

Trend Study 16A-19-07

Study site name: Flat Canyon .

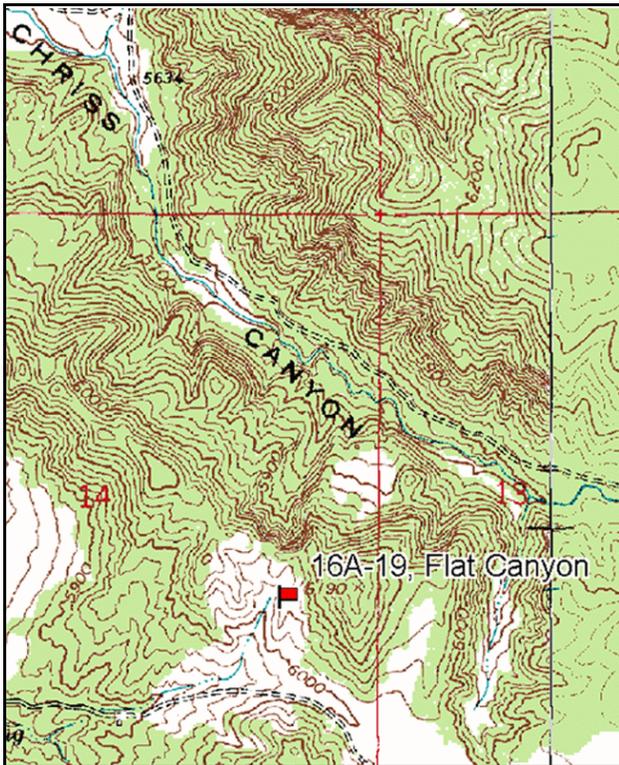
Vegetation type: Bitterbrush - Sagebrush .

Compass bearing: frequency baseline 204 degrees magnetic (line 2-4 @ 171°M).

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

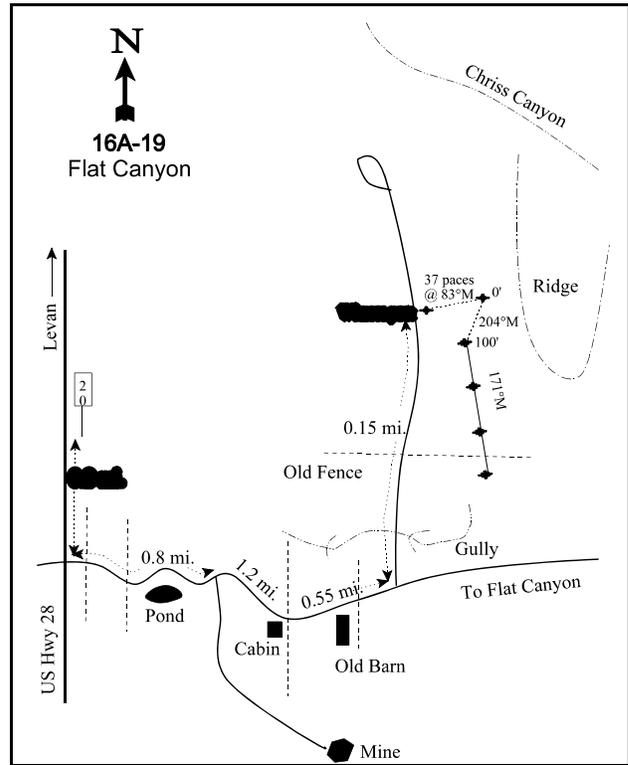
LOCATION DESCRIPTION

From Levan, go south on Highway 28 to 0.2 miles south of mile marker #20. Turn left here (east) and go 0.8 miles to a fork, keep left. Continue 1.2 miles to an old fence by an old cabin where the road makes a 90° turn to the east. Continue up the main road for 0.55 miles to a faint road which turns off to the left down into the sagebrush. Follow this road for 0.15 miles to a witness post on the right side of the road. From here walk up the hill about 37 paces bearing 83degrees magnetic to the 0 foot baseline stake which is marked with browse tag #9084.



Map Name: Skinner Peaks

Township 16S, Range 1W, Section 14



Diagrammatic Sketch

GPS: NAD 83, UTM 12S 423840 E 4363157 N

DISCUSSION

Flat Canyon - Trend Study No. 16A-19

Study Information

This study was established in 1989 on the critical winter range in the hills around Flat and Chriss Canyons, north of Gunnison. Most of the surrounding land is privately-owned. It is located on a small ridge. The original baseline sampled the steeper side of the ridge, while the extended baseline samples the ridge top [elevation: 6,050 feet (1,844 m), slope: 3-5% on ridge top, 30% on ridge side, aspect: southwest]. The vegetation is typical of the higher elevation range in the area and is composed of a moderate density of Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*), with a shrub understory of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bitterbrush (*Purshia tridentata*). Big game use was reportedly heavy in 1989. Pellet group quadrat frequency for deer was moderately high at 28% in 1997, and use was estimated at 44 days use/acre (109 ddu/ha) in 2002 and 15 days use/acre (36 ddu/ha) in 2007. Most of the deer pellet groups appeared to be from late winter or early spring use in 2002. Summer cattle use was estimated at 2 days use/acre (5 cdu/ha) in 2002 and 2007. Elk and sheep use were estimated at 3 days use/acre (7 edu/ha) and 2 days use/acre (5 sdu/ha) in 2007, respectively.

Soil

The soil is classified within the Saxby series (USDA-NRCS 2007). The soils in this series are shallow and well-drained. They formed in colluvium, residuum, and alluvium from basalt mixed with alluvium from lacustrine sediments, with some areas having loess deposits. The soil texture is a sandy loam, and it has a neutral pH (7.2). Organic matter is limited at only 1.6%, and soil phosphorus is also low at 4.4 ppm. Phosphorus levels below 6 ppm may be limiting to plant growth and development (Tiedemann and Lopez 2004). There appears to be a caliche layer in places that varies in depth. Large and small gravel sized rocks are common on the surface and throughout the profile. Rocks found at approximately 12 inches (30.5 cm) in depth have a calcium carbonate coating. The soil erosion condition was classified as stable in 2002 and slight in 2007, due to some gullies and indication of soil movement.

Browse

The preferred browse cover is composed mostly of mountain big sagebrush and bitterbrush, with a very low density of ephedra (*Ephedra viridis*). Sagebrush density decreased from 2,532 plants/acre (6,256 plants/ha) in 1989 to 1,220 plants/acre (3,015 plants/ha) with the extended baseline in 1997, then steadily increased to 1,340 plants/acre (3,311 plants/ha) by 2007. Its average cover increased from 9% in 1997 to 11% in 2002, then declined to 7% in 2007. The population has been mostly mature, with young recruitment steadily decreasing from 24% of the population in 1989 to only 3% by 2007. Decadence decreased from 26% of the population in 1989 to 15% in 1997, then increased to 42% by 2007. Plants showing poor vigor and classified as dying also increased between 1997 and 2007, from 2% of the population to 21%. Use was mostly light-moderate in all years, with some heavy use in 1989, 2002, and 2007. Annual leader growth averaged 2.1 inches (5.3 cm) in 2002 and 2007.

Bitterbrush density increased from 533 plants/acre (1,317 plants/ha) in 1989 to 620 plants/acre (1,532 plants/ha) in 2002, and remained stable in 2007. Cover increased from 3% to 5% between 1997 and 2007. Young recruitment increased from 0% of the population in 1989 to 17% in 1997, then declined to 3% in 2002 and 2007. Decadence has steadily increased from 0% of the population in 1989 to 19% in 2007. Vigor has been good on most plants, and 10% and 13% of the sampled plants displayed poor vigor in 2002 and 2007, respectively. The growth form varies from prostrate, layering shrubs to eight foot tall, open tree-like forms. Use on the low-growing plants has been especially heavy, while the taller plants have also been heavily browsed, but some of the forage is unavailable due to height. Annual leader growth averaged 1.7 inches (4.2 cm) in 2002 and 2.6 inches (6.7 cm) in 2007.

Point-centered quarter data estimated juniper density at 45 trees/acre (111 trees/ha) in 2002 and 41 trees/acre (101 trees/ha) in 2007. Average trunk diameter was 7.5 inches (19.1 cm) in 2002 and 8.8 inches (22.4 cm) in 2007. The majority of the trees were over 8 feet (2.4 m) tall in 2007. Pinyon density was 10 trees/acre (25 trees/ha) in 2002 and 19 trees/acre (47 trees/ha) in 2007, with an average trunk diameter of 4.6 inches (11.7 cm) and 7.9 inches (20.1 cm), respectively.

Herbaceous Understory

Grasses provided 12% cover in 1997, 11% in 2002, and 22% in 2007. Perennial bunchgrasses are fairly common, but widely spaced. The most common perennial grass is bluebunch wheatgrass (*Agropyron spicatum*), which provided 59% of the total grass cover in 2002 and 26% in 2007. Sandberg bluegrass (*Poa secunda*) and needle-and-thread (*Stipa comata*) are also common. Cheatgrass (*Bromus tectorum*) is found primarily under the canopies of shrubs and trees. It accounted for 48% of the total grass cover in 1997, 11% in 2002, and 57% in 2007. Forbs are diverse, but few have been abundant, especially with dry conditions in 2002. Gilia (*Gilia* sp.) was abundant in 1997, and pale alyssum (*Alyssum alyssoides*) was abundant in 2007.

1997 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density decreased 52%, from 2,532 plants/acre (6,256 plants/ha) to 1,220 plants/acre (3,015 plants/ha), most of which was likely due to the increase in sample area. Decadence decreased from 26% of the population to 15%, and young recruitment also decreased from 24% of the population to 13%. The density of dead plants was high at 1,020 plants/acre (2,520 plants/ha). Some of the dead sagebrush appeared to have died recently, but not due to excessive use. Seedlings were sampled at a density of 120 seedlings/acre (297 seedlings/ha). Plants displaying poor vigor decreased from 21% of the population to 2%, and use decreased to light. Bitterbrush density increased slightly from 533 plants/acre (1,317 plants/ha) to 600 plants/acre (1,483 plants/ha). Decadence remained low at only 3% of the population, while recruitment increased from 0% of the population to 17%. All of the sampled plants were vigorous, and use remained moderate-heavy. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 11%. Bluebunch wheatgrass decreased significantly in nested frequency, while Sandberg bluegrass increased significantly in nested frequency. The trend for forbs is up. The sum of nested frequency for perennial species increased substantially. The Desirable Components Index (DCI) was rated as poor due to low preferred browse and perennial understory cover.

winter range condition (DCI) - poor (46) Mid-level potential scale

browse - stable (0)

grass - slightly down (-1)

forb - up (+2)

2002 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density increased slightly from 1,220 plants/acre (3,015 plants/ha) to 1,280 plants/acre (3,163 plants/ha). Young recruitment decreased from 13% of the population to 6%, and decadence increased from 15% of the population to 22%. Plants displaying poor vigor and classified as dying increased from 2% of the population to 11%, and use increased from light to approximately one-third of the sampled plants showing moderate-heavy use. Bitterbrush density remained relatively stable at 620 plants/acre (1,532 plants/ha). Decadence increased from 3% of the population to 13%, and young recruitment decreased from 17% of the population to 3%. Plants displaying poor vigor and classified as dying increased from 0% to 10% of the population, and use remained moderate-heavy. The trend for grass is stable. The sum of nested frequency for perennial grasses increased only 7%, but average perennial grass cover increased from 6% to 10%. Cheatgrass decreased significantly in nested frequency, and its cover also decreased from 6% to 1%. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 63%, while that for annual forbs decreased 12%. Several species, including sego lily (*Calochortus nuttallii*), Douglas chaenactis (*Chaenactis douglasii*), and gilia, decreased significantly in nested frequency. The DCI rating increased slightly to poor-fair due to increased preferred browse and perennial grass cover, and decreased annual grass cover.

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

2007 TREND ASSESSMENT

The trend for browse is stable. Sagebrush density slightly increased from 1,280 plants/acre (3,163 plants/ha) to 1,340 plants/acre (3,311 plants/ha). However, decadence almost doubled from 22% of the population to 42%, and young recruitment continued to decline from 6% of the population to 3%. Plants displaying poor vigor and classified as dying increased from 11% of the population to 21%, and 44% of the sampled plants showed moderate-heavy use. Bitterbrush density remained stable at 620 plants/acre (1,532 plants/ha). Decadence continued to increase to 19% of the population. Plants classified as dying increased from 10% of the population to 13%, and use remained heavy. The trend for grass is stable. The sum of nested frequency for perennial grasses did not change substantially since 2002, but increased 12% since 1997. The sum of nested frequency for annual grasses increased 52%. Cheatgrass cover increased from 1% to 12%. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum increased significantly in nested frequency. The DCI rating decreased to very poor due to an increase in decadence and decrease in recruitment for preferred browse, and an increase in cheatgrass cover.

winter range condition (DCI) - very poor (33) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 16A, Study no: 19

Type	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
G	Agropyron spicatum	_b 171	_a 122	_{ab} 150	_a 121	3.44	6.67	5.55
G	Bromus japonicus (a)	-	-	20	-	-	.06	-
G	Bromus tectorum (a)	-	_b 275	_a 211	_c 350	5.80	1.19	12.38
G	Oryzopsis hymenoides	_b 27	_{ab} 11	_a -	_b 16	.10	.01	.52
G	Poa secunda	_a 20	_b 65	_b 55	_b 72	1.22	1.53	1.27
G	Sitanion hystrix	_a 2	_a 6	-	_a 10	.15	-	.09
G	Stipa comata	_a 38	_a 26	_a 41	_a 39	1.33	1.82	1.81
Total for Annual Grasses		0	275	231	350	5.80	1.26	12.38
Total for Perennial Grasses		258	230	246	258	6.25	10.05	9.25
Total for Grasses		258	505	477	608	12.05	11.31	21.64
F	Agoseris glauca	-	_b 20	_{ab} 11	_a 8	.27	.05	.04
F	Alyssum alyssoides (a)	-	_a 1	_a 25	_b 166	.00	.04	1.15
F	Allium sp.	-	-	2	-	-	.00	-
F	Arabis sp.	-	-	1	-	-	.00	-
F	Astragalus agrestis	-	_a 4	_a 5	_a 6	.07	.04	.16
F	Astragalus eurekensis	-	-	_a 6	_a 6	-	.04	.04
F	Castilleja linariaefolia	-	2	-	-	.06	-	-
F	Camelina microcarpa (a)	-	-	-	2	-	-	.00
F	Calochortus nuttallii	-	_b 41	_a 15	_a 6	.16	.05	.03

Type	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
F	<i>Chaenactis douglasii</i>	-	_b 25	_a 2	-	.69	.00	-
F	<i>Chorispora tenella</i> (a)	-	_a 4	_a 3	-	.03	.00	-
F	<i>Cirsium</i> sp.	-	5	-	-	.04	-	-
F	<i>Collinsia parviflora</i> (a)	-	-	_a 3	_a 2	-	.00	.00
F	<i>Crepis acuminata</i>	-	-	_a -	_a -	-	.00	.00
F	<i>Cryptantha</i> sp.	_a 6	_a 16	-	_a 9	.11	-	.02
F	<i>Descurainia pinnata</i> (a)	-	-	_a 7	_a 14	-	.01	.03
F	<i>Draba</i> sp. (a)	-	-	-	1	-	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	_a 3	_a 7	_a 2	.00	.02	.00
F	<i>Erodium cicutarium</i> (a)	-	_a 2	_a 3	_a 10	.00	.00	.07
F	<i>Eriogonum racemosum</i>	-	-	2	-	-	.03	-
F	<i>Galium aparine</i> (a)	-	-	_a 1	_a 2	-	.00	.01
F	<i>Gilia</i> sp. (a)	-	_b 61	_a 11	_a 18	2.15	.03	.05
F	<i>Lappula occidentalis</i> (a)	-	-	-	13	-	-	.06
F	<i>Lactuca serriola</i>	-	_a 4	-	_a 2	.00	-	.00
F	<i>Machaeranthera canescens</i>	_a 3	_a -	-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	_a 3	_a 1	-	.01	.00
F	<i>Phlox austromontana</i>	-	_a 6	-	_a 3	.18	-	.15
F	<i>Phlox longifolia</i>	_a 9	_a 9	_a 6	_a 6	.04	.02	.01
F	<i>Polygonum douglasii</i> (a)	-	3	-	-	.00	-	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	-	8	-	-	.01
F	<i>Streptanthus cordatus</i>	_a 3	_a 5	_a 1	_a 2	.04	.00	.00
F	<i>Tragopogon dubius</i>	-	_a 9	-	_a 2	.10	-	.06
F	<i>Veronica biloba</i> (a)	-	-	_a 2	_a 2	-	.00	.00
F	<i>Zigadenus paniculatus</i>	-	-	3	-	-	.03	-
Total for Annual Forbs		0	74	65	241	2.20	0.15	1.42
Total for Perennial Forbs		21	146	54	50	1.80	0.28	0.54
Total for Forbs		21	220	119	291	4.00	0.43	1.96

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

BROWSE TRENDS --

Management unit 16A, Study no: 19

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Artemisia tridentata vaseyana	43	44	44	8.83	10.96	7.23
B	Chrysothamnus viscidiflorus viscidiflorus	4	4	4	.15	.06	-
B	Ephedra viridis	0	0	0	-	.00	.03
B	Gutierrezia sarothrae	7	4	4	.35	.30	.00
B	Juniperus osteosperma	1	4	5	2.96	6.56	6.59
B	Opuntia sp.	3	0	4	.03	-	-
B	Purshia tridentata	14	18	15	3.04	4.09	4.55
B	Quercus gambelii	0	1	1	-	-	.00
Total for Browse		72	75	77	15.37	21.99	18.42

CANOPY COVER, LINE INTERCEPT --

Management unit 16A, Study no: 19

Species	Percent Cover	
	'02	'07
Artemisia tridentata vaseyana	-	6.09
Chrysothamnus viscidiflorus viscidiflorus	-	.05
Juniperus osteosperma	.81	16.85
Purshia tridentata	-	4.36

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16A, Study no: 19

Species	Average leader growth (in)	
	'02	'07
Artemisia tridentata vaseyana	2.1	2.1
Purshia tridentata	1.7	2.7

POINT-QUARTER TREE DATA --

Management unit 16A, Study no: 19

Species	Trees per Acre	
	'02	'07
Juniperus osteosperma	45	41
Pinus edulis	10	19

Average diameter (in)	
'02	'07
7.5	8.8
4.6	7.9

BASIC COVER --

Management unit 16A, Study no: 19

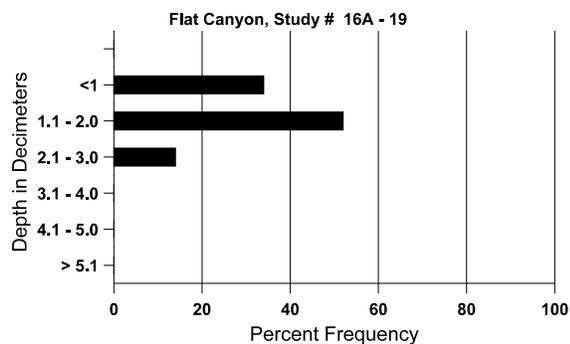
Cover Type	Average Cover %			
	'89	'97	'02	'07
Vegetation	4.75	26.96	31.86	37.45
Rock	8.75	7.50	9.19	7.91
Pavement	21.00	15.75	11.90	14.13
Litter	42.25	32.46	35.46	33.34
Cryptogams	1.25	.92	.76	.30
Bare Ground	22.00	28.46	30.32	23.53

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 19, Flat Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
17.2	50.8 (17.1)	7.2	70.4	15.8	13.8	1.6	4.4	153.6	.5

Stoniness Index



PELLET GROUP DATA --

Management unit 16A, Study no: 19

Type	Quadrat Frequency		
	'97	'02	'07
Sheep	-	-	2
Rabbit	2	23	59
Horse	-	1	-
Elk	1	-	1
Deer	28	29	12
Cattle	-	2	2

Days use per acre (ha)	
'02	'07
-	2 (5)
-	-
-	-
-	3 (7)
44 (109)	15 (36)
2 (5)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 16A, Study no: 19

		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)
<i>Artemisia tridentata vaseyana</i>												
89	2532	66	600	1266	666	-	39	8	26	3	21	20/24
97	1220	120	160	880	180	1020	10	0	15	2	2	22/35
02	1280	-	80	920	280	580	33	2	22	11	11	19/29
07	1340	-	40	740	560	440	31	13	42	21	21	27/34
<i>Chrysothamnus nauseosus albicaulis</i>												
89	132	-	66	66	-	-	0	50	-	-	0	20/13
97	0	-	-	-	-	-	0	0	-	-	0	28/33
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	0	-	-	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
89	465	-	66	333	66	-	14	14	14	-	14	12/13
97	140	-	40	100	-	-	0	0	0	-	0	13/19
02	120	-	20	60	40	-	0	0	33	-	0	11/15
07	120	-	-	80	40	-	0	0	33	17	17	10/11
<i>Ephedra viridis</i>												
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	18/13
02	0	-	-	-	-	-	0	0	-	-	0	16/13
07	0	-	-	-	-	-	0	0	-	-	0	43/54
<i>Gutierrezia sarothrae</i>												
89	0	-	-	-	-	-	0	0	0	-	0	-/-
97	1400	180	1160	240	-	20	0	0	0	-	0	10/14
02	400	-	-	100	300	300	0	0	75	75	75	4/6
07	80	20	40	40	-	-	0	0	0	-	0	12/11
<i>Juniperus osteosperma</i>												
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	20	-	-	20	-	-	0	0	-	-	0	-/-
02	80	-	-	80	-	-	0	0	-	-	0	-/-
07	100	20	20	80	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	80	-	-	80	-	-	0	0	-	-	0	3/10
02	0	-	-	-	-	-	0	0	-	-	0	-/-
07	100	-	20	80	-	-	0	0	-	-	0	3/7

		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												
89	533	-	-	533	-	-	63	38	0	-	0	15/32
97	600	-	100	480	20	20	67	27	3	-	0	57/46
02	620	-	20	520	80	100	23	45	13	10	10	21/56
07	620	-	20	480	120	100	23	71	19	13	13	25/60
Quercus gambelii												
89	0	-	-	-	-	-	0	0	-	-	0	-/-
97	0	-	-	-	-	-	0	0	-	-	0	-/-
02	20	-	-	20	-	-	0	0	-	-	0	-/-
07	20	-	20	-	-	-	0	0	-	-	0	-/-