

Trend Study 17-25-07

Study site name: North Battle Creek.

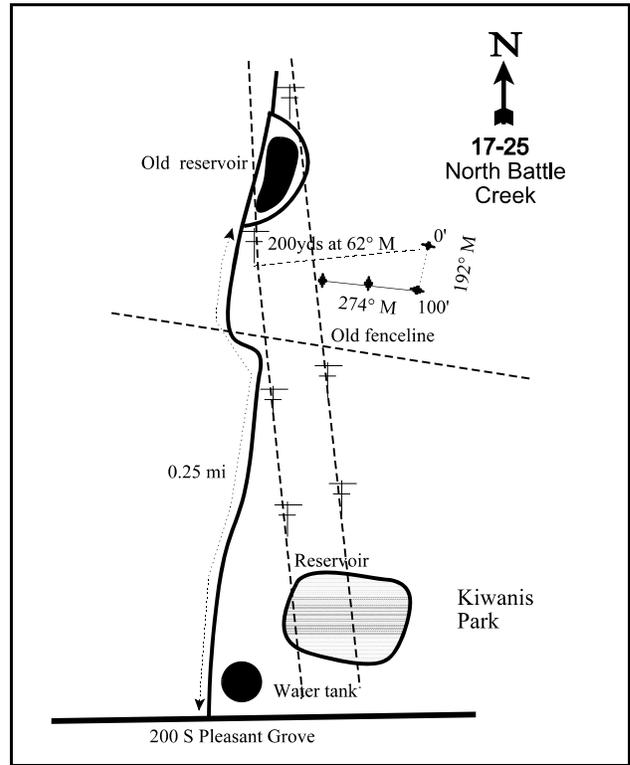
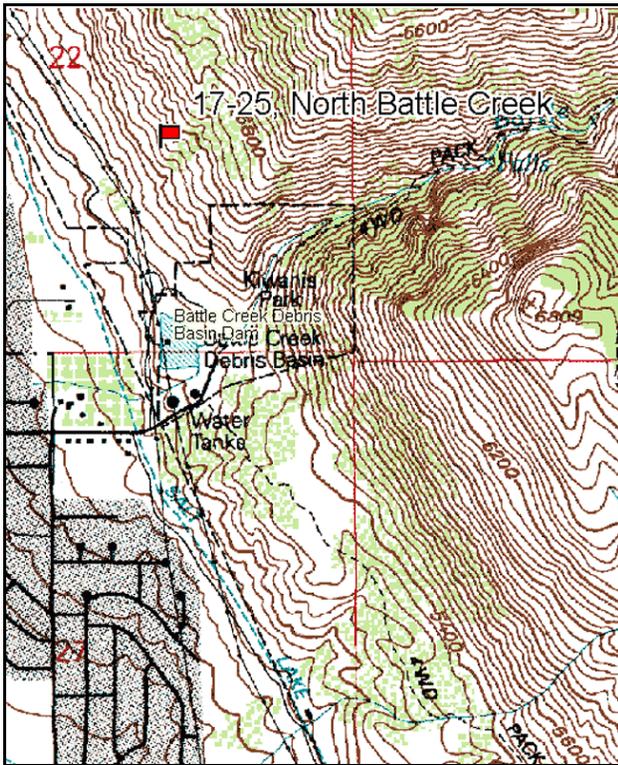
Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 192 degrees magnetic (lines 2 & 3 @ 274°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (34 & 71ft). Rebar: None on site.

LOCATION DESCRIPTION

From Pleasant Grove, go up 200 South towards Battle Creek Canyon. The paved road ends at a water tank. Follow one of the many dirt roads north along the base of the foothill under the powerlines. From the water tank, go about 1/4 mile to a 2<sup>nd</sup> reservoir. Stop on the south end. From the powerline pole on the south end of the old reservoir, the 0-foot stake is about 200 yards at 62 degrees magnetic. The study samples the first face or slope below the second terrace, in a fairly dense cliffrose type, just north of a small drainage. A red browse tag, #3988, is attached to the 0-foot stake.



Map Name: Orem

Diagrammatic Sketch

Township 5S, Range 2E, Section 22

GPS: NAD 83, UTM 12T 440346 E 4468842 N

## DISCUSSION

### North Battle Creek - Trend Study No. 17-25

#### Study Information

This study is located north of Battle Creek above the city of Pleasant Grove [elevation: 5,500 feet (1,676 m), slope: 65%, aspect: southwest]. The study is typical of the severe winter range in this area. The Battle Creek and Grove Creek debris basins, which act as small reservoirs in the spring, are located below the site to the north and south. Otherwise, the nearest perennial source of water is Grove Creek, which is located 0.7 miles (1.1 km) to the northwest. Residential subdivisions have been constructed up to the base of the hill just below the site. The area is moderately browsed by deer. From the pellet group transect, there were an estimated 44 deer days use/acre (109 ddu/ha) in 2002 and 72 deer days use/acre (177 ddu/ha) in 2007. There was one elk pellet group in 2002. Bighorn sheep use was estimated at 11 days use/acre (26 sdu/ha) in 2007. All pellet groups appeared to be from winter use. Three deer skeletons were found on the study in 2007.

#### Soil

The soil has a clay loam texture, a neutral reaction (pH of 7.1), and formed from limestone. The concentration of phosphorous is relatively low (6.4 ppm) and potassium is low (38.4 ppm). Values less than 6 ppm for phosphorus and 60 ppm for potassium may limit normal plant growth and development (Tiedemann and Lopez 2004). Rock cover is high on the lower half of the transect where the baseline crosses a talus slope. Relative rock and vegetation cover have each averaged 25% since 1997. The erosion condition was classified as slight in 2002 and improved to stable in 2007.

#### Browse

The dominant browse species is Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Cliffrose canopy cover increased from less than 1% in 2002 to 13% in 2007. The density of cliffrose increased from 332 plants/acre (822 plants/ha) in 1983 to 800 plants/acre (1,980 plants/ha) by 1997, then decreased to 640 plants/acre (1,584 plants/ha) by 2007. Few seedling or young plants have been sampled, and the population has consisted predominantly of mature plants. Decadence has ranged from 6% to 33% of the population and was highest in 1989 and 2002. Dead plants were first sampled in 1997, and have averaged 60 plants/acre (149 plants/ha). The proportion of plants exhibiting poor vigor was highest in 1983 (40%), but has been lower in successive sample years (0%-11%). The average annual leader growth was 1.1 inches (2.8 cm) in 2002 and 2.7 inches (6.8 cm) in 2007. Browse use has been moderate and heavy.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides some additional forage. Since 2002, canopy cover has been 1% or less. Prior to 1997, sagebrush was the dominant shrub and had an estimated density of approximately 1,000 plants/acre (2,475 plants/ha). When the sample area increased in 1997, the estimated density decreased to 220 plants/acre (545 plants/ha). In 2002 and 2007, the density was 120 plants/acre (297 plants/ha). No seedling or young plants have been sampled since 1989. Decadence increased from 0% in 1983 to 20% in 1989, decreased to 17% by 2002, and decreased to 0% in 2007. Vigor has been good, except in 1997 when 18% of the population was in poor vigor. The average annual leader growth was 2 inches (5.1 cm) in 2007. Browse use has ranged from light to moderate-heavy.

#### Herbaceous Understory

The herbaceous understory comprises approximately two-thirds of the vegetative ground cover. Perennial grasses provided 4% cover in 1997 and 2002, and decreased to 1% in 2007. Bluebunch wheatgrass (*Agropyron spicatum*) is the dominant perennial species. It has steadily declined in quadrat frequency from 46% in 1983 to 15% in 2007. Cheatgrass (*Bromus tectorum*) is the dominant annual species. It provided 3% cover in 1997, less than 1% in 2002, and 7% in 2007. Quadrat frequency decreased from 59% in 1997 to 18% in 2002, then increased to 72% in 2007. Other grasses that have been sampled at low frequencies include crested wheatgrass (*Agropyron cristatum*), Japanese brome (*Bromus japonicus*), bulbous bluegrass (*Poa*

*bulbosa*), Sandberg bluegrass (*Poa secunda*), and winter rye (*Secale cereale*).

Perennial forb cover decreased from 6% in 1997 to 4% in 2002, and 1% in 2007. The forb component is dominated by the annual species storksbill (*Erodium cicutarium*), catchweed bedstraw (*Galium aparine*), and bur buttercup (*Ranunculus testiculatus*). Bonneville pea (*Lathyrus brachycalyx*) and northern sweetvetch (*Hedysarum boreale*) have been the dominant perennial species. However, it is likely that these two species have been misidentified as they are difficult to distinguish without the flower. Two noxious weed species have been sampled; yellow starthistle (*Centaurea solstitialis*) and field bindweed (*Convolvulus arvensis*).

#### 1989 TREND ASSESSMENT

The browse trend is stable. The densities of cliffrose and sagebrush remained fairly stable. Cliffrose decadence increased from 20% to 33%, but the proportion of plants exhibiting poor vigor decreased from 40% to 0%. The young age class of sagebrush decreased from 20% to 0% of the population, and decadence increased from 0% to 20%. Browse use on sagebrush shifted from light to moderate. The grass trend is stable. The sum of nested frequency of perennial grasses decreased 7%. The forb trend is down. The sum of nested frequency of perennial forbs decreased 24%.

browse - stable (0)

grass - stable (0)

forb - down (-2)

#### 1997 TREND ASSESSMENT

The browse trend is slightly down. The density of cliffrose increased two-fold, yet that of sagebrush decreased 78%. These changes in density were attributed to the larger area sampled in 1997. Therefore, trend was determined from other parameters. Cliffrose decadence decreased to 10% and vigor remained good. Browse use on cliffrose shifted from moderate to heavy. Sagebrush decadence decreased slightly to 18% of the population, but all of these plants were classified as dying. Browse use on sagebrush shifted from moderate to moderate-heavy. The grass trend is down. The sum of nested frequency of perennial grasses decreased 47%, including a significant decrease in bluebunch wheatgrass. The forb trend is up. The sum of nested frequency of perennial forbs increased more than two-fold. The number of perennial forb species sampled increased from five to 12. However, field bindweed, a noxious weed, was sampled for the first time. The Desirable Components Index (DCI) score was very poor-poor due to the low preferred browse cover and recruitment, low perennial grass and forb cover, and the presence of one noxious weed species.

winter range condition (DCI) - ver poor-poor (37) Mid-level potential scale

browse - slightly down (-1)

grass - down (-2)

forb - up (+2)

#### 2002 TREND ASSESSMENT

The browse trend is slightly down. The density of cliffrose decreased 10%, and decadence increased to 31% of the population. Cliffrose plants with poor vigor increased to 11%, and all of those plants were classified as dying. The proportion of plants showing heavy use decreased from 90% of the population to 58%. The density of sagebrush decreased 45%, and most of the decrease was attributed to fewer mature plants. Decadence remained stable at 17%, yet plants with poor vigor decreased from 18% to 0% of the population. All of the sagebrush plants had moderate browse use. The grass trend is slightly up. Excluding bulbous bluegrass which was sampled for the first time, the sum of nested frequency of perennial grasses increased 4%. There was a significant decrease in the nested frequency of cheatgrass. The forb trend is stable. Excluding field bindweed, the sum of nested frequency of perennial forbs increased 6%. There were significant decreases in the nested frequencies of western ragweed (*Ambrosia psilostachya*), storksbill, Bonneville pea, prickly lettuce (*Lactuca serriola*), and bur buttercup. There was a significant increase in the nested frequency of wild onion (*Allium sp.*). The DCI score remained very poor-poor.

winter range condition (DCI) - very poor-poor (35) Mid-level potential scale

browse - slightly down (-1)

grass - slightly up (+1)

forb - stable (0)

2007 TREND ASSESSMENT

The browse trend is stable. The density of cliffrose decreased 11%. Young plants were sampled for the first time and comprised 3% of the population. The density of mature plants increased, while decadence decreased from 31% of the population to 6%. All of the decadent plants were classified as dying. Browse use on cliffrose shifted to light-moderate, and heavily browsed plants decreased from 58% of the population to 13%. The density of sagebrush remained stable, and all of the plants were mature and had good vigor. Browse use shifted to light-moderate. The grass trend is down. The sum of nested frequency of perennial grasses decreased 46%, and bluebunch wheatgrass was the only perennial species sampled. Cheatgrass increased significantly in nested frequency, and its average cover increased from less than 1% to 7%. Japanese brome was sampled for the first time, and had a quadrat frequency of 1%. The forb trend is down. Excluding noxious weeds, the sum of nested frequency of perennial forbs decreased 73%. Most of the decrease was attributed to the significant decrease in wild onion. There were significant increases in the nested frequencies of storksbill and pale alyssum (*Alyssum alyssoides*). A second noxious weed species, yellow starthistle, was sampled for the first time. The DCI score decreased to very poor due to a decrease in perennial grass and forb cover, an increase in annual grass cover, and the presence of an additional noxious weed species.

winter range condition (DCI) - very poor (20) Mid-level potential scale  
browse - stable (0)                      grass - down (-2)                      forb - down (-2)

HERBACEOUS TRENDS --  
 Management unit 17 , Study no: 25

T y p e	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Agropyron cristatum	-	-	<sub>a</sub> 1	<sub>a</sub> 7	-	.00	.18	-
G	Agropyron spicatum	<sub>bc</sub> 128	<sub>c</sub> 117	<sub>ab</sub> 65	<sub>ab</sub> 71	<sub>a</sub> 42	3.48	3.71	1.42
G	Bromus japonicus (a)	-	-	-	-	3	-	-	.00
G	Bromus tectorum (a)	-	-	<sub>b</sub> 159	<sub>a</sub> 38	<sub>c</sub> 216	2.51	.24	7.43
G	Poa bulbosa	-	-	-	2	-	-	.00	-
G	Poa secunda	<sub>a</sub> 15	<sub>a</sub> 13	<sub>a</sub> 6	-	-	.18	-	-
G	Secale cereale (a)	-	-	<sub>a</sub> 2	-	<sub>b</sub> 37	.00	-	.88
G	Unknown grass - perennial	-	<sub>a</sub> 3	<sub>a</sub> 3	-	-	.03	-	-
<b>Total for Annual Grasses</b>		<b>0</b>	<b>0</b>	<b>161</b>	<b>38</b>	<b>256</b>	<b>2.51</b>	<b>0.24</b>	<b>8.31</b>
<b>Total for Perennial Grasses</b>		<b>143</b>	<b>133</b>	<b>75</b>	<b>80</b>	<b>42</b>	<b>3.70</b>	<b>3.90</b>	<b>1.42</b>
<b>Total for Grasses</b>		<b>143</b>	<b>133</b>	<b>236</b>	<b>118</b>	<b>298</b>	<b>6.22</b>	<b>4.14</b>	<b>9.74</b>
F	Alyssum alyssoides (a)	-	-	<sub>a</sub> 81	<sub>a</sub> 60	<sub>b</sub> 140	.30	.30	.84
F	Allium sp.	<sub>a</sub> 20	<sub>a</sub> 6	<sub>a</sub> 16	<sub>b</sub> 121	<sub>a</sub> 2	.08	.86	.00
F	Ambrosia psilostachya	-	-	<sub>b</sub> 13	<sub>a</sub> 1	<sub>a</sub> 4	.21	.00	.18
F	Artemisia ludoviciana	-	-	5	-	-	.30	-	-
F	Astragalus sp.	-	-	-	1	-	-	.03	-
F	Camelina microcarpa (a)	-	-	-	-	7	-	-	.01
F	Centaurea solstitialis	-	-	-	-	12	-	-	.07
F	Cirsium undulatum	-	-	<sub>a</sub> 1	<sub>a</sub> 2	-	.00	.03	-

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	<i>Convolvulus arvensis</i>	-	-	<sub>a</sub> 11	<sub>ab</sub> 14	<sub>b</sub> 19	.36	.49	.16
F	<i>Descurainia pinnata</i> (a)	-	-	-	-	2	-	-	.00
F	<i>Epilobium brachycarpum</i> (a)	-	-	<sub>a</sub> 4	<sub>a</sub> 7	-	.01	.02	-
F	<i>Erodium cicutarium</i> (a)	-	-	<sub>b</sub> 213	<sub>a</sub> 91	<sub>b</sub> 196	6.43	1.01	3.82
F	<i>Galium aparine</i> (a)	-	-	<sub>b</sub> 59	<sub>c</sub> 99	<sub>a</sub> 31	.84	2.61	.55
F	<i>Grindelia squarrosa</i>	-	-	-	-	-	-	-	.03
F	<i>Hackelia patens</i>	-	-	<sub>a</sub> 14	<sub>a</sub> 10	<sub>a</sub> 7	.05	.07	.04
F	<i>Hedysarum boreale</i>	<sub>b</sub> 57	<sub>b</sub> 52	-	<sub>a</sub> 7	<sub>a</sub> 3	-	.01	.03
F	<i>Lathyrus brachycalyx</i>	-	-	<sub>b</sub> 111	<sub>a</sub> 58	<sub>a</sub> 28	4.23	2.51	.25
F	<i>Lactuca serriola</i>	-	-	<sub>b</sub> 17	<sub>a</sub> 1	<sub>a</sub> 7	.16	.00	.03
F	<i>Machaeranthera canescens</i>	<sub>a</sub> 2	<sub>a</sub> 1	-	-	-	-	-	.00
F	<i>Medicago sativa</i>	-	-	3	-	-	.03	-	-
F	<i>Oenothera latifolia</i>	2	-	-	-	-	-	-	-
F	<i>Phlox longifolia</i>	<sub>a</sub> 6	<sub>a</sub> 13	<sub>a</sub> 11	<sub>a</sub> 9	-	.05	.05	-
F	<i>Ranunculus testiculatus</i> (a)	-	-	<sub>b</sub> 166	<sub>a</sub> 124	<sub>a</sub> 89	1.64	.95	.68
F	<i>Sisymbrium altissimum</i> (a)	-	-	<sub>a</sub> 3	<sub>a</sub> 4	<sub>a</sub> 1	.00	.01	.03
F	<i>Stanleya pinnata</i>	<sub>a</sub> 24	<sub>a</sub> 12	-	-	-	-	-	-
F	<i>Taraxacum officinale</i>	-	-	<sub>a</sub> 6	<sub>a</sub> 2	-	.07	.03	-
F	<i>Tragopogon dubius</i>	-	-	<sub>a</sub> 18	<sub>a</sub> 16	<sub>a</sub> 10	.11	.08	.04
F	Unknown forb-annual (a)	-	-	<sub>a</sub> 1	<sub>b</sub> 44	-	.15	1.33	-
Total for Annual Forbs		0	0	527	429	466	9.38	6.26	5.95
Total for Perennial Forbs		111	84	226	242	92	5.66	4.19	0.86
Total for Forbs		111	84	753	671	558	15.05	10.46	6.82

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

BROWSE TRENDS --

Management unit 17 , Study no: 25

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	<i>Artemisia tridentata vaseyana</i>	8	5	6	.83	.36	.60
B	<i>Celtis reticulata</i>	0	0	1	-	-	-
B	<i>Chrysothamnus nauseosus albicaulis</i>	2	2	1	.78	.38	-
B	<i>Cowania mexicana stansburiana</i>	32	26	25	7.41	8.80	6.78
B	<i>Gutierrezia sarothrae</i>	12	6	4	.56	.39	-
B	<i>Purshia tridentata</i>	0	4	0	-	.30	-
Total for Browse		54	43	37	9.59	10.23	7.38

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 25

Species	Percent Cover	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	.21	1.39
<i>Chrysothamnus nauseosus albicaulis</i>	-	-
<i>Cowania mexicana stansburiana</i>	.16	12.71
<i>Gutierrezia sarothrae</i>	-	.21

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 25

Species	Average leader growth (in)	
	'02	'07
<i>Artemisia tridentata vaseyana</i>	-	2.0
<i>Cowania mexicana stansburiana</i>	1.1	2.7

**BASIC COVER --**

Management unit 17 , Study no: 25

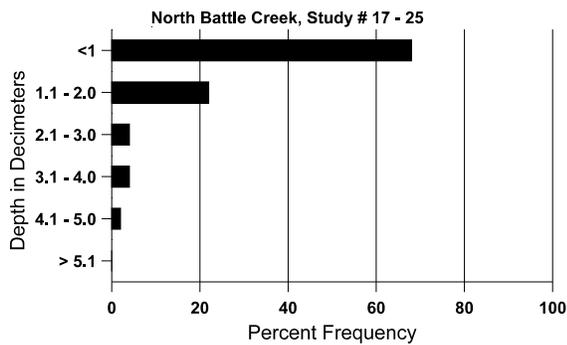
Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	3.50	7.00	30.84	26.16	26.63
Rock	8.75	20.50	28.40	32.22	22.88
Pavement	20.25	26.00	11.94	9.89	19.18
Litter	48.75	30.50	19.88	15.82	25.24
Cryptogams	.75	.25	.01	.04	0
Bare Ground	18.00	15.75	16.89	27.09	20.08

**SOIL ANALYSIS DATA --**

Herd Unit 17, Study no: 25, North Battle Creek

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%OM	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
12.7	52.3 (15.4)	7.1	28.0	33.4	38.6	2.9	6.4	38.4	.6

**Stoniness Index**



**PELLET GROUP DATA --**

Management unit 17 , Study no: 25

Type	Quadrat Frequency		
	'97	'02	'07
Sheep	-	-	-
Rabbit	-	-	2
Elk	-	1	3
Deer	47	18	22

Days use per acre (ha)	
'02	'07
-	11 (26)
-	-
1 (2)	-
44 (109)	72 (177)

BROWSE CHARACTERISTICS --  
Management unit 17 , Study no: 25

		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>												
83	<b>1066</b>	-	200	866	-	-	0	0	0	-	0	20/35
89	<b>1000</b>	-	-	800	200	-	100	0	20	-	7	22/26
97	<b>220</b>	-	-	180	40	80	36	55	18	18	18	26/40
02	<b>120</b>	-	-	100	20	80	100	0	17	-	0	28/46
07	<b>120</b>	-	-	120	-	120	67	0	0	-	0	31/53
<i>Celtis reticulata</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
07	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<i>Chrysothamnus nauseosus albicaulis</i>												
83	<b>66</b>	-	-	66	-	-	0	0	0	-	0	23/30
89	<b>66</b>	-	-	66	-	-	100	0	0	-	0	20/37
97	<b>60</b>	-	-	20	40	-	0	0	67	67	67	22/30
02	<b>40</b>	-	20	-	20	20	0	0	50	50	50	18/33
07	<b>20</b>	-	-	-	20	-	0	0	100	100	100	27/38
<i>Cowania mexicana stansburiana</i>												
83	<b>332</b>	-	-	266	66	-	60	40	20	-	40	50/60
89	<b>399</b>	-	-	266	133	-	83	17	33	-	0	58/59
97	<b>800</b>	-	-	720	80	40	10	90	10	3	3	50/57
02	<b>720</b>	20	-	500	220	80	11	58	31	11	11	54/63
07	<b>640</b>	-	20	580	40	60	56	13	6	6	9	59/66
<i>Gutierrezia sarothrae</i>												
83	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
97	<b>860</b>	-	120	740	-	-	0	0	0	-	0	9/11
02	<b>140</b>	-	-	60	80	200	0	0	57	43	43	7/15
07	<b>80</b>	-	-	80	-	-	0	0	0	-	0	14/15

		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>Purshia tridentata</i>												
83	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
89	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
97	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
02	<b>80</b>	40	20	60	-	-	25	50	-	-	0	13/8
07	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-