

1 seedling
cacha and
died 37 = 0

① one seedling alive 8/1/47
☐ due ① died
① + one seedling cacha alive 1960

[illegible]

Grass Valley, Lassen National Forest
(Exclosure fenced October 1933)

9-20

7-20

Strip Cache		Approximate age and location	1941	1941	1942	1942	1942	1943	1943	1944	1944	1945	1947	1952	1952	(13) 1960						
No.	No.		6/19	11/12	6/21	8/1	10/	5/11	11/19	7/31	10/24	8/13	8/14	8/1	5/30	ALH	ALH	ALH	ALH	ALH		
			ALH	ALH	ALH	ALH	ALH	ALH-FDD	ALH	ALH-NCB	ALH-KH	ALH	U.C. students	Kay Hub	Ht	"Dia"	No Plants	Dia	Ht	Def	Surv	
10 S (Cont.)	58	Open pine-1941 Ger.	+	5	4	4	4	4	4	4	4	4	4	3	6	8	3+	9	8	20	95	
	59	" 4 or 5 years	-	1	1	1	1	1	1	1	1	1	1	1	7	9	1	8	6	5	98	
11 N	60	" 1941 Ger.		6	5	2	2	0	0	0	0	0	0	0			0					
	61	" " "		10	7	7	3	2	2	2	0	0	0	0			0					
	62	" base of pine-1941 Ger.	+	8	4	3	3	2	1	1	1	1	1	1	11	9	1	10	10	0	90	
	63	" " " 5 or 6 years	-	11	11	11	11	11	11	11	11	11	11	11	17	20	1	18	19	10	95	
	64	" " " 1941 Ger.	+	15	14	14	13	10	9	8	6	4	3	3	6	8	3+	8	6	0	99	
	65	" " " " "	+	12	11	11	10	9	9	9	9	9	9	8	7	6	7+	11	6	2	90	
	66	" " " " "	+	20	11	11	11	7	6	6	6	6	6	6	6	9	6+	17	16	2	90	
	67	" " " " "		6	0	0	0	0	0	0	0	0	0	0			0					
	68	" " " " "		8	2	2	2	1	1	0	0	0	0	0			0					
	69	" " " " "		8	1	0	0	0	0	0	0	0	0	0			0					
	70	" " " " "		20	0	0	0	0	0	0	0	0	0	0			0					
	71	" " " " "		15	1	1	2	0	0	0	0	0	0	0			0					
	72	" " " " "	+	13	7	7	7	6	6	6	4	4	4	3	2	5	7	1+	6	6	0	100
	12 S	73	" Open	+	11	8	8	8	6	6	6	6	6	5	5	8	10	5+	8	7	20	100
74		" base of pine-1941 Ger.		6	1	1	1	0	0	0	0	0	0	0			0					
13 N	75	Under Pt-1941 Ger.	-	1	1	1	1	1	1	1	1	1	0	0			0					
	76	Open " "		5	0	0	0	0	0	0	0	0	0	0			0					
	77	" " "		5	5	3	3	3	2	2	0	0	0	0			0					
	78	Edge Pt-1941 Ger.		13	12	12	11	5	5	5	4	4	2	1	5	4	0	(Dead)				
	79	Open " "	+	14	11	11	10	6	6	6	6	6	6	5	7	10	5+	9	7	0	90	
	80	" " "	+	18	14	14	14	13	13	13	13	8	8	8	8	9	8+	10	12	0	80	
	81	" " "	+	12	10	9	9	7	7	7	6	6	6	6	10	10	6+	11	9	2	100	
	82	" " "	+	14	10	10	7	7	7	7	7	7	7	7	5	5	5+	7	8	0	80	
	83	Edge sage " "		5	1	0	0	0	0	0	0	0	0	0			0					
	84	Open " "		5	4	3	3	0	0	0	0	0	0	0			0					
85	" " "		3	3	3	1	0	0	0	0	0	0	0			0						
86	" " "		10	7	7	3	2	2	2	1	1	1	0			0						
87	" " "		9	0	0	0	0	0	0	0	0	0	0			0						
88	" " "		8	0	0	0	0	0	0	0	0	0	0			0						
89	Under pine-1941 Ger.		21	18	13	13	4	1	1	0	0	0	0	0			0					
90	" Pt " "		6	5	4	4	4	0	0	0	0	0	0	0			0					
91	Open " "		6	2	2	2	2	2	2	2	0	0	0	0			0					
92	" " "	+	14	13	12	11	10	10	10	10	9	9	9	5	4	4	2+	6	7	0	80	
93	" " "		6	5	5	1	1	0	0	0	0	0	0			0						
94	" " "	+	8	7	7	7	6	6	6	6	6	6	6	4	9	10	4+	8	6	30	100	

Totals US SI UP
3 19 12 (34)

Grand total Number of 1941 caches → 72
" " " " " seedlings → 736
Av. No. of seedlings per cache 10.2

1941	1942	1943	1944	1945	1947	1952	1960
72	64	62	61	54	49	49	43
736	498	469	427	342	307	304	272
10.2	7.9	7.7	7.1	6.4	6.4	6.3	6.5

Grand totals
Stems 182
N=28
Av. 7.1 6.8
1952
235 241 144 240.5
Av. 8.4 8.6 5.1 85.9%
20 years old

Staked 1941 Seedlings (Not included because only 1 seedling in spot therefore not a cache)
No 34,

Measure in Sept.

Measure in Sept.																									
1	2	3	4	5	Strip	Cache	No of Seedlings per cache							1952		1960		1961		1962		1963			
No	No	No	No	No	No	No	1941	1942	1943	1944	1945	1947	seedlings	HT	No	HT	No	HT	No	HT	No	HT	No	HT	
														SI	Shrub inter spaces										
...	...	5	2	2	1	1	Dead																		
...	...	6	15	12	10	8	8	8	2	2	6	9	2	6	10	5	60	2	10	20	5	8	2	13	
...	...	10	8	8	7	4	Dead																		
...	...	13	6	5	2	2	1	1	Dead																
...	...	15	11	9	6	6	6	6	6	6	8	8	6	10	12	5	95	4	11	11	0	4	3	10	
...	...	16	7	2	1	Dead																			
...	...	17	15	15	14	12	10	10	1	1	6	7	1	6	9	3	95	1	7	11	5	5	1	12	
...	...	18	13	7	7	7	7	7	2	3	4	Dead													
...	...	21	3	2	1	1	Dead																		
...	...	23	3	3	3	3	3	3	3	3	17	14	3	15	15	2	98	2	11	23	10	?	1	18	
...	...	28	24	12	11	11	8	4	1	Dead															
...	...	29	17	17	16	16	15	13	2	2	4	7	2	6	6	3	98	1	5	10	T	6	1	7	
...	...	31	10	4	1	Dead																			
...	...	32	13	5	5	4	Dead																		
...	...	39	13	7	5	4	4	4	3	3	5	5	2	6	6	0	95	1	7	8	T	4	1	9	
...	...	54	14	14	14	14	9	9	9	7	5	5	3	6	5	10	100	3	6	6	1	?	2	6	
...	...	55	8	7	3	3	2	Dead																	
...	...	56	9	1	Dead																				
...	...	57	13	10	Dead																				
...	...	58	5	4	4	4	4	4	4	3	8	6	3	9	8	20	95	3	9	13	2	4	3	11	
...	...	60	6	5	Dead																				
...	...	61	10	7	2	2	Dead																		
...	...	73	11	8	8	6	6	6	5	5	10	8	5	8	7	20	100	3	9	13	5	7	2	11	
...	...	76	5	Dead																					
...	...	77	5	5	3	2	Dead																		
...	...	79	14	11	6	6	6	6	5	10	7	5	9	7	0	90	4	11	15	1	6	4	12		
...	...	80	18	14	13	13	13	8	8	8	9	8	8	10	12	0	80	7	16	17	0	5	6	16	
...	...	81	12	10	7	7	6	6	6	6	10	10	6	11	9	2	100	4	11	12	5	5	4	13	
...	...	82	14	10	7	7	7	7	7	7	5	5	5	7	8	0	80	4	9	12	2	6	4	9	
...	...	84	5	4	Dead																				
...	...	85	3	3	Dead																				
...	...	86	10	7	2	2	1	1	Dead																
...	...	87	9	Dead																					
...	...	88	8	Dead																					
...	...	91	6	2	2	2	2	Dead																	
...	...	92	14	13	10	10	9	9	9	5	4	4	2	6	7	0	80	1	6	12	0	?	1	6	
...	...	93	6	5	1	Dead																			
...	...	94	8	7	6	6	6	6	4	10	9	4	8	6	30	100	1	11	15	0	9	1	15		
Total or no		38	373	257	188	163	133	118	85	69	122	116	57	123	127	99	1366	41	139	198	36	69	36	168	
No caches & Ave			9.8	7.3	6.3	6.0	6.3	6.2	5.0	4.3	7.6	7.3	3.8	8.2	8.5	6.7	91.1	2.7	9.3	13.2	2.8	5.8	2.4	11.2	
Summary (SI, UPE, US) 1941/1 staked plants																									
SI		Tot	38	373	257	188	163	133	118	85	69	122	116	57	123	127	99	1366	41	139	198	36	69	36	168
UPE		T	38	38	35	30	27	21	19	17	16	16	15	15	15	15	15	15	15	15	15	12	15	15	15
US		T	22	283	183	140	126	101	96	76	63	94	89	50	112	114	44	1039	45	129	171	58	67	32	153
US		T	22	22	26	17	17	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
US		T	12	80	62	31	19	16	11	4	2	7	11	0	—	—	—	—	—	—	—	—	—	—	—
US		T	12	12	10	7	6	6	6	4	2	2	2	0	—	—	—	—	—	—	—	—	—	—	—
GT		T	72	72	502	359	308	250	225	165	134	223	218	107	235	241	44	2405	86	268	361	94	136	68	321
GT		T	72	72	65	54	50	41	39	35	31	31	31	28	28	28	28	28	28	28	28	25	28	28	28
GT		Ave	102	102	7.7	6.6	6.2	6.1	5.8	4.7	4.3	7.2	7.0	3.8	8.4	8.6	15	85.9	3.1	9.6	12.9	3.4	5.4	2.4	11.5

Staked 1940 and 1936 seedlings

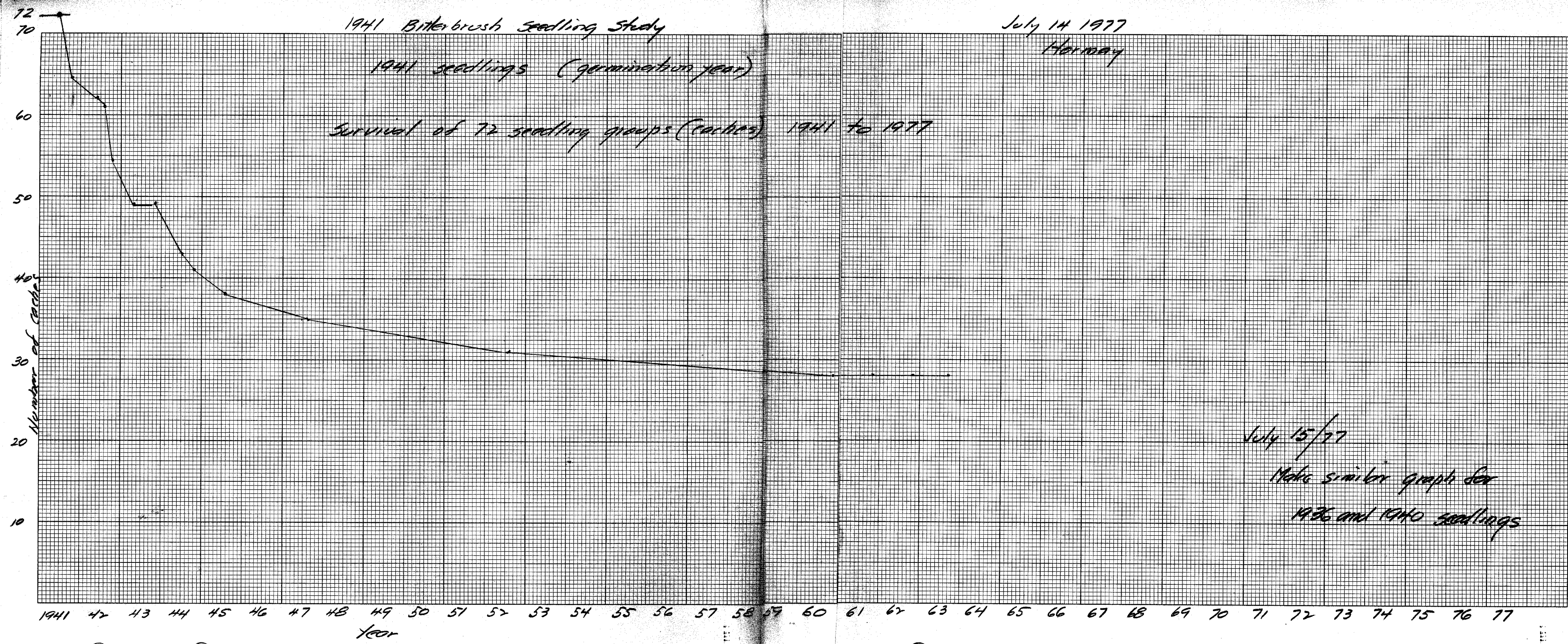
[illegible]

1941 Bitterbrush seedling study

July 14 1977
Hormay

1941 seedlings (germination year)

Survival of 72 seedling groups (caches) 1941 to 1977



July 15/77
Make similar graph for
1936 and 1940 seedlings

1941 Bitterbrush Seeding Study Continued I

July 14 1977
Hermay

Catche	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1941 June 19	1941 Nov 12	1942 June 21	1942 Aug 1	1942 Oct	1943 May 11	1943 Nov 19	1944 July 31	1944 Oct 24	1945 Aug 13	1947 Aug 14	1952 Aug 1	1960 Oct 17	1961 Oct 23	1962 Oct 24	1963 Sept 5	1965 Oct 8	1977
No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
1941 Germination																		
1	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	3	15	13	13	11	1	1	1	1	1	1	1	1	1	1	1	1	1
3	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	5	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	6	15	12	10	10	10	8	8	8	8	8	8	8	8	8	8	8	8
6	7	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
8	10	8	7	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4
9	13	6	5	5	3	2	2	2	2	2	2	2	2	2	2	2	2	2
10	15	11	9	9	6	6	6	6	6	6	6	6	6	6	6	6	6	6
11	16	7	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	17	15	15	15	14	14	12	12	10	10	10	10	10	10	10	10	10	10
13	18	13	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
14	Note No 22 } 21	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	external after } 23	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	No 60 } 26	7	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
17	27	9	7	7	7	6	5	5	5	5	5	5	5	5	5	5	5	5
18	28	24	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
19	29	17	17	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
20	30	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21	31	10	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	32	13	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4
23	35	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24	39	13	7	7	7	5	4	4	4	4	4	4	4	4	4	4	4	4
25	42	17	15	14	14	12	9	8	8	8	8	8	8	8	8	8	8	8
26	44	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27	47	17	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7
28	48	20	19	19	19	16	16	16	16	16	16	16	16	16	16	16	16	16
29	49	28	28	28	28	27	26	26	26	26	26	26	26	26	26	26	26	26
30	50	15	15	15	15	9	8	7	7	7	7	7	7	7	7	7	7	7
31	51	20	19	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18
32	52	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
33	53	6	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4
34	54	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
35	55	8	7	7	7	3	3	3	3	3	3	3	3	3	3	3	3	3
36	56	9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	57	13	10	10	10	3	3	3	3	3	3	3	3	3	3	3	3	3
38	58	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
39	60	6	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
40	22	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N=40 Total Seedlings																		
Total Catches	40	37	37	36	33	30	30	28	26	24	22	18	16	16	16	16	16	16

Total 11

Cache		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		1941 June 19	1941 Nov 12																
		No	No	No	No	No	No	No	Seedlings in cache		No	No	No	No	No	No	No	No	No
		1941 Elimination																	
		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
32	61	10	7	7	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1
1	62	8	4	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1
2	64	15	14	14	13	10	9	8	6	4	3	3	3	3	3	3	3	3	3
3	65	12	11	11	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9
4	66	20	11	11	11	7	6	6	6	6	6	6	6	6	6	6	6	6	6
5	67	6	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	68	8	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	69	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	70	20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	71	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	72	13	7	7	7	6	6	6	4	4	4	3	2	1	1	1	1	1	1
11	73	11	8	8	8	8	6	6	6	6	6	5	5	5	5	5	5	5	5
12	74	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
75 out																			
13	76	5	5	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1
14	77	5	5	3	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1
15	78	13	12	12	11	5	5	5	4	4	2	1	1	1	1	1	1	1	1
16	79	14	11	11	10	6	6	6	6	6	6	6	5	5	5	5	5	5	5
17	80	18	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13
18	81	12	10	9	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7
19	82	14	10	10	10	7	7	7	7	7	7	7	7	7	7	7	7	7	7
20	83	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	84	5	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
22	85	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
23	86	10	7	7	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1
24	87	9	7	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	88	8	7	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	89	21	18	13	13	4	1	1	1	1	1	1	1	1	1	1	1	1	1
27	90	6	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
28	91	6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
29	92	14	13	12	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10
30	93	6	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
31	94	8	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6
N = 32																			
Total seedlings I																			
" " I																			
6 Total																			
Total caches II		32	27	25	25	21	19	19	15	15	14	13	13	12	12	12	12	12	12
" " I		40	37	37	36	33	30	30	28	26	24	22	18	16	16	16	16	16	16
6 Total		72	64	62	61	54	49	49	43	41	38	35	31	28	28	28	28	28	28
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16	16

July 15/77 v' checked this figure

Total 10

1941 Bitterbrush Seedling Study
 The seedlings that were observed germinated in 1936, 1940, 1941
 all in groups (caches) from seeds cached by rodents

July 14 1977
 Hervey

Cache	Examination Number and Date																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1941	1941	1942	1942	1942	1943	1943	1944	1944	1945	1947	1952	1960	1961	1962	1963	1965	1977
	June 19	Nov 12	June 21	Aug 1	Oct	Nov 11	Nov 19	July 31	Oct 24	Aug 13	Aug 14	Nov 1	Oct 17	Oct 23	Oct 24	Sept 5	Oct 8	
	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	①					②		③		④	⑥	⑦	⑨	⑩	⑪	⑫	⑬	⑭
	1936 Germination																	
	GS	W		GS	W	GS	W	GS	W	GS	W							
9	6	6	6	6	6	6	6	6	5	5	4	1	1	1				
11	2	2	2	2	2	2	2	2	1	1	1	1	1	1	①			
12	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2			
24	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
33	7	7	7	7	7	7	7	7	7	7	5	1	1	1	1			
37	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
38	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
40	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
41	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2			
43	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
45	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4			
46	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
59	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
63	11	11	11	11	11	11	11	11	11	11	11	11	11	11	6			
N=15 Total	56	54	54	54	54	54	54	51	51	50	47	37	29	29				
Mortality																		
Spring-fall	2			0														
Winter		0			0													
Caches alive	15	15	15	15	15	15	15	15	15	15	15	13	12	12				
	1940 Germination (No seedlings removed from these caches)																	
	GS	W		GS	W	GS	W	GS	W	GS	W							
1	6	6	6	6	6	6	6	5	5	5	5	4	4	4	4	4		
14	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1		
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
36	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
N=5 Total	11	11	11	11	11	11	11	9	9	9	9	8	7	7	7	7		
Mortality																		
Spring-fall	0			0														
Winter		0			0			2		0								
Year of observation		1		2			3		4									
Age of seedlings		2		3			4		5		7	12	20	21	22	23	25	37
Caches alive	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4		

SF = Growing season Spring-fall W = Winter
 ← GS = Growing season
 Caches

Caches N=5
 Died 1
 Survived 4