trend is stable. Trend for perennial forbs is also stable and still is almost non-existent and in very poor condition.

browse - stable (0) grass - stable (0) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. The difference in density for Wyoming big sagebrush is likely due to the change in sampling methods. Decadence is slightly higher, but similar to 1991. The perennial grass trend is slightly down because of the moderate decrease in sum of nested frequency and the dominance of the understory by cheatgrass with 99% quadrat frequency and over 15% cover. Cheatgrass constitutes a great fire hazard which could ultimately cause the loss of the Wyoming big sagebrush. Trend for perennial forbs is stable. The sum of nested frequency went slightly down, but it contributes very little forage (<0.1% total cover).

Winter Range Condition (DCI) - poor (16) low-level potential scale
browse - stable (0) grass – slightly down (-1) forb - stable (0)

2003 TREND ASSESSMENT

Trend for browse is down. Wyoming big sagebrush was the key browse on the site but density has declined by 99% following the burn. No young plants were sampled in 2003, so a short recovery period is not likely. Trend for the perennial grasses is up as sum of nested frequency moderately increased. The seeding treatment added several perennial species to the community including crested and intermediate wheatgrass, and alfalfa. These species are not highly abundant, but they provide valuable forage and soil stability values to the site. Native warm season grasses remain the most abundant species on the site. Trend for forbs is slightly up, but it still provides barely 1% cover and provides little value as forage.

Winter Range Condition (DCI) - fair (30) low-level potential scale
browse - down (-2) grass - up (+2) forb - slightly up (+1)

2008 TREND ASSESSMENT

Trend for browse is stable, but very low numbers. Sagebrush density is only 40 plants/acre. No young plants were sampled in 2003 or 2008, therefore, a short recovery period is not likely. Trend for the perennial grasses is slightly up with the sum of nested frequency being the highest ever recorded for this site. Native warm season grasses still remain the most abundant species on the site. The seeding treatment added several perennial species to the community including crested and intermediate wheatgrass. Cheatgrass nested frequency was significantly higher. The trend for forbs is down, but forbs are an insignificant part of the understory, with total cover being <0.3%.

Winter Range Condition (DCI) - fair (29) low-level potential scale
browse - stable (0) grass - slightly up (+1) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 13

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$32	$_{c}$71	-	1.04	3.51
G	Agropyron intermedium	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$32	$_{b}$56	-	1.10	3.31
G	Agropyron spicatum	-	-	-	-	-	-	.01	.03
G	Aristida purpurea	$_{ab}$56	$_{ab}$59	$_{a}$33	$_{a}$37	$_{b}$69	1.61	1.17	2.01
G	Bouteloua gracilis	$_{a}$-	$_{b}$16	$_{b}$19	$_{a}$12	$_{a}$-	.29	.21	-
G	Bromus inermis	-	-	-	1	7	-	.04	.33
G	Bromus tectorum (a)	-	-	$_{c}$356	$_{a}$62	$_{b}$221	15.16	.44	2.71
G	Elymus junceus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$7	$_{b}$14	-	.38	.42
G	Hilaria jamesii	$_{bc}$138	$_{a}$90	$_{a}$72	$_{ab}$109	$_{c}$158	2.92	8.55	12.53
G	Oryzopsis hymenoides	-	2	11	2	4	.32	.07	.19
G	Sitanion hystrix	$_{a}$34	$_{b}$76	$_{b}$65	$_{a}$11	$_{a}$13	1.95	.52	.33
G	Sporobolus cryptandrus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$16	$_{a}$6	-	.66	.04
G	Vulpia octoflora (a)	-	-	$_{a}$-	$_{b}$8	$_{a}$9	-	.05	.02
Total for Annual Grasses		0	0	356	70	230	15.16	0.49	2.73
Total for Perennial Grasses		228	243	200	259	398	7.10	13.77	22.73
Total for Grasses		228	243	556	329	628	22.27	14.26	25.46
F	Alyssum alyssoides (a)	-	-	1	-	-	.00	-	-
F	Calochortus nuttallii	$_{a}$1	$_{ab}$5	$_{a}$6	$_{b}$18	$_{a}$2	.01	.07	.01
F	Eriogonum cernuum (a)	-	-	-	2	-	-	.06	-
F	Gilia sp. (a)	-	-	$_{a}$-	$_{b}$108	$_{a}$3	-	4.85	.03
F	Leucelene ericoides	-	-	-	14	6	-	.60	.03
F	Lupinus sp. (a)	-	-	-	-	1	-	-	.00
F	Medicago sativa	-	-	-	6	-	-	.05	-
F	Phlox longifolia	$_{a}$3	$_{b}$23	$_{a}$2	$_{a}$2	$_{a}$-	.01	.01	-
F	Salsola iberica (a)	-	-	$_{a}$-	$_{a}$4	$_{b}$32	-	.01	.27
F	Sisymbrium altissimum (a)	-	-	-	2	2	-	.03	.00
F	Sphaeralcea coccinea	-	1	-	6	5	-	.30	.19
F	Tragopogon dubius	-	-	-	-	-	-	-	.00
F	Unknown forb-perennial	3	-	-	6	-	-	.30	-
Total for Annual Forbs		0	0	1	116	38	0.00	4.95	0.31
Total for Perennial Forbs		7	29	8	52	13	0.01	1.34	0.24
Total for Forbs		7	29	9	168	51	0.02	6.30	0.55

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

BROWSE TRENDS --
Management unit 22 , Study no: 13

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata wyomingensis	81	2	2	8.84	.00	.00
B	Chrysothamnus viscidiflorus stenophyllus	2	0	0	.00	-	-
B	Ephedra nevadensis	0	1	1	.00	.15	.15
B	Juniperus osteosperma	1	0	0	.06	-	-
B	Opuntia sp.	2	0	0	.03	-	-
B	Pinus edulis	0	0	0	.38	-	-
Total for Browse		86	3	3	9.31	0.15	0.15

CANOPY COVER, LINE INTERCEPT --
Management unit 22 , Study no: 13

Species	Percent Cover		
	'98	'03	'08
Ephedra nevadensis	-	.20	.10
Juniperus osteosperma	.80	-	-

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 13

Species	Average leader growth (in)	
	'03	'08
Atriplex canescens	8.9	-
Artemisia tridentata wyomingensis	1.7	-

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 13

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	15	<18	<18
Pinus edulis	8	<18	<18

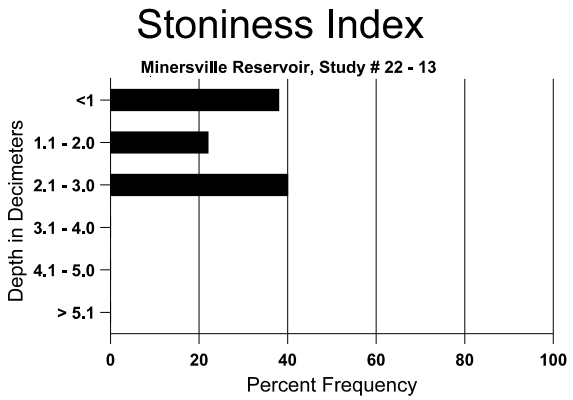
Average diameter (in)		
'98	'03	'08
3.1	-	-
3.4	-	-

BASIC COVER --
Management unit 22 , Study no: 13

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	8.00	1.75	30.53	20.13	26.56
Rock	7.00	12.00	11.05	17.53	15.86
Pavement	45.50	31.25	25.52	17.97	26.11
Litter	31.75	41.75	34.77	14.30	34.61
Cryptogams	0	0	.01	0	.02
Bare Ground	7.75	13.25	18.45	36.10	7.34

SOIL ANALYSIS DATA --
Management unit 22, Study no: 13, Study Name: Minersville Reservoir

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
11.3	65.6 (10.1)	6.3	54.0	21.4	24.6	1.0	7.1	121.6	0.5



PELLET GROUP DATA --
Management unit 22 , Study no: 13

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	13	5	35
Horse	-	3	-
Elk	-	1	-
Deer	36	6	4
Cattle	1	7	13

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	5 (13)	-
-	-	-
62 (153)	9 (23)	15 (36)
3 (7)	20 (50)	19 (46)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 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)
Artemisia tridentata wyomingensis												
85	**3665**	-	66	2066	1533	-	15	2	42	-	0	26/26
91	**3998**	533	-	2199	1799	-	15	3	45	5	23	24/25
98	**2780**	20	140	1220	1420	1040	17	0	51	14	14	24/31
03	**40**	-	-	40	-	-	0	50	0	-	0	9/8
08	**40**	-	-	40	-	20	0	50	0	-	0	11/12
Atriplex canescens												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	28/36
08	**0**	-	-	-	-	-	0	0	-	-	0	46/80
Chrysothamnus nauseosus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	22/37
Chrysothamnus viscidiflorus stenophyllus												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**133**	-	-	133	-	-	0	50	-	-	0	8/7
98	**40**	-	-	40	-	-	0	0	-	-	0	13/19
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	21/50
Echinocereus engelmanii												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	5/7
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		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)
Ephedra nevadensis												
85	**0**	-	-	-	-	-	0	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	0	-	0	-/-
03	**20**	-	-	20	-	-	0	0	0	-	0	13/16
08	**20**	-	-	-	20	-	0	0	100	-	0	17/33
Gutierrezia sarothrae												
85	**133**	-	-	-	133	-	0	0	100	-	0	-/-
91	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	0	-	0	13/23
08	**0**	-	-	-	-	-	0	0	0	-	0	6/6
Juniperus osteosperma												
85	**66**	-	66	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	100	-/-
98	**20**	-	20	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Kochia prostrata												
85	**0**	-	-	-	-	-	0	0	-	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	20	-	-	-	-	0	0	-	-	0	10/21
Opuntia sp.												
85	**66**	-	66	-	-	-	0	0	-	-	0	-/-
91	**66**	-	66	-	-	-	0	0	-	-	0	-/-
98	**40**	-	-	40	-	-	0	0	-	-	0	6/11
03	**0**	-	-	-	-	-	0	0	-	-	0	8/19
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-