THE HARVEY VALLEY RANGE DEMONSTRATION

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ALH-2069

FOREST SERVICE, REGION 5

U. S. DEPARTMENT OF AGRICULTURE

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INTRODUCTION

The best range management practices known to the Forest Service in Region 5 at the present time for improving and increasing the grazing capacity of perennial bunchgrass type mountain summer ranges like those found on many national forests throughout the West are being tested and demonstrated on the Harvey Valley cattle allotment of the Lassen National Forest in northeastern California (Fig. 1). These practices include rest-rotation grazing--described previously in the two publications listed below--artificial reseeding, chemical weed and brush control, erosion control and drainage improvement. Some reseeding and spraying work was started in 1951. However, management of grazing did not start until 1952. The entire program is scheduled to run for 23 years ending in 1974. The eighth year of operation was completed in 1959.

Figure 1--Location of the Harvey Valley Range Allotment and the Burgess Spring Experimental Range.

Cooperating in this effort are the Lassen National Forest and Regional Office of the Forest Service who are applying the practices; Pacific Southwest Forest and Range Experiment Station who prepared the management plan and is measuring the results; Roney Brothers, the

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(1) Hormay, August L.
1956. How Livestock Grazing Habits and Growth Requirements of Range Plants Determine Sound Grazing Management. Journal of Range Management, Vol. 9, No. 4, 161-164, illus.

(2) Hormay, A. L., and Evanko, A. B.
1958. Rest-Rotation Grazing--A management system for bunchgrass ranges. U. S. Forest Service Pacific Southwest Forest and Range Experiment Station Miscellaneous Paper No 27, 11pp., illus. (Processed.)

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grazing permittees who are assisting in various ways, including handling and weighing the cattle; and the Agricultural Research Service and Extension Service who are providing advice and counsel. The allotment is being administered like any other national forest range allotment.

Through the application of rest-rotation grazing, cultural treatments, and logging, it was estimated that grazing capacity of the allotment could be about doubled in 23 years. The proportion of the total increase expected from areas treated in various ways is as follows:

Area Treatment	Proportion of Grazing Capacity Increase (Percent)
Grazing management only	43
Reseeding, spraying, etc., and grazing management	42
Logging and grazing management	15
Total	100

This assumes the cultural treatments and logging will be carried out on the scale planned.

The purpose of this publication is to report what has been done on the allotment--particularly how rest-rotation is being applied--and what has been observed in the way of results. The first measurements of range responses are scheduled for 1960. So quantitative results will be reported thereafter.

STOCKING AND GRAZING SEASON

The allotment is being grazed by cows and calves, breeding heifers and yearling steers from a commercial Hereford herd. Herefords are being used because it is the breed found most commonly on northeastern California mountain ranges. Through 1959 the allotment was stocked with 515 animal units--the same number that was grazed on the allotment prior to the beginning of the test. The range was estimated to be properly stocked with this number of animals. No reduction in livestock numbers is necessary to initiate rest-rotation grazing when a range is properly stocked.

During fall, winter, and spring the cattle are grazed on annual type range at the home ranch in the Sacramento Valley and are fed supplements when necessary. The permittee handles the cattle throughout the year.

A 4-month grazing season starting when the flower stalks of Idaho fescue start emerging from the boot--about June 1 in the average year--and ending about September 30 was used from 1952 through 1958. In 1959 the season was adjusted to start and end a week earlier because it was estimated to yield greater livestock production without jeopardizing the

improvement of the range. (Table 1) This adjustment also fitted the permittees operation better.

Table 1.--Estimated cattle production from seven different possible 4-month long grazing seasons under rest-rotation grazing.

The present season starts when the flower stalks of Idaho fescue are in mid-boot. (Fig. 2) In the average year Idaho fescue starts growth April 1 just as snow leaves the ground, reaches mid-boot stage on May 22, flowers July 9, ripens seed August 4 and dries to a minimum level of 8 to 10 percent moisture near the end of September. The vegetation has highest grazing value about flowering time. This is illustrated by the trend in cattle weight gains during the season on (Fig. 3) this type of range.

Fig. 2.--Appearance of Idaho fescue when flower stalks are in mid-boot. The grazing season on the allotment is started at this growth stage.

Fig. 3.--Seasonal weight trend of yearling heifers on timber type range - Burgess Spring Experimental Range, 1944-48.

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Figure 2. Appearance of Idaho fescue when flower stalks are in mid-boot. The grazing season on the allotment is started at this growth stage.

THE REST-ROTATION GRAZING SYSTEM

Maintenance of existing grazing capacity or any additional capacity developed by grazing management or cultural treatments on a range depends entirely on management of grazing. Proper management of grazing therefore is absolutely essential for sustained, high level range forage and livestock production.

Rest-rotation grazing was designed specifically to improve and maintain perennial bunchgrass type ranges. The principles on which it is based, however, can be applied to any type of range. The key point in the system is the definite provision for resting the range from grazing at certain time so the vegetation can reproduce. This resting is supplemental to proper stocking, season of grazing, and livestock distribution, the only factors usually considered in conventional grazing. In bunchgrass types where the plants depend on seed for regeneration, rest is needed at three critical times: first, after a period of grazing to restore the vigor of the plants; second, during seed development to permit formation and ripening of seed; and third, during seedling establishment to permit firm rooting and vigorous initial growth of the young plants.

The amount and time of resting is based on the growth requirements of the vegetation, in fact on the key species on the range--the one species that is most desired for forage and ground cover. All other species with less exacting growth requirements will also be maintained or increased on the range under this condition, site factors permitting.

The key species at Harvey Valley is Idaho fescue. (Fig. 4) Stocking of the range under rest-rotation grazing, on the other hand, is based on the yield of available herbage of all forage species on the range.

Fig. 4.--Management of grazing on the Harvey Valley allotment is based on the growth requirements of Idaho fescue. Shown here growing on a big sagebrush site at the edge of a valley.

To apply rest the range must be divided into units of equal grazing capacity. The number of units is equal to the number of resting and grazing treatments used to encourage the establishment of a crop of new reproduction. At Harvey Valley 5 treatment are being used so the allotment was divided into 5 units. The sequence and purpose of the grazing and resting treatments used in any one unit are shown in table 2.

Table 2. Schedule of grazing for any one unit on the Harvey Valley allotment during a 5-year cycle.

Year	Treatment	Character of treatment	Main purpose of treatment
1st	A	Full use season-long	Maximum herbage utilization and livestock production
2nd	B	Rest season-long	Recovery of plant vigor
3rd	C	Rest until mid-season	Permit plants to ripen seed
		Full use second half of season	Trample seed into the soil and maximum herbage utilization and maximum livestock production
4th	D	Rest season-long	Aid establishment of new reproduction
5th	E	Moderate use until mid-season	Aid establishment of new reproduction and produce livestock production
		Rest second half of season	Aid establishment of new reproduction

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Figure 4. Management of grazing on the Harvey Valley allotment is based on the growth requirements of Idaho fescue. Shown here growing on a big sagebrush site at the edge of a valley.

Trampling of seed into the soil, encouraged in the second half of the grazing season in treatment C, is very important for seedling establishment.

By the end of 1959 each of the 5 units had been subjected to the first of 4 such cycles of grazing and resting treatment planned to be carried out during the program. (Table 3)

Table 3. Grazing schedule for all 5 units on Harvey Valley Allotment 1/ 1952 to 1959

Stocking (Animal units)

Year	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
1952	B Rest	C Rest 2/ 400	D Rest	E [illegible] Rest	A 300 100
1953	C Rest 2/ 400	D Rest	E 200 Rest	A 300 100	B Rest
1954	D Rest	E 200 Rest	A 300 100	B Rest	C Rest 400
1955	E 200 Rest	A 300 100	B Rest	C Rest 400	D Rest
1956	A 300 100	B Rest	C Rest 400	D Rest	E 200 Rest
1957	B Rest	C Rest 400	D Rest	E 200 Rest	A 300 100
1958	C Rest 400	D Rest	E 200 Rest	A 300 100	B Rest
1959	D Rest	E 200 Rest	A 300 100	B Rest	C Rest 400

1/ Treatments above the dotted line were not applied in the years indicated because fences were not completed.

2/ Top figure or comment indicates stocking or treatment during first 2 months of the season, and bottom figure or comment indicates stocking or treatment during last 2 months of the season. Also, stocking was assumed to be 300, rather than 2?5 animal units [illegible] for simplification.

To get the grazing pressures and resting called for in the schedule the cattle were handled as follows each year. (Refer to 1956 in the table for the example.) At the beginning of the grazing season 60 percent (300) of the cattle were placed in unit 1, receiving treatment A, and the remaining 40 percent (200) in unit 3 receiving treatment E. At mid-season two-thirds of the cattle in unit 1 (200) and all those in unit 3 or a total of 400 were moved to unit 5 which received treatment C. One hundred animals were held in unit 1. Thus units 1 and 3 were grazed fully, unit 5 moderately and units 2 and 4 were rested.

In this plan full use has been arbitrarly defined as 66 percent and moderate use as 33 percent. With these levels of use in the grazed units 33 percent use is made of all the available forage on the allotment during a season. The stocking rate (515 animal units) used to date was calculated to result in this degree of use in the average year at the start of the program.

Besides encouraging plant regeneration there are other desirable features inherent in a rest-rotation grazing system. Herbage produced during rest years is returned to the soil to increase fertility and improve surface soil conditions. This herbage also constitutes a forage reserve which can be used during low forage production years if necessary to carry all the livestock on the range through the normal grazing season. Rest-rotation grazing management applies to introduced as well as native forage species. Seed of introduced species

can be planted at the time seed of native species is being trampled into ground and the resulting stand managed thereafter along with the natives. The reseeded areas need not be fenced off from the rest of the range.

On most cattle ranges application of the system requires fencing. All units need not be built at one time, however. They can be installed one at a time over a period of years and managed as though all units were established. On sheep ranges where the animals can be herded fencing is unnecessary.

DESCRIPTION OF THE HARVEY VALLEY ALLOTMENT

The Harvey Valley allotment lies in the pine timber zone (Fig 5) at an altitude of about 6,000 feet on the east slope of the Sierra Cascade Mountains in northeastern California. Precipitation averages about

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ALH-Dec. 1959

Figure 5. General aspect of the Harvey Valley allotment.

18 inches a year. The winters are cold and snowy and the summers dry and warm. The soils are of volcanic origin and range in texture from heavy clays to light loams.

The allotment consists essentially of a large basin that drains the southeast. Mountain ridges form the boundary except for a segment on the east side. Two large valleys--Harvey Valley and Little Harvey Valley--and 4 smaller drainage ways cover the central portion of the allotment (Fig. 5a). Timbered slopes extend outward and upward from there to the boundaries.

Figure 5a--Location of main drainages.

The allotment has a gross area of 34,850 acres. About 22,000 acres are suitable for cattle grazing at present. Still another 11,000 acres are expected to yield grazing values following logging and development of additional stock water. figures not final

The principal vegetation cover types are timber, sagebrush, wet and dry grasslands and chaparral. The timber type is composed primarily of ponderosa and jeffrey pine but white fir is associated in some places. Three types of sagebrush grow on the range- big sagebrush on well drained upland soils, silver sagebrush on poorly drained heavy bottomland soils and black sagebrush on fairly well drained clay soils, that are usually underlain with an impervious concretion layer. The wet grasslands are the typical mountain meadow. The dry grasslands consist of stands of bunchgrasses and hair sedge.

The principal forage species in the drier types--timber, big sagebrush and dry grassland--are Idaho fescue, bottlebrush squirreltail, western needlegrass, Ross sedge, longspur lupine, woolly mules-ears, and antelope bitterbrush. In the more moist black sagebrush

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Location of
main drainages

and silver sagebrush types and the wet meadow type Nevada bluegrass, Sandberg bluegrass, bottlebrush squirreltail, Nebraska sedge, wire-rush, and several other sedges are important. A more complete list of species by vegetation types is in the appendix.

The chaparral type occurs in openings created by fire in the timber type. The principal species are greenleaf manzanita, tobacco brush, and Sierra evergreen chinka-pin--all of little value for cattle grazing.

The area and grazing capacity of these types are shown in table 4.

Table 4--Area and Estimated Grazing Capacity of Cover Types
Harvey Valley Allotment--1951

The allotment has been heavily deteriorated by past grazing and is estimated to be producing only about half of potential yield of forage. Most of this deterioration occurred prior to the establishment of the Lassen National Forest during the period from about 1865 to 1900 when large numbers of both sheep and cattle grzed on the area. The worn condition of the range is evident in sheet and gully erosion, high proportion of inferior plant species in the vegetation cover and low density of forage species. Heaviest deterioration has occurred in

Table 4. Area and Estimated Grazing Capacity of Cover Types
Harvey Valley Allotment--1951

Cover Type	Area	Grazing Capacity	
	Acres-Percent	Acres per Animal Unit Month	Total Animal Units in Type

(Data to be filled in later)

bottomland areas (Figs. 6, 7, 8, & 9). Here large areas that once supported hair sedge and grass are now dominated by sagebrush (Fig. 10). Grazing capacity has also been decreased in upland types (Fig. 11). There is therefore considerable room for increasing forage production on the allotment.

Figure 6--Gully erosion in a wet meadow in the shoestring drainage on the allotment.

Figure 7--Heavy sheet erosion on a Nevada bluegrass-bottlebrush squirreltail site.

Figure 8--Widespread loss of topsoil and low density of forage species resulted from past grazing in the big sagebrush--black sagebrush site.

Figure 9--Heavy deterioration has occurred on sheep bed grounds like the one shown here. Many such areas are scattered throughout Harvey Valley.

Figure 10--An estimated 3,000 acres on Harvey Valley once supported a hair sedge-bunchgrass cover like that in the upper photo. This cover has been virtually destroyed and replaced by sagebrush as indicated below.

Figure 11--Perennial bunchgrasses have been all but killed out on many of the more accessible openings and margins of the timber type, like the one shown here. The prominent broad leaf plant on this area is woolly mules-ears, an inferior forage species.

ALH-Dec. 1959

Figure 6. Gully erosion in a wet meadow in the shoestring drainage on the allotment.

ALH-2093

Figure 7. Heavy sheet erosion on a Nevada bluegrass-bottlebrush squirreltail site.

ALH-884

Figure 8. Widespread loss of topsoil and low density of forage species resulted from past grazing in the big sagebrush--black sagebrush site.

ALH-2064

Figure 9. Heavy deterioration has occurred on sheep bed grounds like the one shown here. Many such areas are scattered throughout Harvey Valley.

AIH-2006 & AIH-2042

Figures 10 & [redacted]. An estimated 3,000 acres on Harvey Valley once supported a hair sedge-bunchgrass cover like that in the upper photo. This cover has been virtually destroyed and replaced by sagebrush as indicated below.

ALH-720

Figure 12. Perennial bunchgrasses have been all but killed out on many of the more accessible openings and margins of the timber type, like the one shown here. The prominent broad leaf plant on this area is woolly mules-ears, an inferior forage species.

PRECIPITATION AND CHARACTER OF GROWTH YEARS

There were two rather severe droughts during the first 8 years of the program, one in 1955 and 9.50 inches of precipitation fell and the other in 1959, when 9.63 inches fell compared with a normal of about 17 inches. (Table 5) The 1952, 1956, and 1958 seasons were unusually wet and vegetation growth was considerably above average. The other years were about normal.

Table 5--Precipitation and estimated forage and seed production.

During the two drought years both seed production and soil moisture were reduced making conditions unfavorable for seedling establishment. In fact, each drought year affected seedling establishment in two years--one during the year of drought because of low soil moisture and the second the following year because of limited seed production the year before. Below average growing conditions prevailed during the first years of operation therefore.

ALLOTMENT LAYOUT, FENCES AND WATERING PLACES

The 5 range units, fences and watering places on the allotment are shown in figure 12. The fences were located to delimit units of approximately equal grazing capacity, provide maximum numbers of

Figure 12--Location of allotment units, fences, and stock watering places.

Table 5. Precipitation and Estimated Forage and ~~Seed~~ Seed Production[1]/

Season[2]/	Precipitation (inches)	Estimated Forage Production (Percent of average year)	Estimated Seed Production
1950-51	19.30	80	Low
1951-52	24.86	130	High
1952-53	19.94	100	Average
1953-54	17.06	100	Average
1954-55	9.50	75	Low
1955-56	37.00 (approx.)	125	High
1956-57	no record (av. year)	95	Average
1957-58	no record (wet year)	120	High
1958-59	9.63	45	Low

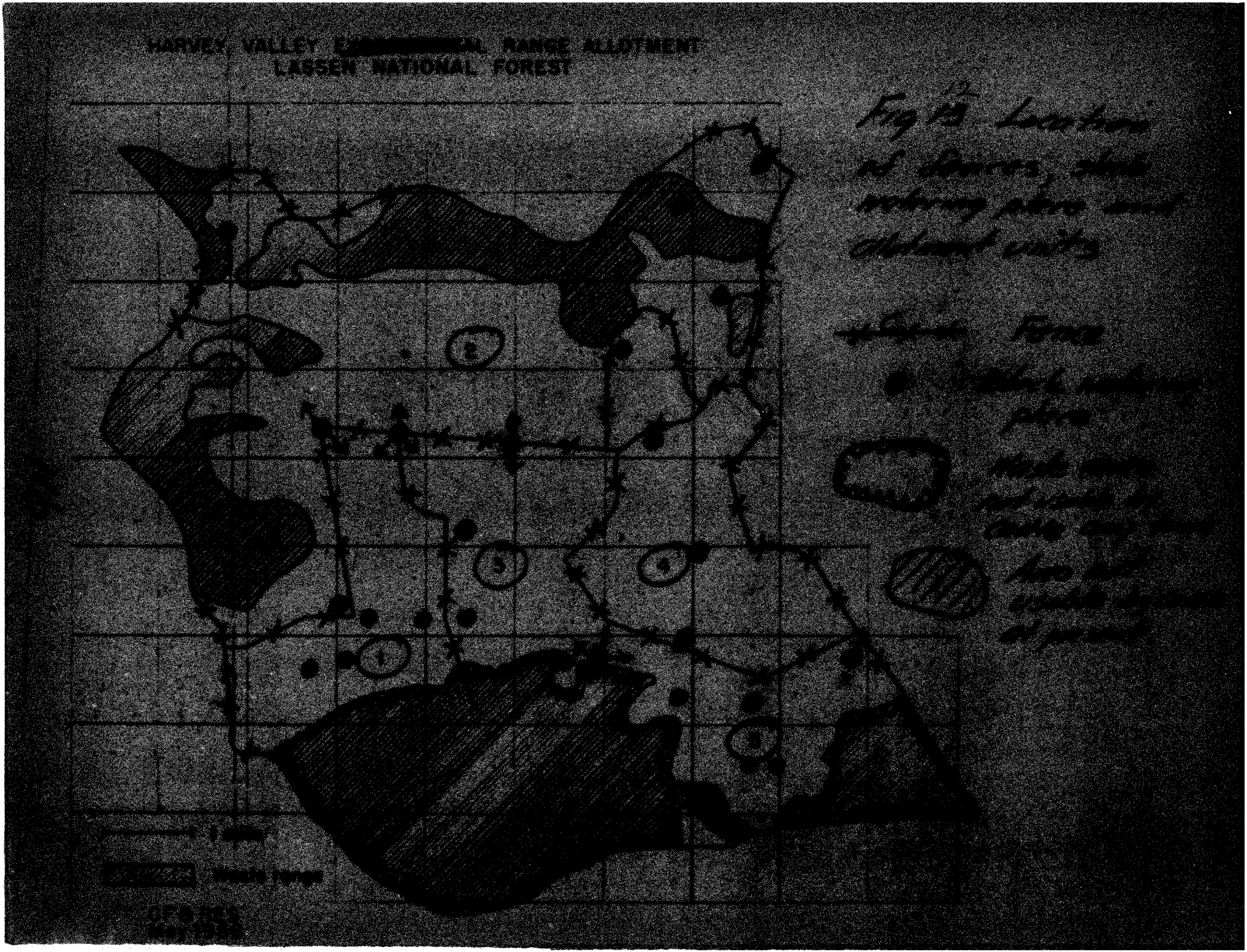
Data & Figures not final

Average 22 years--17.36
1935-1959[3]/

1/ Precipitation records were taken at the Blacks Mountain Branch of the Experiment Station located some 12 miles airline west of Harvey Valley.

2/ September 1 to August 31.

3/ 1957 and 1958 not included.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watering places in each unit, and get best distribution possible of cattle over the allotment. The south and west boundaries of unit 2 for example were located at the base of timbered mountain slopes to force cattle to graze more widely in the timber type. No attempt was made--nor is it essential--to get the same proportion of vegetation types in all units. However, all of the main types are represented in each unit.

The amount of grazing management facilities planned and completed by 1959 is given in table 6. Fences and water developments are most important for management (Figs. 13 & 14). In addition, however, corrals, a livestock scale, squeeze chute and holding fields were built to provide means of getting cattle weights (Fig. 15).

Table 6--Grazing Management Facilities--Harvey Valley Allotment

Figure 13--Fences provide a degree of control of cattle grazing that cannot be obtained in any other way.

Figure 14--Excavated earthen tanks (above), wildmills (lower) and developed and undeveloped springs provide water for cattle on the Harvey Valley Allotment.

Figure 15--Cattle handling and weighing facilities are important management tools on the Harvey Valley Allotment. They provide the means of measuring beef production on the range.

Table 5 - Grazing Management Facilities

[illegible] Allotment

Facilities	On Al. in 1955 1/	Needed (Additional) Planned	Completed by 1968	Remaining Needed	Total Facilities
Boundary Fences (Miles)	6.21	12.78	9.83	2.90	16.16 2/
Interior Fences (Miles)	6.97	15.68	13.68	2.00	21.93
Holding Field Fences (Miles)	0	2.00	2.00	----	2.00
Cattleguards (Number)	2	11	10	1	13
Metal Gates (Number)	0	23	16	5	23
Spring Troughs (Number)	1	5	0	5	6
Windmills (Number)	3	0	0	0	3
Troughs (On Windmills) (Number)	2	1	1	0	3
Earthen Tanks or Dams (Number)	8	6	6	7	14
[illegible] (Number)	0	1	1	0	1

1/ And suitable to the 3-unit rest-rotation grazing plan.

2/ An additional 16 miles of the boundary is natural barrier, or is impassable by cattle at the present time.

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Figure 13. Fences provide a degree of control of cattle grazing that cannot be obtained in any other way.

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ALH-864 & ALH-799

Figure 14. Excavated earthen tanks (above), windmills (lower) and developed and undeveloped natural springs provide water for cattle on the Harvey Valley Allotment.

ALH-2038

Figure 15. Cattle handling and weighing facilities are important management tools on the Harvey Valley Allotment. They provide the means of measuring beef production on the range.

Cattleguards and metal gates are being used in several places for adequate control of the cattle because of heavy public traffic through the allotment, especially during the deer hunting season (Fig. 16) See outside of back cover for read not (Fig No 9)

Figure 16--Cattleguards with concrete foundations and iron grills (above) and metal gates (below) were found necessary for adequate control of the cattle in Harvey Valley.

All the improvements in Harvey Valley are somewhat more elaborate than on the average range because of the need for rigid control of grazing for demonstration and study purposes.

SOME RESPONSES TO GRAZING MANAGEMENT

In spite of adverse weather some seedlings became established in each unit. The best stands got started on soils in good condition particularly deep, heavy textured, non-eroded bottom land soils of high moisture holding capacity. These sites normally support a cover of silver sagebrush with a light understory of Nevada bluegrass and bottlebrush squirreltail. The interspaces among shrubs are fairly large and nearly bare of vegetation providing room for new plants to grow (Fig. 17). The very best stands of seedlings were obtained on

Figure 17--Silver sagebrush type--the kind of site on Harvey Valley that offers best opportunity for rapid natural reseeding under rest-rotation grazing.

ALH-2032 & ALH-2044

Figure 16. Cattleguards with concrete foundations and iron grills (above) and metal gates (below) were found necessary for adequate control of cattle in Harvey Valley.

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Figure 14. Silver sagebrush type--the kind of site on Harvey Valley that offers best opportunity for rapid natural reseeding under rest-rotation grazing.

sites where sagebrush competition was removed by spraying (Fig. 18). Seedlings survived on these sites even in the severest drought year.

Figure 18--Seedlings of Nevada bluegrass and bottlebrush squirreltail established on a sprayed silver sagebrush area. Several crops of seedlings have become established on this productive site in 8 years under rest-rotation grazing. The small plants (center foreground) germinated in 1959--the year the photo was taken. Notice the heavy accumulation of litter in the plant interspaces.

In contrast few seedlings became established on areas where most of the topsoil had been eroded away. The interspaces among plants on these sites now consist mainly of subsoil that is dense and hard when dry and devoid of litter and organic matter (Fig. 19). Even on deteriorated areas like these the soils are usually fertile enough to grow forage species but the seedlings have difficulty getting started. Seeds that lodge on the bare soil surface have very little chance of germinating and producing seedlings. However, seeds trampled into the soil by the cattle produce many seedlings.

Figure 19--Seedlings of desirable forage grasses become established very slowly on eroded sites like the one shown here. This area is in the black sagebrush type. The soil in the plant interspaces consists mainly of horizon B which is low in fertility and devoid of litter and organic matter so important for seedling growth.

~~Illustration~~
~~substitute~~
~~photo~~

Figure 2. Seedlings of Nevada bluegrass and bottlebrush squirreltail established on a sprayed silver sagebrush area. Several crops of seedlings have become established on this productive site in 8 years under rest-rotation grazing. The small plants (center foreground) germinated in 1959--the year the photo was taken. Notice the heavy accumulation of litter in the plant interspaces.

~~Substitute~~
~~Photo~~

ALH-737

Figure 19. Seedlings of desirable forage grasses became established very slowly on eroded sites like the one shown here. This area is in the black sagebrush type. The soil in the plant interspaces consists mainly of horizon B which is low in fertility and devoid of litter and organic matter so important for seedling growth.

In Harvey Valley trampling in summer has not been very effective on the more heavily deteriorated sites because of the hard unyielding condition of the soil. Trampling in spring when the soil was soft, however, resulted in hoof impressions where seed, litter and extra moisture collected. Masses of seedlings germinated in these small soil pockets (Fig 20). In fact, this is the principal way new reproduction has started on these sites. Adjustments will be made in grazing starting in 1960 to promote more trampling in springtime. The amount of seedling establishment on the allotment was strongly related to both the type and condition of the soil and to the amount of plant competition.

Figure 20--Upper photo shows seed of bottlebrush squirreltail lodged in a cattle hoof print made when the soil was wet and soft. Lower photo shows a clump of bottlebrush squirreltail seedlings that originated in such a hoof print.

Many seedlings of native (and introduced) species in the second year of growth were pulled up and trampled out by the cattle (Fig. 21). An estimated 50 percent or more of the stands on many of the preferred grazing areas were destroyed especially when poor growing conditions prevailed during the first or second year, or both, of seedling growth.

Figure 21--Seedlings of Nevada bluegrass (above) and tall wheatgrass (below) in the first and second year of growth pulled up and trampled out by cattle.

ALH-1302 & ALH-2088

Figure 20. Upper photoshows seed of bottlebrush squirreltail lodged in a cattle hoof print made when the soil was wet and soft. Lower photo shows a clump of bottlebrush squirreltail seedlings that originated in such a hoof print.

ALH-2078 & ALH-2802

Figure 21. Seedlings of Nevada bluegrass (above) and tall wheatgrass (below) in the first and second year of growth pulled up and trampled out by cattle.

Under Harvey Valley conditions most seedlings did not develop a big enough root system in the one year of rest provided for establishment to fully withstand grazing and trampling. Two full seasons of rest from grazing during seedling establishment are clearly indicated. Grazing will be adjusted starting in 1960 to provide this additional rest.

In all vegetation types there was evident buildup of litter which is improving surface soil conditions and soil fertility. In fact some of the coarse sedge-rush types are accumulating too much litter and growth is being stifled. Removal of the litter by burning is being considered.

Some of the forage reserves provided by the rest-rotation grazing system were utilized in the two drought years. In both years the unit normally protected to restore plant vigor (treatment B) was opened to grazing so the cattle could be carried through the regular grazing season.

All in all, rest-rotation grazing is functioning as expected and there is every indication that it will yield the results desired.

SPRAYING AND ARTIFICIAL RESEEDING

A little less than half of the planned spraying and reseeding on the allotment was completed by 1959. (Table 7) Experience on the ground provided a better basis than existed before for determining

Table 7--Status of Spraying and Artificial Reseeding -- 1959

Table 7. Status of Spraying and Artificial Reseeding -- 1959

Treatment	Plan 1951 (acres)	Completed 1959 (acres)	Probable Final Plan (acres)
Spraying			
Spray ~~site~~ with 2-4-D Total	4530	1432	3000
Reseeding			
1. Cultivate soil, drill introduced species	200	232	300
2. Spray site, drill introduced species	340	15	150
3. Spray site, harrow seed of native species	490	100	250
Total	1030	347	700
Grand Total	5560	1779	3700

the sites that could be treated effectively by present methods and justify treatment on the basis of results likely to be obtained. So the final program visualized now is somewhat smaller than planned in 1951.

SPRAYING WITH 2-4-D

The purpose of spraying was to kill sagebrush on suitable areas and make more room for growth of desirable forage species. About 1432 acres were effectively treated to date, 649 acres in unit 1, 104 acres in unit 2, 296 acres in unit 3, 195 acres in unit 4 and 188 acres in unit 5. Areas were sprayed in 1951, 1954, 1957, and 1958 using the following 2-4-D mixture.

Ingredients	Amount Per Acre
2-4-D Butyl ester	2 pounds
Diesel oil	0.5 pounds
Emulsifier (Antarox A-400)	0.1 gallons
Water	9.0 gallons
Total	10.0 gallons

This formulation was effective on all three sagebrush species on the allotment--big sagebrush, black sagebrush, and silver sagebrush. The spray was applied in spring. Best results were obtained when the new shoots of big sagebrush were about 1-1/2 to 2 inches long at time of spraying. At that time the shoots of black sagebrush were 3 to 4 inches long and silver sagebrush was about 1 inch long.

The spray was applied by airplane (Fig. 22) and by a ground operated turbine sprayer, with equally good results. To get the spray on the ground by airplane the airplane had to be flown within 25 feet of the ground and during periods when wind movement was less than 10 miles per hour. At Harvey Valley conditions were satisfactory for spraying between day break and about 11:00 a.m. on the average day. Flagmen were used to obtain uniform ground coverage.

Figure 22--Spraying sagebrush by airplane in Harvey Valley.

Growth of perennial grasses increased markedly on sprayed areas. Best results were obtained on silver sagebrush sites (Fig. 23), but good results were also obtained on big sagebrush and black sagebrush sites (Fig. 24).

Figure 23--Contrast in growth of Nevada bluegrass on a sprayed (upper) and unsprayed (lower) area in the silver sagebrush type in 1958--8 years after spraying.

Figure 24--Contrast in growth of bottlebrush squirreltail and western needlegrass on a sprayed (upper) and unsprayed (lower) area in the big sagebrush type in 1953--3 years after spraying.

ALH-832

Figure 22. Spraying sagebrush by airplane in Harvey Valley.

ALH-2020 & ALH-2019

Figure 23. Contrast in growth of Nevada bluegrass on a sprayed (upper) and unsprayed (lower) area in the silver sagebrush type in 1958—8 years after spraying.

ALH-1079 & ALH-1081

Figure 24. Contrast in growth of bottlebrush squirreltail and western needlegrass on a sprayed (upper) and unsprayed (lower) area in the big sagebrush type in 1953--3 years after spraying.

Sagebrush is reinvading some sprayed areas where the grass stand is sparse. On these areas respraying may be needed about 15 years after the initial spraying.

Spraying with 2-4-D is an effective, rapid, economical means of increasing forage production on bunchgrass ranges. Airplane spraying at Harvey Valley cost about $4.00 per acre, $2.50 for chemicals and $1.50 for application. Ground spraying cost about a dollar more per acre.

ARTIFICIAL RESEEDING

In 1951 a total of 1030 acres on the allotment was judged unsuitable for artificial reseeding. Plans called for cultivating the soil and drilling seed of introduced perennial grasses on 200 acres; spraying sagebrush and without further ground preparation, drilling seed of introduced species on 340 acres; and spraying sagebrush and harrowing seed of native species into the soil on 490 acres. To date a total of 347 acres has been treated. The final program will total about 700 acres.

Nine different areas were cultivated and planted with introduced grasses (Table 8 and Fig. 25). Areas selected for planting supported vegetation of low grazing value but had deep fertile soils capable of producing heavy forage crops. Most of the areas were cultivated once with a heavy Towner disc and then smoothed and drilled in one operation

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Table 8--Areas disced and drilled with introduced perennial grasses.

Figure 25--Location of reseeded areas by area number.

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with the disc, a heavy roller and a conventional grain drill hooked up in tandem (Fig. 26). The seed was drilled about one inch deep. These plantings cost about $14.00 per acre--$7.00 for ground preparation, $2.00 for drilling and $5.00 for seed.

Figure 26--Ground preparation and drilling of smooth bromegrass on a rich bottomland soil on reseeding area no. 1 on the Harvey Valley Allotment.

All plantings were made in the fall of the year, usually in October and in the allotment unit receiving treatment C. None of the plantings was fenced off from the rest of the range.

Most of the stands were thin and spotty initially due to shortcomings in ground preparation and planting. Also the stands were grazed closely by cattle especially when grazing was started early in the season when the vegetation was succulent and green. In spite of use ranging between moderate to very heavy the plantings developed and thickened materially under the grazing system (Figs. 27, 28, 29 & 30).

Figure 27--Upper. Smooth bromegrass stand on area no. 1 in the second year of growth in 1953--a good growing season. The stand had not stood out appreciably at this stage but had good height growth. Lower. The same stand during a severe drought in 1959. By this time the stand had about reached maximum density. The short height growth is the result of the drought and a natural tendency for the species to decrease in height as it spreads out. The area inside a livestock exclosure in the right middle ground was not grazed since the establishment of the stand. The outside was grazed under the rest-rotation system. There is no material difference in the stands on the protected and grazed areas.

Figure 28--Intermediate wheatgrass stand on area 4 in 1958, 6 years after planting. This stand was very thin to start with but is thickening rapidly under rest-rotation grazing.

Figure 29--A mixture of smooth bromegrass and crested wheatgrass on area 7 in 1958. The site was planted in 1952.

Figure 30--A portion of the margin of reseeded area no. 8, in allotment unit 4 in 1958, is seen here on the left. The character of the site before planting may be seen on the right. The reseeded stand was utilized very closely because of season-long grazing in the unit.

ALH-895

Figure 23--Ground preparation and drilling of smooth bromegrass on a rich bottomland soil on reseeding area no. 1 on the Harvey Valley Allotment.

ALH-1071A & ALH-2086

Figure 27. Upper. Smooth bromegrass stand on area no. 1 in the second year of growth in 1953--a good growing season. The stand had not stood out appreciably at this stage but had good height growth. Lower. The same stand during a severe drought in 1959. By this time the stand had about reached maximum density. The short height growth is the result of the drought and a natural tendency for the species to decrease in height as it spreads out. The area inside a livestock exclosure in the right middle ground was not grazed since the establishment of the stand, The outside was grazed under the rest-rotation system. There is no material difference in the stands on the protected and grazed areas.

Shelter

production

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ALH-2029

Figure 28. Intermediate wheatgrass [redacted] on area 4 in 1958, 6 years after planting. This stand was very thin to start with but is thickening rapidly under rest-rotation grazing.

AIH-2015

Figure 28. A mixture of smooth bromegrass and crested wheatgrass on area 7 in 1958. The site was planted in 1952.

AIH-2009

Figure 20 A portion of the margin of reseeded area no 8, allotment unit 4 in 1958, is seen here on the left. The character of the site before planting may be seen on the right. The reseeded stand was utilized very closely because of season-long grazing in the unit.

Only one area of 15 acres, on a silver sagebrush--black sagebrush site, was sprayed and drilled with introduced species--smooth bromegrass and crested wheatgrass. This work was done in 1951. The results varied from good to poor from one part of the area to another depending primarily on the condition of the soil. Poor results were obtained on eroded areas where most of the topsoil was gone. The cost of this work was about $7.00 an acre.

In 1958 the seed of native species was harrowed into the soil on 6 separate areas on which sagebrush has been reduced by spraying in 1951. (Table 8) The 1959 drought marked the results of these plantings. A substanial number of seedlings was evident in the spring of 1959 on all areas but most of them appeared to die by late summer. Observations in 1960 will provide a better indication of degree of success. The cost of this work was about $3.00 an acre. The kind of response expected on a favorable site with this kind of treatment is illustrated by results obtained in 1941 at Normal Hat located about 12 miles South of Harney Valley (Fig 30a)

The grass stands released by spraying and established by reseeding are being maintained and in many places are thickening, either by establishment of new reproduction of by underground rhizomes, under rest-rotation grazing. Of the introduced grasses smooth bromegrass and intermediate wheatgrass--both rhizome formers-- have preformed best on Harvey Valley.

EROSION CONTROL

Dependence is being placed on rest-rotation grazing to thicken vegetation cover and thereby effect the initial and in many cases the

Table 9--Areas sprayed with 2-4-D in 1951 and harrowed in 1958 to cover seed of native plants. Harvey Valley Unit 1.

ALH 527

Fig 30a Nevada bluegrass established by harrowing seed, formed in place, into the soil in the fall of the year. Norvel Flat, Lassen National Forest 1941

entire control of both gully and sheet erosion (Fig. 31). Dams and similar structures are being used to speed up and effect control of active deep gullies.

Figure 31--Change in vegetation on an eroded area in Harvey Valley from 1951 (upper photo) to 1959 (lower photo) reflecting the effectiveness of rest-rotation in increasing vegetation cover and forage.

In 1957 rock dams were built along about one mile of gullied drainage course affecting the grazing capacity of a wet meadow in the Burgess Spring drainage (Figs. 32 & [redacted]). The main object here is to raise the water table close to its original level and reestablish desirable wet meadow conditions.

To date vegetation has been the main factor checking erosion. Very little soil has been deposited behind the dams in two seasons. Vegetation in the channel has thickened appreciably since rest-rotation grazing was started in the unit in 1953.

Figure 32--Eroded stream channel in the Burgess Spring drainage where rock dams were built in 1957 to help control erosion. The vegetation has been thickening in the fully since the start of rest-rotation grazing in the unit in 1953. Photo taken in 1958.

~~Figure 33--Location of main drainage areas.~~

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Figure 22. Change in vegetation on an eroded area in Harvey Valley from 1951 (upper photo) to 1959 (lower photo) reflecting the effectiveness of rest-rotation in increasing vegetation cover and forage.

ALH-1981

Figure 32.-- Eroded stream channel in the Burgess Spring drainage where rock dams were built in 1957 to help control erosion. The vegetation has been thickening in the gully since the start of rest-rotation grazing in the unit in 1953. Photo taken in 1958.

This is the only structural erosion control project planned on the allotment. A similar gully system in the Shoestring drainage (Fig. 6) one mile east of the Burgess Spring drainage is being used to check the effectiveness of vegetation alone in controlling such gullies. Dams will not be used there.

DRAINAGE IMPROVEMENT

Improvement of drainage has been planned on two areas, one of about 300 acres in Little Harvey Valley that remains too wet for growth of desirable forage plants (Fig. 34), and another of about 200 acres in Big Harvey Valley that remains flooded in late spring in wet years. The latter situation is preventing artificial reseeding of some of the best bottomland soil on the allotment.

Figure 34--Area requiring drainage in Little Harvey Valley. This poorly drained site supports a vegetation stand consisting mainly of coarse sedges and rushes. Better drainage would encourage the growth of desirable grasses.

Drainage ditches were cut in Little Harvey Valley in 1959 (Fig. 35). No ditching has been done in Big Harvey Valley yet. There has been no opportunity so far, therefore, for observing the results of drainage improvement.

Figure 35--One of the drainage ditches cut in Little Harvey Valley in 1959.

ALH-545

Figure 34. Area requiring drainage in Little Harvey Valley. This poorly drained site supports a vegetation stand consisting mainly of coarse sedges and rushes. Better drainage would encourage the growth of desirable grasses.

ALH-Dec. 1959

Figure 35. One of the drainage ditches cut in Little Harvey Valley in 1959.

LOGGING

No harvest cutting of the remaining virgin timber on the allotment has been made since the start of the program. When cutting is resumed the unit area control system of forest management will be employed. Openings from a few acres to several acres in size, largely devoid of trees, are created in the forest stand by cutting under this system. These openings often support shrubby and herbaceous vegetation that provides grazing for both livestock and game for several years until trees again take over the site.

CATTLE WEIGHTS

The first cattle weights on the allotment were obtained in 1954 when facilities for weighing were completed. Fully satisfactory weights that are comparable between years and classes of animals have not been obtained yet because cattle of different backgrounds and breeding have been used each year. Since the Romey Brothers became the permittees on the allotment in 1957, cattle from essentially one herd have been used, and this herd has been made more uniform by culling and breeding since then. Probably the first acceptable weights will be obtained in 1960.

A record of weight gains made by the cattle to date is included here, however, to provide an indication of cattle performance on the allotment. (Table 10)

Table 10--Average weight gains of cattle on the Harvey Valley Allotment 1954 to 1959 inclusive.

Fluctuations in weather and forage conditions from year to year as well as differences in cattle account for the variations in weight gains. The figures are based on 50 or more head of each class of cattle. The animals were tagged for identification and weighed individually so performance of individuals as well as classes of animals can be determined.

GOAL OF PROGRAM

The objective of the present range management program at Harvey Valley is maximum livestock production. This goal is expected to be realized principally through increased forage production permitting more livestock to be grazed on the range and through a breeding and culling program carried out by the permittee, aimed at increasing cattle weight gains.

With the planned adjustments in management of grazing providing for more livestock trampling when the soils are soft to promote more rapid establishment of seedlings and longer rest from grazing during early growth of seedlings the rest-rotation system at Harvey Valley should provide about maximum opportunity for range improvement within the limitations of range conditions and weather.

On the basis of the results observed on Harvey Valley, Region 5 of the Forest Service has set a policy calling for some form of rest-rotation grazing as quickly as possible on all national forest range allotments on which the system can be applied. This is in keeping with the over-all policy of the Forest Service to develop national forest ranges to yield maximum production.

Rest-rotation grazing is more than a livestock management tool since it [redacted] promotes vegetation regeneration and thickens plant cover generally, whether of grasses, forbs shrubs, or trees. On mountain lands like those found on the national forests rest-rotation grazing applied to livestock and big game (deer in most cases), holds promise of aiding forest regeneration and increasing recreation and watershed values as well as grazing values. The principals of rest-rotation grazing therefore have wide application in the broad field of wild land management.