

Trend Study 21B-15-08

Study site name: Fillmore Cemetery East.

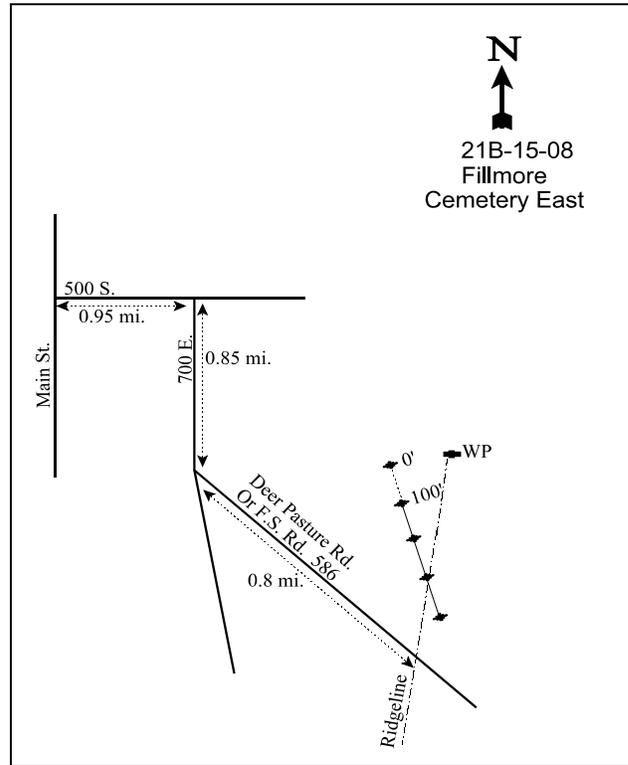
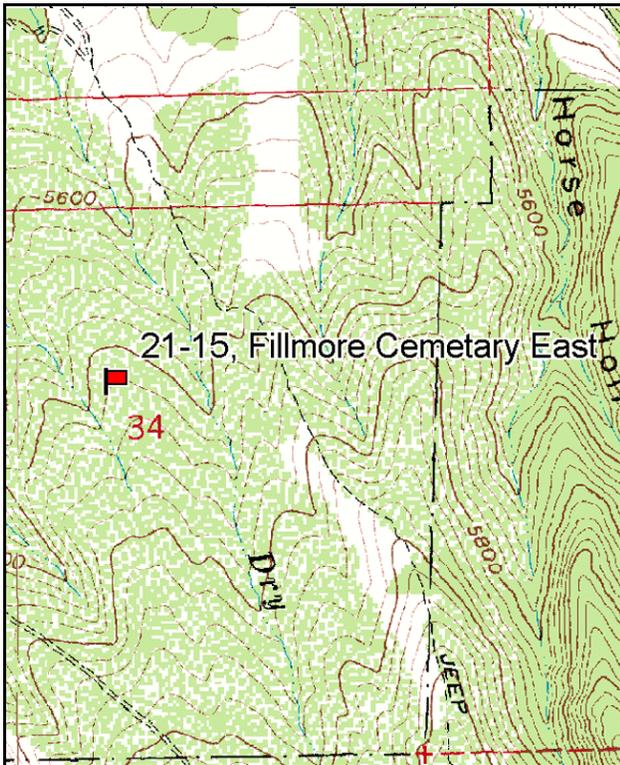
Vegetation type: Oak-Sagebrush.

Compass bearing: frequency baseline 165 degrees magnetic.

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

LOCATION DESCRIPTION

From 500 South and Main in Fillmore (the bend in the road), go east for 0.95 miles past the LDS Church and the cemetery to an intersection. Turn right (south) and go 0.85 miles to F.S. Road #386. Turn left and follow this road 0.8 miles to the ridgeline. From the ridgeline, walk north about 1/3 of a mile to a witness post (full high rebar). The frequency baseline starts 100 feet west (254°M) of the cairn. The 0' foot stake is a rebar tagged #7073.



Map Name: Fillmore

Diagrammatic Sketch

Township 21S, Range 4W, Section 34

GPS: NAD 83, UTM 12S 388216 E, 4311293 N

DISCUSSION

Fillmore Cemetery East - Trend Study No. 21B-15

Study Information

This study is located in the center of a section of land owned by the DWR, southeast of Fillmore [elevation: 5,720 feet (1,743 m), slope: 8%, aspect: northwest]. The area was chained and seeded in 1973. Pellet group data from the DWR South Chalk transect estimated an average of 49 deer days use/acre (121 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Deer use averaged 42 days use/acre (104 ddu/ha) between 1985 and 1990 (Jense et al. 1991). A pellet group transect sampled along the study baseline estimated 80 deer days use/acre (198 ddu/ha) in 1998, 62 days use/acre (152 ddu/ha) in 2003, and 111 days use/acre (274 ddu/ha) in 2008. Elk use is minimal at 1 day use/acre (3 edu/ha) in 2003 and 2008. Most of the pellet groups that were sampled in 1998 were centered around antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plants. Cattle grazed the allotment in the late 1970s, but it has been rested since 1981.

Soil

The soil is classified as a Borvant-Pahvant complex (USDA-NRCS 2008). The Borvant series consists of well-drained soils that are shallow over a petrocalcic horizon. These soils formed in alluvium or colluvium derived from limestone and sandstone. The Pahvant series consists of well-drained soils that are shallow to a calcium carbonate cemented hardpan. The soil on the study is a sandy clay loam with a slightly acidic reaction (pH 6.5). Relative combined vegetation and litter cover has increased from 71% in 1998 to 82% in 2008. Relative combined rock and pavement cover has decreased from 17% in 1998 to 13% in 2003 and 2008. Relative bare ground cover decreased from 12%-14% in 1998 and 2003 to 4% in 2008. The soil erosion condition was classified as stable in 2003 and 2008.

Browse

Preferred browse includes mountain big sagebrush and Gambel oak (*Quercus gambelii*). A portion of the sagebrush population appears to be a hybrid with basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), but all big sagebrush was classified as mountain big sagebrush. Sagebrush provided 17% quadrat cover in 1998 and 2003, and 8% in 2008. Density decreased from 2,680 plants/acre in 1998 to 2,420 plants/acre by 2008. Decadence has been high every sample year, ranging from 33% of the population to 68%. Young plants were only sampled in 1998 and 2008, and comprised only 6%-7% of the population. Vigor was good in 1985 and 1998, but plants with poor vigor made up 19%-32% of the population in 1991, 2003, and 2008. Average annual leader growth was 1.8 inches (4.6 cm) in 2003 and 1.4 inches (3.7 cm) in 2008.

Oak occurs in scattered clones throughout the study. Quadrat cover increased from 3% in 1998 to 5% in 2008, while density increased from 1,500 plants/acre in 1998 to 3,780 plants/acre in 2008. Decadence has been low except in 1991 and 2003, when decadent plants comprised 11%-12% of the population. Young recruitment steadily decreased from 81% in 1985 to 26% in 2008. Vigor has generally been good throughout the population.

Antelope bitterbrush was first sampled in 1998 when the baseline was lengthened. Quadrat cover has remained constant at 6% since 1998, and density has remained similar at approximately 350 plants/acre. The population is largely mature, and has a short growth form due to moderate-heavy use. Vigor has been excellent. Annual leader growth averaged 2.2 inches (5.7 cm) in 2003 and 0.7 inches (1.9 cm) in 2008.

Herbaceous Understory

Total grass cover was 11% in 1998, 18% in 2003, and 16% in 2008. However, the grass component was dominated by annual species. Cheatgrass (*Bromus tectorum*) provided 34%-55% of the total grass cover since 1998. Japanese brome (*Bromus japonicus*), rattail fescue (*Festuca myuros*), and sixweeks fescue (*Vulpia*

octoflora) also contributed to the annual grass cover. Crested wheatgrass (*Agropyron cristatum*), bottlebrush squirreltail (*Sitanion hystrix*), and Sandberg bluegrass (*Poa secunda*) were the most abundant perennial grasses, and provided 22%-29% of the total grass cover since 1998. Bulbous bluegrass (*Poa bulbosa*) has also been increasing in quadrat frequency since 1991. This species is a short-lived perennial with a life cycle similar to that of cheatgrass.

Total forb cover was 3% in 1998, and 1% in 2003 and 2008. The forb component was diverse, but composition was poor. Pale alyssum (*Alyssum alyssoides*) was the most abundant forb and provided 34%-38% of the total forb cover since 1998. Blue-eyed Mary (*Collinsia parviflora*), tansymustard (*Descurainia pinnata*), and bur buttercup (*Ranunculus testiculatus*) were also fairly common. Cainville thistle (*Cirsium calcareum*), death camas (*Zigadenus paniculatus*), Lewis flax (*Linum lewisii*), and western stoneseed (*Lithospermum ruderale*) were the most commonly sampled perennial forbs, but provided little cover.

1991 TREND ASSESSMENT

The browse trend is slightly down. Sagebrush density slightly increased from 2,466 plants/acre to 2,533 plants/acre, however, decadence increased from 41% of the population to 68%. No young plants were sampled, although seedlings were sampled at a density of 266 plants/acre. Plants displaying poor vigor increased from 5% of the population to 32%. Oak density decreased slightly from 9,065 plants/acre to 8,932 plants/acre, and decadence increased from 1% of the population to 12%. Young recruitment remained high, although it slightly decreased from 81% of the population to 63%. Vigor remained good on most of the population, with 7% of the plants displaying poor vigor. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased slightly. The trend for forbs is stable. The sum of nested frequency for perennial forbs increased slightly, but few desirable species were present. Cainville thistle increased significantly in nested frequency.

browse - slightly down (-1) grass - stable (0) forb - stable (0)

1998 TREND ASSESSMENT

The browse trend is stable. Density changes may have been related to the larger sample area in 1998, therefore, the trend was determined using other parameters. Sagebrush decadence decreased from 68% of the population to 33%. Young plants were sampled for the first time, comprising 7% of the population. Plants displaying poor vigor decreased from 32% of the population to 7%. Oak decadence decreased from 12% of the population to 0%, and young recruitment also decreased from 63% of the population to 47%. All of the sampled plants were vigorous. The trend for grass is slightly up. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased slightly. The trend for forbs is stable. The sum of nested frequency for perennial forbs decreased slightly. Cainville thistle decreased significantly in nested frequency. The winter range condition, determined by the Desirable Components Index (DCI), was rated as poor-fair due to adequate preferred browse cover, but low perennial herbaceous cover and moderate annual grass cover.

winter range condition (DCI) - poor-fair (49) Mid-level potential scale
browse - stable (0) grass - slightly up (+1) forb - stable (0)

2003 TREND ASSESSMENT

The browse trend is stable. Sagebrush density decreased 9%, and decadence increased from 33% of the population to 41%. Young recruitment decreased from 7% of the population to 0%, and plants displaying poor vigor increased from 7% of the population to 19%. Oak density increased 52%, and decadence increased from 0% of the population to 11%. Young recruitment remained high, but decreased from 47% of the population to 34%. Plants displaying poor vigor increased slightly from 0% of the population to 5%. Bitterbrush density remained similar to 1998, and while young plants comprised 17% of the population in 1998, all of the plants sampled in 2003 were mature. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, increased 16%. However, cheatgrass and bulbous bluegrass increased

significantly in nested frequency. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum, bur buttercup, and holosteum (*Holosteum umbellatum*) decreased significantly in nested frequency. The DCI rating declined to poor due to an increase in decadence and decrease in young recruitment of preferred browse, as well as an increase in annual grass cover, and a decrease in perennial forb cover.

winter range condition (DCI) - poor (42) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2008 TREND ASSESSMENT

The browse trend is stable. Sagebrush density remained similar to 2003, and decadence increased from 41% of the population to 60%. Young recruitment increased from 0% of the population to 6%, and plants with poor vigor increased from 19% of the population to 28%. Oak density increased 66%, and decadence decreased from 11% of the population to 5%. Young recruitment continued to decrease, but remained high at 26%. Vigor remained good on most plants. Bitterbrush density was stable, and all of the sampled plants were mature and vigorous. The trend for grass is stable. The sum of nested frequency for perennial grasses, excluding bulbous bluegrass, changed little. Rattail fescue increased significantly in nested frequency, while that for bluebunch wheatgrass (*Agropyron spicatum*) decreased significantly. The trend for forbs is stable. The sum of nested frequency for perennial forbs changed little. Pale alyssum increased significantly in nested frequency. The DCI rating remained poor.

winter range condition (DCI) - poor (38) Mid-level potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 21B, Study no: 15

T y p e	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
G	<i>Agropyron cristatum</i>	22	11	28	23	24	1.03	.96	1.74
G	<i>Agropyron spicatum</i>	a-	ab ³	ab ⁴	b ¹⁰	a-	.03	.91	.00
G	<i>Bromus japonicus</i> (a)	-	-	155	133	157	2.98	1.03	2.30
G	<i>Bromus tectorum</i> (a)	-	-	a ²⁶⁶	b ²⁹²	b ²⁹⁵	3.80	9.64	7.62
G	<i>Festuca myuros</i> (a)	-	-	a-	a ⁸	b ²³	-	.02	.10
G	<i>Poa bulbosa</i>	a-	a ⁸	a ²⁶	b ⁶⁶	b ⁷³	1.16	2.07	1.20
G	<i>Poa fendleriana</i>	-	-	3	-	3	.03	-	.01
G	<i>Poa secunda</i>	a ¹⁶	ab ²⁶	bc ⁵⁵	bc ⁵²	c ⁷⁸	.87	.89	1.69
G	<i>Sitanion hystrix</i>	a ²²	ab ⁴⁵	ab ⁵⁰	b ⁷⁷	b ⁷⁵	1.35	2.04	1.09
G	<i>Vulpia octoflora</i> (a)	-	-	7	-	-	.01	-	-
Total for Annual Grasses		0	0	428	433	475	6.80	10.70	10.03
Total for Perennial Grasses		60	93	166	228	253	4.48	6.88	5.75
Total for Grasses		60	93	594	661	728	11.29	17.59	15.78
F	<i>Alyssum alyssoides</i> (a)	-	-	b ¹⁵⁷	a ⁸⁶	b ¹⁴⁴	1.03	.45	.55
F	<i>Arabis</i> sp.	-	-	3	-	-	.03	-	-

Type	Species	Nested Frequency					Average Cover %		
		'85	'91	'98	'03	'08	'98	'03	'08
F	<i>Astragalus argophyllus</i>	2	3	3	-	-	.03	-	-
F	<i>Astragalus cibarius</i>	1	1	3	-	2	.04	-	.03
F	<i>Asclepias</i> sp.	-	-	7	-	-	.18	-	-
F	<i>Astragalus lentiginosus</i>	-	-	-	-	1	-	-	.00
F	<i>Calochortus nuttallii</i>	a-	b8	a-	a-	ab3	-	-	.00
F	<i>Chaenactis douglasii</i>	-	4	-	-	-	-	-	-
F	<i>Cirsium calcareum</i>	ab17	b34	ab15	a5	a-	.70	.21	-
F	<i>Cirsium</i> sp.	a-	a-	a-	a-	b7	-	-	.10
F	<i>Collomia linearis</i> (a)	-	-	-	-	1	-	-	.00
F	<i>Collinsia parviflora</i> (a)	-	-	8	5	3	.02	.01	.01
F	<i>Crepis acuminata</i>	-	-	1	-	-	.00	-	-
F	<i>Cryptantha</i> sp.	-	3	-	-	-	-	-	-
F	<i>Descurainia pinnata</i> (a)	-	-	13	1	3	.02	.00	.00
F	<i>Draba</i> sp. (a)	-	-	b43	a-	a-	.42	-	-
F	<i>Epilobium brachycarpum</i> (a)	-	-	3	-	-	.00	-	-
F	<i>Eriogonum racemosum</i>	-	5	-	-	4	-	-	.01
F	<i>Galium boreale</i>	-	-	4	6	-	.01	.30	-
F	<i>Holosteum umbellatum</i> (a)	-	-	b27	a3	a-	.06	.00	-
F	<i>Lactuca serriola</i>	-	9	-	-	1	-	-	.03
F	<i>Linum lewisii</i>	14	2	6	6	1	.04	.01	.06
F	<i>Lithospermum ruderales</i>	6	7	-	5	4	.00	.16	.15
F	<i>Lotus utahensis</i>	-	-	-	-	2	-	-	.00
F	<i>Machaeranthera canescens</i>	1	3	3	-	-	.00	-	-
F	<i>Microsteris gracilis</i> (a)	-	-	6	-	-	.04	-	-
F	<i>Phlox longifolia</i>	3	5	2	1	-	.01	.00	-
F	<i>Polygonum douglasii</i> (a)	-	-	-	-	16	-	-	.04
F	<i>Ranunculus testiculatus</i> (a)	-	-	b49	a9	a3	.13	.01	.00
F	<i>Sphaeralcea coccinea</i>	-	-	2	-	3	.00	-	.15
F	<i>Streptanthus cordatus</i>	-	-	1	3	-	.00	.00	-
F	<i>Zigadenus paniculatus</i>	6	17	6	10	12	.07	.13	.27
Total for Annual Forbs		0	0	306	104	170	1.74	0.49	0.61
Total for Perennial Forbs		50	101	56	36	40	1.14	0.82	0.82
Total for Forbs		50	101	362	140	210	2.89	1.31	1.44

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

BROWSE TRENDS --

Management unit 21B, Study no: 15

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Artemisia tridentata vaseyana	80	68	71	16.78	17.32	7.88
B	Gutierrezia sarothrae	41	18	27	2.22	.54	.25
B	Juniperus osteosperma	0	0	0	-	1.16	1.62
B	Opuntia sp.	2	2	3	.15	.00	.15
B	Purshia tridentata	12	12	15	6.00	5.68	5.85
B	Quercus gambelii	16	19	22	2.68	3.82	4.84
Total for Browse		151	119	138	27.84	28.55	20.62

CANOPY COVER, LINE INTERCEPT --

Management unit 21B, Study no: 15

Species	Percent Cover	
	'03	'08
Artemisia tridentata vaseyana	13.69	12.93
Gutierrezia sarothrae	.50	.76
Juniperus osteosperma	2.68	3.70
Purshia tridentata	6.56	8.51
Quercus gambelii	6.88	10.13

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 21B, Study no: 15

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.8	1.4
Purshia tridentata	2.3	0.7

POINT-QUARTER TREE DATA --

Management unit 21B, Study no: 15

Species	Trees per Acre		
	'98	'03	'08
Juniperus osteosperma	7	<18	20

Average diameter (in)		
'98	'03	'08
8.7	-	6.9

BASIC COVER --

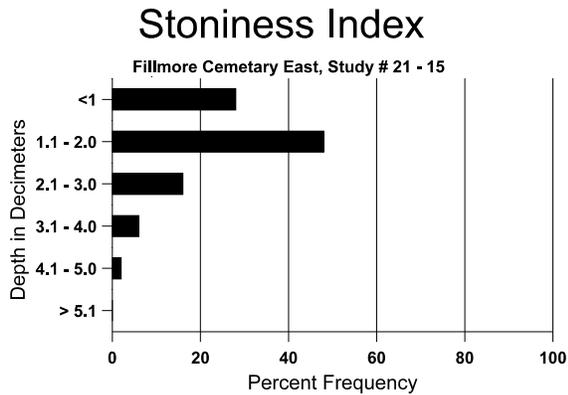
Management unit 21B, Study no: 15

Cover Type	Average Cover %				
	'85	'91	'98	'03	'08
Vegetation	1.75	2.75	39.64	44.63	41.96
Rock	4.75	6.75	6.26	5.70	5.78
Pavement	17.25	12.50	16.35	9.59	9.30
Litter	57.25	57.00	54.25	43.54	51.06
Cryptogams	0	0	1.10	.57	1.25
Bare Ground	19.00	21.00	15.75	16.76	4.27

SOIL ANALYSIS DATA --

Management unit 21, Study no: 15, Study Name: Fillmore Cemetary East

Effective rooting depth (in)	Temp °F (depth)	pH	sandy clay loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
10.7	66.0 (13.0)	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8



PELLET GROUP DATA --

Management unit 21B, Study no: 15

Type	Quadrat Frequency		
	'98	'03	'08
Rabbit	15	6	21
Horse	1	-	-
Elk	-	-	3
Deer	51	35	51
Cattle	-	-	-

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
-	1 (3)	1 (2)
80 (198)	62 (152)	111 (274)
1 (2)	-	-

BROWSE CHARACTERISTICS --
Management unit 21B, Study no: 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>Artemisia tridentata vaseyana</i>												
85	2465	66	-	1466	999	-	38	0	41	.81	5	26/29
91	2532	266	-	799	1733	-	13	0	68	9	32	31/35
98	2680	80	180	1620	880	520	15	0	33	5	7	28/38
03	2440	-	-	1440	1000	640	16	7	41	19	19	26/34
08	2420	-	140	820	1460	780	40	5	60	28	28	28/37
<i>Ceanothus fendleri</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	17/56
<i>Cercocarpus montanus</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	26/44
<i>Gutierrezia sarothrae</i>												
85	1399	266	933	466	-	-	5	0	0	-	14	7/6
91	2865	466	399	2333	133	-	0	0	5	-	0	9/11
98	5100	60	640	4460	-	-	0	0	0	-	0	7/9
03	980	-	60	880	40	80	0	0	4	2	2	7/9
08	1000	80	120	780	100	-	2	0	10	6	8	8/13
<i>Juniperus osteosperma</i>												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	20	-	-	-	-	0	0	-	-	0	-/-
08	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)
Opuntia sp.												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	40	-	-	40	-	-	0	0	-	-	0	7/16
03	40	-	-	40	-	-	0	0	-	-	0	6/19
08	60	-	-	60	-	-	0	0	-	-	33	7/21
Purshia tridentata												
85	0	-	-	-	-	-	0	0	-	-	0	-/-
91	0	-	-	-	-	-	0	0	-	-	0	-/-
98	360	-	60	300	-	-	67	17	-	-	0	21/46
03	340	-	-	340	-	-	0	100	-	-	0	25/87
08	360	-	-	360	-	-	67	6	-	-	0	24/62
Quercus gambelii												
85	9065	8066	7333	1666	66	-	2	0	1	-	7	66/45
91	8931	2266	5666	2199	1066	-	7	0	12	2	7	72/38
98	1500	180	700	800	-	300	0	0	0	-	0	50/35
03	2280	60	780	1240	260	360	10	.87	11	3	5	34/27
08	3780	80	980	2620	180	600	5	0	5	-	1	44/46