

TUCSON HOLLOW - TREND STUDY NO. 5-2-11

Vegetation Type: Mountain Brush

Range Type: Crucial Deer Winter

NRCS Ecological Site Description: [Mountain Loam \(Mountain Big Sagebrush\), R047XA430UT](#)

Land Ownership: Private

Elevation: 5,720 ft (1,744 m)

Aspect: South

Slope: 3%

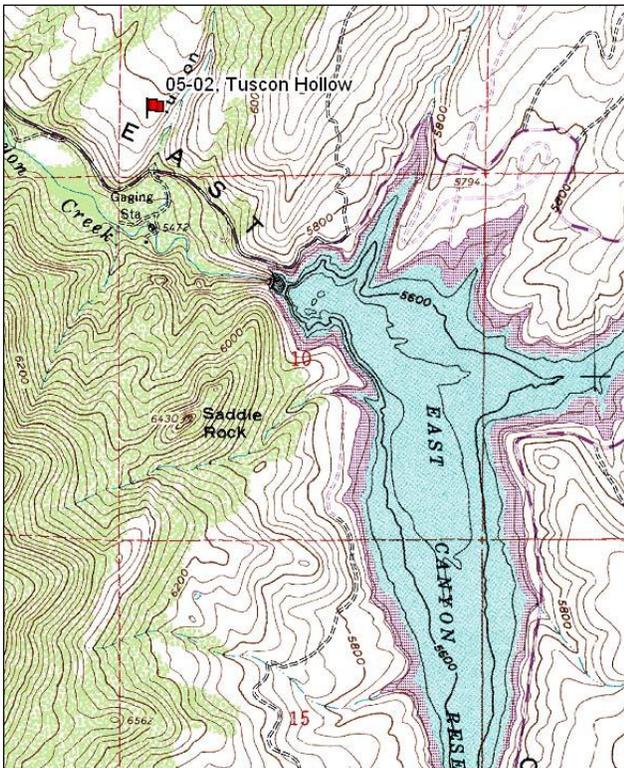
Transect bearing: 204° magnetic

Belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95 ft)

Directions:

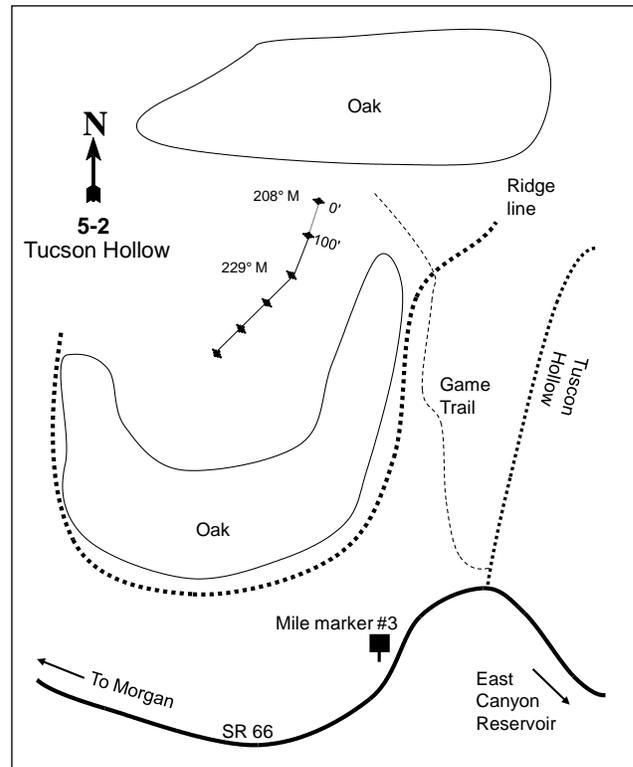
From the dam at East Canyon Reservoir, proceed 0.2 miles northwest past Tucson Hollow, and stop near mile marker 3. Walk up the slope following a game trail (to the northeast) to the plateau. Walk through the oak stand bordering the ridge line continuing northeast to an opening in the oak. Look for a full high fence post on the north side of the opening. This full high fence post is the 0-foot stake. The baseline runs 208 degrees magnetic. At the 200-foot baseline stake the baseline doglegs and runs 229 degrees magnetic.

Map Name: East Canyon Reservoir



Township: 2N Range: 3E Section: 3

Diagrammatic Sketch:



GPS: NAD 83, UTM 12S 448863 E 4530807 N

TUCSON HOLLOW - TREND STUDY NO. 5-2

Site Information

Site Description: This study is located on a nearly level bench just northwest of East Canyon Reservoir. It was originally placed in a nearby thick patch of Gambel oak (*Quercus gambelii*) brush. Because there was very little apparent utilization in the dense oak, the study was moved just south of the original study in 1996. The study now samples a basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and grass opening about 25 to 30 acres in size that is surrounded on three sides by oak clones. In 1990, three winter-killed deer and several shed antlers were found in the immediate vicinity. Deer and elk pellet groups are scattered throughout the area. In addition, deer pellet groups were sampled in moderate abundance in 2001, high abundance in 2006, and low abundance in 2011. Elk pellet groups were sampled in moderate abundance in 2006, but low abundance in 2011 (Table - Pellet Group Data).

Browse: The site supports a variety of browse species, but basin big sagebrush and stickyleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) have provided the majority of the browse cover. Sagebrush on the site displays characteristics of both basin big sagebrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and is considered the key browse species. All sagebrush was classified as basin big sagebrush for the purposes of this study. The sagebrush population is moderately dense and is centered within the mature demographic. The decadent age class within the sagebrush population has varied little and is a moderate component of the population. The sagebrush population is all available for browsing, and is lightly to moderately hedged. Decadence in the population is moderate, but poor vigor is low. Recruitment of young basin big sagebrush plants was nominal over the early years of the study, but was good in 2011. The average height and crown measurements increased steadily from 1996-2006, but decreased slightly in 2011. Although the defoliator moth (*Aroga websteri*) was identified on the East Canyon Reservoir study (5-3) less than 1.5 miles to the east, no evidence of the moth was identified on this study (Table - Browse Characteristics).

Other common shrub species sampled on the site include stickyleaf low rabbitbrush and Oregon grape (*Mahonia repens*). Less frequent shrubs found on the site are antelope bitterbrush (*Purshia tridentata*), Saskatoon serviceberry (*Amelachier alnifolia*) and chokecherry (*Prunus virginiana*), which are scattered throughout the site and display moderate to heavy hedging. Bitterbrush has displayed the heaviest use with most of the available plants exhibiting a clubbed growth form (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is productive with high diversity. The weedy annual species cheatgrass (*Bromus tectorum*) and Japanese chess (*B. japonicus*) have dominated the understory throughout the duration of the study. The undesirable perennial grass species bulbous bluegrass (*Poa bulbosa*) has increased steadily over the course of the study. Other common perennial species include Sandberg bluegrass (*P. secunda*), Kentucky bluegrass (*P. pratensis*), bluebunch wheatgrass (*Agropyron spicatum*), and Great Basin wildrye (*Elymus cinereus*). A compositional transition took place in 2001 with a decline in annual grasses, and an increase in perennial grasses. The forb community is highly diverse. Some of the common forbs include silvery lupine (*Lupinus argenteus*), cutleaf balsamroot (*Balsamorhiza macrophylla*), oneflower helianthella (*Helianthella uniflora*), yellow salsify (*Tragopogon dubius*), and Pacific aster (*Aster chilensis*). Other forbs occur in relatively low numbers and contribute little to the overall herbaceous understory cover (Table - Herbaceous Trends).

Soil: The soil is part of the Manila component, which is found on lake terraces and mountain slopes. The parent material consists of slope alluvium and/or colluvium derived from sandstone and quartzite (Soil Survey Staff 2011). The soil texture is a clay loam and is slightly acidic (pH 6.5). Few rocks were encountered in the soil profile. Bare ground cover is fairly low. Protective ground cover consists of a high amount of vegetation and litter cover that preclude soil erosion (Table - Basic Cover). The soil erosion condition has been classified as stable since 2001.

Trend Assessments

Browse:

- **1996 to 2001 - slightly down (-1):** The density of basin big sagebrush decreased 13% from 1,400 plants/acre to 1,220 plants/acre, though cover increased slightly from 7% to 8%. The sagebrush population decreased slightly in decadence from 19% to 15%. The sagebrush population had a negligible decrease in poor vigor from 9% to 8%. Recruitment of young sagebrush decreased from 6% to 0% of the overall population.
- **2001 to 2006 - down (-2):** The density for basin big sagebrush decreased 30% to 860 plants/acre, but cover increased to 10%. Decadence within the sagebrush population increased to 23%. The sagebrush population decreased slightly in poor vigor to 5%. Recruitment of young sagebrush increased to 5% of the overall population.
- **2006 to 2011 - slightly up (+1):** The density of basin big sagebrush increased 19% to 1,020 plants/acre, but cover decreased to 7%. Most of the increase in density was due to an increase in the recruitment of young plants, which increased to 25% of the population. Decadence within the sagebrush population decreased to 16%. The sagebrush population increased in poor vigor to 14%.

Grass:

- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased over two-fold. The perennial grass species Sandberg bluegrass and Kentucky bluegrass increased significantly in nested frequency. Sandberg bluegrass increased in cover from 3% to 20%, and comprised the bulk of herbaceous production. The undesirable species bulbous bluegrass was sampled for the first time at 2% cover. The weedy annual species Japanese chess decreased significantly in nested frequency, and decreased in cover from 15% to 1%.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, decreased 25%. Oniongrass (*Melica bulbosa*) and thickspike wheatgrass (*Agropyron dasystachyum*) had a significant increase in nested frequency. Sandberg bluegrass decreased significantly in nested frequency, and decreased in cover to 11%. The weedy annual species cheatgrass increased significantly in nested frequency, and increased in cover from 2% to 10%.
- **2006 to 2011 - stable (0):** The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, remained similar. Bluebunch wheatgrass and Kentucky bluegrass increased significantly in nested frequency. The weedy species bulbous bluegrass increased significantly in nested frequency, and increased in cover from 2% to 4%. The weedy annual species cheatgrass decreased significantly in nested frequency, and decreased in cover from 10% to 4%.

Forb:

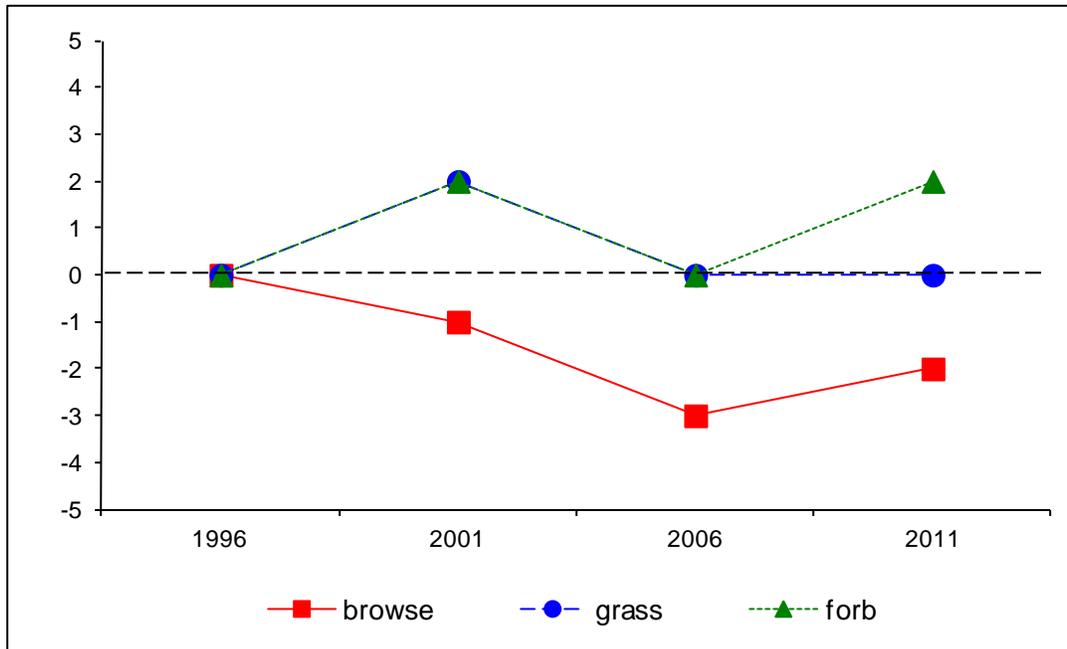
- **1996 to 2001 - up (+2):** The sum of nested frequency for perennial forbs increased over two-fold. Wild onion (*Allium sp.*), Pacific aster, and American vetch (*Vicia americana*) increased significantly in nested frequency. Hoary aster (*Machaeranthera canescens*) had a significant decrease in nested frequency. Silvery lupine increased in cover from 2% to 3%.
- **2001 to 2006 - down (-2):** The sum of nested frequency for perennial forbs decreased 22%. American vetch increased significantly in nested frequency and maintained cover near 3%. Wild onion decreased significantly in nested frequency.
- **2006 to 2011 - up (+2):** The sum of nested frequency for perennial forbs increased 54%. Wild onion and woodland-star (*Lithophragma sp.*) had a significant increase in nested frequency. The annual species prickly lettuce (*Lactuca serriola*) increased significantly in nested frequency.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
 Management unit 5, study no: 2

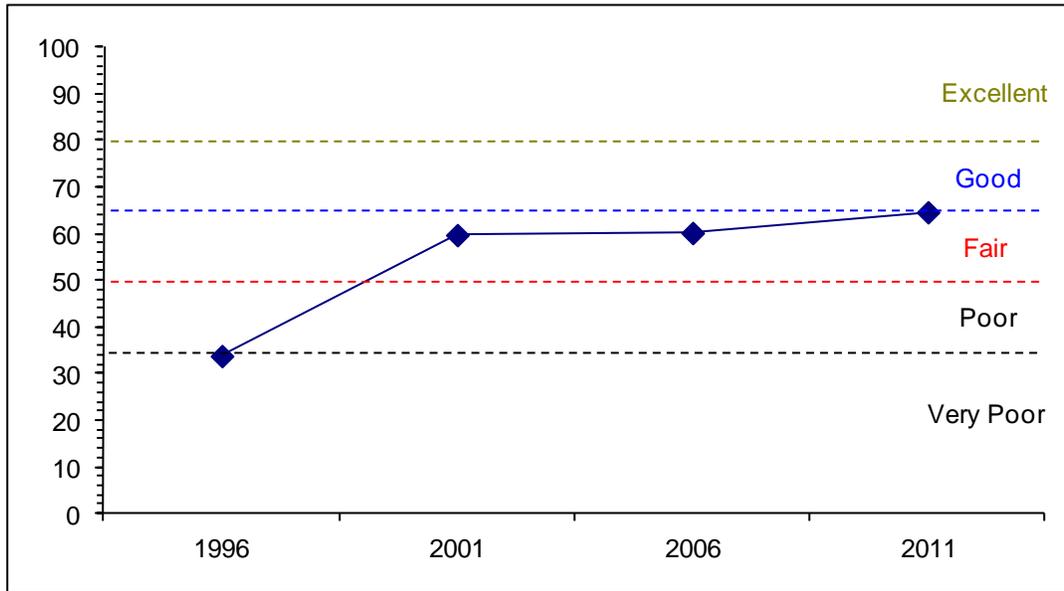
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover (-POBU)	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	15.4	11.3	2.6	9.0	-14.5	10.0	0.0	33.8	Very Poor-Poor
01	15.4	6.5	0.0	30.0	-2.1	10.0	0.0	59.7	Fair
06	15.8	8.7	4.3	29.1	-7.6	10.0	0.0	60.2	Fair
11	11.4	11.4	9.5	30.0	-7.6	10.0	0.0	64.6	Fair-Good

Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
 Management unit 5 Study no: 2



DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL--
 Management unit 5, Study no: 2



HERBACEOUS TRENDS--
 Management unit 05, Study no: 2

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
G	Agropyron dasystachyum	a-	a4	b19	a3	-	.03	.04	.15
G	Agropyron intermedium	-	3	-	-	-	.06	-	-
G	Agropyron spicatum	a33	a33	a32	b73	1.09	1.66	2.26	4.44
G	Bromus japonicus (a)	c344	a114	ab150	b180	14.94	.69	.65	6.05
G	Bromus tectorum (a)	b216	a136	c334	ab177	4.38	2.17	9.53	4.08
G	Elymus cinereus	2	1	8	3	.01	.63	.53	.85
G	Melica bulbosa	a-	a5	b21	ab9	-	.15	.38	.36
G	Poa bulbosa	a-	b41	b49	c93	-	1.50	1.64	4.21
G	Poa pratensis	a19	b71	a25	c117	.25	2.20	.58	3.00
G	Poa secunda	a141	c315	b220	a122	3.16	19.95	10.71	8.24
Total for Annual Grasses		560	250	484	357	19.32	2.86	10.19	10.13
Total for Perennial Grasses		195	473	374	420	4.51	26.21	16.17	21.27
Total for Grasses		755	723	858	777	23.84	29.07	26.36	31.40
F	Achillea millefolium	a49	a61	ab69	b96	1.00	1.93	3.67	6.02
F	Agoseris glauca	-	16	19	7	-	.08	.15	.04
F	Allium sp.	a-	c137	b33	d194	-	1.44	.10	3.17
F	Alyssum alyssoides (a)	a17	b65	ab57	c146	.08	.73	.15	2.01
F	Artemisia ludoviciana	-	1	-	-	-	.03	-	-
F	Aster chilensis	a27	b50	ab30	a27	2.05	1.79	.79	1.04
F	Astragalus convallarius	ab3	b15	ab10	a1	.05	.25	.11	.00
F	Balsamorhiza macrophylla	11	14	13	17	.91	2.16	2.37	1.81
F	Balsamorhiza sagittata	-	5	4	8	-	.81	.54	.18
F	Camelina microcarpa (a)	3	17	13	5	.01	.13	.03	.03

Type	Species	Nested Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
F	<i>Cirsium undulatum</i>	b24	a4	a3	a-	.33	.07	.03	.00
F	<i>Collinsia parviflora</i> (a)	a-	c117	b53	b37	-	1.07	.24	.33
F	<i>Collomia grandiflora</i> (a)	5	6	9	4	.00	.03	.04	.03
F	<i>Comandra pallida</i>	17	24	22	16	.21	.42	.43	.08
F	<i>Crepis acuminata</i>	6	14	1	8	.06	.57	.24	.04
F	<i>Cynoglossum officinale</i>	4	4	3	-	.21	.15	.03	-
F	<i>Descurainia pinnata</i> (a)	b28	a-	a-	b20	.59	-	-	.22
F	<i>Draba sp.</i> (a)	a2	a10	b46	c89	.00	.04	.09	1.19
F	<i>Epilobium brachycarpum</i> (a)	a-	a3	c108	b80	-	.01	.68	2.58
F	<i>Erodium cicutarium</i> (a)	a-	a5	ab11	b30	-	.15	.16	.41
F	<i>Galium aparine</i> (a)	a23	a29	b59	c104	.17	.61	.47	2.81
F	<i>Gayophytum ramosissimum</i> (a)	b57	a-	a-	a9	.55	-	-	.03
F	<i>Helianthella uniflora</i>	a12	a19	ab28	b42	1.76	1.92	6.05	5.30
F	<i>Heterotheca villosa</i>	-	5	-	-	-	1.58	-	-
F	<i>Holosteum umbellatum</i> (a)	a18	a25	b56	b56	.40	.66	.15	.46
F	<i>Lactuca serriola</i> (a)	b29	ab22	a4	b44	.13	.76	.03	.66
F	<i>Lappula occidentalis</i> (a)	a5	ab48	b34	c172	.15	.14	.08	2.33
F	<i>Lithophragma sp.</i>	a-	a-	a-	b23	-	-	-	.11
F	<i>Lithospermum ruderales</i>	-	-	-	6	.03	-	-	.18
F	<i>Lomatium sp.</i>	8	-	-	-	.04	-	-	-
F	<i>Lupinus argenteus</i>	28	37	41	41	1.93	3.34	2.73	1.99
F	<i>Machaeranthera canescens</i>	b12	a-	a-	a-	.05	-	-	-
F	<i>Melilotus officinalis</i>	-	-	1	-	-	-	.15	-
F	<i>Microsteris gracilis</i> (a)	a-	a-	b39	b45	-	-	.08	.50
F	<i>Nemophila breviflora</i> (a)	-	-	8	8	-	-	.06	.21
F	<i>Phlox longifolia</i>	-	22	-	-	-	.09	-	-
F	<i>Polygonum douglasii</i> (a)	b51	a6	b49	b43	.19	.01	.11	.37
F	<i>Ranunculus testiculatus</i> (a)	-	7	21	14	-	.01	.09	.05
F	<i>Senecio integerrimus</i>	-	2	1	9	-	.03	.05	.36
F	<i>Sisymbrium altissimum</i> (a)	a13	b33	a12	ab29	.27	1.25	.25	.56
F	<i>Taraxacum officinale</i>	a-	b12	b6	b30	-	.16	.25	.36
F	<i>Tragopogon dubius</i> (a)	a41	b153	a31	a48	.55	4.56	.21	1.21
F	<i>Veronica biloba</i> (a)	a-	a-	a-	b23	-	-	-	1.08
F	<i>Vicia americana</i>	a21	b117	c155	bc150	.10	2.57	3.14	4.53
Total for Annual Forbs		292	546	610	1006	3.14	10.21	2.97	17.14
Total for Perennial Forbs		222	559	439	675	8.77	19.45	20.87	25.26
Total for Forbs		514	1105	1049	1681	11.92	29.66	23.85	42.40

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

BROWSE TRENDS--

Management unit 05, Study no: 2

T y p e	Species	Strip Frequency				Average Cover %			
		'96	'01	'06	'11	'96	'01	'06	'11
B	Amelanchier alnifolia	2	3	2	1	.18	.00	.15	.00
B	Artemisia tridentata tridentata	46	39	35	35	6.76	7.79	9.46	6.59
B	Chrysothamnus nauseosus albicaulis	2	0	2	1	.38	-	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	43	45	43	35	6.92	8.61	6.84	4.80
B	Gutierrezia sarothrae	0	1	1	5	-	.03	-	.78
B	Mahonia repens	41	42	49	40	2.50	1.93	3.28	4.68
B	Purshia tridentata	8	6	7	8	4.13	3.76	2.48	2.09
B	Symphoricarpos oreophilus	6	4	6	5	1.06	.91	1.75	1.51
Total for Browse		148	140	145	130	21.95	23.06	23.97	20.48

CANOPY COVER, LINE INTERCEPT--

Management unit 05, Study no: 2

Species	Percent Cover	
	'06	'11
Amelanchier alnifolia	.11	.23
Artemisia tridentata tridentata	10.44	6.08
Chrysothamnus nauseosus albicaulis	.33	.26
Chrysothamnus viscidiflorus viscidiflorus	8.83	5.55
Mahonia repens	3.08	4.43
Purshia tridentata	4.83	3.09
Symphoricarpos oreophilus	1.46	1.43

KEY BROWSE ANNUAL LEADER GROWTH--

Management unit 05, Study no: 2

Species	Average leader growth (in)		
	'01	'06	'11
Artemisia tridentata tridentata	3.8	3.7	2.8
Purshia tridentata	3.2	2.0	1.6

BASIC COVER--

Management unit 05, Study no: 2

Cover Type	Average Cover %			
	'96	'01	'06	'11
Vegetation	57.73	72.55	68.09	78.29
Rock	1.45	1.56	1.25	1.30
Pavement	.71	.32	.44	.06
Litter	68.56	52.19	47.06	38.18
Cryptogams	.01	0	.22	.00
Bare Ground	3.37	3.33	3.50	4.11

SOIL ANALYSIS DATA --

Management unit 05, Study no: 2, Study Name: Tucson Hollow

Effective rooting depth (in)	pH	Clay-Loam			%OM	PPM P	PPM K	ds/m
		% sand	% silt	% clay				
12.5	6.5	33.9	37.1	29.0	4.2	29.8	304.0	0.6

PELLET GROUP DATA--

Management unit 05, Study no: 2

Type	Quadrat Frequency				Days use per acre (ha)		
	'96	'01	'06	'11	'01	'06	'11
Rabbit	6	1	7	1	-	-	-
Elk	5	1	-	-	-	24 (60)	8 (20)
Deer	17	17	32	8	31 (76)	69 (170)	7 (17)
Cattle	-	1	-	-	-	-	-

BROWSE CHARACTERISTICS--

Management unit 05, Study no: 2

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization			Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy	% poor vigor	
Amelanchier alnifolia									
96	40	0	100	-	-	50	50	0	27/29
01	60	33	67	-	-	0	67	0	34/28
06	40	0	100	-	-	50	50	0	34/33
11	20	0	100	-	-	0	100	0	41/39
Artemisia tridentata tridentata									
96	1400	6	76	19	-	31	0	9	26/35
01	1220	0	85	15	-	5	0	8	31/38
06	860	5	72	23	140	42	12	5	33/44
11	1020	25	59	16	-	22	0	14	29/39
Chrysothamnus nauseosus albicaulis									
96	60	33	67	-	-	0	0	33	53/68
01	0	0	0	-	-	0	0	0	-/-
06	60	33	67	-	-	0	0	0	33/41
11	20	0	100	-	-	0	0	0	23/33
Chrysothamnus viscidiflorus viscidiflorus									
96	1620	1	96	2	-	1	0	0	20/37
01	1740	1	94	5	-	0	0	0	21/33
06	1540	4	70	26	-	4	0	5	20/31
11	1120	11	89	0	-	0	0	0	12/23
Gutierrezia sarothrae									
96	0	0	0	-	-	0	0	0	12/9
01	60	0	100	-	-	0	0	0	-/-
06	20	0	100	-	-	0	0	0	14/25
11	140	29	71	-	-	14	0	0	12/13

Year	Plants per Acre (excluding seedlings)	Age class distribution			Seedling (plants/acre)	Utilization		% poor vigor	Average Height Crown (in)
		% Young	% Mature	% Decadent		% moderate	% heavy		
Mahonia repens									
96	8680	16	84	-	80	0	0	0	5/6
01	18740	4	96	-	-	0	0	0	4/5
06	16360	3	97	-	-	0	0	0	4/5
11	17720	0	100	-	-	0	0	0	5/6
Prunus virginiana									
96	0	0	0	-	-	0	0	0	21/15
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	73/66
Purshia tridentata									
96	200	0	100	0	-	0	100	0	38/63
01	180	0	44	56	-	11	89	22	30/66
06	260	23	62	15	-	0	46	8	34/60
11	200	0	100	0	-	60	10	0	30/62
Quercus gambelii									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	77/57
11	0	0	0	-	-	0	0	0	-/-
Rosa woodsii									
96	0	0	0	-	-	0	0	0	-/-
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	16/11
Sambucus cerulea									
96	0	0	0	-	-	0	0	0	93/81
01	0	0	0	-	-	0	0	0	-/-
06	0	0	0	-	-	0	0	0	-/-
11	0	0	0	-	-	0	0	0	63/69
Symphoricarpos oreophilus									
96	240	17	83	0	-	0	17	0	21/30
01	140	0	100	0	-	0	0	0	24/41
06	160	13	75	13	-	0	0	13	23/42
11	120	0	100	0	-	0	0	0	31/55