

ck

THE HARVEY VALLEY EXPERIMENTAL RANGE

California
Forest and Range
Experiment Station
George M. Jemison, Director

Forest Service
U. S. Department of Agriculture
Berkeley, California

July, 1954

THE HARVEY VALLEY EXPERIMENTAL RANGE

The Harvey Valley Range Allotment, an area of 32,352 acres on the Lassen National Forest in northeastern California, is being used as a proving ground for range management practices developed from studies conducted by the California Forest and Range Experiment Station. These studies have been conducted at the Burgess Spring Experimental Range, a field station of the Forest and Range Experiment Station, and other experimental sites nearby (see map) since 1936. The principal practices being tested are: (1) a five-unit system of grazing management, (2) artificial reseeding, and (3) chemical weed and brush control. These practices are designed to increase the grazing capacity and effect efficient use of the range.

The need for better range management practices in northeastern California stems from the deteriorated condition of the range. It is estimated that mountain summer ranges in this region are producing only about 50 percent of potential capacity.

Research and Cooperation

The grazing management system being applied at the Harvey Valley Allotment was developed at the Burgess Spring Experimental Range from 1936 to 1951. The artificial reseeding and chemical spray research were conducted at Halls Flat Meadow and Grass Valley from 1945 to date. Cooperating directly in this research were the California Forest and Range Experiment Station, the Lassen National Forest, the Lassen County Farm Advisor, Lassen Forest grazing permittees, and the Forest Service Regional Office. This cooperation is being maintained on the Harvey Valley Allotment. As a result of reorganization in the U. S. Department of Agriculture, research on artificial reseeding, weed control and range fertilization, formerly handled by the Forest Service, is now being carried on by the Forage and Range Section of the Agricultural Research Service. This agency is cooperating in the work at Harvey Valley.

Description of Harvey Valley Allotment

Principal vegetation types:

<u>Name</u>	<u>Acres</u>	<u>Percent</u>
Grassland	505	1.5
Meadow	1,322	4.1
Sagebrush	4,105	12.7
Conifer	14,713	45.5
Waste	11,707	36.2
Total	32,352	100.0
Usable Range	20,645	

General class of forage types	Bunchgrass
Class of livestock	Cattle
Type of operation	Usually cow and calf
Grazing capacity	500 animal units
Grazing season	June 1 to September 30

Grazing Plan

The main purpose of the grazing plan is to provide for the improvement, maintenance and efficient use of the range. The key provision in the plan for encouraging range improvement is periodic resting of the range from grazing. This makes possible (1) restoration of vigor and seed production of plants weakened by grazing; (2) establishment of forage reproduction; and (3) improvement of soil fertility.

The timing of grazing and resting is based on the growth requirements and maintenance of the key forage species on the range -- in this case Idaho fescue. This species is highly susceptible to grazing injury. All other species less susceptible to grazing injury than Idaho fescue are thus also maintained on the range.

The grazing plan calls for subdivision of the range into five units of equal grazing capacity. Three units are grazed each year and two rested so as to get 33 percent use of the total forage production on the allotment. This level of use is moderate and is estimated to provide adequately for the 500 animal units to be grazed on the allotment at the start. The regular permitted number of animal units on the allotment has been 500. No reduction in numbers has been necessary to put the present grazing plan into operation. Application of the planned grazing and cultural practices are expected to double grazing capacity in 20 years or less.

During a 5-year period each of the range units receives a different grazing treatment (Table 1). Heavy grazing (60 to 70 percent forage use) is employed the first season to insure full use of the available forage. Rest is provided the entire second season and half of the third to permit the grazed plants to recover vigor and produce seed. Heavy grazing during the latter half of the third season provides for getting as much seed as possible trampled into the soil. Complete rest the fourth season gives the young seedlings a chance to become established. Moderate grazing (30 to 35 percent forage use) is provided during the first half of the fifth season to give the young plants further opportunity to become established. The grazing called for in the fifth season is also necessary to make the plan work; that is, to permit stocking the pastures at given intensities and moving the livestock about as required. The grazing schedule for five units during a 5-year cycle is shown in Table 2. This sequence of grazing is repeated every five years indefinitely.

The proposed stocking and grazing schedule for the Harvey Valley Allotment up to 1956 is shown in Table 3.

The grazing intensity desired in each unit in a given season is obtained as follows: (refer to first year in Table 2). At the beginning of the grazing season 60 percent of the animals to be grazed on the entire range are placed in unit 1 and the remaining 40 percent are placed in unit 5. In mid-season two-thirds of the animals in unit 1 and all of those in unit 5 are moved to unit 3. In this way units 1 and 3 are grazed heavily, unit 5 moderately, and units 2 and 4 are rested. Should the forage in the heavily grazed units -- those receiving treatments A and C in Table 3 -- be inadequate for the livestock in any given season because of low forage production, the livestock can be moved to units receiving treatments B and E. Only in extreme cases should the unit receiving treatment D be opened to grazing.

Forage produced through artificial reseeding, chemical weed control or other cultural means in the units is managed together with the rest of the area in the unit without special fence control.

Status of Grazing Test and Cultural Treatments

Construction and installation of the necessary livestock management facilities was begun in 1951. The fencing program is now 75 percent completed and the livestock water development program 40 percent completed. Five usable units became available for use with the completion of the interior pasture fences late in 1953. Unit 1, which was constructed in 1951, is receiving its third year of planned grazing, and units 2 and 3 their second year. Units 4 and 5 are being grazed according to schedule for the first time in 1954. This is the first year, then, that all five units are receiving scheduled grazing treatments simultaneously.

Ninety-five percent of the area planned for artificial reseeding has been planted and about 40 percent of the acreage set up for weed control has been sprayed.

Cattle are being weighed for the first time this year to measure total seasonal weight gains. The cattle grazed on the allotment this season consist of yearling heifers and steers.

Where to See Results in the Field

Cultural practices.---The experimental work on artificial reseeding and chemical spraying leading to the applications on Harvey Valley may be seen at Halls Flat Meadow and Grass Valley (see map).

Halls Flat Meadow

Adaptation tests of more than 100 introduced and native grasses and legumes are being conducted here. Some of the points that are checked on each species include seed viability, seedling emergence rate, seedling vigor, palatability, herbage yield, and seed production. The more promising species are later tested on larger field plots under grazing use.

Table 1.---Schedule of grazing for any one unit during a 5-year cycle

Year	Treatment	Character of treatment	Main purpose of treatment
1st	A	Heavy use season-long	Maximum forage utilization
2nd	B	Rest season-long	Recovery of plant vigor
3rd	C	Rest until mid-season Graze heavily second half of season	Permit plants to ripen seed Trample seed into the soil and forage utilization
4th	D	Rest season-long	Aid establishment of new reproduction
5th	E	Graze moderately until mid-season Rest second half of season	Aid establishment of new reproduction Permits completion of grazing schedule

Table 2.---Schedule of grazing of five units during a 5-year cycle

Year	Range unit				
	1	2	3	4	5
	<u>Treatment</u>				
1st	A	B	C	D	E
2nd	B	C	D	E	A
3rd	C	D	E	A	B
4th	D	E	A	B	C
5th	E	A	B	C	D

1/ See A to E in Table 1.

Table 3.--Planned grazing schedule for Harvey Valley Allotment^{1/}

		Range unit				
Year	1	2	5	4	3	
(Stocking - (animal units))						
1952	B Rest	C 400	D Rest	E Rest	A 100	Rest 200 300
1953	C 400	D Rest	E Rest	A 100	B Rest	Rest 2/ 200 300
1954	D Rest	E Rest	A 100	B Rest	C 400	Rest 200 300
1955	E Rest	A 100	B Rest	C 400	D Rest	Rest 200 300
1956	A 100	B Rest	C 400	D Rest	E Rest	Rest 200 300

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

2/ Top figure or comment indicates stocking or treatment during first two months of the season, and bottom figure or comment indicates stocking or treatment during last two months of the season.

Grass Valley

Here, tests are made of artificial reseeding and weed control methods, of soil fertilization and of the effect of season on the growth and development of planted and sprayed areas. This area includes stands of big sagebrush, black sagebrush and silver sagebrush -- three of the most widespread weed species in northeastern California.

Harvey Valley Allotment

The beneficial effect of the five-unit grazing system in increasing forage production is already evident in unit 1, which has received but three years of grazing treatment (see Table 3). The most significant result is the germination in 1954 of large numbers of seedlings of desirable grasses. These seedlings were obtained as a direct result of planned grazing use of the unit. They mark the beginning of range improvement and increased live-stock production.

Certain points relative to the grazing management and cultural work are brought out at seven different field stops in the various range units. In going from unit to unit it would be well to keep the grazing treatments of each in mind.

Unit 1.--This unit, grazed heavily in 1951, was rested season-long during 1952 and until mid-season in 1953 to restore the vigor of the forage species and encourage seed production. In the latter half of 1953 it was grazed heavily to get as much seed as possible trampled into the soil and also to make full use of the forage crop. The seedlings from this seed crop are in evidence this year. Grazing is being withheld through 1954 to permit the seedlings to become established sufficiently to withstand two seasons of grazing before additional rest is provided. Note the good vigor and heavy seed crop on the old established grass clumps.

Approximately 1,300 acres of sagebrush (*Artemisia tridentata*, *A. arbuscula*, *A. cana*) in this unit were sprayed with 2,4-D in June 1951. The release of the grass from sagebrush competition by this spraying combined with rest from grazing two seasons out of three has built up the vigor of the plants.

Unit 2.--This unit was rested in 1953 and grazed moderately 1954 until mid-season. It will be rested the remainder of 1954. Note the uneven use of the forage, close use of meadows, areas around watering places and along fences and light use in the timber type, especially on the mountain slopes.

Unit 3.--This unit has been rested from grazing for a year and a half up to mid-season 1954 to build up plant vigor and a seed crop. Much of the seed now in evidence will be trampled into the soil by grazing scheduled for the second half of this season.

Unit 4.--This unit is receiving its first season of rest. The plants are not as vigorous yet as in units 1 and 3.

Unit 5.--This unit has not yet received any rest from grazing. In 1954 it is being grazed heavily season-long. Most of the seed stalks are already grazed off, especially on the choice grazing areas, so little seed is being produced in the unit.

Inspection Stops in Units (see map for locations)

Stop 1, Range condition.--Some of the more evident indications of range deterioration can be seen at this stop. A sod of short-hair sedge once clothed many of the benchland sites on the allotment. Small areas in good condition still remain in some places, but most of the sod has been broken open and killed out by grazing. Some of the resulting bare soil areas have been invaded by inferior grazing species such as sagebrush, grasses like needlegrass, and annual plants like tarweed. Others remain bare, and here top soil has been blown or washed away reducing soil fertility and forage production potential. The total density of

the forage cover has been reduced. Similar manifestations of range deterioration resulting directly from livestock grazing may be seen throughout the allotment, particularly in the non-timber types. There is evident need for better grazing management and cultural practices to improve soil fertility and forage production.

Stop 2, Reproduction.--On perennial bunchgrass type ranges such as this, increased forage production is obtained through the establishment of new plants. These plants are obtained from seed rather than from underground shoots as in sod types.

The five-unit grazing system includes definite provision for establishment of new plants. Seedlings of perennial grasses like squirreltail (Sitanion hystrix), Nevada bluegrass (Poa nevadensis) and Junegrass (Koeleria cristata) were brought on by the grazing system and are evident at this stop.

Most of the seedlings on this eroded, heavy soil site are starting in (1) depressions in the soil where some litter has accumulated, (2) close to established grass clumps and sagebrush plants where top soil remains and some litter exists, and (3) in cracks in the soil. Some seedlings are evident on bare soil surfaces where trampling apparently was a factor in getting the seed into the soil. On lighter textured soils a high proportion of seedlings come from trampled in seed.

Stop 3, Sagebrush spraying with 2,4-D.--Sagebrush, a relatively poor grazing species, can be killed with the chemical 2,4-D. Grasses, on the other hand, are not affected materially. The selective action of 2,4-D in killing out sagebrush provides more room for grass growth.

The effect of 2,4-D on big sagebrush is shown here. The increased growth of grass -- mainly needlegrass (Stipa occidentalis) -- on the sprayed area is evident. Grass seedlings also are more abundant on the sprayed area than on the unsprayed.

Statistics on the spraying are as follows:

Date of spraying	June 11-16, 1951
Plant growth stage	New twigs 2.5 inches long
Method	Fixed wing airplane flying 10-20 feet above the ground
Chemical	2,4-D butyl ester
Formulation per acre	2,4-D 2 pounds
	diesel oil 0.5 gallons
	emulsifier (Antarox A-400) 0.1 gallons
	water 9 gallons

Total solution per acre 10 gallons.

Cost per acre	Chemicals and materials	\$2.65
	Application (airplane)	<u>.35</u>
	Total	\$3.00

Stop 4, Reseeding, smooth brome grass (Bromus inermis), 3-year-old stand.--This stand was planted in October 1951 at the rate of 10 pounds of seed per acre. The ground was plowed twice with a Towner offset plow and smoothed with a roller ahead of drilling. The seed was drilled 0.5 to 1.0 inch deep.

Cost per acre	Ground preparation	\$7.50
	Seed	3.00
	Planting	<u>1.50</u>
	Total	\$12.00

The yield was estimated to be about 1,500 pounds per acre in the second year under favorable growing conditions. This year the yield is less mainly because of the dry season.

The essential requirements for the establishment of a good reseeded stand are:

1. Select species that are adapted to the site.
2. Prepare seedbed thoroughly to reduce as much of the existing vegetation from the planting site as possible and provide a smooth, compacted seedbed.
3. Plant the seed at the proper depth in the soil.
4. Drill the seed into the soil where possible.
5. Plant the most fertile rock-free soils first.

Stop 5, Reseeding, intermediate wheatgrass (Agropyron intermedium), 2-year-old stand.--This nutritious grass makes good growth on fertile, medium to heavy textured soils. Establishment and growth is poor on eroded areas, however, as can be seen here. Ground preparation was inadequate on portions of the planting site, resulting in a thin spotty stand on these areas. Seedlings originating from shallowly planted seeds were very lightly rooted the first year of growth and were easily pulled up by livestock. Now in the second year most of the plants are well rooted and can tolerate grazing without being pulled out.

Cost per acre	Ground preparation and drilling	\$ 8.00
	Seed (6 pounds per acre at 60 cents per pound)	<u>3.60</u>
	Total	\$11.60

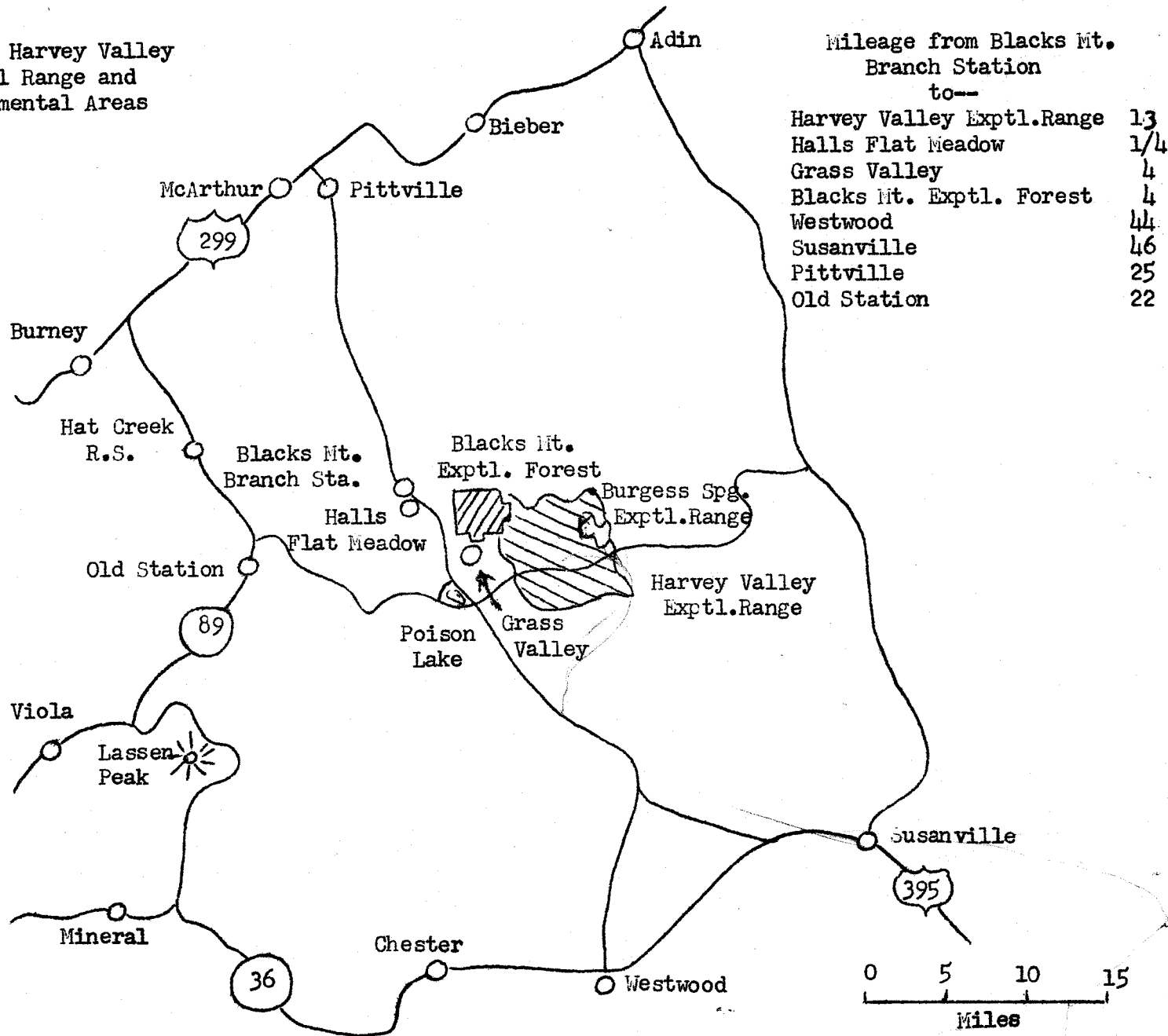
Stop 6, Reseeding, intermediate wheatgrass, first-year stand.--The border around this area was planted in the fall of 1953. The onset of winter prevented completion of planting of the interior of the area until April this year. The poorer stand development

in the interior is the result of dry conditions during the spring growing period. No precipitation fell for about a month after the seed was planted. The full density of the stand will not be apparent until next year.

Cost per acre	Ground preparation and drilling	\$ 8.00
	Seed (8 pounds per acre at 60 cents per pound)	<u>4.80</u>
	Total	\$12.80

Stop 7, Sagebrush spraying with 2,4-D.--This area shows the reaction of sagebrush to 2,4-D during the season of spraying. Most of the plants show indications of dying. All three species of sagebrush are found here and are equally affected. The area was sprayed on June 22 with a Buffalo turbine sprayer with the same chemical formulation and rate of application as at Stop 3. The cost of application was \$1.40 per acre and the total cost, including materials, \$4.05.

Location of the Harvey Valley
Experimental Range and
Other Experimental Areas



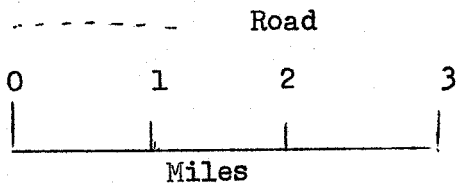
Legend

S1 to S7 Field stops marked
in field along roads
with numbered, all
yellow steel fence
posts; spade up.

A to K Gate or cattle guard.
Marked in field with
letters.



Waste range



Harvey Valley Experimental Range

