

Trend Study 16B-11-07

Study site name: Hilltop.

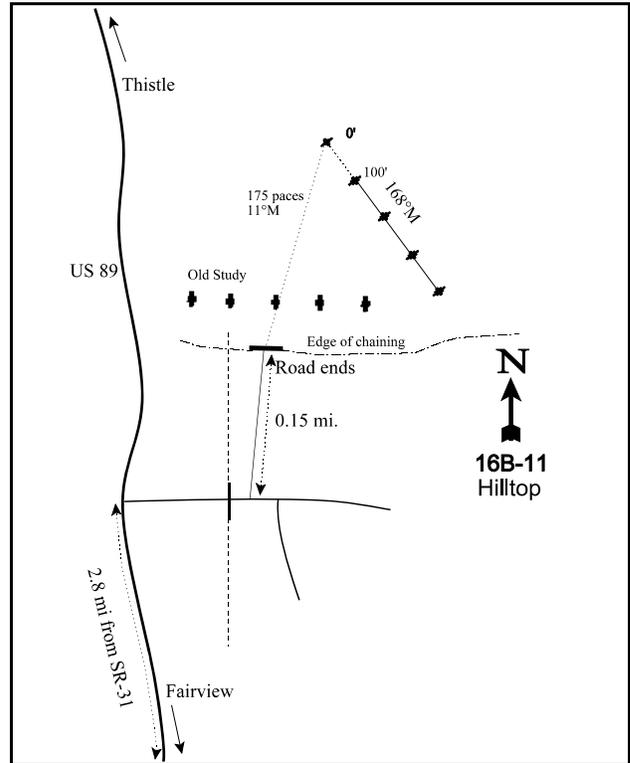
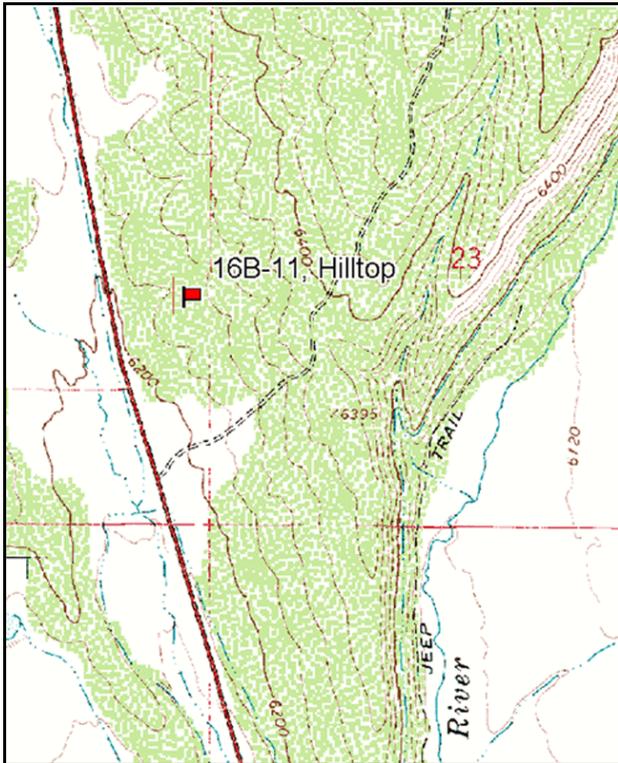
Vegetation type: Chained, Seeded P-J.

Compass bearing: frequency baseline 168 degrees magnetic.

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

LOCATION DESCRIPTION

From the intersection of US-89 and SR-31 in Fairview, travel north on US-89 for 2.8 miles. Turn right (east) onto DWR property. Pass through a gate and turn to the left, following a road that parallels the fence. Go 0.15 miles to the end of the road. The 0-foot baseline stake, marked by browse tag #439, is 175 paces at an azimuth of 11 degrees magnetic from the end of the road.



Map Name: Fairview

Diagrammatic Sketch

Township 13S, Range 4E, Section 22

GPS: NAD 83, UTM 12S 461110 E 4391620 N

## DISCUSSION

### Hilltop - Trend Study No. 16B-11

#### Study Information

This study was established on land formerly owned by the Division of Wildlife Resources, north of Fairview and just east of US-89 [elevation: 6,200 feet (1,890 m), slope: 5%-10%, aspect: west]. The area was part of a land swap between the Division of Wildlife Resources and a private land owner. A conservation easement was established, which allows grazing for a short time in spring and fall. The study monitors a 250 acre (101 ha) pinyon-juniper chaining treatment that was completed in 1978. It was established in the lower, southern end of the chaining. The nearest perennial body of water is Cottonwood Canyon Creek, 3 miles (4.8 km) to the southeast. Quadrat frequency of deer pellets decreased from 25% in 1997 to 4% in 2002, and increased to 9% in 2007. However, quadrat frequency of rabbit pellets increased from 6% in 1997 to 21% in 2002, and 42% in 2007. From the pellet group transect, there were an estimated 4 deer days use/acre (10 ddu/ha) in 2002 and 11 deer days use/acre (26 ddu/ha) in 2007. Elk use was estimated at 2 days use/acre (5 edu/ha) in 2002 and 12 days use/acre (30 edu/ha) in 2007. The study had been heavily utilized by both cows and sheep before sampling occurred in 1997 and 2002. In 2002, cattle use was estimated at 19 days use/acre (47 cdu/ha) and sheep use was estimated at 50 days use/acre (124 shu/ha). In 2007, there was no indication of grazing by cattle or sheep.

#### Soil

The soil is classified within the Borvant-Lodar soil complex. Soils in this series are shallow, well-drained, and formed in alluvium, colluvium, or residuum, from limestone or sandstone parent material. They are moderately permeable and have a medium to very high surface runoff potential (USDA-NRCS 2007). Specifically at the study, soil depth varies along the baseline and is about 10 inches (25.4 cm) along the first half and about 20 inches (51 cm) along the last half. The texture is a clay loam with a slightly alkaline pH (7.4). Organic matter content is the second highest in the unit at 3.9%. The erosion condition was classified as moderate in 2002, but had improved to the upper threshold of stable in 2007. Relative bare ground cover decreased from 43% in 2002 to 27% in 2007, and relative vegetation cover increased from 18% in 2002 to 35% in 2007. Despite the change in cover composition, there was evidence of moderate soil movement in 2007.

#### Browse

Browse species were seeded in the initial treatment, however, the establishment of seeded browse has been poor and is suspected to be a reason for the low wildlife use. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and four-wing saltbush (*Atriplex canescens*) were included in the aerial broadcast mix, while Stansbury cliffrose (*Cowenia mexicana* ssp. *stansburiana*) and bitterbrush (*Purshia tridentata*) were seeded with a dribbler. With the exception of big sagebrush, none of the species that were seeded have been sampled in any year. Sagebrush canopy cover was less than 1% in both 2002 and 2007. The estimated density decreased from approximately 300 plants/acre (743 plants/ha) in 1989, to 40 plants/acre (99 plants/ha) in 2002, and increased to 160 plants/acre (396 plants/ha) in 2007. The fluctuation is due to the change in young and decadent individuals sampled. The mature population has remained stable at 40 plants/acre since 1997. Decadence and poor vigor were low in 1989 and 2002. However, in 1997, 20% of the population was decadent and in poor vigor. In 2007, 38% of the population was decadent and 13% had poor vigor. Additionally, 38% of the sagebrush plants were infested with the sagebrush defoliator moth (*Aroga websteri*) in 2007. The average annual leader growth was not measured in 2002 because of the low density, but was 2.0 inches (5.1 cm) in 2007. Browse use has been mostly light.

The most common shrub is broom snakeweed (*Gutierrezia sarothrae*), though density has fluctuated widely in the sample years. There are also scattered clumps of Gambel oak (*Quercus gambelii*). Elderberry (*Sambucus racemosa*), slenderbush eriogonum (*Eriogonum microthecum*), and white rubber rabbitbrush (*Chrysothamnus*

*nauseosus* ssp. *albicaulis*) occur infrequently.

Utah juniper trees (*Juniperus osteosperma*) in the chaining had an average height between 8 feet (2.4 m) and 12 feet (3.7 m) in 2007. Although tree heights were not measured prior to 2007, tree density and diameter have increased since 1997. Using point-center quarter data, the juniper density increased from 47 trees/acre (116 trees/ha) in 1997 to 56 trees/acre (139 trees/ha) in 2007. Average tree diameter was 5.0 inches (12.7 cm) in 1997 and 7.8 inches (19.8 cm) in 2007. Canopy cover of juniper was less than 1% in 2002 and 2007.

#### Herbaceous Understory

Seeded perennial grasses are the dominant component in the vegetative community. Perennial grass cover has ranged from 16%-18% since 1997. Crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*) are the primary forage species, combining to produce approximately 90% of the grass cover, and averaging 16% of the ground cover since 1997. Native grasses are also present, but in very low frequencies. Cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) are present in the understory and occur in low, but increasing, numbers. Cheatgrass cover was less than 1% in 1997 and 2002, but increased to 2% in 2007.

Diversity of forbs is fair, yet none are particularly abundant. Perennial forb cover has been 1% or less since 1997. Two noxious weeds, musk thistle (*Carduus nutans*) and field bindweed (*Convolvulus arvensis*), have been sampled at low quadrat frequencies. Musk thistle was only present in 1997, and field bindweed was present in 1997 and 2007. Annual forbs, primarily bur buttercup (*Ranunculus testiculatus*) and pale alyssum (*Alyssum alyssoides*), occur in higher frequencies than do perennial species. Changes in the sum of nested frequency for perennial forbs appear to follow precipitation patterns and may be most affected by the availability of water, and not from competition with other vegetation. Forb nested frequency and cover were lowest in 2002, a drought year (Utah Climate Summaries 2007).

#### 1997 TREND ASSESSMENT

The browse trend is slightly down. Mountain big sagebrush had decreased density, increased decadence, and increased poor vigor. Rubber rabbitbrush and slenderbush eriogonum also had heavy sheep use. There were few young plants and no seedlings of any shrub species. The trend for grass is stable. The sum of nested frequency of perennial grasses changed little, decreasing 6%. Nested frequency increased significantly for bluebunch wheatgrass (*Agropyron spicatum*) and Indian ricegrass (*Oryzopsis hymenoides*), and decreased for intermediate wheatgrass and squirreltail (*Sitanion hystrix*). The forb trend is slightly up. The sum of nested frequency for perennial forbs increased four-fold, but perennial forbs were such a small vegetative component that the increase was inconsequential. The number of perennial species sampled increased from four to 13. Musk thistle and bindweed were sampled in 19 and 7 quadrats, respectively. The Desirable Components Index (DCI) score was very poor because of the extremely low cover of preferred browse species, low perennial forb cover, and the presence of two noxious weed species.

winter range condition (DCI) - very poor (30) Mid-level potential scale

browse - slightly down (-1)

grass - stable (0)

forb - slightly up (+1)

#### 2002 TREND ASSESSMENT

The browse trend is slightly down. Browse remained very limited. Sagebrush density declined and there was no recruitment of young plants into the population. The few white-stemmed rubber rabbitbrush and bitterbrush plants observed around the study showed heavy use by sheep. With virtually no reproduction of any palatable browse, this study is losing its value as critical winter range for big game. The trend for grass is slightly down. The sum of nested frequency decreased by 13%, and the number of perennial grass species sampled decreased from six to three. However, cheatgrass nested frequency significantly decreased. The forb trend is slightly down. The sum of nested frequency decreased 87%, but the abundance was so low that the decrease had a small impact. There were significant increases in the nested frequencies of bur buttercup and

pale alyssum. Musk thistle and field bindweed were not sampled in 2002. The DCI score remained very poor.

winter range condition (DCI) - very poor (31) Mid-level potential scale

browse - slightly down (-1)      grass - slightly down (-1)      forb - slightly down (-1)

2007 TREND ASSESSMENT

The browse trend is slightly up. Sagebrush density increased four-fold, though is still extremely low. Reproduction and recruitment both increased; sagebrush seedlings were sampled for the first time. Conversely, sagebrush decadence increased as did the number of plants with poor vigor. The poor vigor was attributed to extensive sagebrush defoliator moth (*Aroga websteri*) damage on mature plants. White rubber rabbitbrush plants continued to show heavy use and have a short growth form. The high quadrat frequency of rabbit pellets suggests that the high rabbitbrush browse use is likely from rabbits and not deer. The trend for grass is slightly up. The sum of nested frequency for perennial grasses increased 21%, including significant increases in the nested frequencies of intermediate wheatgrass and Indian ricegrass. Adversely, there was a significant increase in cheatgrass nested frequency. Cheatgrass cover increased from less than 1% to 2%. The forb trend is down. The sum of nested frequency for perennial forbs increased, but abundance continued to be low. The sum of nested frequency of annual forbs also increased, including significant increases in bur buttercup and pale alyssum. The increase in bur buttercup is of greater concern because it is allelopathic (Buchanan et al. 1978). Annual forb cover increased from 2% to 13%. Additionally, the noxious weed field bindweed was measured again. The DCI score remained very poor.

winter range condition (DCI) - very poor (29) Mid-level potential scale

browse - slightly up (+1)      grass - slightly up (+1)      forb - down (-2)

HERBACEOUS TRENDS --

Management unit 16B, Study no: 11

Type	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
G	Agropyron cristatum	a203	a198	a238	a193	11.51	12.36	8.49
G	Agropyron intermedium	b182	a129	a107	b204	3.53	3.68	9.04
G	Agropyron spicatum	a3	b40	-	-	.91	-	-
G	Bromus brizaeformis (a)	-	-	-	4	-	-	.01
G	Bromus japonicus (a)	-	a4	-	a14	.01	-	.06
G	Bromus tectorum (a)	-	b48	a16	c116	.33	.06	1.67
G	Elymus junceus	a7	-	-	a6	-	-	.18
G	Oryzopsis hymenoides	a4	b23	a5	b19	.40	.15	.32
G	Poa secunda	a4	a4	-	a2	.01	-	.03
G	Sitanion hystrix	b24	a8	-	-	.02	-	-
<b>Total for Annual Grasses</b>		<b>0</b>	<b>52</b>	<b>16</b>	<b>134</b>	<b>0.34</b>	<b>0.06</b>	<b>1.74</b>
<b>Total for Perennial Grasses</b>		<b>427</b>	<b>402</b>	<b>350</b>	<b>424</b>	<b>16.39</b>	<b>16.21</b>	<b>18.07</b>
<b>Total for Grasses</b>		<b>427</b>	<b>454</b>	<b>366</b>	<b>558</b>	<b>16.73</b>	<b>16.27</b>	<b>19.82</b>
F	Alyssum alyssoides (a)	-	a41	b71	c339	.40	.17	7.43
F	Arabis sp.	-	-	-	3	-	-	.01
F	Astragalus convallarius	a3	-	-	a2	-	-	.03

T y p e	Species	Nested Frequency				Average Cover %		
		'89	'97	'02	'07	'97	'02	'07
F	Astragalus sp.	-	<sub>a</sub> 1	-	<sub>b</sub> 7	.00	-	.09
F	Astragalus utahensis	-	<sub>a</sub> 4	<sub>a</sub> 4	<sub>b</sub> 10	.01	.01	.29
F	Camelina microcarpa (a)	-	-	-	6	-	-	.01
F	Carduus nutans (a)	-	40	-	-	.44	-	-
F	Chaenactis douglasii	-	1	-	-	.00	-	-
F	Chenopodium fremontii (a)	-	9	-	-	.04	-	-
F	Cirsium sp.	-	<sub>a</sub> 5	-	<sub>a</sub> 5	.04	-	.07
F	Convolvulus arvensis	-	<sub>a</sub> 16	-	<sub>a</sub> 20	.11	-	.39
F	Descurainia pinnata (a)	-	<sub>b</sub> 11	-	<sub>a</sub> 2	.04	-	.00
F	Draba sp. (a)	-	-	-	17	-	-	.02
F	Erodium cicutarium (a)	-	-	-	3	-	-	.01
F	Erigeron eatonii	-	-	-	2	-	-	.00
F	Lappula occidentalis (a)	-	<sub>a</sub> 3	-	<sub>a</sub> 2	.01	-	.00
F	Medicago sativa	-	3	-	-	.09	-	-
F	Phlox hoodii	<sub>a</sub> 11	<sub>a</sub> 16	<sub>a</sub> 5	<sub>a</sub> 9	.25	.18	.08
F	Phlox longifolia	<sub>a</sub> 2	<sub>a</sub> 4	-	<sub>a</sub> 7	.01	-	.02
F	Ranunculus testiculatus (a)	-	<sub>a</sub> 163	<sub>b</sub> 196	<sub>c</sub> 279	.97	1.86	5.03
F	Salsola iberica (a)	-	-	-	3	-	-	.03
F	Sisymbrium altissimum (a)	-	4	-	-	.04	-	-
F	Sphaeralcea coccinea	<sub>a</sub> 1	<sub>a</sub> 4	-	<sub>a</sub> 11	.03	-	.03
F	Streptanthus cordatus	-	-	-	5	-	-	.06
F	Taraxacum officinale	-	2	-	-	.00	-	-
F	Tragopogon dubius	-	<sub>a</sub> 1	-	<sub>a</sub> 5	.00	-	.04
F	Verbascum thapsus	-	11	-	-	.48	-	-
F	Viguiera multiflora	-	3	-	-	.01	-	-
Total for Annual Forbs		0	271	267	651	1.96	2.03	12.56
Total for Perennial Forbs		17	71	9	86	1.06	0.19	1.13
Total for Forbs		17	342	276	737	3.02	2.23	13.69

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

BROWSE TRENDS --

Management unit 16B, Study no: 11

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	<i>Artemisia tridentata vaseyana</i>	5	2	7	.46	.18	.03
B	<i>Chrysothamnus nauseosus albicaulis</i>	2	0	0	.38	-	-
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	2	2	5	.15	.15	.33
B	<i>Gutierrezia sarothrae</i>	20	6	26	.37	.12	.43
B	<i>Juniperus osteosperma</i>	1	0	0	.63	.15	.53
B	<i>Opuntia sp.</i>	3	2	0	-	.03	.06
B	<i>Quercus gambelii</i>	1	2	1	.63	.63	.38
Total for Browse		34	14	39	2.63	1.27	1.75

CANOPY COVER, LINE INTERCEPT --

Management unit 16B, Study no: 11

Species	Percent Cover	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	.38	.56
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.36	.10
<i>Gutierrezia sarothrae</i>	.03	1.08
<i>Juniperus osteosperma</i>	.80	.95
<i>Quercus gambelii</i>	1.79	.60

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 16B, Study no: 11

Species	Average leader growth (in)	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	-	2.0

POINT-QUARTER TREE DATA --

Management unit 16B, Study no: 11

Species	Trees per Acre	
	'02	'07
<i>Juniperus osteosperma</i>	53	56

Average diameter (in)	
'02	'07
5.3	7.8

BASIC COVER --

Management unit 16B, Study no: 11

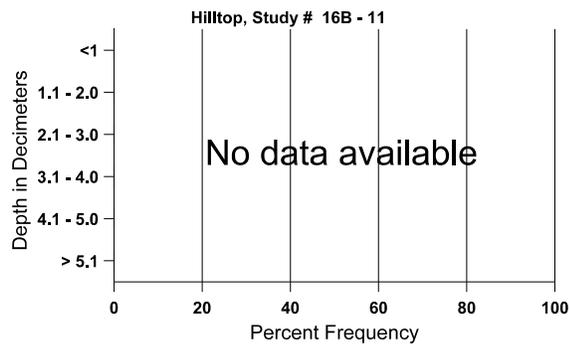
Cover Type	Average Cover %			
	'89	'97	'02	'07
Vegetation	10.50	22.73	19.68	39.06
Rock	4.75	3.01	3.42	1.52
Pavement	11.25	5.28	7.03	6.73
Litter	46.75	20.90	33.79	34.16
Cryptogams	0	.04	.02	.37
Bare Ground	26.75	35.57	48.51	29.79

SOIL ANALYSIS DATA --

Herd Unit 16B, Study no: 11, Hilltop

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
13.8	55.6 (14.3)	7.4	38.7	25.1	36.2	3.9	8.8	134.5	.5

Stoniness Index



PELLET GROUP DATA --

Management unit 16B, Study no: 11

Type	Quadrat Frequency		
	'97	'02	'07
Sheep	13	15	-
Rabbit	6	21	42
Elk	1	-	3
Deer	25	4	9
Cattle	3	-	1

Days use per acre (ha)	
'02	'07
50 (124)	-
-	-
2 (5)	12 (30)
4 (10)	11 (26)
19 (47)	-

BROWSE CHARACTERISTICS --  
Management unit 16B, Study no: 11

		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	<b>299</b>	-	33	233	33	-	89	0	11	-	0	33/30
97	<b>100</b>	-	40	40	20	-	20	0	20	20	20	31/35
02	<b>40</b>	-	-	40	-	20	0	0	0	-	0	26/28
07	<b>160</b>	120	60	40	60	-	25	0	38	13	13	23/27
<i>Chrysothamnus nauseosus albicaulis</i>												
89	<b>33</b>	-	-	33	-	-	100	0	-	-	0	47/91
97	<b>40</b>	-	20	20	-	-	50	50	-	-	0	20/34
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/8
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	36/68
<i>Chrysothamnus viscidiflorus viscidiflorus</i>												
89	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
97	<b>80</b>	-	-	80	-	-	0	0	0	-	0	7/9
02	<b>200</b>	-	-	200	-	-	0	0	0	-	0	5/11
07	<b>220</b>	-	40	160	20	-	18	0	9	-	0	6/13
<i>Eriogonum microthecum</i>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	4/8
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/11
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Gutierrezia sarothrae</i>												
89	<b>133</b>	-	-	133	-	-	0	0	0	-	0	7/10
97	<b>720</b>	-	180	520	20	20	0	0	3	3	3	10/12
02	<b>200</b>	-	40	120	40	20	30	30	20	-	0	4/7
07	<b>920</b>	20	40	860	20	-	0	0	2	-	0	7/10
<i>Juniperus osteosperma</i>												
89	<b>33</b>	-	-	33	-	-	0	0	-	-	0	69/35
97	<b>20</b>	-	-	20	-	20	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<i>Opuntia sp.</i>												
89	<b>33</b>	-	-	33	-	-	0	0	-	-	0	7/20
97	<b>60</b>	-	-	60	-	-	0	0	-	-	0	6/19
02	<b>40</b>	-	-	40	-	-	0	0	-	-	0	4/9
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	7/8

		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)
<b>Quercus gambelii</b>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>80</b>	-	40	40	-	20	0	0	-	-	0	98/47
02	<b>100</b>	-	-	100	-	-	0	0	-	-	0	6/3
07	<b>140</b>	-	20	120	-	-	0	0	-	-	0	62/40
<b>Rhus trilobata</b>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	32/69
<b>Sambucus cerulea</b>												
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	119/98
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-