

Trend Study 17-17-07

Study site name: Dutch Canyon .

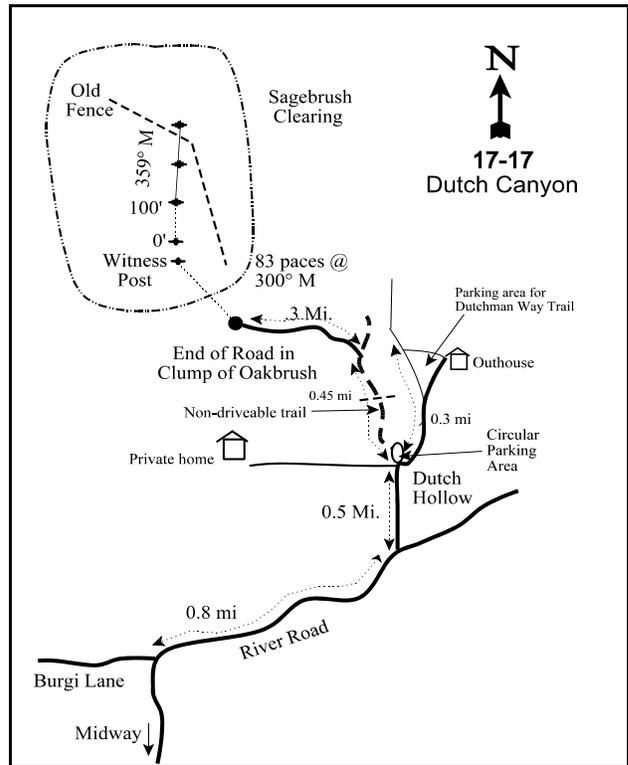
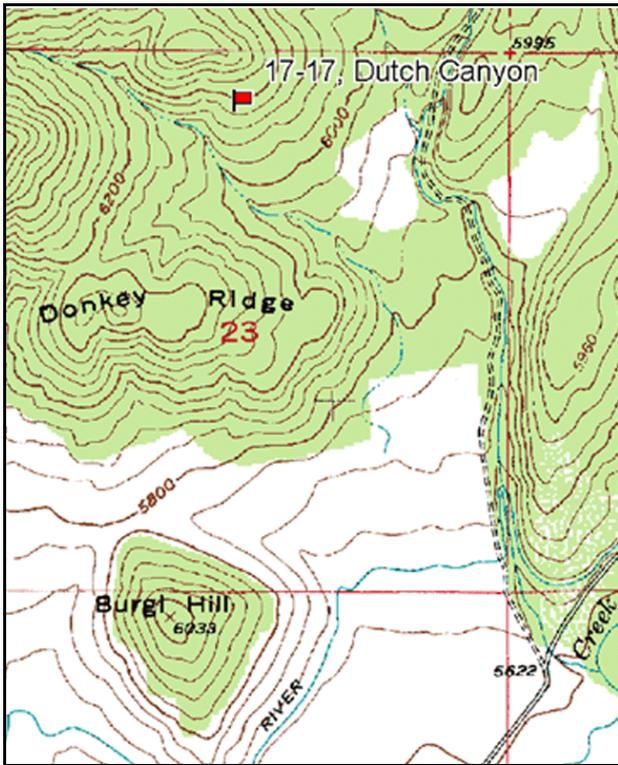
Vegetation type: Big Sagebrush-Grass .

Compass bearing: frequency baseline 359 degrees magnetic.

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

LOCATION DESCRIPTION

Beginning at the intersection of River Road and Burgi Lane (north of Midway), proceed northward on River Road for 0.80 miles to an intersection. Turn left and proceed 0.50 miles to a circular parking area. Take a dirt Forest Service road on the east side of the parking area for 0.3 miles to a dirt parking area with an outhouse. Across from the parking area is the Dutchman Way Trail head. Park in the dirt lot and take this trail up to the site. Use the GPS to navigate up the hills to the site (0.44 miles). The frequency baseline is marked by green steel "T" fenceposts, approximately 12 to 18 inches in height. A red browse tag, number 3952, is attached to the 0-foot baseline stake.



Map Name: Heber

Diagrammatic Sketch

Township 3S, Range 4E, Section 23

GPS: NAD 83, UTM 12T 460836 E 4488842 N

DISCUSSION

Dutch Canyon - Trend Study No. 17-17

Study Information

This winter range study is located within a small sagebrush-grass clearing surrounded by thick Gambel oak [elevation: 6,200 feet (1,890 m), slope: 15%, aspect: south-southeast]. Several of the baseline posts were missing in 2002, so the baseline was reset and is now only 300 feet in length. Therefore, the sample area has changed twice; once in 1996 when the baseline was extended, and then again in 2002 when the baseline was contracted. These changes to the baseline and the sample area is likely to have an impact on the changes in cover, frequency, and density data. The nearest perennial source of water is a stream flowing down Dutch Hollow located 0.35 miles (0.6 km) to the east. Big game use has been moderate. From the pellet group transect, there were an estimated 65 deer days use/acre (160 ddu/ha) in 2002 and 62 deer days use/acre (152 ddu/ha) in 2007. Elk use was estimated at 9 days use/acre (23 edu/ha) in 2002 and 25 days use/acre (63 edu/ha) in 2007. A deer skeleton was found at the north edge of the baseline in 2007.

Soil

This study is located within the Cloud Rim soil series, which consists of very deep, well-drained, moderately permeable soils. The series formed in alluvium and colluvium derived from mixed sedimentary and metamorphic rocks of sandstone and quartzite. The soil is classified as fine-loamy, mixed, superactive, frigid Typic Argixerolls (USDA-NRCS 2007). Specifically at the study, the soil texture is a sandy clay loam with a neutral reactivity (pH of 6.9). The profile is rocky, but surface rock and pavement cover are low, averaging approximately 5% since 1996. The combined, relative vegetation and litter cover have comprised an average 90% of the total ground cover since 1996. The erosion condition was classified as slight in 2002 and 2007. Most evidence of erosion comes from the abundance of trails that traverse the study and serve as flow paths.

Browse

The browse component is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*). As mentioned above, some of the changes in the browse component are likely the result of the change in sample area. Sagebrush canopy cover was 25% in 2002 and 2007. The estimated density decreased from 2,798 plants/acre (6,925 plants/ha) in 1983 to approximately 1,370 plants/acre (3,391 plants/ha) in 1989 and 1996. The density increased to 2,380 plants/acre (5,891 plants/ha) in 2002, and decreased to 1,680 plants/acre (4,158 plants/ha) in 2007. The density of seedling plants has been low in all sample years, and the young plants have decreased from 31% of the population in 1983 to 0% in 2007. Decadence increased from 24% of the population in 1983 to 44% in 1989, and decreased to 15% by 2002. In 2007, decadence had increased to 24% of the population. Dead plants were first sampled in 1996 at a density of 1,060 plants/acre (2,624 plants/ha), and the density of dead plants steadily decreased to 860 plants/acre (2,129 plants/ha) by 2007. There have been few plants with poor vigor, except in 2007 when 29% of the plants were in poor vigor. The average annual leader growth was 2.5 inches (6.4 cm) in 2002 and 1.2 inches (3.2 cm) in 2007. Browse use has ranged from light to moderate.

Gambel oak clones surround the sagebrush opening sampled by the baseline. Canopy cover was 8% in 2002 and 10% in 2007. The estimated oak density has vacillated from increasing to decreasing in alternate sample years. The lowest estimate was 1,533 plants/acre (3,795 plants/ha) in 1983, and the highest estimate was 2,832 plants/acre (7,010 plants/ha) in 1989. The age class distribution has shifted from a young to a mature population. Vigor was good through 1996, and the proportion of plants exhibiting poor increased to 16% and 30% in 2002 and 2007, respectively. Browse use on oak stems has been light to light-moderate.

Antelope bitterbrush (*Purshia tridentata*) is present, but less abundant than sagebrush or oak. Canopy cover was 5% in 2002 and 2007. The density has varied from 66 plants/acre (163 plants/ha) in 1983 to 240 plants/acre (594 plants/ha) in 2007. The bitterbrush population is composed mostly of mature plants. Plants

vigor has been good in all sample years. Bitterbrush annual leader growth averaged 3.4 inches (8.6 cm) in 2002 and 2.4 inches (6 cm) in 2007. Browse use on bitterbrush has been moderate to heavy.

Herbaceous Understory

The herbaceous understory is dominated by annual species. Cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) cover has averaged 8% since 1996. Cheatgrass quadrat frequency was 96% in 1996, 76% in 2002, and 88% in 2007. Perennial grass cover has been 2% or less since 1996, and between two and four perennial species have been sampled. The dominant perennial grasses are Kentucky bluegrass (*Poa pratensis*) and bulbous bluegrass (*Poa bulbosa*). Although bulbous bluegrass is a perennial species, it has a phenology similar to annual grasses (Stewart and Hull 1949). Nearly all of the perennial grasses sampled were found growing in or near oak clones.

Forbs are diverse, but composition is poor. Perennial forb cover was 3% in 1996, 9% in 2002, and 7% in 2007. Leafy spurge (*Euphorbia esula*), a noxious weed, is one of the most abundant perennial species and has comprised an average of 7% cover since 2002. Dalmatian toadflax (*Linaria dalmatica*), another noxious weed, was sampled in 2007. Other perennial species that have been sampled with relatively moderate frequencies include prickly lettuce (*Lactuca serriola*), yellow salsify (*Tragopogon dubius*), and showy goldeneye (*Viguiera multiflora*). Pale alyssum (*Alyssum alyssoides*) is the dominant annual forb species, and has increased in percent cover since 1996.

1989 TREND ASSESSMENT

The browse trend is slightly down. The density of mountain big sagebrush decreased 51%. The young age class decreased from 31% to 22%, and decadence increased from 24% to 44% of the population. Because the decrease in young plants did not correspond to an increase in the mature age class, it is assumed that those plants died. Additionally, the average crown width decreased 18 inches (46 cm). Browse use on sagebrush remained light. The negative sagebrush trend was partly countered by increases in the Gambel oak population. The density of Gambel oak increased 85%. Young plants accounted for 59% of the population, and decadence increased from 7% to 13% of the population. Browse use on oak remained light-moderate. The grass trend is slightly up. The sum of nested frequency of perennial grasses increased three-fold, but perennial grasses remained a very small vegetative component. The number of perennial species increased from one to four. The forb trend is up. The sum of nested frequency of perennial forbs increased six-fold, including a significant increase in showy goldeneye. Four additional perennial species were sampled that had not been sampled previously.

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

1996 TREND ASSESSMENT

The browse trend is stable. The density of sagebrush remained stable, and the population shifted to a mostly mature stand. Young plants comprised 16% of the population, and decadent plants comprised another 16%. The density of dead plants was estimated at 1,060 plants/acre (2,624 plants/ha). The proportion of plants exhibiting poor vigor increased to 10%, all of which were classified as dying. The average crown width increased 21 inches (53 cm), which more than compensated for the decrease that was measured in 1989. None of the sagebrush had evidence of moderate or high browse use. The density of Gambel oak decreased 22% and, like sagebrush, the population shifted to a mature stand. Young plants accounted for 38% of the population, and decadence decreased to 4% of the population. The average height and crown widths increased 28 inches (71 cm) and 37 inches (94 cm), respectively. The increases in crown sizes of both sagebrush and Gambel oak is likely the result of above-average precipitation in 1995 and 1996 (Utah Climate Summaries 2007). The grass trend is stable. The sum of nested frequency of perennial grasses increased 36%, but perennial grasses remained a very small vegetative component. It is likely that cheatgrass, which was sampled in 96% of the quadrats and provided 8% cover, was limiting the establishment of perennial grasses. The forb trend is up. The sum of nested frequency of perennial forbs increased 33%. There was a significant decrease

in the nested frequency of showy golden-eye, and a significant increase in that of yellow salsify. The Desirable Components Index (DCI) score was poor due to the high preferred browse cover, low browse decadence, moderate browse recruitment, low perennial grass and forb cover, and high annual grass cover.

winter range condition (DCI) - poor (46) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - up (+2)

2002 TREND ASSESSMENT

The browse trend is up. The density of sagebrush increased 73%. The population continued to shift to a predominantly mature stand. No seedlings were sampled, and young plants decreased to 3% of the population. Decadence remained stable, and there was an 11% decrease in the density of dead plants. Vigor remained stable, and browse use remained light. The Gambel oak population density increased 18%. Young plants comprised 28% of the population, and decadence increased to 13%. The proportion of plants exhibiting poor vigor increased to 16%, most of which were classified as dying. Browse use shifted to light-moderate. The average height and crown measurements decreased 24 and 25 inches (61 and 64 cm), respectively. Again, the change in height and crown measurements was attributed to precipitation amounts. Both 2001 and 2002 were considered drought years for the Heber Valley (Utah Climate Summaries 2007). The grass trend is slightly down. Excluding bulbous bluegrass, the sum of nested frequency of perennial forbs increased 2%. Bulbous bluegrass and Japanese brome were sampled for the first time, and had quadrat frequencies of 5% and 34%, respectively. However, there was a significant decrease in the nested frequency of cheatgrass. The forb trend is down. Excluding leafy spurge, the sum of nested frequency of perennial forbs decreased 75%. Leafy spurge accounted for 68% of the perennial forb cover. The DCI score declined to poor due to a decrease in browse recruitment, a decrease in perennial forb cover, and the presence of a noxious weed species.

winter range condition (DCI) - poor (41) Mid-level potential scale
browse - up (+2) grass - slightly down (-1) forb - down (-2)

2007 TREND ASSESSMENT

The browse trend is down. The density of sagebrush decreased 29%. No young plants were sampled, and decadence increased to 24% of the population. Sagebrush plants exhibiting poor vigor increased to 29%, and 12% of the population was classified as dying. In addition to the poor vigor, 45% of the plants were infested with the sagebrush defoliator moth (*Aroga websteri*). Browse use shifted to moderate. The density of Gambel oak decreased 31%. Young plants comprised 20% of the population, and the percentage of decadent plants remained stable. The proportion of oak plants exhibiting poor vigor increased to 30%, and dying plants accounted for 6% of the population. Browse use on oak was light. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 30%. Although the decrease in perennial grasses was muted by the already low abundance, there was a significant increase in the nested frequency of cheatgrass. The forb trend is slightly down. Excluding noxious weeds, the sum of nested frequency of perennial forbs increased 6%. Leafy spurge continued to be the dominant perennial forb species. Additionally, dalmatian toadflax was sampled for the first time. The DCI score decreased to very poor-poor due to the increase in browse decadence and the presence of an additional noxious weed.

winter range condition (DCI) - very poor-poor (34) Mid-level potential scale
browse - down (-2) grass - down (-2) forb - slightly down (-1)

HERBACEOUS TRENDS --
Management unit 17 , Study no: 17

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'96	'02	'07	'96	'02	'07
G	<i>Agropyron spicatum</i>	-	-	-	a-	a3	-	.00	.00
G	<i>Bromus carinatus</i>	-	-	2	-	-	.00	-	-
G	<i>Bromus inermis</i>	-	a5	a10	-	-	.33	-	-
G	<i>Bromus japonicus</i> (a)	-	-	-	a81	a70	-	.70	.86
G	<i>Bromus tectorum</i> (a)	-	-	c336	a228	b280	8.16	8.21	4.71
G	<i>Poa bulbosa</i>	-	-	-	a17	a21	-	.86	1.44
G	<i>Poa fendleriana</i>	-	7	-	-	-	-	-	-
G	<i>Poa pratensis</i>	a10	ab18	b30	ab36	ab22	1.11	.56	.60
G	<i>Poa secunda</i>	-	a1	-	a7	a5	-	.56	.06
Total for Annual Grasses		0	0	336	309	350	8.16	8.91	5.57
Total for Perennial Grasses		10	31	42	60	51	1.44	1.98	2.10
Total for Grasses		10	31	378	369	401	9.61	10.90	7.68
F	<i>Alyssum alyssoides</i> (a)	-	-	a245	a198	b283	2.12	2.73	6.74
F	<i>Artemisia dracunculus</i>	a3	a2	-	-	-	-	-	-
F	<i>Artemisia ludoviciana</i>	a3	a3	a8	a1	a3	.33	.03	.06
F	<i>Aster chilensis</i>	-	-	-	-	-	-	-	.00
F	<i>Astragalus</i> sp.	-	-	-	1	-	-	.00	-
F	<i>Camelina microcarpa</i> (a)	-	-	-	a3	a4	-	.00	.01
F	<i>Calochortus nuttallii</i>	ab5	b21	-	a4	a2	-	.01	.01
F	<i>Chenopodium fremontii</i> (a)	-	-	a3	a5	-	.00	.04	-
F	<i>Cirsium</i> sp.	-	-	a9	a2	a4	.02	.04	.21
F	<i>Collomia linearis</i> (a)	-	-	a16	b36	a9	.04	.15	.04
F	<i>Collinsia parviflora</i> (a)	-	-	-	3	-	-	.00	-
F	<i>Cryptantha</i> sp.	-	2	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	-	-	14	-	-	.10
F	<i>Draba</i> sp. (a)	-	-	-	a2	b11	-	.00	.19
F	<i>Epilobium brachycarpum</i> (a)	-	-	a4	a5	a3	.04	.01	.00
F	<i>Eriogonum brevicaule</i>	-	-	-	1	-	-	.00	-
F	<i>Erodium cicutarium</i> (a)	-	-	-	-	3	-	-	.01
F	<i>Erigeron</i> sp.	-	-	a18	-	a21	.16	-	.32
F	<i>Eriogonum racemosum</i>	-	a4	a10	a3	a1	.03	.06	.00
F	<i>Euphorbia esula</i>	-	-	-	a114	a127	-	7.96	5.71
F	<i>Galium aparine</i> (a)	-	-	-	-	2	-	-	.03
F	<i>Gayophytum ramosissimum</i> (a)	-	-	-	a2	a3	-	.00	.00
F	<i>Heterotheca villosa</i>	-	-	-	-	-	.15	-	-

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'96	'02	'07	'96	'02	'07
F	Holosteum umbellatum (a)	-	-	-	_a 20	_a 21	-	.14	.11
F	Lactuca serriola	_a 3	_{ab} 14	_b 34	-	-	.24	-	-
F	Linaria dalmatica	-	-	-	-	13	-	-	.07
F	Lupinus argenteus	-	-	_a 5	_a 6	_a 4	.21	.45	.15
F	Polygonum douglasii (a)	-	-	_b 28	_a 8	_a 6	.05	.02	.01
F	Sisymbrium altissimum (a)	-	-	_a 6	_a 3	-	.07	.03	-
F	Taraxacum officinale	-	-	-	1	-	-	.03	-
F	Tragopogon dubius	_a 2	_{ab} 17	_c 93	_b 31	_{ab} 10	.76	.36	.05
F	Unknown forb-annual (a)	-	-	96	-	-	2.63	-	-
F	Verbascum thapsus	_a 2	_a 7	_a 6	-	-	.39	-	-
F	Vicia americana	-	_a 10	-	-	_a 3	-	-	.00
F	Viguiera multiflora	_a 6	_c 78	_b 31	_a 3	_{ab} 7	.36	.04	.09
F	Zigadenus paniculatus	-	_a 3	_a -	-	_a 1	.00	-	.00
Total for Annual Forbs		0	0	398	285	359	4.98	3.16	7.27
Total for Perennial Forbs		24	161	214	167	196	2.68	8.99	6.71
Total for Forbs		24	161	612	452	555	7.66	12.15	13.99

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

BROWSE TRENDS --

Management unit 17 , Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'96	'02	'07	'96	'02	'07
B	Artemisia tridentata vaseyana	37	60	51	8.92	18.89	15.18
B	Chrysothamnus viscidiflorus viscidiflorus	1	2	2	-	.03	.00
B	Gutierrezia sarothrae	44	31	12	2.31	1.21	.27
B	Purshia tridentata	3	10	9	.45	2.61	2.14
B	Quercus gambelii	31	23	22	7.17	5.42	4.88
Total for Browse		116	126	96	18.86	28.18	22.49

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 17

Species	Percent Cover	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	24.61	24.60
<i>Chrysothamnus viscidiflorus viscidiflorus</i>	.28	-
<i>Gutierrezia sarothrae</i>	1.93	.43
<i>Purshia tridentata</i>	5.21	4.86
<i>Quercus gambelii</i>	8.11	9.91

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 17

Species	Average leader growth (in)	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	2.6	1.2
<i>Purshia tridentata</i>	3.4	2.4

BASIC COVER --

Management unit 17 , Study no: 17

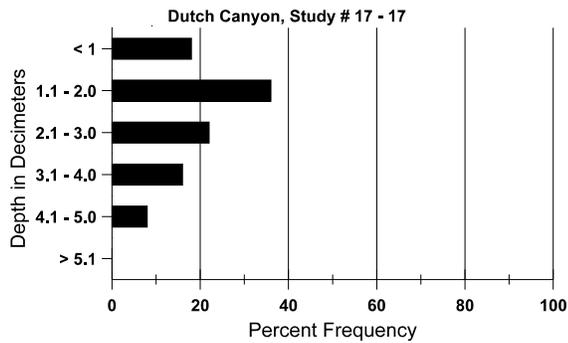
Cover Type	Average Cover %				
	'83	'89	'96	'02	'07
Vegetation	0	3.25	34.90	50.00	44.14
Rock	5.00	2.25	2.64	2.45	2.12
Pavement	6.00	11.50	2.76	2.95	3.27
Litter	67.25	78.50	71.23	58.48	65.83
Cryptogams	.25	0	.10	.30	.22
Bare Ground	21.50	4.50	2.18	11.38	6.58

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 17, Dutch Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	Sandy clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
19.7	49.3 (17.5)	6.9	48.2	25.4	28.4	2.5	32.9	160.0	.5

Stoniness Index



PELLET GROUP DATA --

Management unit 17 , Study no: 17

Type	Quadrat Frequency		
	'96	'02	'07
Sheep	1	-	-
Rabbit	6	8	7
Horse	-	-	1
Elk	-	2	8
Deer	25	24	28
Cattle	-	1	-

Days use per acre (ha)	
'02	'07
-	-
-	-
-	-
9 (23)	25 (63)
65 (160)	62 (152)
-	-

BROWSE CHARACTERISTICS --

Management unit 17 , Study no: 17

		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)
Amelanchier alnifolia												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
96	0	-	-	-	-	-	0	0	-	-	0	-/-
02	0	-	-	-	-	60	0	0	-	-	0	22/28
07	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
83	2798	-	866	1266	666	-	17	1	24	-	0	22/40
89	1366	100	300	466	600	-	22	5	44	2	2	23/22
96	1380	60	220	940	220	1060	0	0	16	10	10	23/43
02	2380	-	60	1960	360	940	15	2	15	3	10	27/44
07	1680	20	-	1280	400	860	62	12	24	12	29	30/47

		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)
Chrysothamnus viscidiflorus viscidiflorus												
83	0	-	-	-	-	-	0	0	-	-	0	-/-
89	0	-	-	-	-	-	0	0	-	-	0	-/-
96	20	-	-	20	-	-	0	0	-	-	0	19/40
02	60	-	-	60	-	-	0	0	-	-	0	20/32
07	60	-	-	60	-	-	0	0	-	-	0	21/37
Gutierrezia sarothrae												
83	499	366	133	366	-	-	0	0	0	-	0	9/11
89	4565	100	33	4166	366	-	0	0	8	-	0	11/13
96	2740	-	20	2100	620	500	0	0	23	2	2	8/13
02	1660	-	-	1500	160	140	0	0	10	6	6	9/11
07	300	-	-	280	20	-	0	0	7	7	7	9/11
Purshia tridentata												
83	66	-	-	66	-	-	0	100	-	-	0	13/25
89	100	-	-	100	-	-	33	67	-	-	0	15/31
96	80	-	-	80	-	-	75	25	-	-	0	19/87
02	220	-	20	200	-	-	9	73	-	-	0	17/76
07	240	-	20	220	-	40	8	83	-	-	0	22/73
Quercus gambelii												
83	1533	533	1333	100	100	-	37	0	7	-	0	39/21
89	2832	433	1666	800	366	-	42	1	13	-	0	30/13
96	2200	240	840	1280	80	340	2	0	4	-	0	58/50
02	2600	-	720	1540	340	380	28	8	13	13	16	34/25
07	1800	140	360	1240	200	200	17	6	11	6	30	52/34