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1957
FIELD DAY
REPORT

SQUAW BUTTE-HARNEY

RANGE AND LIVESTOCK

EXPERIMENT STATION

BURNS, OREGON

NINETH ANNUAL FIELD DAY

Welcome to the 9th Annual Field Day of the Squaw Butte-Harney Range and Livestock Experiment Station.

The Station is jointly operated by the Agricultural Research Service of the U. S. Department of Agriculture and the Oregon Agricultural Experiment Station of Oregon State College. By executive order the federal participation in the Station program and operation was transferred from the Bureau of Land Management of the U. S. Department of Interior to the Agricultural Research Service on July 1, 1956.

This report is presented to give a very brief summary of some of the things you will see and hear on the Field Day tour. More detailed information may be obtained by requesting copies of Station publications. The staff of this Station have published more than 30 technical papers, bulletins, and reports in the last few years and more are on the way.

On behalf of the entire Station staff, may I say thank you for the opportunity and privilege of showing you some of our work. We also appreciate greatly having the members of the Pacific Northwest Section of the American Society of Range Management as our guests at Field Day.

W. A. Sawyer,
Superintendent

NATIVE FLOOD MEADOW INVESTIGATIONS

Clee S. Cooper, Agronomist

Native flood meadow investigations have been conducted at the Squaw Butte Experiment Station for the past six years. During this period a number of significant findings have been made which have resulted in increased production from these meadow lands. Facts concerning these results are as follow.

Nitrogen Fertilization

Nitrogen fertilizer applied at 60 to 80 pounds of actual nitrogen (180 to 240 pounds of ammonium nitrate or 300 or 400 pounds of ammonium sulphate) can be expected to increase hay yields approximately one ton per acre. Applications may be made in either fall or spring with equal success. We recommend applications on those meadows which contain pure stands of Nevada bluegrass or a mixture of rushes, sedges, and grasses. We do not recommend nitrogen fertilization of those meadows which contain pure stands of rush (wire grass).

At the present time three nitrogen experiments are being conducted on the Station. These are:

(1) A study of the long term effects of nitrogen fertilization--In this study rates of nitrogen up to 200 pounds per acre have been applied annually for four years. The response to nitrogen was as good in the third year as in the first year. Changes in the type of plants growing on these plots have not been noted.

(2) A comparison of urea and ammonium nitrate--In this study the two fertilizer materials are being compared at rates of application up to 480 pounds of nitrogen per acre. It was hoped in this experiment that the urea would mostly remain inactive during the flooding period and become available when the flood waters receded. In this case one might expect an increase in protein from the urea and might make an application of both urea and ammonium nitrate prior to flooding with the prospect of increasing both yields and crude protein. However, such was not the case in first year data. Yield responses from the two fertilizers were equal and crude protein content was increased at the higher rates from applications of ammonium nitrate but not from urea. This study is being continued for further evaluation.

(3) Changing vegetative composition with fertilizers--In this study rates of nitrogen are being applied at 0, 200, 400, 600 pounds per acre, rates of phosphorus at 0 and 240 P_2O_5 per acre, and rates of manure at 0 and 20 tons per acre. Nitrogen, phosphorus, and manure treatments are applied in every possible combination. The main purpose of this study is to attempt to change vegetative composition, to measure the yield potential of new plant populations, and to discover the reasons for changes in composition.

In the first year of this experiment (1956) maximum hay yields were obtained at 400 pounds of nitrogen per acre and were 5.4 tons per acre. Crude protein content of hay was not increased with nitrogen.

Changes in composition are readily apparent in the second year (1957). Those plots receiving phosphorus alone containe excellent stands of white-tip clover and those plots receiving manure alone show an increase in beardless wild-rye. On those plots receiving high rates of nitrogen most of the rush and sedge species are gone and grasses are increasing. Measurements of vegetative change will not be made until the third year.

Time of Cutting Meadow Hay

Studies were conducted over a five year period to determine the effect of time and height of cutting on yields and crude protein of hay. It was found that yields of meadow hay do not increase after Nevada bluegrass has reached full bloom (about July 1), and that delaying cutting after this date results in a loss in crude protein. It was also found that raising the cutter bar from 2 to 4 inches results in a loss of 40% in hay yields. This result emphasizes the low dense growing characteristics of native meadow plants and emphasizes the desirability of setting mower blades as low as possible to obtain maximum yields.

White-Tip Clover Culture

Of particular importance in our investigations is the development of annual white-tip clover (T. variegatum) for use as a legume in native flood meadows. This legume is a native which occurs throughout a large part of our meadowlands. Establishment and maintenance of this legume in a meadow results in a two-fold increase in hay yields and almost a like increase in crude protein content. Stands of white-tip clover in a meadow can be obtained either by delayed cutting to allow for seed dissemination (if the clover is initially present) or by seeding. In either case phosphorus fertilization is necessary for the clover to be productive.

White-tip clover should by seeded at a rate of 1 pound or more of germinable seed per acre (this means about 10 pounds of untreated seed as the seeds are 80 to 90% hard). The germination content of seed may be doubled by scarification. This reduces the amount of seed necessary to obtain one pound of germinable seed. At the present time seed is not available on the market.

Phosphorus should be applied at a rate of 40 pounds of P_2O_5 (approximately 100 pounds of treble super phosphate) per acre annually to any area on which white-tip clover is being increased. Our research to date indicates that this amount is adequate to maintain an established stand at optimum production. Our research also indicated that

annual applications are better than large applications made at 2, 3, or 4 year intervals, as phosphorus becomes unavailable rapidly in these soils.

Site selection is important to successful clover establishment. White-tip clover cannot be successfully established on areas which are flooded to a depth of more than 2 inches. A high mortality of seedlings has been observed when they become completely submerged. For this reason it is desirable, if possible, to hold flood waters off of a meadow or keep the depth of water shallow until the clover attains a growth of several inches.

It is necessary to have a good supply of seed in the soil to maintain this clover as it is an annual. Our research has shown, however, that if a large supply of seed is allowed to drop in one year, the hard seed present will maintain stands of clover for several years and thus allow early cutting. From our results we recommend that cutting be delayed every third year, or whenever the clover stand begins to thin, to restock the hard seed supply.

Cutting white-tip clover hay early has resulted in higher crude protein content of hay and has permitted some regrowth. The regrowth is of considerable interest and can be of importance as fall pasture. Normally, little regrowth occurs on native meadows. In this case it is attributed to nitrogen release from the decomposition of clover roots. The average yield of regrowth over a three year period was 355 pounds per acre.

Other Clovers

We are starting experiments with other native clovers. Two seed sources of perennial cow clover, (Trifolium involucratum), (from our meadows and from Astoria, Oregon) and one seed source of a perennial from the White Horse Ranch (believed to be Trifolium wildenovii) were seeded broadcast and drilled in the spring of 1957. White-tip clover is included in the trial for comparative purposes. As this work is just beginning it is too early to present results. If these initial trials look promising, the research will be expanded.

Spraying Experiments

Exploratory trials have been initiated with growth regulators. Of primary interest is the possibility of changing composition and of thus creating more desirable plant populations. Of interest also is the possibility of killing existing vegetation and seeding other species. This work is not far enough along to permit drawing conclusions.

Pasture Trials

A study is being conducted to evaluate the grazing of unfertilized and fertilized meadows. In this study animals graze pastures until

mid-July, at which time the pastures will be cut and the hay bunched. Animals will consume bunched hay until mid-September. Previous trials have shown that animals perform well on native flood meadows. With the increased yield from meadows as a result of fertilization, the possibility exists of diverting some meadow land to pasture.

BEEF CATTLE INVESTIGATIONS

R. R. Wheeler, Animal Husbandman

The Squaw Butte-Harney Experiment Station owns a herd of Hereford cattle which consists of 150 cows, 127 yearlings, and 28 two-year-old heifers at the present time. All of the livestock investigations are conducted with animals from this herd.

Beef cattle investigations at the Station fall into four categories: nutrition, management, breeding, and disease studies.

Nutrition

VITAMIN A:

An experiment on the vitamin A status of Squaw Butte cattle and carotene content of stacked native hay has been completed. Cows were confined to dry lot and fed hay extremely low in carotene (pro vitamin A) for three successive winters. Twelve cows received a carotene supplement - 4 on each of 3 levels and 4 cows received only the low carotene hay. Our research indicates that cows on these levels of carotene intake produced normal calves with no reproductive complications. Cows were found to store quantities of vitamin A in the liver during the summer months on green range forage. This storage was decreasing during the winter hay feeding, but was not low enough in the following spring to cause vitamin A deficiencies in the cows. Calves showed deficiency symptoms after 28 days of age, but this should not be expected generally where good hay is fed or new growth meadow pasture is available in early spring at calving time.

A study on the carotene content of 1, 2, and 3-year-old hay has shown that approximately one-half the carotene is lost the first year after stacking and another 25% is lost the second year. Though these percentage losses seem high, the carotene content of 3-year-old hay is still above the minimum daily requirement for beef cows.

We recommend that older hay be fed during the early part of the winter and new hay be fed the last two months of gestation.

COPPER:

A four-year study of the effects of copper supplementation on weaner steers was completed last year. Results of this study showed that there was no increase in rate of gain or feed efficiency by supplementing the wintering ration with copper.

VITAMIN E:

The vitamin E status of cows and calves in the herd has been investigated the last two years. This study is a blood survey to establish the vitamin E level in blood of range cattle in this region

and to associate these levels to possible white muscle occurrence. Results show that the vitamin E levels are higher than those reported by other workers as indicating vitamin E deficiency.

SUPPLEMENTATION:

Supplementation of cows and calves on summer range has been investigated. Increasing weaning weights of calves have been noted by supplementing cows and calves with cottonseed meal. A study was conducted during the summer and fall of 1956 to evaluate supplementary feeds and methods in terms of calf gains. Cows were supplemented barley or cottonseed meal in feed bunks raised 3 feet from the ground to prevent consumption of feed by calves. One group of calves was creep fed a ration that was designed to increase gains, and not to achieve maximum gains. Ground salt was used to regulate the consumption of the barley and cottonseed meal to the two supplemented groups of cows. Group I was a check group which received no supplement, group II had barley supplemented to the cows only, group III had cottonseed meal supplemented to the cows only, and in group IV the calves were creep fed a barley-cottonseed meal mixture. Supplementation of cottonseed meal to cows during the late summer and fall aftermath grazing periods proved to be more profitable in terms of calf gains than the other supplementation methods. Additional gains will be made when the calves are allowed access to the supplement. Other benefits that may be received in supplementing are: (1) maintaining cow weights, and (2) increasing conception percentage of cows because of better condition.

DIGESTIBILITY:

Basic studies are underway at the Station to determine digestibility of range forage which will provide more accurate evaluation of supplementary feeds that may be necessary in this region.

Management

MEADOW PASTURING:

A study involving yearling steers grazing native flood meadows is currently in progress. The outline of this study is presented in the meadow investigations portion of this mimeograph, entitled Pasture Trials. Factors to be used in evaluating the grazing of fertilized and unfertilized meadows are: (1) average daily gain of animals by periods for the total grazing season, (2) total animal grazing days per acre, and (3) total pounds of beef produced per acre.

IMPROVED NATIVE HAY USE:

An investigation to evaluate hay from white-tip clover (T. variegatum) converted areas will be conducted this winter. Performance of weaner steers on this clover hay will be compared to that of steers on rush-sedge

hay as well as steers fed rush-sedge hay supplemented with other protein.

CATTLE RECORDS:

Twenty years of continuous records of the Squaw Butte herd have been tabulated and the data has been punched on IBM cards to permit analysis of the data. These data are expected to provide information of interest to the stockmen on such things as the effect of age and condition of cows on breeding efficiency, factors effecting birth weight and weaning weight of calves, desirability of breeding yearling heifers vs. 2-year-olds; and numerous other like studies.

Breeding

RATE AND EFFICIENCY OF GAINS:

A study is being conducted to compare the rate and efficiency of gains of heifers on a growing ration to that of heifers on a fattening ration. The majority of investigations on performance testing has been on a fattening ration. This type of feeding for the selection of replacement heifers is impractical under normal ranching conditions. If rate and efficiency of gains can be accurately determined on a growing ration, stockmen can use these factors as part of their basis for selection of replacement stock.

Calves from these performance tested heifers will be placed on a performance test as weaners. Their rate and efficiency of gains will be compared to those of the dams. In addition, the heifers on test as weaner calves have been placed on a common fattening ration as long yearlings to determine the predictability of rate and efficiency of gains.

Disease Studies

ANAPLASMOSIS STUDY:

In cooperation with the Department of Veterinary Medicine, Oregon State College, a study is underway to determine anaplasmosis infection in the Squaw Butte herd. All cows, calves, and yearlings will be bled in the spring and fall each year. The results of this bleeding program will show the time of year when cattle of this area become infected with this disease. Data collected will also show if there is a definite transfer of anaplasmosis from the dam to her calves.

RANGE INVESTIGATIONS

Donald N. Hyder and Forrest A. Sneva

The Area and Its Climate

The Squaw Butte Range unit of the Experiment Station is approximately 42 miles west of Burns, and lies within the Oregon High Desert at an elevation of 4,600 feet, north latitude--43°35", west longitude--119°3". This summer range unit is comprised of 16,000 acres of sagebrush-bunchgrass range, enclosed and divided by approximately 60 miles of fence.

The soils are sandy loam, of basaltic origin, and are underlaid with a caliche layer varying from 2 to 4 feet below the surface. These soils are characteristic of much of the 96 million acres of sagebrush range. Most of these semi-arid soils have not been classified.

Temperature and precipitation is extremely variable. Average annual precipitation is approximately 10 to 11 inches, with most of it being received in the winter months. During the last 19 years the lowest precipitation recorded was 5.90 inches and the highest 18.12 inches. Except for April and July, all months have been high in the amount of precipitation received during one of those years. Conversely, all months with the exception of January, February, and May have been low in the same manner. All months have experienced temperatures below 32°F; however, the average frost-free period is approximately 50 days. Evaporation from a free-water surface is approximately 45 inches during the period from April 1 to October 31. Average monthly means for precipitation and temperature during the period 1937 to 1951 and for 1956 are shown in the following table.

Average Monthly Precipitation and Temperature for the Period Indicated

	1937-51		1956	
	Precipitation in inches	°F	Precipitation in inches	°F
Jan.	1.19	23	3.20	29
Feb.	1.05	29	1.00	26
March	0.80	35	0.65	37
April	0.65	43	0.20	47
May	1.28	52	3.04	52
June	1.37	55	0.80	55
July	0.27	66	0.48	68
Aug.	0.54	64	0.38	65
Sept.	0.69	58	0.15	59
Oct.	1.11	46	2.57	48
Nov.	1.17	35	0.18	38
Dec.	1.36	28	0.75	31
Annually	11.47	45	13.40	46

Sagebrush and Rabbitbrush Control

PRODUCTION OF SPRAYED RANGE:

Prior to spraying for control of big sagebrush, a 40-acre sagebrush-bunchgrass range produced one pound of herbage for each 4.9 tons of water received by precipitation. Since spraying there has been one pound of herbage produced for each 1.9 tons of water received. The ratio is 2.6 times more production of forage plants with a given amount of moisture as a result of sagebrush control.

Herbage production has increased from an annual average of 227 pounds per acre prior to spraying to 642 pounds per acre since spraying. Yearling gains in the month of August each year have increased from an annual average of 6.7 pounds per acre to 17.4 pounds per acre. With the value of increased beef production estimated at 18 cents per pound, there has been a gross return of $7.48 per acre accumulative in the 4 years since spraying. Spraying costs about $2.50 per acre; consequently, the gross profit has been about $5.00 per acre. Net profit depends upon the cattle investment and overhead expenses necessary to the operation; however, it is readily apparent that the spraying investment has been recovered in full in only 4 years. Furthermore, range condition has improved and gives assurance of additional profit for many more years.

CHEMICAL CONTROL OF RABBITBRUSH:

Rabbitbrush has been more susceptible to 2,4-D esters than to any of 13 other herbicides used. With 2,4-D butyl ester, an acid equivalent rate of 2 to 3 lb/A gave good rabbitbrush control when applied in water at 10 gpa. A preliminary index to rabbitbrush susceptibility is as follows: New rabbitbrush twig growth must exceed 3 inches in length, sandberg bluegrass must have reached flowering development, squirreltail (Sitanion hystrix), and Thurber's needlegrass (Stipa thurberiana) must be heading, and sandberg bluegrass herbage must retain some green color. With this multiple index favorable years and times may be chosen.

Fertilizer on Range and Dryland Hay

NITROGEN ON CRESTED WHEATGRASS:

During three consecutive years ammonium nitrate at 30 lb/A of actual N increased crested wheatgrass production from an average of 270 lb/A unfertilized to 578 lb/A when yields were taken on June 1. When yields were taken on August 1, annual yields were increased from 711 to 1031 lb/A respectively at 0 and 30 lb/A of N. Spring yields (taken on June 1) were in direct proportion to the mean temperatures in April and May. Annual yields were directly related to the total amount of winter and spring precipitation (November 1 to June 1). Fertilized grasses depleted soil moisture more rapidly and shortened

the green-herbage season. Herbage crude protein content was increased in the very dry year of 1955. Herbage yields in the second year following fertilization showed residual response when the fertilization year was very dry. The highest efficiency of N was obtained at 20 pounds of N per acre. At this rate, 25 pounds of additional herbage was produced (including residual response) with each pound of nitrogen.

RYE HAY PRODUCTION:

Rye hay production was increased from approximately 1 to 1½ tons per acre when fertilized at 40 pounds of nitrogen. Crude protein content was 7.5, 8.4, 9.3, and 10.4 percent, respectively, at fertilization rates of 0, 20, 40, and 60 lb/A of nitrogen when the rye was cut in flower. Those protein levels decreased about 2 percent from early flower (July 9) to soft dough (July 24).

CARBOHYDRATE STORAGE IN CRESTED WHEATGRASS:

The low point in root storage of carbohydrates was created by clipping crested wheatgrass herbage at a dry matter content of 47 and 48 percent respectively in 1955 and 1956. This low point occurred with clipping at or shortly after maximum herbage yields were attained--depending upon growing conditions.

Carbohydrate storage was completed when herbage dry matter content reached 68 and 69 percent respectively in 1955 and 1956, and at 72 percent in potted grasses.

Crude protein percentages decreased rapidly during herbage growth. There was a slight plateau of protein percentage in the last week of June each year. In the first two weeks of July rapid decrease in protein continued. Rapid losses terminated on July 21, 1955, July 20, 1956, and on July 17 in 1956 in the potted grasses.