Trend Study 16A-17-07

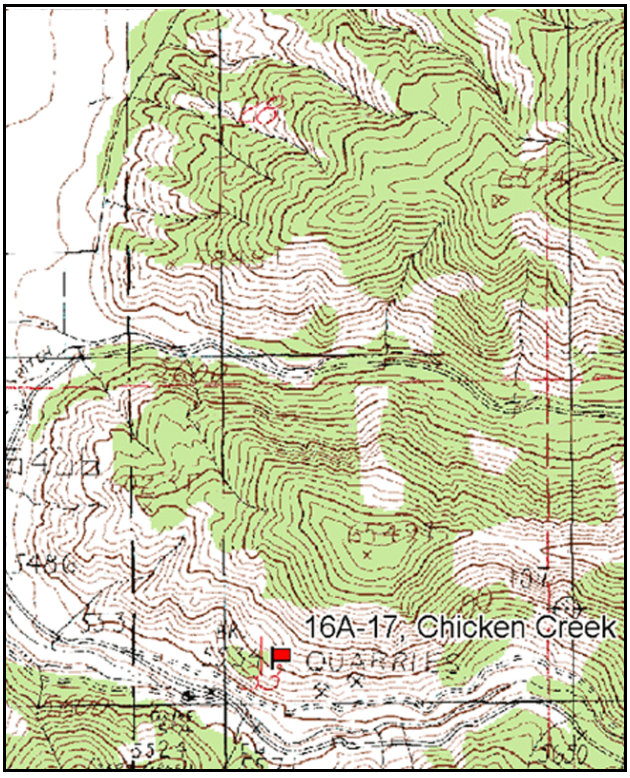
Study site name: Chicken Creek . Vegetation type: Stansbury Cliffrose .

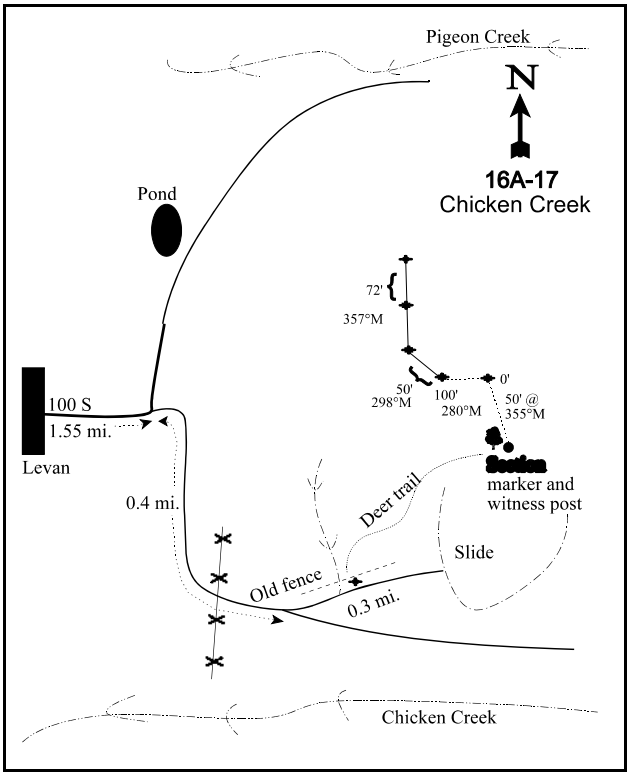
Compass bearing: frequency baseline 280 degrees magnetic (line 2 @ 298°M, lines 3 and 4 @ 357°M).

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

LOCATION DESCRIPTION

From the intersection of 100 South and Main Street in Levan, proceed east on 100 South for 1.55 miles to a fork. Turn right (south) and proceed 0.40 miles towards Chicken Creek to a road to the left. Turn left and proceed east for 0.30 miles to a green steel "T" fencepost on the north side of the road (fencepost may no longer exist). From the fencepost, walk up slope at an azimuth of 344 degrees true to the eastern most juniper on the ridge. There is a section marker and witness post next to the juniper. The 0-foot baseline stake is located 50 feet away at an azimuth 355 degrees magnetic. The study is marked by green, steel “T” fenceposts approximately 12 to 18 inches in height.





Map Name: Levan

Diagrammatic Sketch

Township 14S , Range 1E , Section 33

GPS: NAD 83, UTM 12S 429073 E 4378304 N

DISCUSSION

Chicken Creek - Trend Study No. 16A-17

Study Information

This study is located on deer winter range near the mouth of Chicken Creek Canyon [elevation: 5,800 feet (1,768 m), slope: 10-60%, aspect: south]. It samples Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) intermixed with Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah juniper (*Juniperus osteosperma*), and Gambel oak (*Quercus gambelii*). Pellet groups were abundant in 1983. Quadrat frequency of deer pellet groups was moderately high at 39% in 1997, and use was estimated at 74 days use/acre (182 ddu/ha) in 2002 and 52 days use/acre (129 ddu/ha) in 2007. Elk pellet quadrat frequency was low at 2% in 1997 and 3% in 2007, and use was estimated at 2 days use/acre (5 edu/ha) in 2002. Most of the deer pellet groups appeared to be from winter and spring use, and most were sampled on the downslope end of the baseline where there was more vegetation. Three live and two dead deer were noted during the 2007 sampling.

Soil

The soil is derived from limestone, with many gravel-sized fragments covering the surface. Large rock outcrops are also present. The soil texture is a clay loam, and it has a neutral pH (6.9). Pedestalling is common, and several large cracks in the ground surface were noted in 1983, which are indicative of high potential for slippage or landslides. Bare ground has accounted for less than 10% of the relative ground cover since 1983. The soil erosion condition was classified as slight in 2002 and 2007 due to surface rock and litter movement and flow patterns.

Browse

The preferred browse species are Stansbury cliffrose and serviceberry, although both occur in low densities. Cliffrose density has ranged from 199 plants/acre (492 plants/ha) to 460 plants/acre (1,137 plants/ha) since 1983. Over half of the population has been classified as decadent every sample year except 1997, when 33% of the sampled plants were decadent. No young plants have been sampled. Dead plants were sampled at a density of 100 plants/acre (247 plants/ha) in 1997 and 80 plants/acre (198 plants/ha) in 2002 and 2007. Plants showing poor vigor made up 42% of the population in 1983, decreased to 17% by 1997, then increased to 38% by 2007. Use has been mostly moderate-heavy, although many of the mature plants are tall and partly unavailable for browsing. Annual leader growth averaged 3.8 inches (9.7 cm) in 2002 and 1.6 inches (4.1 cm) in 2007.

Serviceberry occurs less frequently than cliffrose. Its density was 166 plants/acre (410 plants/ha) in 1983, and has ranged from 60 plants/acre (148 plants/ha) to 80 plants/acre (198 plants/ha) since 1989. The majority of the plants have been either young or decadent in each sample year. Vigor has been good on all plants, and use has been moderate-heavy.

Scattered Gambel oak clones have increased in density from 2,060 plants/acre (5,090 plants/ha) in 1997 to 2,900 plants/acre (7,166 plants/ha) in 2007. Most plants were young in 1997 and 2002, and most were mature in 2007. All of the sampled plants have been vigorous, and use is light. Other shrubs that provide additional forage but occur infrequently are mountain big sagebrush, true mountain mahogany (*Cercocarpus montanus*), white rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *albicaulis*), and chokecherry (*Prunus virginiana*).

Herbaceous Understory

The herbaceous understory is sparse and of poor quality. Total grass cover was 23% in 1997 and 2007, and 20% in 2002. Bluebunch wheatgrass (*Agropyron spicatum*) has provided between 54% and 57% of the total grass cover and between 44% and 49% of the total herbaceous cover since 1997. Cheatgrass is also abundant, and has provided 42%-45% of the total grass cover since 1997. However, this species is concentrated mostly under the crowns of juniper trees. The forb component of the understory is diverse, but few forbs are

particularly abundant. Total forb cover has been 3%-5% since 1997. Bedstraw (*Galium aparine*) has made up 29%-40% of the total forb cover since 1997.

1989 TREND ASSESSMENT
The trend for browse is down. Cliffrose density decreased from 399 plants/acre (986 plants/ha) to 199 plants/acre (492 plants/ha), and decadence remained high at 83% of the population. Plants displaying poor vigor decreased slightly, but still made up one-third of the population. Use remained moderate-heavy. Serviceberry density decreased from 166 plants/acre (410 plants/ha) to 66 plants/acre (163 plants/ha). Decadence increased from 60% of the sampled plants to 100%, and use increased to heavy. The trend for grass is up. The sum of nested frequency for perennial grasses increased 40%, and Sandberg bluegrass (*Poa secunda*) was sampled for the first time. The trend for forbs is slightly down. The sum of nested frequency for perennial forbs decreased almost 30%, and the number of species important to big game remained low.

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

1997 TREND ASSESSMENT
The trend for browse is slightly up. Cliffrose density increased 21%, from 199 plants/acre (492 plants/ha) to 240 plants/acre (593 plants/ha). However, this increase was partly attributed to the increase in sampling area. Decadence decreased from 83% to 33% of the population. Vigor improved from 33% of the plants displaying poor vigor to only 17%. Use remained moderate-heavy. Serviceberry density also increased slightly from 66 plants/acre (163 plants/ha) to 80 plants/acre (198 plants/ha). There were no decadent plants, and 75% of the sampled plants were young. Use decreased to mostly moderate, with some heavy use. The trend for grass is down. The sum of nested frequency for perennial forbs decreased 25%. The trend for forbs is up. The sum of nested frequency for perennial forbs increased substantially. Bonneville pea (*Lathyrus brachycalyx*), longleaf phlox (*Phlox longifolia*), and heartleaf twistflower (*Streptanthus cordatus*) increased significantly in nested frequency. The Desirable Components Index (DCI) was rated as fair due to low preferred browse cover and high cheatgrass cover, but good recruitment of preferred browse and high perennial grass cover.

winter range condition (DCI) - fair (54) Mid-level potential scale
browse - slightly up (+1) grass - down (-2) forb - up (+2)

2002 TREND ASSESSMENT
The trend for browse is stable. Cliffrose density increased from 240 plants/acre (593 plants/ha) to 460 plants/acre (1,137 plants/ha). However, decadence increased from 33% of the population to 61%, and 22% of the sampled plants were classified as dying. Plants displaying poor vigor increased slightly from 17% of the population to 22%. Use remained moderate-heavy. Serviceberry density decreased slightly from 80 plants/acre (198 plants/ha) to 60 plants/acre (148 plants/ha), and all of the sampled plants were decadent and heavily hedged. The trend for grass is slightly down. The sum of nested frequency for perennial grasses decreased 14%. Cheatgrass nested frequency did not change. The trend for forbs is down. The sum of nested frequency for perennial forbs decreased 52%. Bonneville pea, longleaf phlox, stickseed (*Hackelia patens*), and thistle (*Cirsium* sp.) decreased significantly in nested frequency, while bur buttercup (*Ranunculus testiculatus*), an allelopathic annual (Buchanan et al. 1978), increased significantly in nested frequency. Total forb cover decreased from 5% to 3%. The DCI rating declined to very poor-poor due to an increase in decadence and decrease in recruitment of preferred browse.

winter range condition (DCI) - very poor-poor (36) Mid-level potential scale
browse - stable (0) grass - slightly down (-1) forb - down (-2)

2007 TREND ASSESSMENT
The trend for browse is slightly down. Cliffrose density decreased 30%, from 460 plants/acre (1,137 plants/ha) to 320 plants/acre (791 plants/ha). Plants showing poor vigor increased to 38% of the population, and use

increased to mostly heavy. Decadence slightly decreased from 61% of the population to 50%, and plants classified as dying slightly decreased from 22% of the population to 19%. Serviceberry density increased slightly from 60 plants/acre (148 plants/ha) to 80 plants/acre (198 plants/ha), and decadence decreased from 100% of the sampled plants to 50%. Use decreased to moderate-heavy. The trend for grass is up. The sum of nested frequency for perennial grasses increased 28%, while cheatgrass nested frequency did not change. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little, while that for annual forbs decreased 15%. Total forb cover slightly increased from 3% to 4%. The DCI rating declined slightly to very poor because total preferred browse cover dropped below 5%.

winter range condition (DCI) - very poor (27) Mid-level potential scale
browse - slightly down (-1) grass - up (+2) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 16A, Study no: 17

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Agropyron spicatum	ab150	b185	ab139	a121	ab146	12.44	11.67	12.23
G	Bromus japonicus (a)	-	-	-	7	-	-	.04	-
G	Bromus tectorum (a)	-	-	a260	a253	a253	10.29	8.61	10.41
G	Poa secunda	-	a25	a19	a15	a28	.38	.13	.65
Total for Annual Grasses		0	0	260	260	253	10.29	8.65	10.41
Total for Perennial Grasses		150	210	158	136	174	12.82	11.80	12.88
Total for Grasses		150	210	418	396	427	23.11	20.46	23.29
F	Alyssum alyssoides (a)	-	-	-	-	15	-	-	.05
F	Allium sp.	-	-	-	a1	a1	-	.00	.03
F	Artemisia ludoviciana	-	-	-	-	3	-	-	.15
F	Camelina microcarpa (a)	-	-	b23	ab12	a6	.06	.07	.04
F	Chorispora tenella (a)	-	-	a7	a14	a8	.01	.07	.08
F	Cirsium sp.	-	-	b17	a3	a1	.53	.45	.33
F	Collinsia parviflora (a)	-	-	-	2	-	-	.00	-
F	Cryptantha flavoculata	-	5	-	-	-	-	-	-
F	Cruciferae	-	-	12	-	-	.54	-	-
F	Cryptantha sp.(a)	-	-	-	-	2	-	-	.00
F	Cryptantha sp.	a14	a6	-	a2	a3	-	.01	.00
F	Cymopterus sp.	-	-	-	1	-	-	.01	-
F	Descurainia pinnata (a)	-	-	a21	a7	a8	.12	.02	.02
F	Eriogonum brevicaule	a9	a14	a11	a5	a6	.52	.09	.10
F	Erodium cicutarium (a)	-	-	a13	a25	a19	.07	.33	.12
F	Erigeron pumilus	-	-	-	-	2	-	-	.03
F	Galium aparine (a)	-	-	a62	a55	a45	2.00	.94	1.60
F	Gilia sp. (a)	-	-	-	a5	a3	-	.04	.00

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	Hackelia patens	$_{a}$2	-	$_{b}$19	$_{a}$3	$_{ab}$14	.44	.42	.80
F	Holosteum umbellatum (a)	-	-	-	-	8	-	-	.04
F	Lathyrus brachycalyx	$_{a}$2	$_{a}$2	$_{b}$25	$_{a}$7	$_{ab}$12	.31	.04	.40
F	Lappula occidentalis (a)	-	-	$_{a}$8	$_{a}$22	$_{a}$16	.02	.24	.18
F	Lactuca serriola	$_{b}$27	-	$_{a}$6	$_{a}$7	$_{a}$3	.02	.02	.03
F	Lithospermum ruderale	-	-	-	4	-	-	.06	-
F	Machaeranthera canescens	$_{a}$4	-	$_{a}$1	-	-	.00	-	-
F	Phacelia sp.	-	-	-	9	-	-	.04	-
F	Physalis hederaefolia	-	$_{a}$7	$_{a}$2	-	-	.00	-	-
F	Phlox longifolia	-	$_{a}$3	$_{b}$21	$_{a}$6	$_{ab}$9	.07	.04	.07
F	Ranunculus testiculatus (a)	-	-	$_{a}$6	$_{b}$14	$_{ab}$8	.01	.10	.02
F	Sisymbrium altissimum (a)	-	-	$_{b}$35	$_{a}$12	$_{a}$6	.18	.12	.07
F	Streptanthus cordatus	$_{a}$3	$_{a}$8	$_{b}$23	$_{ab}$18	$_{ab}$18	.06	.06	.08
F	Tragopogon dubius	2	-	-	-	-	.00	-	.00
F	Unknown forb-annual (a)	-	-	5	-	-	.03	-	-
F	Veronica biloba (a)	-	-	-	$_{a}$5	$_{a}$3	-	.03	.01
Total for Annual Forbs		0	0	180	173	147	2.52	1.99	2.26
Total for Perennial Forbs		63	45	137	66	72	2.53	1.27	2.05
Total for Forbs		63	45	317	239	219	5.05	3.27	4.32

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

BROWSE TRENDS --
Management unit 16A, Study no: 17

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Amelanchier utahensis	3	1	3	.41	-	.38
B	Cercocarpus montanus	1	1	0	-	.38	-
B	Chrysothamnus nauseosus albicaulis	6	5	4	.90	.71	.53
B	Cowania mexicana stansburiana	12	13	16	3.00	3.21	1.52
B	Gutierrezia sarothrae	5	4	2	.01	.15	-
B	Juniperus osteosperma	0	1	1	-	1.00	2.11
B	Mahonia repens	20	21	23	.07	.31	1.02
B	Prunus virginiana	6	2	3	.00	-	-
B	Quercus gambelii	9	6	7	1.58	.83	1.33
B	Rhus glabra cismontana	0	0	0	.03	-	-
Total for Browse		62	54	59	6.03	6.60	6.92

CANOPY COVER, LINE INTERCEPT --
Management unit 16A, Study no: 17

Species	Percent Cover	
	'02	'07
Amelanchier utahensis	-	.50
Cercocarpus montanus	-	.01
Chrysothamnus nauseosus albicaulis	-	1.46
Cowania mexicana stansburiana	-	2.01
Gutierrezia sarothrae	-	.16
Juniperus osteosperma	.21	4.71
Mahonia repens	-	.76
Quercus gambelii	.75	8.18

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 16A, Study no: 17

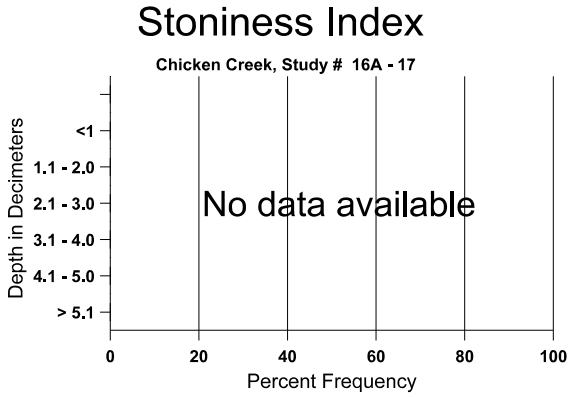
Species	Average leader growth (in)	
	'02	'07
Cowania mexicana stansburiana	3.8	1.6

BASIC COVER --
Management unit 16A, Study no: 17

Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	2.25	7.00	29.85	29.54	31.93
Rock	4.75	4.25	13.62	22.55	20.35
Pavement	52.00	57.25	26.51	26.07	22.63
Litter	33.50	29.75	27.93	30.74	32.72
Cryptogams	0	0	.26	.15	.05
Bare Ground	7.50	1.75	8.96	5.48	2.97

SOIL ANALYSIS DATA --
Herd Unit 16A, Study no: 17, Chicken Creek

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%0M	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
21.7	48.0 (13.0)	6.9	39.4	30.7	29.8	2.8	11.6	192.0	1.2



PELLET GROUP DATA --
Management unit 16A, Study no: 17

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	-	2	11
Elk	2	-	3
Deer	39	36	26

Days use per acre (ha)	
'02	'07
-	-
2 (5)	-
74 (181)	52 (129)

BROWSE CHARACTERISTICS --
Management unit 16A, Study no: 17

		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)
Amelanchier utahensis												
83	**166**	-	33	33	100	-	40	40	60	-	0	18/8
89	**66**	-	-	-	66	-	0	100	100	-	0	-/-
97	**80**	-	60	20	-	-	75	25	0	-	0	49/69
02	**60**	-	-	-	60	-	0	100	100	-	0	51/64
07	**80**	-	40	-	40	-	25	50	50	-	0	38/54
Artemisia tridentata vaseyana												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	20	0	0	-	-	0	34/30
02	**0**	-	-	-	-	40	0	0	-	-	0	25/36
07	**0**	-	-	-	-	-	0	0	-	-	0	30/28
Cercocarpus montanus												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**20**	-	-	20	-	40	100	0	-	-	0	88/86
02	**20**	-	-	20	-	-	0	100	-	-	0	61/82
07	**0**	-	-	-	-	-	0	0	-	-	0	89/105
Chrysothamnus nauseosus albicaulis												
83	**100**	-	-	100	-	-	0	0	0	-	0	27/33
89	**233**	-	133	100	-	-	0	0	0	-	0	28/34
97	**120**	-	20	60	40	-	33	0	33	17	17	26/40
02	**100**	-	-	40	60	-	0	40	60	-	0	26/34
07	**80**	-	-	20	60	20	25	0	75	50	50	31/43
Cowania mexicana stansburiana												
83	**399**	-	-	66	333	-	25	75	83	-	42	43/72
89	**199**	-	-	33	166	-	33	50	83	33	33	114/126
97	**240**	20	-	160	80	100	25	50	33	17	17	50/48
02	**460**	-	-	180	280	80	4	57	61	22	22	55/60
07	**320**	-	-	160	160	80	6	75	50	19	38	63/65

		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)
Gutierrezia sarothrae												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**180**	-	40	140	-	40	0	0	0	-	0	9/15
02	**140**	-	-	80	60	40	0	0	43	14	14	5/11
07	**40**	-	20	20	-	-	0	0	0	-	0	16/27
Juniperus osteosperma												
83	**33**	-	-	33	-	-	0	0	-	-	0	67/118
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	116/145
02	**20**	-	-	20	-	-	0	0	-	-	0	-/-
07	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Mahonia repens												
83	**4933**	-	1333	3600	-	-	0	0	0	-	0	5/4
89	**4166**	-	2900	1266	-	-	10	0	0	-	0	4/5
97	**2740**	-	460	2280	-	-	0	0	0	-	0	3/4
02	**4840**	-	460	4220	160	40	0	0	3	.41	.41	2/4
07	**7300**	-	480	6820	-	-	0	0	0	-	0	3/5
Prunus virginiana												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**300**	80	220	60	20	-	20	13	7	-	0	15/15
02	**40**	-	-	20	20	20	50	50	50	50	50	6/8
07	**60**	-	60	-	-	-	0	100	0	-	0	8/12
Quercus gambelii												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**2060**	280	1700	360	-	100	0	0	0	-	0	113/140
02	**2180**	-	2080	100	-	100	0	0	0	-	0	104/65
07	**2900**	-	-	2860	40	100	0	0	1	-	0	20/15
Rhus glabra cismontana												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**0**	-	-	-	-	-	0	0	-	-	0	88/128
07	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		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)
Rhus trilobata												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**0**	-	-	-	-	-	0	0	-	-	0	-/-
07	**0**	-	-	-	-	-	0	0	-	-	0	102/142