

Trend Study 30-3-08

Study site name: Upper Broad Hollow .

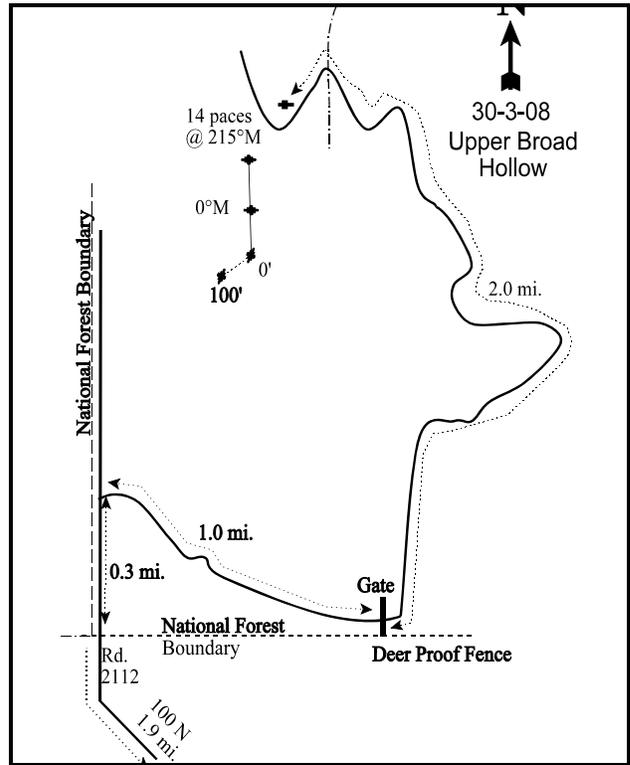
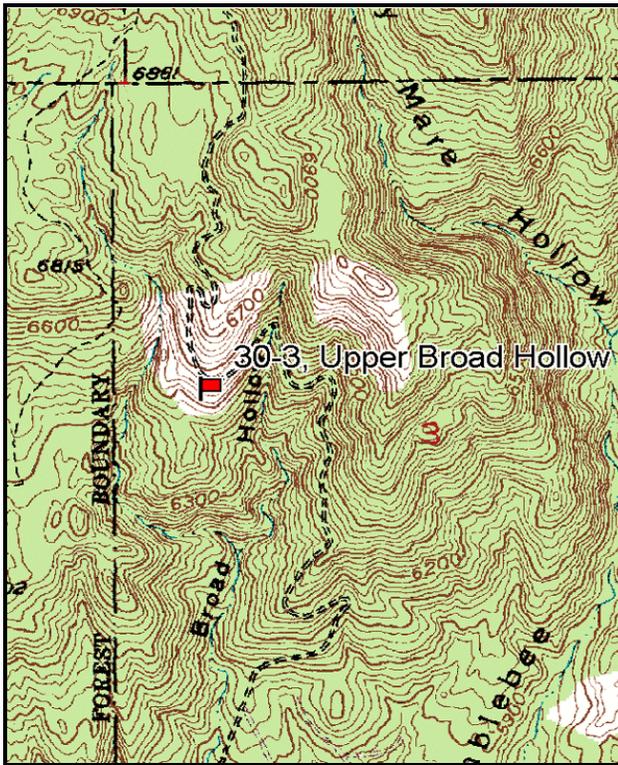
Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 215 degrees magnetic. (Line 2 & 3, 0°M)

Frequency belt placement: line 1 (8 & 89ft), line 2 (34 & 71ft), line 3 (59ft). Rebar: belt 3 on 1ft.

LOCATION DESCRIPTION

From the intersection of Harmony Drive and 100 N. in New Harmony, drive north 1.9 miles to the Dixie National Forest boundary. From the boundary, proceed north on Pace Draw Road (Road 2112) for 0.30 miles. Turn right onto Harmony Mountain Road and travel 1.0 miles, at which point there will be a gate. Go through the gate, turn left and travel 2.0 miles to a sharp right-hand turn in the road. On the southwestern side of the road is a witness post. Walk 14 paces at 215 degrees magnetic to the 300-foot stake. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.



Map Name: Stoddard Mountain

Diagrammatic Sketch

Township 38S, Range 13W, Section 3

GPS: NAD 83, UTM 12S 296194 E, 4155175 N

DISCUSSION

Upper Broad Hollow - Trend Study No. 30-3

Study Information

This site at Upper Broad Hollow is intermediate in elevation, but is still critical deer winter range [elevation: 6,500 feet (1,981 m), slope: 35%, aspect: south]. It is located about three miles north of the town of New Harmony on the Harmony Mountains. The range type is mixed mountain brush, which varies somewhat in composition depending upon slope, exposure, and micro-site characteristics. On steeper south or west slopes, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) prevail. On more easterly slopes, there is more shrub-live oak (*Quercus turbinella*) and Utah serviceberry (*Amelanchier utahensis*) with considerable amounts of bitterbrush, and occasional clumps of Gambel oak (*Quercus gambelii*). Deer use of the entire area, judging from levels of utilization and the number of pellet groups observed, is moderate to heavy. Data from the nearby DWR Broad Hollow pellet group transect taken from 1988 through 1992, indicated heavy deer use with an average of 75 deer days use/acre (185 ddu/ha), the highest average on the herd unit (Jense et al. 1992). A pellet group transect read along the trend study site baseline in 1998 estimated a very high level of deer use at 110 deer days use/acre (272 ddu/ha), high use at 87 ddu/acre in 2003 (215 ddu/ha), and very high use at 160 ddu/acre (395 ddu/ha) in 2008. No signs of livestock grazing were noted during any of the readings.

Soils

Soils are relatively shallow and very rocky, derived from limestone parent material. Effective rooting depth is estimated at just over 7 inches. Rocks are very common on the surface and within the soil profile. There is little bare soil exposed, therefore erosion is not a serious problem due to the abundant protective ground cover. Relative combined vegetation and litter cover has been high at 69%-73% from 1998 to 2008. Relative bare ground cover was low at 5%-7% from 1998 to 2003, and increased slightly to 9% in 2008. The erosion condition rating was classified as stable in 2003 and slight in 2008 due to surface litter movement and flow patterns.

Browse

The key browse species are Utah Serviceberry, mountain big sagebrush, and antelope bitterbrush. Important secondary species would include curlleaf mountain mahogany (*Cercocarpus ledifolius*). Mountain big sagebrush provides about 25% of the total browse cover on the site. The sagebrush population remained at a relatively constant density between 1982 and 1998 at around 2,300 plants/acre, but declined 25% to 1,720 plants/acre in 2003 with little change in 2008. Utilization of sagebrush has been light to moderate with little heavy use in all sample years. All sagebrush plants displayed good vigor in the 1982 and 1992 surveys, but plants displaying poor vigor have steadily increased from 8% in 1998 to 21% in 2008. Sagebrush decadence has ranged from 18%-36% from 1982 to 2008, with the highest level in 2003. Reproduction of sagebrush was good from 1982 to 2003 with young plants comprising 6%-16% of the total population, but young plants decreased to just 1% in 2008.

Bitterbrush displayed heavier use than sagebrush, especially in 1992 when 69% of the plants were classified as heavily hedged. Density has ranged from 2,133 plants/acre in 1982 to 780 plants/acre in 2008. Some of the differences in numbers between years may be due to problems counting individual plants of this relatively low growing sprawling shrub which had an average crown diameter of 4 feet in 2008. It appears, however, that the population has declined slightly since 1998. Recruitment of young bitterbrush plants has decreased slightly from 12% of the population in 2003 to 5% in 2008.

Utah serviceberry, curlleaf mountain mahogany, and shrub-live oak are mainly large plants with mature populations. Serviceberry was encountered in higher density with the larger sample area used in 1998. Serviceberry density was estimated to be 1,880 plants/acre in 1998, then decreasing 61% to 740 plants/acre in

2003 and 2008. The average mature plant was about 4 feet in height in 1998, 2003, and 2008. Utilization has been mostly light to moderate with some heavy use on certain plants. Vigor has been normal and decadence low during all readings. Reproduction has been good with young plants comprising 16%-30% of the population from 1998 to 2008.

Occasional shrubs which occur on the site include true mountain mahogany (*Cercocarpus montanus* ssp. *montanus*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*), grey horsebrush (*Tetradymia canescens*), broom snakeweed (*Gutierrezia sarothrae*), yellowleaf silktassel (*Garrya flavescens*), pinyon pine (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*). Point-quarter data estimated 28 pinyon trees/acre and 40 juniper trees/acre in 2003, and 31 pinyon trees/acre and 32 juniper trees/acre in 2008. Average basal diameter for pinyon was estimated at 7 inches in 2003 and 2008, and for juniper at 5.4 inches in 2003 and 7.9 in 2008.

Herbaceous Understory

The herbaceous understory is diverse but only moderately abundant. Total grass cover was estimated at 24% in 1998, but only 12% and 13% in 2003 and 2008, respectively. The most common species is mutton bluegrass (*Poa fendleriana*) which provided 54% of the total grass cover in 1998, 57% in 2003, and 76% in 2008. The annual, cheatgrass (*Bromus tectorum*), is also common providing an additional 39% of the grass cover in 1998, declining to 23% in 2003, and declining further to 12% in 2008. All other grasses occur occasionally. Forbs are diverse, but their total cover was only 5% in 1998 and 2003, and decreased to only 2% in 2008. The common species include false dandelion (*Agoseris glauca*), milkvetch (*Astragalus spp.*), tansy mustard (*Descurainia pinnata*), and an annual Gilia (*Gilia sp.*).

1992 TREND ASSESSMENT

Trend for browse is down due to declining populations of mountain big sagebrush and especially bitterbrush. Bitterbrush declined 50% in density and decadence increased to 31%. The number of bitterbrush plants displaying poor vigor also increased to 13%. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, both grass and forb trends are considered to be stable with increased quadrat frequency for perennial grasses and slightly decreased quadrat frequency of perennial forbs.

browse - down (-2)

grass - stable (0)

forb - stable (0)

1998 TREND ASSESSMENT

Trend for key browse species, mountain big sagebrush, bitterbrush and serviceberry, appear stable. Differences in browse density may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Sagebrush displays improved reproduction, and relatively low decadence at 24%. Bitterbrush vigor has improved and decadence has declined from 31% to 14%. Serviceberry shows good vigor and low decadence. Trend for the grasses is slightly down. Sum of nested frequency for perennial grasses has declined slightly, with a significant increase in nested frequency for mutton bluegrass and significant decrease in nested frequency of bottlebrush squirreltail. There was also large increase in the nested frequency of the annual invasive cheatgrass which may have been due to the increased sample area. Trend for forbs is up. The sum of nested frequency of perennial forbs has increased.

winter range condition (DCI) - good (78) High potential scale

browse - stable (0)

grass - slightly down (-1)

forb - up (+2)

2003 TREND ASSESSMENT

Trend for the key browse species, serviceberry, mountain big sagebrush, and bitterbrush, is mixed. Trend for serviceberry and bitterbrush is relatively stable. Vigor remains good and decadence low in both species. Density estimates have declined for both species, however, it appears that density was overestimated in 1998 since cover numbers are similar between readings and few dead plants were sampled in 2003. Mountain big

sagebrush shows a downward trend. Density has declined 25%, and the proportion of decadent plants increased from 24% in 1998 to 36%. Recruitment has declined with only 6% of the sagebrush population comprised of young plants, down from 16% in 1998. Trend for browse is considered slightly down. Trend for the grasses is slightly down. Sum of nested frequency has declined slightly for perennial grasses, and cover of perennial grasses declined from 15% in 1998 to 9%. The key grasses, mutton bluegrass and bottlebrush squirreltail, both declined significantly. One positive aspect of the grass composition is the significant decline in nested frequency of cheatgrass. The trend for forbs is down. The sum of nested frequency of perennial forbs declined 47% from 1998, and perennial forb cover decreased from 4% in 1998 to 2%. Total herbaceous production was poor this year, likely due to drought conditions. In 1998, total herbaceous cover was estimated at nearly 30% (24% grasses 5% forbs). During the 2003 reading, total herbaceous cover was estimated at only 16%. Total forb cover remained at 5% but total grass cover declined to only 12%. Part of the decline is due to the drop in cheatgrass cover, 9.5% to 3% cover, but cover of mutton bluegrass also declined by 50% (13% to 6.6%).

winter range condition (DCI) - fair-good (70) High potential scale
browse - slightly down (-1) grass - slightly down (-1) forb - down (-2)

2008 TREND ASSESSMENT

Trend for the key browse species, serviceberry, mountain big sagebrush, and antelope bitterbrush, is stable. Serviceberry density, vigor, and recruitment of young plants has remained similar to 2003 levels. Decadence in serviceberry has increased slightly to 14%, but is still considered low. Sagebrush density and decadence are similar to 2003 levels. Sagebrush plants displaying poor vigor have increased slightly to 21% and recruitment has decreased with just 1% of the population being comprised of young plants. Bitterbrush density has decreased slightly, but vigor remains good in the population. Decadence in bitterbrush increased from 9% in 2003 to 23%, and recruitment of young plants decreased from 12% of the population to 5%. The trend for grasses is stable. There was little to no change in the sum of nested frequency of any grass species, though the cover of perennial species increased slightly and cover of annual species (i.e. cheatgrass) decreased slightly. The trend for forbs is up. The sum of nested frequency of perennial forbs increased by 60% from 2003, though the cover of perennial forbs has remained similar.

winter range condition (DCI) - fair-good (70) High potential scale
browse - stable (0) grass - stable (0) forb - up (+2)

HERBACEOUS TRENDS --
Management unit 30 , Study no: 3

T y p e	Species					Average Cover %		
		'92	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	-	-	-	1	.03	-	.00
G	Bouteloua gracilis	2	3	2	3	.15	.03	.03
G	Bromus tectorum (a)	-	_b 264	_a 124	_a 131	9.47	2.66	1.56
G	Festuca ovina	-	3	-	-	.00	-	-
G	Koeleria cristata	34	31	27	20	.81	.94	.81
G	Poa fendleriana	_a 166	_b 216	_a 155	_a 158	13.11	6.58	9.60
G	Sitanion hystrix	118	19	26	29	.31	.90	.57
G	Stipa comata	7	6	10	5	.36	.39	.12

Type	Species					Average Cover %		
		'92	'98	'03	'08	'98	'03	'08
	Total for Annual Grasses	0	264	124	131	9.47	2.66	1.56
	Total for Perennial Grasses	327	278	220	216	14.79	8.85	11.13
	Total for Grasses	327	542	344	347	24.26	11.52	12.69
F	Agoseris glauca	a6	c46	ab26	bc43	.58	.18	.38
F	Allium sp.	-	10	-	-	.04	-	-
F	Androstephium breviflorum	1	-	-	-	-	-	-
F	Arabis sp.	-	-	2	-	-	.00	-
F	Artemisia ludoviciana	b18	a-	a-	ab6	-	-	.03
F	Arenaria macradenia	a-	a-	b16	a1	-	1.09	.15
F	Astragalus straturensis	7	-	-	-	-	-	-
F	Aster sp.	-	1	-	-	.00	-	-
F	Astragalus sp.	c32	bc19	a5	ab9	.91	.04	.21
F	Astragalus utahensis	-	-	-	-	.03	-	-
F	Brodiaea pulchella	a-	a-	a-	b43	-	-	.18
F	Castilleja linariaefolia	b23	ab6	a1	a4	.06	.01	.01
F	Calochortus nuttallii	-	-	2	1	-	.00	.00
F	Collomia linearis (a)	a-	a-	b19	a-	-	.37	-
F	Comandra pallida	-	-	5	-	-	.06	-
F	Collinsia parviflora (a)	-	a14	b53	a29	.03	.55	.09
F	Cymopterus sp.	-	8	-	3	.06	-	.03
F	Descurainia pinnata (a)	-	b57	b67	a6	.38	.99	.01
F	Dichelostemma pulchellum	a-	b33	a-	a-	1.55	-	-
F	Draba sp. (a)	-	2	6	6	.00	.01	.01
F	Erysimum asperum	4	3	-	-	.03	-	-
F	Erodium cicutarium (a)	-	b13	a-	a1	.52	-	.00
F	Eriogonum sp.	-	-	1	-	-	.00	-
F	Erigeron pumilus	1	8	7	5	.07	.18	.18
F	Eriogonum racemosum	-	-	1	-	-	.00	-
F	Gilia sp. (a)	-	a-	c103	b22	-	1.01	.07
F	Lappula occidentalis (a)	-	-	3	6	-	.00	.01
F	Lactuca serriola	6	-	-	-	-	-	-
F	Microsteris gracilis (a)	-	a10	b30	a6	.03	.12	.02
F	Orobanche fasciculata	-	-	-	2	-	-	.01
F	Phlox hoodii	-	-	1	5	-	.03	.16
F	Senecio multilobatus	-	-	4	5	-	.01	.06
F	Sphaeralcea grossulariifolia	-	6	4	7	.06	.04	.21

T y p e	Species					Average Cover %		
		'92	'98	'03	'08	'98	'03	'08
F	<i>Stephanomeria tenuifolia</i>	_b .16	_b .16	_b .8	_a -	.13	.19	-
F	<i>Zigadenus paniculatus</i>	-	3	1	-	.00	.00	-
Total for Annual Forbs		0	96	281	76	0.97	3.07	0.22
Total for Perennial Forbs		114	159	84	134	3.57	1.88	1.63
Total for Forbs		114	255	365	210	4.54	4.96	1.86

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

BROWSE TRENDS --

Management unit 30 , Study no: 3

T y p e	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	<i>Amelanchier utahensis</i>	30	23	24	12.87	11.09	10.02
B	<i>Artemisia nova</i>	0	1	0	-	.15	-
B	<i>Artemisia tridentata vaseyana</i>	64	57	55	8.79	6.16	8.01
B	<i>Chrysothamnus parryi</i>	6	4	10	.30	1.32	.55
B	<i>Chrysothamnus viscidiflorus viscidiflorus</i>	5	0	5	.15	-	.66
B	<i>Garrya flavescens</i>	4	2	5	.00	1.00	1.48
B	<i>Gutierrezia sarothrae</i>	1	3	1	.00	.18	.00
B	<i>Juniperus osteosperma</i>	1	1	1	.78	1.85	4.56
B	<i>Opuntia sp.</i>	3	5	1	.15	.15	.00
B	<i>Pinus edulis</i>	3	1	2	2.99	3.12	3.00
B	<i>Purshia tridentata</i>	34	30	27	5.40	3.85	5.18
B	<i>Quercus turbinella</i>	4	2	5	.39	1.61	1.48
B	<i>Tetradymia canescens</i>	1	3	5	.03	.03	.03
Total for Browse		156	132	131	31.87	30.53	34.98

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 3

Species	Percent Cover		
	'98	'03	'08
Amelanchier utahensis	-	11.76	9.48
Artemisia tridentata vaseyana	-	5.96	8.96
Chrysothamnus parryi	-	.88	.28
Chrysothamnus viscidiflorus viscidiflorus	-	.40	.56
Garrya flavescens	-	.81	1.93
Gutierrezia sarothrae	-	-	.16
Juniperus osteosperma	5.00	8.00	6.73
Pinus edulis	3.59	3.98	5.09
Purshia tridentata	-	5.09	6.76
Quercus turbinella	-	1.53	1.14
Tetradymia canescens	-	-	.16

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 3

Species	Average leader growth (in)	
	'03	'08
Amelanchier utahensis	1.2	0.9
Artemisia tridentata vaseyana	1.3	0.8
Purshia tridentata	1.4	0.8

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 3

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	31	40	32
Pinus edulis	26	28	31

Average diameter (in)		
'98	'03	'08
7.2	5.4	7.9
8.2	7.0	7.1

BASIC COVER --

Management unit 30 , Study no: 3

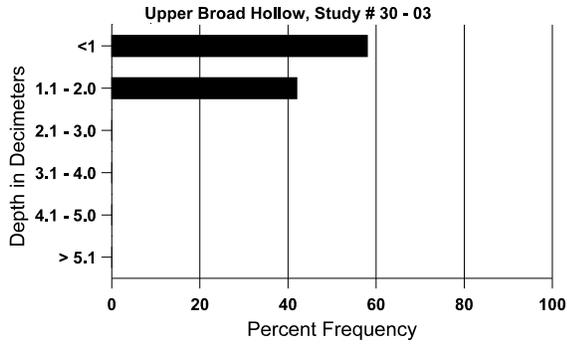
Cover Type	Average Cover %				
	'82	'92	'98	'03	'08
Vegetation	0	15.25	50.70	44.51	43.36
Rock	0	19.50	27.54	20.95	21.54
Pavement	0	4.25	5.34	3.90	6.08
Litter	0	51.75	45.95	47.70	43.67
Cryptogams	0	0	.03	0	.00
Bare Ground	21.50	9.25	7.44	8.52	11.37

SOIL ANALYSIS DATA --

Management unit 30, Study no: 3, Study Name: Upper Broad Hollow

Effective rooting depth (in)	Temp °F (depth)	pH				%OM	PPM P	PPM K	ds/m
			% sand	% silt	% clay				
7.3	43.5 (11.2)	-	-	-	-	-	-	-	-

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 3

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	29	10	38
Deer	59	32	38

Days use per acre (ha)		
'98	'03	'08
-	-	-
110 (271)	87 (215)	160 (395)

BROWSE CHARACTERISTICS --
Management unit 30 , Study no: 3

		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												
82	199	-	-	199	-	-	33	0	0	-	0	33/41
92	332	-	133	199	-	-	0	40	0	-	0	34/36
98	1880	320	300	1480	100	240	27	2	5	2	2	50/55
03	740	20	220	500	20	40	32	11	3	-	0	51/72
08	740	180	200	440	100	100	8	3	14	-	0	50/65
Artemisia nova												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	40	-	-	40	-	-	0	0	-	-	0	6/15
08	0	-	-	-	-	-	0	0	-	-	0	-/-
Artemisia tridentata vaseyana												
82	2598	-	199	1933	466	-	31	10	18	-	0	18/26
92	2198	66	266	1466	466	-	48	9	21	-	0	16/18
98	2300	120	360	1380	560	980	24	.86	24	8	8	20/30
03	1720	-	100	1000	620	640	10	0	36	15	15	21/30
08	1700	20	20	1200	480	680	14	2	28	20	21	23/35
Cercocarpus ledifolius												
82	133	-	-	133	-	-	0	0	-	-	0	47/51
92	66	-	-	66	-	-	0	100	-	-	0	106/106
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	60/40
08	0	-	-	-	-	-	0	0	-	-	0	33/41
Chrysothamnus parryi												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	0	-	0	-/-
98	520	-	40	480	-	-	0	0	0	-	0	12/15
03	120	-	-	120	-	-	0	0	0	-	0	20/28
08	540	120	80	360	100	-	0	70	19	-	7	9/19

		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												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	0	-	0	-/-
98	160	-	40	120	-	-	0	0	0	-	0	14/24
03	0	-	-	-	-	-	0	0	0	-	0	15/28
08	120	-	-	60	60	-	0	0	50	17	17	14/28
Garrya flavescens												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	0	-	0	-/-
98	200	-	-	180	20	-	0	0	10	-	0	55/56
03	40	-	-	40	-	20	0	0	0	-	0	56/67
08	100	-	-	100	-	40	20	0	0	-	20	37/55
Gutierrezia sarothrae												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	10/15
03	100	-	-	100	-	-	0	0	-	-	0	12/17
08	20	-	-	20	-	-	0	0	-	-	0	5/6
Juniperus osteosperma												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	20	-	-	20	-	-	0	0	-	-	0	-/-
03	20	-	-	20	-	-	0	0	-	-	0	-/-
08	20	-	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
82	199	-	-	133	66	-	0	0	33	-	0	3/8
92	199	-	-	199	-	-	0	0	0	-	67	6/8
98	60	-	-	60	-	-	0	0	0	-	0	5/11
03	100	-	-	100	-	-	0	0	0	-	0	7/15
08	20	-	-	-	20	20	0	0	100	-	100	5/9
Pinus edulis												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	60	-	20	40	-	-	0	0	-	-	0	-/-
03	20	20	-	20	-	-	0	0	-	-	0	-/-
08	40	-	20	20	-	-	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)
Purshia tridentata												
82	2133	-	-	2133	-	-	31	22	0	-	0	24/32
92	1065	-	333	399	333	-	13	69	31	-	13	20/35
98	1320	100	80	1060	180	40	32	55	14	5	5	26/39
03	860	20	100	680	80	80	44	30	9	7	7	27/50
08	780	40	40	560	180	80	8	49	23	3	3	27/46
Quercus turbinella												
82	265	-	66	199	-	-	0	0	0	-	0	45/55
92	398	-	133	66	199	-	17	50	50	-	0	39/47
98	120	-	60	60	-	-	0	0	0	-	0	36/40
03	40	-	-	40	-	-	0	0	0	-	0	23/43
08	160	180	100	60	-	-	0	0	0	-	0	21/19
Tetradymia canescens												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	0	-	0	-/-
98	20	-	-	20	-	-	0	0	0	-	0	7/8
03	60	-	-	40	20	-	0	0	33	-	0	13/13
08	120	-	40	60	20	-	0	0	17	-	0	11/13