

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

RR
Pine Ranges
Burgess Spring

December 14, 1937

PINE SEEDLINGS VS. CATTLE DAMAGE

Burgess Spring Experimental Range

1937

By

R. W. Gardner
Junior Range Examiner



California Forest and Range Experiment Station

Pine seedlings vs. cattle damage

Object — The most important summer grazing lands of California are in the Eastside Ponderosa Pine type. A large percentage of this area is in the national forest and thus an attempt is being made to put both the grazing and timber resources on a sustained yield basis. The greater part of this area has not yet been logged and a system of management for the cut-over lands has yet to be worked out.

The practice on most of the national forest areas in this type that have been cut-over so far has been to allow ^{cattle} grazing immediately following logging. Pine seedling survival from germination after logging has been very sparse in the past and it is the belief of some authorities that this has been due to livestock. To determine to what extent this was true on cattle range an experiment was started in November 1935 on the Burgess Spring Experimental Range, Lassen National Forest, logged over in 1934. *not always? sheep!*

Method — For this study it was necessary to have a large number of seedlings distributed throughout the area, each of which could be examined for cattle damage during the grazing season.

An ideal set-up would be to wait for a good seed year or a year in which all conditions are right for germination. This is impossible to forecast, however, and such ideal conditions may not occur for 15 or 20 years. For this reason artificial seeding was resorted to.

In the fall of 1935, 834⁶ quarter-milacre quadrats were each planted with 72 seed spots of ponderosa and jeffrey pine. In 1936 the quadrats were examined bi-weekly and the lives of the seedlings followed until November 8. A more complete description of method may be obtained from the 1936 Progress Report.

Germination percent of this first seeding was very low and mortality due to natural causes during the first year was high. It was felt that the 1937 seedling crop should be greater.

Little can be done with our knowledge to date to prevent seedlings from dying due to natural causes and our only means of increasing the seedling crop is to plant more and select a better time and method of planting so more seeds will have a chance to germinate before the rodents get at them.

In 1936 it was believed that the proper time to plant was immediately before the winter snows began at which time the rodent activity would be at a minimum and more seeds would be germinated before the rodents got at them in the spring.

The first seeding was from November 6-14, immediately before a predicted storm. ¹²⁸⁵ 1199 quarter-milacre quadrats were seeded with 50 seed spots each. A corn planter was used, dropping 1 to 3 seeds per spot. 86 quadrats were selected at random and planted by hand, one seed per spot, in a study to find out if we were losing anything by using corn planters. The storm that was expected did not occur and the weather cleared up. It remained clear and cold until about December 16, when a light snow fell.

Another seeding was made December 18 to 21 on ⁹⁵⁸~~957~~ quadrats on a similar area immediately west of the quadrats seeded in November. An additional row of 10 seed spots were planted 1 foot north of 403 quadrats of the "west" seeding with strychnine coated seed prepared by W. E. Fair of the U. S. Biological Survey. It was hoped that rodents would pass up this poisoned seed.

The day following the final planting the winter storms began which covered the ground with snow until spring.

The first seedling examination was made June 1 to 11, 1937 just prior to the entering of the cattle. 16 head of Herefords composed of 4 yearling heifers, 4 yearling steers, 4 two-year-old steers and 4 three-year-old dry cows arrived on the range June 14 and stayed until October 3. The regular grazing season on the Lassen Forest is from June 1 to October 15. Seedling examinations were made bi-weekly throughout the grazing season.

In 1936 examinations were made of ⁸³⁶~~854~~ quarter-milacre quadrats systematically distributed over 537 acres. The 1936 results indicated that the area needed to be cut down and more quadrats added. Consequently 849 random quadrats were added to the north 269 acres which was the area examined regularly in 1937. The 443 systematic quadrats in the north half plus ⁵⁰~~958~~ quarter-milacre areas seeded to the west of established quadrats makes a total of 224⁵⁰~~9~~ quadrats regularly examined in 1937.

The systematic quadrats in the south 268 acres were examined only at the beginning and end of the season. No attempt was made to determine the cause of death of these seedlings that died.

Seedlings on each quadrat were plotted on a map with "X" to aid examiners and as a seedling died the "X" was circled. Each dead seedling was examined carefully to determine whether it had been grazed or trampled by cattle and the ground around it examined for cattle tracks. Examinations at bi-weekly intervals were close enough together that tracks made between examinations were distinguishable. Position and appearance of seedling and condition of ground on and around the quadrat made it fairly easy to tell when seedling had been trampled or grazed.

For the first four examinations all quadrats seeded in 1936 were visited. At the fourth examination new germination had dropped off so much that on the following examinations only those quadrats with live seedlings on them at the preceding examination were visited.

Results

Seeding studies — Of the two seedings on November 6-14 and December 18-21 it was expected that the latter would yield a much higher crop of seedlings as the ground was covered with snow the day after the last seed was planted whereas the rodents had over a month to work on the seeds planted November 6-14. Such was not the case as the results show that .966 seedlings per quadrat germinated from the November seeding and .936 from the December seeding, figures so nearly alike there is no significant difference.

Of the November seeding, the hand seeded quadrats yielded a germination of .791 seedlings per quadrat as compared with a germination of .978 seedlings per quadrat with the corn planted ones.

Of the 403 quadrats planted with 10 seed spots of poisoned seed, only 34 germinated.

112,130
Of the ~~110,000~~ seed spots planted in 1936, 2,171 seedlings germinated in 1937 as compared with the 5,627 seedlings germinating in 1936 from the ~~59,000~~^{60,200} seed spots planted in 1935.

Of the 5,267 seedlings germinating in the spring, 1936, 436 were alive in the fall. 175 were still alive in the spring, 1937 and that fall 130 were left. Of the total number alive in 1936, 8.3% lived through the first summer as compared with a survival of 74.3% during the second summer based on the 175 alive in the spring. Of the 5,267 total germination, 5,137 or 97.5% were dead 2 years after seeding.

Cattle damage studies — 1937 results correspond quite closely to those of 1936. Seedlings killed by cattle were negligible as compared with mortality by other causes. 2.5% of the dead seedlings were due to cattle in 1937 and only 1.4% in 1936. As in 1936 most of the damage was by trampling and little by grazing. In 1936, 89% of the seedlings were killed by trampling and in 1937 the percentage was 88. As in 1936, most of the cattle damage was done in the earlier part of the season.

Conclusions

Seeding studies — Results of one year's seeding indicate that when the winter storms are late and a period of cold weather precedes them, there is no advantage in waiting to seed until just before the storms begin. Evidently in such a year the rodent activity during the 4 or 5 weeks before the winter storms results in no appreciable difference in the number of seeds left to germinate in the spring.

Seeding with a corn planter gives better results than seeding by hand. This is probably due to the greater number of seeds planted per spot with a corn-planter. It was hoped that hand planting would not

disturb the ground as much as the corn planter and the rodents would not find the seeds as readily but such was not the case.

More work will have to be done on poison coated seed, Practically none of these germinated. Whether this was due more to rodents or whether the coating prevented germination is impossible to say.

The number of seeds planted in the fall gives no indication of the number of seedlings to expect in the spring. The 1935 seeding yielded 5 times as many seeds per spot as the 1936 seeding.

The first winter after germination kills off a great number of the few seedlings that have survived the summer. The second summer also kills off an appreciable number but those that are left appear to be quite sturdy.

Cattle damage studies — Seedlings killed by cattle are negligible as compared to mortality due to other causes. Two years results indicate that the seedlings are not grazed intentionally but that practically all the damage is due to accidental trampling. In 1936 and 1937 over 3/4 of the cattle damage was done before the end of July, the greatest mortality occurring at the hottest period of the year.

As the examiners estimate that most of the seedlings were killed by drought it is safe to assume that the greater number of seedlings killed by cattle were greatly weakened by the heat and whereas the trampling may not have caused death under more favorable growth conditions it was enough to cause them to die at this time. Also as these seedlings died at the beginning of the grazing season, it can be assumed that most of them would have died from other causes during the year had the cattle not trampled them, which further minimizes the destructive effect of cattle on young seedlings.

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Pine Ranges
Burgess Spring

R. W. Gardner
December 15, 1937

PINE SEEDLING RECORD

Burgess Spring Experimental Range
1936 - 1937

	<u>1936</u>	<u>1937</u>
Total Germination, seedlings	5,627	2,171
Mortality, first year, seedlings	5,191	2,053
Mortality, first year, %	92.3	94.6
Area sampled, acres	537	269
Quadrats planted	83 ⁶	1,292
Seed spots	50,000 60,200	116,000 ²⁰⁰

• Fenced quadrats included.

PINE SEEDLING CATTLE DAMAGE
 Burgess Spring Experimental Range
 1936 - 1937

		<u>1936</u>	<u>%</u>	<u>1937</u>	<u>%</u>
Total	Germination, seedlings	4,147		1,956	
Total	Mortality, all causes, seedlings	3,850		1,851	
Total	Mortality, cattle	55	1.3	48	2.5
	Trampled	49	1.2	42	2.2
	Grazed	6	.1	6	.3
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%	Mortality, all causes	95.2		94.6	
%	Mortality, cattle	1.3		2.5	

6
 4,147

o Fenced quadrats omitted.

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Pine Ranges
Burgess Spring

R. W. Gardner
December 12, 1937

PINE SEEDLING SURVIVAL

Burgess Spring Experimental Range

Seeded November, 1935

<u>Date</u>	<u>Season</u>	<u>Number Alive</u>
6/15/36	Spring	3,172
11/8/36	Fall	436
6/1/37	Spring	175
11/3/37	Fall	130
Total Germination		5,267
Total Alive at end of 2 years		130
% Survival in 2 years		2.5

PINE SEEDLING RECORD BY EXAMINATIONS

Burgess Spring Experimental Range

1937

Seeded November - December, 1936

Examination No.	1	2	3	4	5	6	7	8	9	10	11
Date	June 1-11	June 21-26	July 6-8	July 19-22	Aug. 2-3	Aug. 16-17	Aug. 30	Sept. 13	Sept. 29-30	Oct. 11	Nov. 3
Germination	1,607	353	156	49	5	0	1	0	0	0	0
Mortality, all causes	311	612	294	278	190	129	110	52	47	10	20
Mortality, cattle	0	18	11	7	0	9	1	1	1	0	0
Trampled	0	14	9	7	0	9	1	1	1	0	0
Grazed	0	4	2	0	0	0	0	0	0	0	0
Cattle on range											

* Fenced quadrats included.

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Pine Ranges
Burgess Spring

R. W. Gardner
October 22, 1937

Burgess Spring Experimental Range Seedling Germination
November 6-14, December 18-21, 1936 Seeding

	<u>Germinated seedlings per quadrat</u>	<u>Seed spots</u>	<u>Seedlings germinated</u>	<u>Number quadrats</u>
All Seeding (except poison seed)				
November 6-14, 1936 seeding	.97	64,250	1,241	1,285
December 18-21, 1936 seeding	.94	47,900	896	958
Total		112,150	2,137	2,242
Seeded by hand				
November 6-14, 1936	.79	4,300	68	86
Seeded with corn planter				
November 6-14, 1936	.98	59,950	1,173	1,199
Poison coated seed		4,030	34	403