STATE California

PROJECT W46R-4

DATE January 4, 1956

QUARTERLY PROGRESS REPORT

SURVEYS AND INVESTIGATIONS

as required by

FEDERAL AID IN WILDLIFE RESTORATION ACT

1. Title of Project: Game Range Restoration

2. Supervisors: Ben Glading, Chief, and William P. Dasmann, Senior Game Biologist, Game Management Branch, California Department of Fish and Game.

3. Leaders: E. J. Woolfolk and A. L. Hormay

   Assistants: E. C. Nord, R. L. Hubbard, B. O. Pearson, R. F. Wagle, and J. E. Whitacre.

4. Cooperating Agency: California Forest and Range Experiment Station

5. Summary report of progress during the quarter October 1 to December 31, 1955. This report is not for publication.

Purpose

The primary objective of this project is to develop cultural methods of re-establishing and extending native or introduced browse species suitable for forage or cover on deteriorated deer ranges in California. The project was initiated in the Eastside Region of the State on deer winter ranges which extend a distance of about 500 miles from Oregon to the southern end of the Sierra Nevada mountains. These ranges are heavily deteriorated. They lie in a comparatively light snow belt, but in heavy precipitation years snow covers low growing herbage and hinders the movements of deer. Under these conditions erect, upstanding shrubs become premium forage plants for deer. Bitterbrush (Purshia tridentata) is the most important game browse plant in the region and is being given special attention in these studies.

General Accomplishments and Findings During the Period

1. All fall field work including scheduled replications of long-time depth-of-planting and seed-treatment tests was completed at Flukey Spring, Doyle and Wells Meadow. Pilot seedings designed to field-test planting and soil preparation methods developed through research were also made at the Casuse Mountain, Flukey Spring and Doyle areas.

2. Observations on bitterbrush seedling survival and growth were made for all active studies initiated between 1952 and 1955. These data have indicated that drought, insects, rodents, rabbits, other wildlife and domestic grazing animals are all hazards to be reckoned with in the establishment of bitterbrush seedlings on range areas.

3. Early phases of the study of bitterbrush strains and of the genetics of sprouting in bitterbrush were completed.

4. Bitterbrush seed collected from more than 20 locations was cleaned, processed and stored.

5. Spring planted thiourea-treated bitterbrush seed gave satisfactory seedling emergence and survival at Flukey Spring where soil moisture conditions were favorable. On the drier Doyle and Wells Meadow sites seedling emergence was apparently somewhat reduced by the thiourea treatment.

6. First year growth and survival of bitterbrush seedlings differ with sites and between years. Amount and distribution of both annual and growing season precipitation are undoubtedly highly influential.

7. At the end of their third growing season, bitterbrush seedlings on a weed-free site averaged 26 inches in height compared to 18.2 inches and 4.5 inches for seedlings subjected to moderate and heavy competition.

This report deals mainly with (a) first year growth of bitterbrush seedlings, (b) the effects of competition on seedling growth during a three-year period, and (c) the effects of thiourea on seedling emergence and survival under field conditions.

First Year Growth of Bitterbrush Seedlings

During the past three years at Flukey Spring bitterbrush seedlings have grown an average of 5.6 to 8.4 inches in their initial year on weed-free sites. Seedlings from fall plantings made slightly better growth each year than did seedlings from spring seedings. In terms of precipitation for the plant growth year (October 1 of the previous year to September 30 of the current year) 1955 was the least favorable of the three. Seedling growth in 1955 was intermediate between the previous two years which had practically the same total precipitation. For the growing season (April 1 through September 30), 1953 was most favorable and the other two years about equal. Pre-growing season precipitation in 1954 was much greater than in either of the other two years which undoubtedly accounts for the better seedling growth that year.

Only 1955 seedling growth data are available for the Doyle and Wells Meadow sites. At these locations seedlings from fall planting grew 5.6 and 3.2 inches, respectively, in their initial year and from spring planting growth was 4.1 and 2.4 inches. Total precipitation at

Doyle and Wells Meadow was only 64 and 49 percent, respectively, of the amount received at Flukey Spring. At Doyle about 45 percent of the total occurred before the growing season and at Wells Meadow only a quarter of the total was received before the growing season.

The amount and distribution of precipitation undoubtedly have a tremendous effect on seedling growth on any site. Even though extremely dry summers are typical of these three locations, some growing season precipitation occurred during each of the last three years. The best seedling growth from both fall and spring planting at Flukey Spring occurred during 1954, demonstrating clearly the effect of fairly good growing season rainfall following better than average pre-growing season precipitation.

Effects of Competition on Seedling Development

A comparison of bitterbrush seedling growth on a prepared site kept free of weeds through three growing seasons with growth on an unprepared, naturally vegetated site has clearly shown the disadvantages of planting bitterbrush in competition with native vegetation.

Started in the fall of 1952 this study has revealed growth, through seedling size, at the end of each of the last three growing seasons. With seedbed preparation and subsequent removal of weeds during three seasons, bitterbrush seedling growth was more than five times the growth obtained on the unprepared natural site. Even though many range sites in need of bitterbrush seeding are inaccessible to the use of farm machinery, these results illustrate the advantages to be gained by seedbed preparation and maintenance where it is feasible.

	Bitterbrush seedling height growth		
Site treatment	1953	1954	1955
	- - - Inches - - -		
Prepared seedbed-- no competition	6.0	13.8	26.0
No site preparation-- heavy, natural competition	1.3	2.6	4.5

Further evidence of the worthwhileness of site preparation and subsequent weeding can be seen by comparing the root systems shown in figure 1. The seedlings pictured are one year old. The one on the left represents the root growth made in one year on a prepared site kept free of weeds. The other is from a natural unprepared site. Well developed bitterbrush seedlings with good root systems have a much better chance of surviving drought, freezing, grazing, and other hazards and thus hold better prospects of seeding success under range conditions.

Effects of Thiourea on Seedling Emergence and Survival under Field Conditions

Seedling emergence was lower in every case from thiourea-treated bitterbrush seed planted in the fall of 1954 and spring of 1955 at three locations than was emergence from untreated and stratified seed. Earlier laboratory tests had shown some advantages of the thiourea treatment and considerable hope was held that these advantages might carry over under field conditions. The advantage of easy handling of thiourea-treated seed still holds, but at this writing and based on available data this appears to be the only benefit. As shown in the following table, thiourea treatment has no advantage whatever for fall planting in terms of seedling emergence. Natural stratification of untreated seed over winter gave better emergence at all three locations. Similarly, artificially stratified seed, spring seeded, gave better results at all three locations than did thiourea-treated seed.

	Bitterbrush seedling emergence			
	Fall planted		Spring planted	
Site	Untreated seed	Thiourea treated seed	Stratified seed	Thiourea treated seed
	Percent			
Flukey Spring	61.8	59.2	69.2	59.3
Doyle	49.2	13.7	26.2	10.3
Wells Meadow	78.7	11.5	71.3	21.3

For two of the three locations, Flukey Spring and Doyle, comparisons of seedling survival reflected against the thiourea treatment in all but one case. None of the seedlings survived at the very arid Wells Meadow site, regardless of the treatment given the seed before planting.

	Bitterbrush seedling survival			
	Fall planted		Spring planted	
Site	Untreated seed	Thiourea treated seed	Stratified seed	Thiourea treated seed
	Percent			
Flukey Spring	72.8	55.2	72.5	63.6
Doyle	23.7	24.4	19.1	11.3
Wells Meadow	0	0	0	0

Whether these data indicate a toxicity of thiourea to seedling growth and development is not known. Further tests of a more precise nature are needed to determine this point. Examination of the two foregoing tables indicates a strong relationship between sites and the levels of seedling emergence and survival obtained. The effects of soil moisture, soil structure and composition, and seed treatments as well as their interactions can only be determined by further research.

SUBMITTED BY
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APPROVED BY
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By_____
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Error in October 4, 1955 Report

Due to an omission in typing the first paragraph on page 7 of the third quarterly report for 1955 was incomplete. Beginning with line 3, this paragraph should have read:

"However, these tests were conducted under saturated moisture conditions at room temperatures. No information is available as to the effect of lower moisture conditions, temperatures, or length of day on thiourea-treated seed."

Also, in the fifth paragraph on page 3 the first word after the last comma in the first line should be "fall" instead of spring.

EAMOR C. NORD

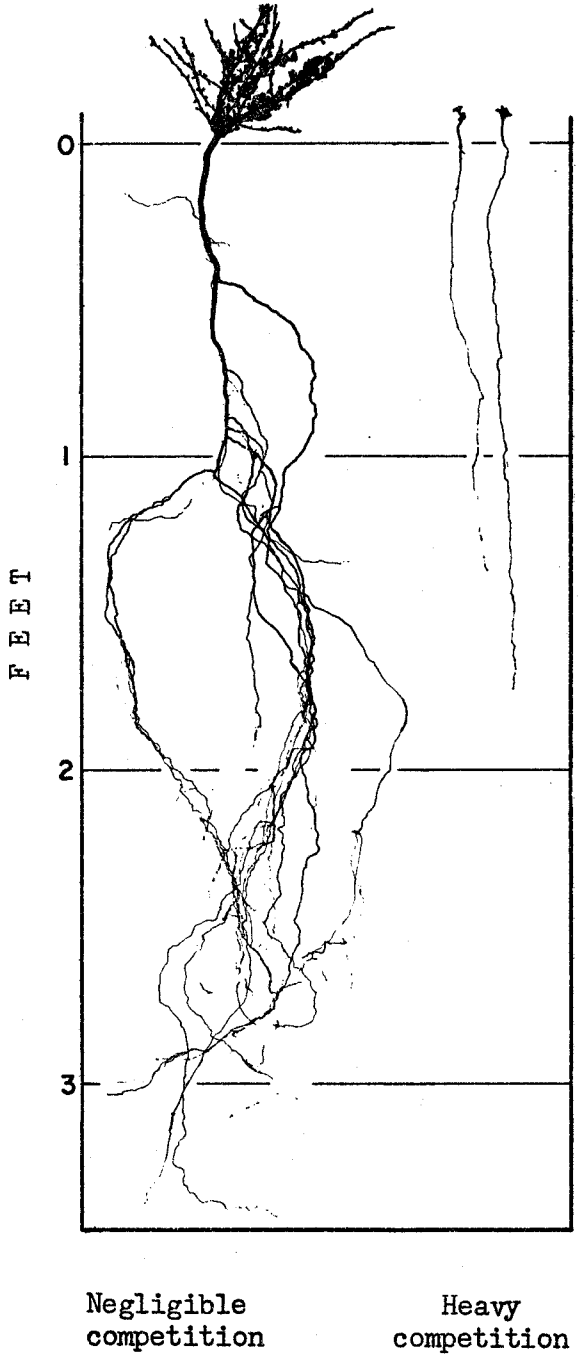

Figure 1.--Size of bitterbrush seedlings grown under two degrees of plant competition.