Trend Study 16A-10-07

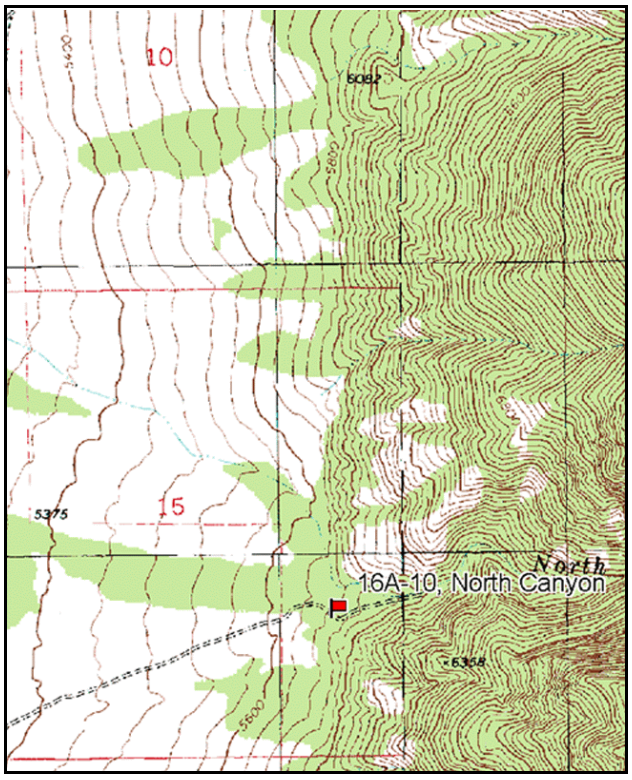
Study site name: North Canyon . Vegetation type: Big Sagebrush-Grass .

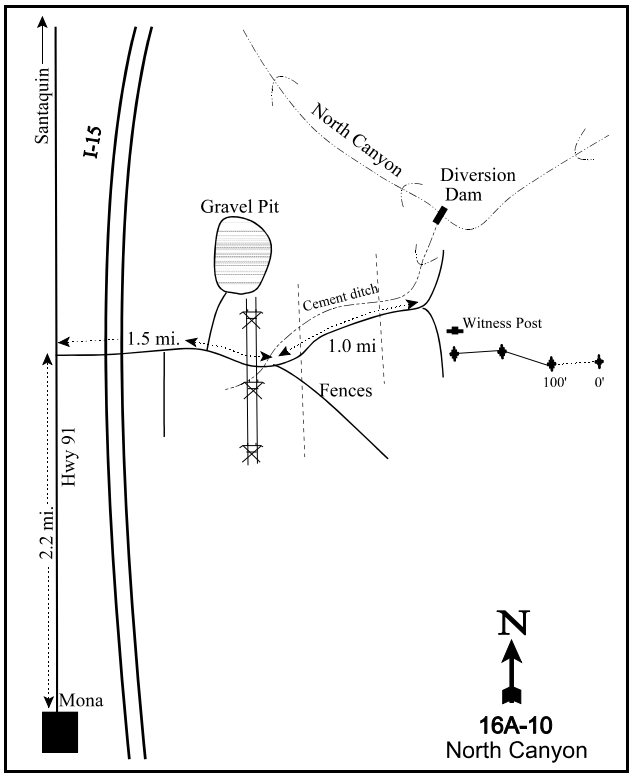
Compass bearing: frequency baseline 267 degrees magnetic (line 2 @ 277°M).

Frequency belt placement: line 1 (11 & 71ft), line 2 [belt 3] (41ft), line 3 (34 ft centered on 40, & 95ft).
Rebar: belt 4 on 2 ft, belt 2 on 1 ft.

LOCATION DESCRIPTION

Beginning at the intersection of 200 North and Main Street in Mona, go north on Main Street for 2.2 miles to an improved gravel road on the east side. Take this road east for 1.5 miles (passing beneath the freeway) to where the road forks after crossing an irrigation ditch. Stay left at this fork and continue another mile to where the road faintly forks again. From here, walk down the right fork for 22 paces. At this point, the witness post is on the left, next to the 300-foot stake. A red browse tag, number 3957, is attached to the 0-foot baseline stake.





Map Name: Mona

Diagrammatic Sketch

Township 11S , Range 1E , Section 15

GPS: NAD 83, UTM 12S 431120 E 4411976 N

DISCUSSION

North Canyon - Trend Study No. 16A-10

Study Information

This study is located on UDWR land near the mouth of North Canyon on an alluvial fan dissected by gullies [elevation: 5,700 feet (1,737 m), slope: 15%, aspect: west]. It supports a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community, with lower densities of Gambel oak (*Quercus gambelii*). There is a creek approximately 650 feet (200 m) north of the study. The area serves as winter range, mainly for deer. Quadrat frequency for deer pellets was low at 6% in 1997. Elk pellet quadrat frequency was 1% in 2002. Pellet group transect data estimated use at 21 deer days use/acre (53 ddu/ha) in 2002 and 54 deer days use/acre (132 ddu/ha) in 2007. A few cattle were observed during the 2007 reading, and use was estimated at 1 day use/acre (2 cdu/ha).

Soil

The soil is classified within the Lizzant series (USDA-NRCS 2007). The soils in this series are deep and well-drained, and formed in alluvium and colluvium derived from sedimentary rocks. The parent material was identified as limestone and quartzite. The soil texture is a sandy loam with a neutral pH (7.1). Soil phosphorus is marginal at 8.2 ppm, and potassium is low at 51.2 ppm (Tiedemann and Lopez 2004). The soil surface is covered with rocks ranging in size from cobble to boulders. The majority of the soil is covered by vegetation and litter. The soil erosion condition was classified as stable in 2002 and 2007.

Browse

The preferred browse species is mountain big sagebrush, which has comprised 66%-80% of the total browse cover since 1997. It provided 20% cover in 1997, 18% in 2002, and 14% in 2007. Sagebrush density has decreased steadily since the study began. When the baseline was lengthened in 1997, the density was estimated at 3,880 plants/acre (9,584 plants/ha), which steadily declined to 2,900 plants/acre (7,163 plants/ha) by 2007. The population has been largely mature, however, decadence was high in 2002 and 2007 at 42% and 39%, respectively. Recruitment has declined from 21% of the population consisting of young plants in 1983 to only 2% in 2007. Very few seedlings have been sampled since 1983. The percent of the population displaying poor vigor increased from 5% to 24% between 1997 and 2007. Sagebrush use has been mostly moderate-heavy, but was mostly light in 2002. Annual leader growth averaged 2.1 inches (5.2 cm) in 2002 and 2.2 inches (5.6 cm) in 2007. Other shrubs that have shown wildlife use include small densities of Gambel oak, curlleaf mountain mahogany (*Cercocarpus ledifolius*), and white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*).

Herbaceous Understory

The understory is diverse, but provides little forage. Ten grass species were sampled in 1997, 14 in 2002, and 15 in 2007. Although the grass cover was dominated by annual species in 1997, perennials comprised 77% of the total grass cover in 2007. Perennial grass cover increased from 4% in 1997 to 14% in 2002 and 21% in 2007, while annual grass cover has remained stable at 6%. Approximately half of the grass species sampled since 1983 have been natives, and half have been introduced. Bulbous bluegrass (*Poa bulbosa*), Sandberg bluegrass (*Poa secunda*), and intermediate wheatgrass (*Agropyron intermedium*) provided the majority of the perennial grass cover in 2007, while cheatgrass (*Bromus tectorum*) was the most abundant annual. Jointed goatgrass (*Aegilops cylindrica*), a noxious weed, was sampled in one quadrat in 2007.

Forb cover has increased from 4% in 1997 to 8% in 2007, but shifted from mostly perennial cover to mostly annual cover. Common houndstongue (*Cynoglossum officinale*), a noxious weed, was sampled in one quadrat in both 1989 and 1997. Redroot eriogonum (*Eriogonum racemosum*) provided 55% of the total forb cover in 1997, but declined to 8% by 2007. The majority of the forb cover was composed of blue-eyed Mary (*Collinsia parviflora*) and bedstraw (*Galium aparine*) in 2007.

1989 TREND ASSESSMENT
The trend for browse is down. Sagebrush density decreased from 6,333 plants/acre (15,643 plants/ha) to 4,865 plants/acre (12,017 plants/ha). Decadence increased slightly to 26% of the population. Recruitment decreased, but remained relatively high with 14% of the population consisting of young plants. Plants showing poor vigor decreased from 20% to 7% of the population, and use increased to mostly moderate-heavy. The trend for grass is up. The sum of nested frequency for perennial grasses increased 30%, however, species diversity was low. The trend for forbs is stable. The sum of nested frequency for perennial forbs did not change substantially. Common houndstongue was sampled, but only in one quadrat.

browse - down (-2) grass - up (+2) forb - stable (0)

1997 TREND ASSESSMENT
The trend for browse is stable. Density of sagebrush decreased 20%, however, the decrease was partly attributed to the change in sampling area. The population remained mostly mature, and decadence decreased to 11% of the population. Recruitment was good, with 10% of the population consisting of young plants. Only 5% of the population displayed poor vigor, and use remained moderate-heavy. The trend for grass is up. The sum of nested frequency for perennial grass increased 32% and Sandberg bluegrass increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency of perennial forbs increased substantially. However, the total forb cover was low at less than 4%. Common houndstongue was sampled again, but did not increase in quadrat frequency. The Desirable Components Index (DCI) was rated as fair due to favorable browse cover with low decadence, but minimal perennial herbaceous cover, and the presence of a noxious weed.

winter range condition (DCI) - fair (52) Mid-level potential scale
browse - stable (0) grass - up (+2) forb - up (+2)

2002 TREND ASSESSMENT
The trend for browse is down. Sagebrush density decreased from 3,880 plants/acre (9,584 plants/ha) to 3,460 plants/acre (8,546 plants/ha). Decadence greatly increased to 42%. Twenty percent of the population was classified as dying. Recruitment decreased from 10% of the population to 3%, and no seedlings were sampled. Plants displaying poor vigor increased from 5% to 21% of the population, and use decreased to mostly light. The trend for grass is stable. The sum of nested frequency for perennial grasses changed little. Total perennial grass cover increased from 4% to 14%, although part of this increase was attributed to an increase in bulbous bluegrass, an undesirable species. Bulbous bluegrass increased significantly in nested frequency, while cheatgrass cover did not increase. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased 21%. Although total forb cover did not change, the composition shifted from mostly perennial cover to mostly annual cover. Blue-eyed Mary and pale alyssum (*Alyssum alyssoides*), both annuals, increased significantly in nested frequency. However, common houndstongue was not sampled. The DCI rating remained fair.

winter range condition (DCI) - fair (55) Mid-level potential scale
browse - down (-2) grass - stable (0) forb - slightly down (-1)

2007 TREND ASSESSMENT
The trend for browse is slightly down. Sagebrush density decreased 16%, and average cover also decreased from 18% to 14%. Decadence remained high at 39% of the population, and reproduction and recruitment remained very low. Twenty-four percent of the population displayed poor vigor, and 22% was classified as dying. Use increased to mostly moderate-heavy. The trend for grass is slightly up. The sum of nested frequency for perennial and annual grasses increased by 20% and 28%, respectively. Perennial grass cover increased from 14% to 21%, however, the majority of this increase was due to the spread of bulbous bluegrass. Jointed goatgrass was sampled, but only in one quadrat. The trend for forbs is slightly up. The sum of nested

frequency for perennial forbs increased 13%, while that for annual forbs changed little. Average cover for annual species increased from 2% to 6%, mainly due to large increases in blue-eyed Mary and bedstraw cover. Pale alyssum and bur buttercup, an allelopathic annual (Buchanan et al. 1978), decreased significantly in nested frequency. The DCI rating remained fair.

winter range condition (DCI) - fair (59) Mid-level potential scale
browse - slightly down (-1) grass - slightly up (+1) forb - slightly up (+1)

HERBACEOUS TRENDS --
Management unit 16A, Study no: 10

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Aegilops cylindrica (a)	-	-	-	-	1	-	-	.00
G	Agropyron cristatum	a8	a22	a7	a6	a11	.04	.57	.34
G	Agropyron intermedium	ab40	ab48	a24	a25	b51	.61	2.76	4.15
G	Agropyron spicatum	-	-	-	-	1	-	-	.00
G	Aristida purpurea	a8	ab7	ab18	ab20	b23	.80	.76	.82
G	Bromus carinatus	a1	-	-	a6	-	-	.68	-
G	Bromus japonicus (a)	-	-	-	a3	a10	-	.03	.02
G	Bromus tectorum (a)	-	-	a274	a284	a274	5.69	5.55	5.60
G	Festuca myuros (a)	-	-	a29	a4	b75	.30	.01	.31
G	Festuca ovina	-	-	a6	ab18	b20	.53	1.01	1.19
G	Poa bulbosa	-	-	a15	b60	c161	.24	2.91	7.85
G	Poa pratensis	-	-	-	a2	b11	-	.03	.10
G	Poa secunda	a75	ab114	c166	bc165	c174	1.37	4.28	4.67
G	Sitanion hystrix	-	-	a7	a2	a3	.01	.06	.09
G	Sporobolus cryptandrus	a15	-	a24	a23	a27	.41	.46	1.40
G	Vulpia octoflora (a)	-	-	-	a7	a21	-	.04	.06
Total for Annual Grasses		0	0	303	298	381	5.99	5.63	6.00
Total for Perennial Grasses		147	191	267	327	482	4.03	13.56	20.65
Total for Grasses		147	191	570	625	863	10.02	19.20	26.66
F	Alyssum alyssoides (a)	-	-	a86	c178	b130	.27	.43	.64
F	Allium sp.	-	-	8	-	-	.01	-	-
F	Antennaria rosea	-	-	-	a4	a3	-	.03	.00
F	Aster chilensis	-	-	-	-	3	-	-	.00
F	Astragalus eurekensis	-	-	-	a14	a8	-	.15	.02
F	Astragalus utahensis	-	-	b27	a8	ab15	.33	.09	.30
F	Castilleja linariaefolia	-	-	-	2	-	-	.03	-
F	Calochortus nuttallii	-	-	a18	a25	a13	.04	.08	.05
F	Cirsium vulgare	ab3	-	b7	a-	ab2	.02	.00	.04

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	Collinsia parviflora (a)	-	-	$_{a}$19	$_{b}$78	$_{c}$126	.06	.27	2.87
F	Cruciferae	-	2	-	-	-	-	-	-
F	Cryptantha sp.	-	-	$_{a}$4	-	$_{a}$1	.03	-	.00
F	Cynoglossum officinale	-	$_{a}$2	$_{a}$3	-	-	.00	-	-
F	Draba sp. (a)	-	-	-	$_{a}$14	$_{b}$81	-	.04	.19
F	Epilobium brachycarpum (a)	-	-	$_{a}$10	$_{a}$6	$_{a}$1	.02	.02	.00
F	Erigeron pumilus	$_{a}$5	$_{a}$2	$_{a}$8	$_{a}$1	-	.09	.00	-
F	Eriogonum racemosum	$_{a}$43	$_{a}$52	$_{a}$73	$_{a}$47	$_{a}$58	2.09	.80	.66
F	Galium aparine (a)	-	-	$_{a}$100	$_{a}$79	$_{a}$97	.42	.62	2.36
F	Helianthus annuus (a)	$_{a}$4	$_{a}$15	-	$_{a}$8	-	-	.01	-
F	Holosteum umbellatum (a)	-	-	$_{a}$29	$_{b}$82	$_{ab}$48	.05	.19	.13
F	Lactuca serriola	-	-	-	-	6	-	-	.01
F	Leucelene ericoides	-	-	$_{a}$6	$_{ab}$14	$_{b}$19	.03	.36	.40
F	Lithospermum incisum	-	-	$_{a}$4	$_{a}$6	$_{a}$3	.03	.04	.04
F	Machaeranthera canescens	$_{a}$6	$_{a}$3	$_{a}$8	-	$_{a}$3	.04	-	.15
F	Medicago sativa	$_{a}$1	$_{a}$3	$_{a}$2	-	-	.03	-	-
F	Microsteris gracilis (a)	-	-	-	$_{a}$13	$_{a}$7	-	.03	.01
F	Oenothera pallida	-	-	-	$_{a}$3	$_{a}$3	-	.03	.06
F	Phlox longifolia	-	-	$_{a}$3	$_{ab}$9	$_{b}$8	.00	.02	.05
F	Ranunculus testiculatus (a)	-	-	$_{ab}$74	$_{b}$93	$_{a}$40	.18	.55	.12
F	Tragopogon dubius	-	-	-	1	-	-	.00	-
F	Unknown forb-annual (a)	-	-	2	-	-	.01	-	-
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
F	Verbascum thapsus	-	-	-	-	3	-	-	.15
F	Wyethia amplexicaulis	-	-	-	-	2	-	-	.15
F	Zigadenus paniculatus	-	-	$_{a}$4	$_{a}$2	$_{a}$3	.01	.03	.03
Total for Annual Forbs		4	15	320	551	530	1.02	2.18	6.34
Total for Perennial Forbs		61	64	175	136	153	2.80	1.69	2.13
Total for Forbs		65	79	495	687	683	3.82	3.88	8.47

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

BROWSE TRENDS --
Management unit 16A, Study no: 10

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Artemisia tridentata vaseyana	88	74	71	19.99	18.17	13.61
B	Cercocarpus ledifolius	1	1	2	.00	-	-
B	Chrysothamnus nauseosus albicaulis	2	6	5	1.39	3.15	.96
B	Chrysothamnus viscidiflorus viscidiflorus	1	0	0	.38	-	-
B	Gutierrezia sarothrae	24	31	33	2.14	.36	.94
B	Opuntia sp.	3	0	0	.00	-	-
B	Pediocactus simpsonii	0	1	2	-	.00	.15
B	Quercus gambelii	7	9	11	1.06	2.40	4.21
B	Rhus trilobata	0	0	1	-	.38	.66
Total for Browse		126	122	125	24.98	24.47	20.53

CANOPY COVER, LINE INTERCEPT --
Management unit 16A, Study no: 10

Species	Percent Cover	
	'02	'07
Artemisia tridentata vaseyana	-	18.11
Cercocarpus ledifolius	-	.11
Chrysothamnus nauseosus albicaulis	-	2.34
Gutierrezia sarothrae	-	.60
Quercus gambelii	-	4.71
Rhus trilobata	-	.45

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16A, Study no: 10

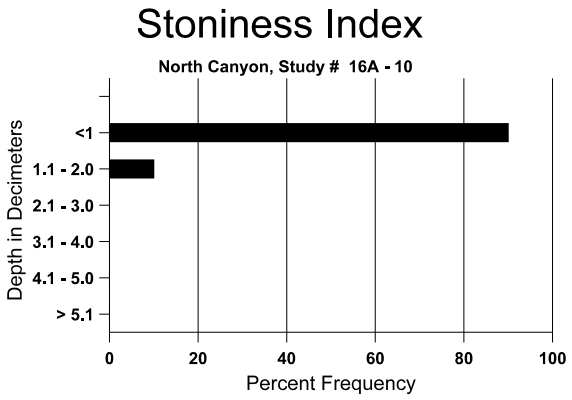
Species	Average leader growth (in)	
	'02	'07
Artemisia tridentata vaseyana	2.1	2.2

BASIC COVER --
Management unit 16A, Study no: 10

Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	1.00	3.75	34.09	48.70	50.06
Rock	20.50	25.25	18.35	20.88	16.87
Pavement	7.00	10.00	15.76	16.25	14.11
Litter	66.75	56.75	43.20	43.88	39.07
Cryptogams	0	0	1.19	1.19	.53
Bare Ground	4.75	4.25	4.25	.91	2.50

SOIL ANALYSIS DATA --
Herd Unit 16A, Study no: 10, North Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy loam			%0M	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
10.3	55.5 (14.3)	7.1	56.4	28.1	15.6	3.2	8.2	51.2	.8



PELLET GROUP DATA --
Management unit 16A, Study no: 10

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	-	4	3
Elk	-	1	-
Deer	6	16	26
Cattle	-	-	-

Days use per acre (ha)	
'02	'07
-	-
-	-
21 (53)	54 (132)
-	1 (2)

BROWSE CHARACTERISTICS --
Management unit 16A, Study no: 10

		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 vaseyana												
83	**6333**	-	1333	3800	1200	-	17	24	19	-	20	21/24
89	**4865**	-	666	2933	1266	-	49	40	26	3	7	19/28
97	**3880**	40	380	3060	440	880	49	17	11	5	5	24/40
02	**3460**	-	100	1900	1460	1660	14	.57	42	20	21	23/33
07	**2900**	20	60	1720	1120	1240	46	14	39	22	24	26/34
Cercocarpus ledifolius												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**20**	-	20	-	-	-	0	0	0	-	0	-/-
02	**20**	-	-	-	20	-	0	100	100	-	0	3/4
07	**40**	-	20	20	-	-	0	100	0	-	0	9/10
Chrysothamnus nauseosus albicaulis												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**40**	-	-	40	-	-	50	0	0	-	0	32/33
02	**220**	-	-	20	200	20	9	0	91	-	0	37/31
07	**100**	-	-	60	40	40	0	0	40	20	20	28/33
Chrysothamnus viscidiflorus viscidiflorus												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**20**	-	-	20	-	-	0	0	-	-	0	34/38
02	**0**	-	-	-	-	-	0	0	-	-	0	-/-
07	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
83	**1066**	-	400	666	-	-	0	0	0	-	0	9/8
89	**1733**	-	733	400	600	-	0	0	35	1	4	8/5
97	**2020**	80	560	1420	40	-	0	0	2	-	0	7/8
02	**1700**	-	80	1500	120	40	0	0	7	7	7	6/6
07	**2660**	100	1600	960	100	-	0	0	4	2	2	11/17

		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)
Opuntia sp.												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**80**	-	-	80	-	-	0	0	-	-	0	5/7
02	**0**	-	-	-	-	-	0	0	-	-	0	-/-
07	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Pediocactus simpsonii												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**40**	-	-	40	-	-	0	0	-	-	0	7/7
07	**60**	-	40	20	-	20	0	0	-	-	0	6/6
Prunus virginiana												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**0**	-	-	-	-	-	0	0	-	-	0	72/142
07	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Quercus gambelii												
83	**199**	66	133	66	-	-	0	0	-	-	0	20/31
89	**200**	-	200	-	-	-	100	0	-	-	0	-/-
97	**140**	-	60	80	-	-	57	0	-	-	0	65/48
02	**420**	-	160	260	-	-	0	0	-	-	38	48/35
07	**620**	-	240	380	-	-	0	0	-	-	0	71/51
Rhus trilobata												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**0**	-	-	-	-	-	0	0	-	-	0	62/113
07	**20**	-	20	-	-	-	0	0	-	-	0	78/143