

Trend Study 27R-5-08

Study site name: Nephi Pasture Livestock Enclosure.

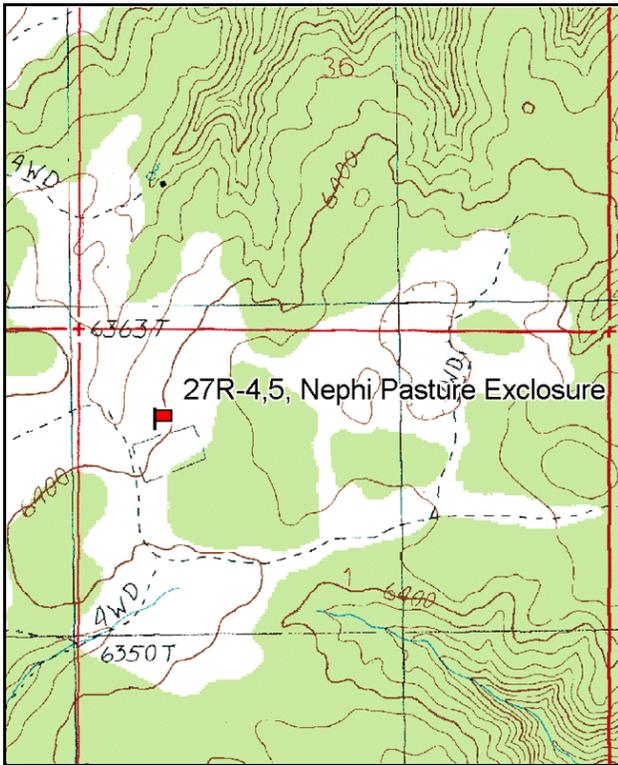
Vegetation type: P-J/ Big Sagebrush .

Compass bearing: frequency baseline 147 degrees magnetic.

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

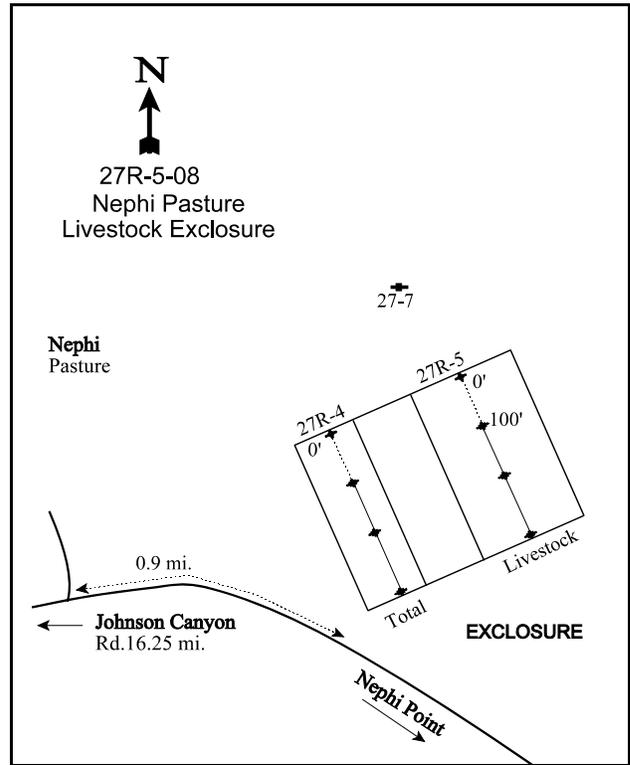
LOCATION DESCRIPTION

From Kanab, take US 89 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right and go 16.25 miles (see 27-6-03 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an enclosure. Walk east along the fence on the north side of the enclosure to the beginning of the livestock enclosure (lower fence). From here, walk down to the midpoint of the fenceposts. The baseline starts on the inside of the livestock enclosure at the midpoint, and runs at an azimuth of 147 degrees magnetic.



Map Name: Nephi Point

Township 42S, Range 4W, Section 1



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 394255 E, 4116822 N

DISCUSSION

Nephi Pasture Livestock Exclosure - Trend Study No. 27R-5

Study Information

The Nephi Pasture exclosure complex was built in the 1960's and is found approximately 20 miles northeast of Kanab [elevation: 6,400 feet (1,950 m), slope: 5%-10%, aspect: northwest]. This transect was established inside the livestock exclosure in 1998 as part of a three-way comparison between the different exclosure grazing treatments. This transect is within 300 feet of the original Nephi Pasture study that samples outside the exclosure complex (27-7). The livestock exclosure is approximately 200 feet by 300 ft in size (about 1.4 acres). Deer utilize this exclosure heavily and use was estimated to be very heavy in 1998, 2003, and 2008 (111 ddu/acre:274 ddu/ha, 169 ddu/acre:418 ddu/ha, and 76 ddu/acre:187 ddu/ha, respectively).

Soil

Soils inside the livestock exclosure are deep, sandy in texture, and moderately acidic (pH of 5.8). Phosphorus and potassium may be limiting to plant development and growth at 6.9 ppm and 12.8 ppm, respectively (Tiedemann and Lopez 2004). Rock and pavement are rare on the surface and within the profile. Relative vegetation and litter cover was high at 82% in 1998, decreasing to 71% and 75% in 2003 and 2008. Relative bare ground cover was moderate at 17% in 1998, increasing to 28% and 24% in 2003 and 2008, respectively. The decrease in vegetation and litter cover and increase in bare ground cover is likely mostly due to drought conditions. The soil erosion condition was classified as slight in 2003, primarily due to pedestaling of plants, and was classified as stable in 2008.

Browse

The livestock exclosure supports more shrub cover than either the total exclosure or outside the exclosure complex. The key species are basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Utah serviceberry (*Amelanchier utahensis*), and antelope bitterbrush (*Purshia tridentata*). Sagebrush is the most abundant of the three species, but has the lowest preference for deer. Density of sagebrush was estimated at 3,340 plants/acre in 1998, decreasing to 2,420 plants/acre in 2003 and to 1,820 plants/acre in 2008. In 1998, recruitment in sagebrush was high with an abundant young age class making up 22% of the population. Sagebrush recruitment declined to 2% in 2003 and to 1% in 2008. Sagebrush decadence was normal in 1998 at 34%, but nearly doubled inside the livestock exclosure in 2003 and 2008 to around 65%. Utilization on sagebrush was light to moderate with 13% of the plants displaying heavy use in 1998. Use was much lighter on sagebrush inside the livestock exclosure in 2003 and 2008. The proportion of the sagebrush population displaying poor vigor in 1998 was estimated at 18%, increasing to 51% in 2003, and decreasing to 24% in 2008.

Serviceberry numbered 740 plants/acre in 1998, declining to 540 plants/acre in 2003, and increasing to 1,000 plants/acre in 2008. This population showed good recruitment in 1998, 2003, and 2008 at 27%, 22%, and 26%, respectively. Serviceberry decadence was low in 1998 and 2003 at 11% and 7%, respectively, but increased slightly to 22% in 2008. Serviceberry vigor has remained normal in all three sample years. These serviceberry plants are large averaging over five feet in height in 2003 and 2008. Because of their size, a lot of the mature plants are partly unavailable to browsing which explains the relatively light use overall on serviceberry.

Bitterbrush density has increased from 800 plants/acre in 1998 to 980 plants/acre in 2008. These plants showed light to moderate use in 1998 and 2008, and mostly heavy use in 2003. Bitterbrush vigor was mostly normal in 1998 and 2003, but plants displaying poor vigor increased to 31% in 2008. Bitterbrush decadence was low in 1998 and 2003, but increased to 49% in 2008.

The only other common shrub in the livestock exclosure in 1998 was broom snakeweed (*Gutierrezia sarothrae*) which had an estimated density of 1,780 mostly mature plants/acre. Snakeweed density decreased

to only 120 plants/acre in 2003 and 20 plants/acre in 2008. Point-centered quarter data estimated 20 pinyon pine (*Pinus edulis*) and 27 juniper (*Juniperus osteosperma*) trees/acre in 1998. Average basal diameter was 7.4 inches for pinyon and 6.8 inches for juniper. Most of these trees were in the 12 to 20 foot tall range.

Herbaceous Understory

The herbaceous understory inside the livestock enclosure provided 18% cover to the site in 1998. Several perennial grasses were sampled including western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*Agropyron spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), mutton bluegrass (*Poa fendleriana*), bottlebrush squirreltail (*Sitanion hystrix*), and needle-and-thread (*Stipa comata*). Cheatgrass (*Bromus tectorum*) was the single most abundant species on the site in 1998 being sampled in just over half of the quadrats and providing 35% of the total grass cover. Sixweeks fescue (*Vulpia octoflora*) was also abundant in 1998. With drought prior to and including the 2003 sampling year, all six of the perennial species listed above significantly decreased in nested frequency, and cheatgrass and sixweeks fescue were not sampled. In 2008, grasses were almost nonexistent on the site, and cheatgrass and sixweeks fescue were the dominant grass species. Total grass cover was under 0.05%, and there was only one perennial grass, Sandberg bluegrass (*Poa secunda*), sampled. Bastard toadflax (*Comandra pallida*) was the most abundant forb from 1998 to 2008, and represented over 50% of the forb cover in all three surveys. Toadflax had a significant decline in frequency from 1998 to 2003, and a significant increase from 2003 to 2008. Combined sum of nested frequency for perennial herbaceous species declined markedly from 1998 to 2003, but changed little in 2008.

1998 DESIRABLE COMPONENTS INDEX

winter range condition (DCI) - good (67) Mid-Level potential scale

2003 TREND ASSESSMENT

Bitterbrush remained stable in density, and maintains good vigor and low decadence. The proportion of young bitterbrush declined from 28% to 7%. Serviceberry density declined from 740 plants/acre to 540 plants/acre in 2003, but young recruitment remains good at 22%, and vigor is normal on most plants. Changes in the sagebrush population are much worse than either serviceberry or bitterbrush. Sagebrush density declined by 28% in 2003, decadence increased to 66%. The number of dead in the population nearly doubled in 2003, and young recruitment declined from 22% to 2%. Half of the sagebrush sampled in 2003 also displayed poor vigor. Individually, bitterbrush and serviceberry have stable trends while basin big sagebrush is down. Collectively, browse trend is down. Trend for both the grasses and forbs is down. Perennial herbaceous sum of nested frequency declined six-fold. The six most abundant perennial grasses sampled in 1998 all significantly declined in 2003 with drought. The one positive change for the understory that often accompanies drought was that cheatgrass was not sampled in 2003.

winter range condition (DCI) - poor (44) Mid-level potential scale

browse - down (-2)

grass - down (-2)

forb - down (-2)

2008 TREND ASSESSMENT

Trend for browse is slightly down. The primary browse species, basin big sagebrush, density decreased by 25% to 1,820 plants/acre. Sagebrush displaying poor vigor decreased from 51% in 2003 to 24%. Decadence in the sagebrush population stayed constant, but high at 65%. Recruitment in sagebrush was low with young plants comprising only 1% of the population. Bitterbrush density increased slightly to 980 plants/acre. Bitterbrush plants displaying poor vigor increased from 5% in 2003 to 31%, and decadence increased from 17% to 49%. There was no new recruitment of young bitterbrush plants and no seedlings were encountered. Serviceberry density had a 46% increase from 2003 to 1,000 plants/acre. Serviceberry vigor remained normal, but decadence increased from 7% in 2003 to 22%. Recruitment of new serviceberry was good with 26% of the population comprised of young plants. Trend for grasses is down. The sum of nested frequency and cover of perennial grasses fell to nearly nothing. Cheatgrass and sixweeks fescue are the only species with any notable frequency, but the combined cover of these species is still less than 0.05%. The trend for forbs is slightly up,

but still lacking. There was an increase in the sum of nested frequency and cover of perennial forbs, primarily due to a significant increase in the frequency of bastard toadflax. The lack in the herbaceous understory is likely primarily due to persistent drought conditions.

winter range condition (DCI) - very poor-poor (36) Mid-level potential scale
browse - slightly down (-1) grass - down (-2) forb - slightly up (+1)

HERBACEOUS TRENDS --
 Management unit 27R, Study no: 5

T y p e	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
G	Agropyron smithii	_b 99	_a 9	_a -	2.82	.04	-
G	Agropyron spicatum	_b 20	_a -	_a -	.60	-	-
G	Bromus tectorum (a)	_b 177	_a -	_a 10	4.69	-	.02
G	Oryzopsis hymenoides	_b 28	_a 2	_a -	.59	.15	-
G	Poa fendleriana	_b 41	_a 8	_a -	2.07	.48	-
G	Poa secunda	-	-	1	-	-	.00
G	Sitanion hystrix	_b 23	_a 1	_a -	.69	.00	-
G	Sporobolus cryptandrus	1	-	-	.00	.00	-
G	Stipa comata	_b 14	_a -	_a -	.07	.03	-
G	Vulpia octoflora (a)	_b 124	_a -	_a 12	1.99	-	.02
Total for Annual Grasses		301	0	22	6.68	0	0.04
Total for Perennial Grasses		226	20	1	6.87	0.71	0.00
Total for Grasses		527	20	23	13.55	0.71	0.04
F	Arabis sp.	5	-	-	.01	-	-
F	Astragalus sp.	7	-	-	.01	-	-
F	Calochortus nuttallii	-	5	-	-	.01	-
F	Comandra pallida	_c 143	_a 47	_b 78	3.15	.68	1.53
F	Descurainia pinnata (a)	_c 11	_a -	_c 15	.10	-	.07
F	Draba sp. (a)	7	-	-	.01	-	-
F	Eriogonum cernuum (a)	_a -	_a -	_b 14	-	-	.03
F	Erigeron sp.	3	-	-	.00	-	-
F	Eriogonum racemosum	5	-	-	.01	-	-
F	Gilia sp. (a)	_a -	_b 17	_a -	-	.67	-
F	Lappula occidentalis (a)	5	-	5	.04	-	.01
F	Lupinus argenteus	8	-	-	.57	-	-
F	Microsteris gracilis (a)	11	-	-	.02	-	-
F	Penstemon sp.	_b 14	_a -	_{ab} 4	.05	-	.06
F	Plantago patagonica (a)	_b 45	_a -	_a 12	.64	-	.02
F	Polygonum douglasii (a)	1	-	2	.00	-	.01

Type	Species	Nested Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
F	<i>Sphaeralcea coccinea</i>	-	-	3	-	-	.00
Total for Annual Forbs		80	17	48	0.82	0.67	0.14
Total for Perennial Forbs		185	52	85	3.81	0.69	1.59
Total for Forbs		265	69	133	4.64	1.37	1.74

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

BROWSE TRENDS --

Management unit 27R, Study no: 5

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Amelanchier utahensis</i>	23	17	28	6.46	8.65	6.52
B	<i>Artemisia tridentata tridentata</i>	81	67	54	10.81	7.75	9.94
B	<i>Gutierrezia sarothrae</i>	36	5	1	2.20	.06	.00
B	<i>Juniperus osteosperma</i>	3	3	3	1.72	1.21	1.20
B	<i>Opuntia sp.</i>	1	0	0	.03	-	-
B	<i>Pinus edulis</i>	0	0	0	.15	.15	-
B	<i>Purshia tridentata</i>	26	27	32	5.34	5.19	3.89
B	<i>Ribes sp.</i>	1	0	0	.00	-	-
Total for Browse		171	119	118	26.72	23.02	21.57

CANOPY COVER, LINE INTERCEPT --

Management unit 27R, Study no: 5

Species	'03	'08
<i>Amelanchier utahensis</i>	10.30	10.89
<i>Artemisia tridentata tridentata</i>	7.88	14.16
<i>Gutierrezia sarothrae</i>	.11	-
<i>Juniperus osteosperma</i>	2.86	4.84
<i>Purshia tridentata</i>	4.76	6.75

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 27R, Study no: 5

Species	Average leader growth (in)	
	'03	'08
Amelanchier utahensis	2.6	2.0
Artemisia tridentata tridentata	2.3	1.2
Purshia tridentata	5.2	3.7

POINT-QUARTER TREE DATA --

Management unit 27R, Study no: 5

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

Average diameter (in)		
'98	'03	'08
6.8	-	-
7.5	-	-

BASIC COVER --

Management unit 27R, Study no: 5

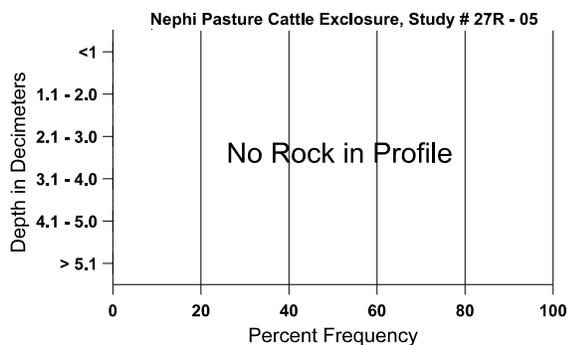
Cover Type	Average Cover %		
	'98	'03	'08
Vegetation	47.41	25.80	24.88
Rock	0	.00	0
Pavement	0	0	.03
Litter	66.72	58.25	60.66
Cryptogams	1.73	1.35	.24
Bare Ground	23.45	32.59	27.82

SOIL ANALYSIS DATA --

Management unit 27R, Study no: 5, Study Name: Nephi Pasture Livestock Exclosure

Effective rooting depth (in)	Temp °F (depth)	pH	sand			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
20.5	70.5 (17.7)	5.8	90.2	2.0	7.8	0.8	6.9	12.8	0.2

Stoniness Index



PELLET GROUP DATA --
 Management unit 27R, Study no: 5

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	28	23	73
Elk	1	-	-
Deer	39	34	34

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
111 (274)	169 (418)	76 (187)

BROWSE CHARACTERISTICS --
 Management unit 27R, Study no: 5

		Age class distribution (plants per acre)					Utilization					
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<i>Amelanchier utahensis</i>												
98	740	100	200	460	80	120	30	3	11	5	8	49/56
03	540	40	120	380	40	80	7	22	7	4	4	61/64
08	1000	-	260	520	220	60	20	12	22	4	4	61/56
<i>Artemisia tridentata tridentata</i>												
98	3340	180	740	1460	1140	1480	27	13	34	17	18	29/30
03	2420	-	60	760	1600	2560	12	4	66	51	51	32/34
08	1820	80	20	620	1180	2320	15	5	65	20	24	43/43
<i>Gutierrezia sarothrae</i>												
98	1780	40	40	1740	-	-	0	0	0	-	0	11/12
03	120	-	-	100	20	-	0	0	17	17	17	11/11
08	20	-	20	-	-	-	0	0	0	-	0	7/5
<i>Juniperus osteosperma</i>												
98	60	-	60	-	-	-	0	0	0	-	0	-/-
03	60	-	40	-	20	-	0	0	33	-	0	-/-
08	60	-	-	60	-	-	0	0	0	-	0	-/-
<i>Opuntia sp.</i>												
98	20	-	-	20	-	-	0	0	-	-	0	6/4
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Purshia tridentata</i>												
98	800	20	220	500	80	20	38	0	10	8	8	33/48
03	840	-	60	640	140	20	29	69	17	5	5	30/46
08	980	-	-	500	480	180	31	14	49	31	31	26/35

		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)
Ribes sp.												
98	40	-	-	40	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	65/45