Trend Study 30-58-08

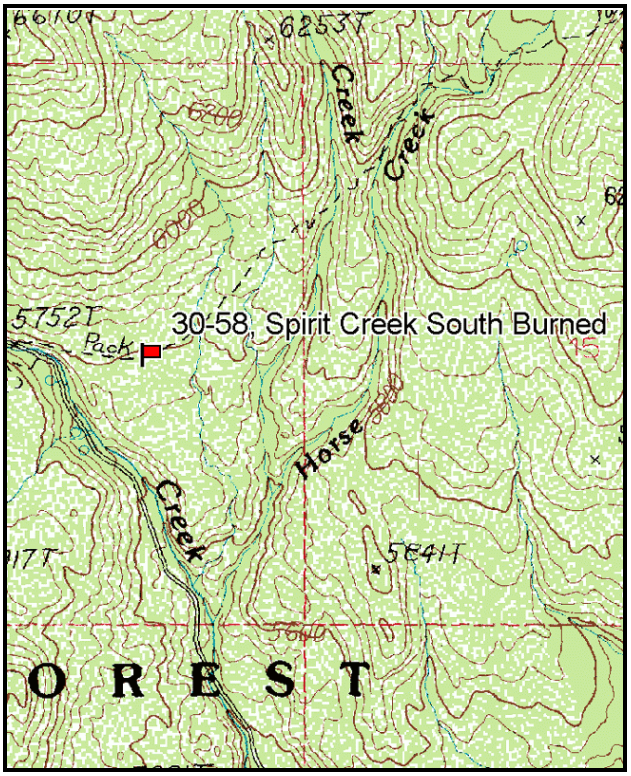
Study site name: Spirit Creek South Burned . Vegetation type: Burn-seeding .

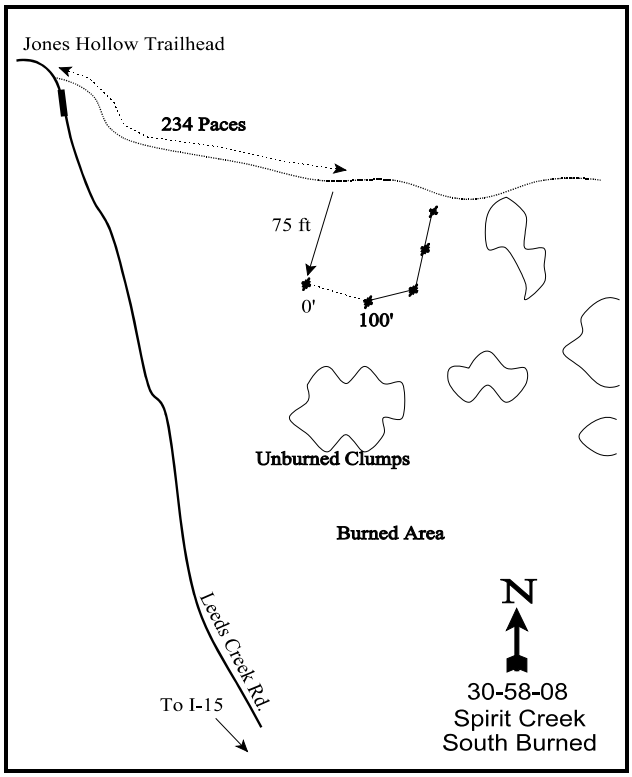
Compass bearing: frequency baseline 111 degrees magnetic. (Line 2, 94°M, line 3 &4, 15°M)

Frequency belt placement: line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft). No rebar.

LOCATION DESCRIPTION

Traveling south on I-15 from Cedar City, take the first Leeds exit #23 (If traveling north, there is no off ramp at exit #23 take exit #22 and the frontage road to exit #23). Travel northwest on the Leeds Creek Road for 3.25 miles. Stay to the right at the fork and proceed about 4.0 miles towards the Oak Grove campground. Stop just past a bridge at the Jones Hollow (Blake-Harmony) trail head. Hike 234 paces up the trail to a 4-foot tall green fence post 75 feet southwest (212°M) of the trail. This is the 0-foot baseline stake. All stakes are 4 foot tall green fence posts.





Map Name: Signal Peak Diagrammatic Sketch

Township 40S , Range 14W , Section 16 GPS: NAD 83, UTM 12S 284967 E, 4131911 N

DISCUSSION

Spirit Creek South - Trend Study No. 30-58

Study Information

The Spirit Creek South Burn trend site consists of a nearly level grass meadow surrounded by Gambel oak (*Quercus gambelii*) and shrub-live oak (*Q. turbenella*) [elevation 5,800 feet (1,768 m), slope: 4-5%, aspect: southeast]. The site, which was previously a mountain big sagebrush (*Artemisia tridentata* ssp. *vaeyana*) flat, was burned in June of 1986 and seeded in early July by the Dixie National Forest. The area is important fawning habitat for mule deer which is evidenced by the abundant pellet groups in 1992. Pellet group data from 1998 also estimated a high level of use at 76 deer days use/acre (188 ddu/ha). Some of the deer pellet groups were fresh when the study was read in 1998 on June 4th. Deer use was much lighter in 2003 with just 17 days use/acre estimated (43 ddu/ha). Pellet group data from 2008 estimated very light use by elk at 1 elk day use/acre (2 edu/ha) and very heavy use by deer at 162 deer days use/acre (400 ddu/ha). No cattle grazing occurs in this area.

Soil

Soil is a deep sandy loam with little rock on the surface or within the profile. Effective rooting depth is estimated at over 27 inches. The soil is slightly acidic in reactivity (pH 6.1). Due to the flat topography, erosion is not a problem, even with high amounts of bare ground occurring after the fire. The study was established September 16, 1986, about 3 months after the fire. At that time, basal vegetation cover was less than one percent. Bare ground covered 94% of the ground surface, while litter cover left after the fire, averaged only 6%. The site was read again in September of 1987. Basal vegetation cover increased to 10%, litter increased to 16%, conversely bare ground declined to 74%. Some soil movement was noticed, yet it was not significant. During the 1992 reading, soil conditions continued to improve. Basal vegetation cover averaged 23%, while bare ground continued to decline significantly. Relative combined vegetation and litter cover has been high at 83%-88% since 1998, and relative bare ground cover has ranged from 12%-16% since 1998. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

The site previously was dominated by mountain big sagebrush. Burned sagebrush stumps counted during the 1986 reading indicated a pre-burn density of approximately 7,100 plants/acre. The only browse left on the site in 1986 consisted of re-sprouting Gambel oak, which numbered 3,533 stems/acre. By 1987, there were an estimated 433 sagebrush seedlings/acre on the site. Desert ceanothus (*Ceanothus greggii*) and broom snakeweed (*Gutierrezia sarothrae*) seedlings also appeared in small numbers. Oak increased along the frequency baseline, but declined to 633 young plants/acre on the density plots. During the 1992 reading, there were an estimated 166 plants/acre of sagebrush, 19% of which were classified as decadent. All other sagebrush consisted of seedlings and young. Gambel oak continued to increase on the frequency belts, but disappeared in the density plots. Broom snakeweed occurred in small numbers. During the 1998 reading, the original 100 foot frequency baseline was extended another 300 feet in order to better sample the small meadow. Density of sagebrush increased to 340 plants/acre with no seedlings sampled. Young plants were also rare at only 60 plants/acre. Dead sagebrush listed in the table consisted of old burned stems. Utilization of the sagebrush was mostly light with some moderate use. Vigor was good on all except decadent sagebrush. Density of Gambel oak increased due to the larger sample as it grows in vigorous scattered clones. Mature plants average nearly 4 feet in height. Sagebrush density declined slightly in 2003, but mature plants were

healthy and vigorous with excellent leader growth. Gambel oak increased in stems/acre due to an abundance of young sprouts. Utilization of browse in all years has been light. In 2008, there was an improvement in sagebrush with an increase in density to 340 plants/acre with good vigor and low decadence. There were some seedlings encountered, but no young sagebrush plants were sampled. Decadence was as 12%. Gambel oak was similar to 2003 readings at 2,620 plants/acre with good recruitment, low decadence, and good vigor.

Herbaceous Understory

The site is now dominated by seeded grasses and alfalfa (*Medicago sativa*). However, during the 1986 reading, no seeded species had established. Bottlebrush squirreltail (*Sitanion hystrix*) and mutton bluegrass (*Poa fendleriana*) were the only perennial grasses encountered. Forbs consisted of a few early seral species. By 1987, seeded grasses became well established with crested and intermediate wheatgrass (*Agropyron cristatum* and *A. intermedium*) being the most common. Seeded forbs, yellow sweetclover (*Melilotus officinalis*) and alfalfa, also became well established along with several invasive weedy species. Crested and intermediate wheatgrass continued to dominate the site in 1992 with quadrat frequencies of 91% and 92% respectively. Smooth brome (*Bromus inermis*) was also fairly abundant. Two species, orchard grass (*Dactylis glomerata*) and mutton bluegrass, were not encountered in 1992. During the 1998 reading, intermediate wheatgrass was by far the most abundant species. It provided 58% of the grass cover and had a cover value of 23%. Crested wheatgrass and smooth brome were the only other common perennial species as they accounted for 24% and 11% of the grass cover, respectively. Annual cheatgrass (*Bromus tectorum*) was also encountered in 1998. Cheatgrass is found in the interspace between bunch grasses, yet it is not abundant. In 2008, the herbaceous understory was stable with good perennial grass cover. Cheatgrass cover decreased in 2008 representing less than 1% of vegetation cover.

The forb composition is diverse but only a few species are abundant. Seeded forbs have all disappeared with the exception of alfalfa and a few yellow sweet clover. During the 1998 reading, alfalfa accounted for 82% of the forb cover. Forb diversity and abundance is likely hindered by the abundance of aggressive exotic grasses seeded onto the site. Annual forbs declined in 2008 due to a loss of slender phlox (*Microsteris gracilis*) which was still the most frequent forb. Alfalfa provided 57% of forb cover but only 2% of total vegetation cover.

1992 TREND ASSESSMENT

Browse are not abundant on the site, but some sagebrush has become reestablished and oak has resprouted. Overall, the browse trend is down when compared to the pre-burn conditions, but has improved since the fire. Further improvements in the browse composition may be hindered by the dominance of seeded exotic grasses. The herbaceous understory has improved significantly since the burn. From 1986 to 1987, both grass and forb sum of nested frequencies increased significantly. Sum of nested frequency for crested wheatgrass and intermediate wheatgrass, and smooth brome continued to increase between 1987 and 1992. Other seeded and native grasses declined or disappeared from the site. Forb nested frequencies declined during the same interval. The only common forbs left on the site are a *Euphorbia* sp. and alfalfa. Combined nested frequencies of grasses and forbs have not increased since 1987. Overall, herbaceous understory has improved between 1986 and 1987 and is stable between 1987 and 1992.

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

1998 TREND ASSESSMENT

Trend for browse is stable. Differences in the density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big sagebrush plants displaying poor vigor have increased to 18% of the population, but are still low in number. Decadence of sagebrush has remained similar to 1992, and recruitment of young sagebrush plants is good at 18% of the population. Trend for grasses is slightly up with a significant increase in the nested frequency of intermediate wheatgrass and smooth brome. The trend for forbs is slightly up, but is in poor condition. The sum of nested frequency for perennial forbs has declined slightly. The most abundant forb, alfalfa, has remained similar in nested frequency, however.

winter range condition (DCI) - good (71) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - slightly up (0)

2003 TREND ASSESSMENT

Trend for the key browse species, mountain big sagebrush, is stable. Density of mature plants has remained similar to 1998 but the number of young plants has declined. Mature sagebrush sampled in 2003 were very vigorous and annual leader growth averaged 2.6 inches by June 3rd. Gambel oakbrush, which occurs in scattered clones, has remained stable. Trend for the herbaceous understory is down slightly. Sum of nested frequency for perennial grasses has declined, while the sum of nested frequency of perennial forbs has increased. Nested frequency of the three primary perennial grasses has declined significantly, but they are still abundant. Average cover of perennial grasses declined from 37% in 1998 to 20%, likely due to drought conditions. Nested frequency of alfalfa increased significantly, but average cover declined from 7% to 3%. Slender phlox increased significantly and provided 68% of the total forb cover in 2003. The dominant forb, alfalfa, doubled in nested frequency, but cover decreased to 3.4%.

winter range condition (DCI) - poor (40) Mid-level potential scale
browse - stable (0) grass - down (-2) forb - up (+2)

2008 TREND ASSESSMENT

Trend for browse is slightly up as cover has increased and density has remained similar on important browse species. Mountain big sagebrush has increased in density 33% to 340 plants/acre with 12% decadence. Recruitment of young is poor with no young plants sampled. Gambel oak density remained similar and decadence is low at 15%. Trend for the grasses is stable. Perennial and annual grasses have remained similar in sum of nested frequency and cover. Intermediate wheatgrass and smooth brome account for 88% of grass cover. Trend for forbs is down. Alfalfa shows a decline in nested frequency and cover.

winter range condition (DCI) - fair (60) Mid-level potential scale
browse - slightly up (+1) grass - stable (0) forb - down (-2)

HERBACEOUS TRENDS --
Management unit 30 , Study no: 58

Type	Species	Nested Frequency						Average Cover %		
		'86	'87	'92	'98	'03	'08	'98	'03	'08
G	Agropyron cristatum	a-	d187	d223	d203	c129	b55	9.51	6.75	2.17
G	Agropyron intermedium	a-	b163	d268	d299	bc215	cd235	22.76	9.99	13.18
G	Bromus inermis	a-	b33	b62	d166	c112	d157	4.42	3.32	6.51
G	Bromus tectorum (a)	-	-	-	b197	a45	a58	1.82	.53	.20
G	Dactylis glomerata	a-	b19	a-	a-	a-	a-	-	-	-
G	Festuca ovina	a-	b15	a2	a5	a-	a-	.18	-	-
G	Poa fendleriana	a2	b14	a-	a2	a-	a1	.15	-	.00
G	Poa pratensis	-	-	-	-	-	3	.00	-	.15
G	Sitanion hystrix	ab5	b10	ab2	ab1	ab1	a-	.03	.00	-
G	Vulpia octoflora (a)	-	-	-	ab36	ab60	a11	.40	1.25	.03
Total for Annual Grasses		0	0	0	233	105	69	2.22	1.78	0.23
Total for Perennial Grasses		7	441	557	676	457	451	37.07	20.07	22.02
Total for Grasses		7	441	557	909	562	520	39.30	21.86	22.25
F	Agoseris glauca	-	-	-	9	-	-	.04	-	-
F	Alyssum alyssoides (a)	-	-	-	a-	a-	b16	-	-	.42
F	Camelina microcarpa (a)	-	-	-	-	1	-	-	.00	-
F	Calochortus nuttallii	-	-	-	-	3	-	-	.01	-
F	Chenopodium sp. (a)	3	-	2	-	2	-	-	.00	-
F	Crepis acuminata	-	-	1	-	-	-	-	-	-
F	Cymopterus sp.	-	-	-	5	6	3	.02	.01	.01
F	Draba sp. (a)	-	-	-	b22	c41	a1	.09	.19	.00
F	Dracocephalum parviflorum	-	-	-	-	1	-	-	.03	-
F	Erodium cicutarium (a)	-	-	-	-	2	-	-	.07	-
F	Erigeron sp.	-	-	3	-	-	-	-	-	-
F	Euphorbia sp.	17	16	23	9	27	16	.06	.56	.09
F	Gilia sp. (a)	-	-	-	a-	c47	b9	-	.55	.02
F	Lotus utahensis	6	12	6	6	3	11	.33	.01	.57
F	Melilotus officinalis	a-	b24	a-	a-	a6	a-	-	.01	-
F	Medicago sativa	a-	b88	bc41	b40	cd82	bc53	7.13	3.40	2.28
F	Microsteris gracilis (a)	-	-	-	b183	c254	a120	1.00	10.71	.39
F	Nicotiana attenuata (a)	-	b39	a-	a-	a-	a-	-	-	-
F	Penstemon leonardi	-	2	-	-	-	-	-	-	-
F	Physalis sp.	-	5	-	-	-	-	-	-	-
F	Sanguisorba minor	-	2	-	-	-	-	-	-	-

Type	Species	Nested Frequency						Average Cover %		
		'86	'87	'92	'98	'03	'08	'98	'03	'08
F	Sphaeralcea grossulariifolia	$_{a}$-	$_{a}$3	$_{a}$-	$_{a}$-	$_{b}$18	$_{ab}$8	-	.09	.21
F	Tragopogon dubius	-	-	-	-	3	-	-	.00	-
F	Unknown forb-perennial	-	-	6	-	-	-	-	-	-
Total for Annual Forbs		3	39	2	205	347	146	1.09	11.55	0.84
Total for Perennial Forbs		23	152	80	69	149	91	7.59	4.14	3.17
Total for Forbs		26	191	82	274	496	237	8.69	15.69	4.02

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

BROWSE TRENDS --
Management unit 30 , Study no: 58

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Arctostaphylos patula	2	1	1	.03	.15	.63
B	Artemisia tridentata vaseyana	13	11	14	.45	1.04	1.10
B	Gutierrezia sarothrae	3	1	0	.15	.00	-
B	Opuntia sp.	2	0	0	.30	-	-
B	Quercus gambelii	27	27	24	5.15	1.98	4.49
B	Quercus turbinella	4	1	2	.03	.18	.15
Total for Browse		51	41	41	6.11	3.35	6.37

CANOPY COVER, LINE INTERCEPT --
Management unit 30 , Study no: 58

Species	Percent Cover		
	'98	'03	'08
Arctostaphylos patula	-	.36	.75
Artemisia tridentata vaseyana	-	1.93	3.91
Quercus gambelii	1.20	4.43	7.23

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 30 , Study no: 58

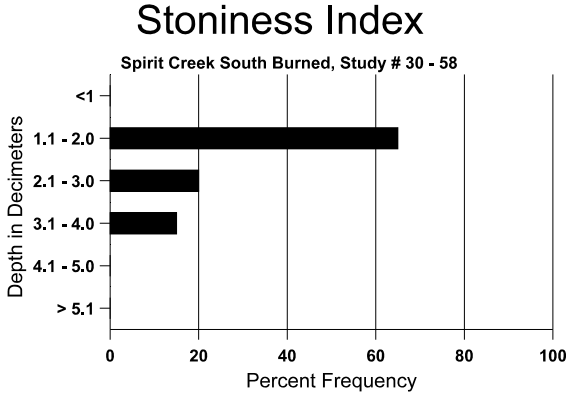
Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	2.6	1.4

BASIC COVER --
Management unit 30 , Study no: 58

Cover Type	Average Cover %					
	'86	'87	'92	'98	'03	'08
Vegetation	.25	9.75	22.50	55.70	43.92	31.24
Rock	0	0	0	.02	0	0
Pavement	0	.25	.75	.51	.24	.39
Litter	5.50	15.75	48.50	68.34	58.87	64.88
Cryptogams	0	0	0	.46	.17	.44
Bare Ground	94.25	74.25	28.25	18.20	13.81	18.42

SOIL ANALYSIS DATA --
Management unit 30, Study no: 58, Study Name: Spirit Creek South Burned

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%0M	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
27.4	42.8 (17.7)	6.1	64.0	21.4	14.6	1.8	15.2	176.0	0.7



PELLET GROUP DATA --
Management unit 30 , Study no: 58

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	1	8	65
Elk	-	-	-
Deer	55	30	25

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	1 (2)
76 (188)	17 (43)	162 (400)

BROWSE CHARACTERISTICS --
Management unit 30 , Study no: 58

		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												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	35/48
Arctostaphylos patula												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**40**	-	-	40	-	20	50	0	-	-	0	14/19
03	**20**	-	-	20	-	-	0	0	-	-	0	30/55
08	**20**	-	-	20	-	20	0	0	-	-	0	39/52
Artemisia tridentata vaseyana												
86	**0**	-	-	-	-	-	0	0	0	-	0	-/-
87	**0**	433	-	-	-	-	0	0	0	-	0	-/-
92	**166**	33	133	-	33	-	20	20	20	-	0	-/-
98	**340**	-	60	200	80	1880	18	0	24	18	18	17/24
03	**280**	-	-	280	-	80	0	0	0	-	0	31/38
08	**340**	380	-	300	40	80	6	6	12	-	0	37/51
Ceanothus greggii												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	133	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	52/69
08	**0**	-	-	-	-	-	0	0	-	-	0	35/58

		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 parryi												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	6/15
Eriodictyon angustifolium												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	13/13
03	**0**	-	-	-	-	-	0	0	-	-	0	-/-
08	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Gutierrezia sarothrae												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**366**	-	33	333	-	-	0	0	-	-	9	9/7
92	**266**	-	133	133	-	-	0	0	-	-	0	10/15
98	**120**	-	-	120	-	-	0	0	-	-	0	6/12
03	**20**	-	-	20	-	-	0	0	-	-	0	6/6
08	**0**	-	-	-	-	-	0	0	-	-	0	6/9
Opuntia sp.												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**66**	-	66	-	-	-	0	0	-	-	0	-/-
92	**33**	-	-	33	-	-	0	0	-	-	100	6/9
98	**40**	-	-	40	-	-	100	0	-	-	100	8/22
03	**0**	-	-	-	-	-	0	0	-	-	0	11/11
08	**0**	-	-	-	-	-	0	0	-	-	0	12/20
Purshia tridentata												
86	**0**	-	-	-	-	-	0	0	-	-	0	-/-
87	**0**	-	-	-	-	-	0	0	-	-	0	-/-
92	**0**	-	-	-	-	-	0	0	-	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	-	0	25/40
08	**0**	-	-	-	-	-	0	0	-	-	0	26/80

		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)
Quercus gambelii												
86	**0**	3533	-	-	-	-	0	0	0	-	0	-/-
87	**633**	-	633	-	-	-	5	0	0	-	0	-/-
92	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**2000**	60	600	1240	160	660	5	0	8	-	0	45/48
03	**2740**	60	1120	1060	560	3080	3	0	20	1	1	44/24
08	**2620**	40	460	1760	400	3860	6	5	15	6	8	74/41
Quercus turbinella												
86	**0**	-	-	-	-	-	0	0	0	-	0	-/-
87	**0**	-	-	-	-	-	0	0	0	-	0	-/-
92	**0**	-	-	-	-	-	0	0	0	-	0	-/-
98	**80**	-	20	20	40	20	0	0	50	50	50	50/59
03	**20**	20	-	-	20	40	0	0	100	100	100	51/46
08	**40**	-	-	-	40	40	0	50	100	50	50	74/82