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In this Issue

Editorial-Opportunities for students in The American Society of Range Management F.W. Albertson 275
The Challenge of the Range Researcher Radford S. Hall 277
Mortality of Velvet Mesquite Seedlings Harold A. Paulsen, Jr. 281
Why Haven't Farmers and Ranchers Taken to Regrassing? Harvey L. Harris 287
Wildlife Depredations on Broadcast Seedings of Burned Brushlands ..... Walter E. Howard 291
Ranching Services: A Challenge to Rengemen R.B. Peck 299
Condition and Grazing Capacity of Wet Meadows on the East Slope of the Sierra Nevada Mountains Basil K. Crane 303
Effects of Spring and Fall Grazing by Sheep on Vegetation of the Upper Snake River Plains Walter F. Mueggler 308
Pollarding--Age -old Practice Permits Grazing in Pays Basque Forests..... John M. Fenley 316
Book Reviews:
Missouri River Basin Agriculture Program (U.S.D.A) Dan Fulton 319
Pigs-from Cave to Corn Belt (Towne and Wentworth) Walt Hopkins 321
The Soil Science Society of America, Proceedings 1948 ..... E.J. Dyksterhuis 322
Farm Structures (Barre and Sammet) L.H. LaFaver 323
Principles of Field Crop Production (Martin and Leonard)..... E.R. Jackman 324
A Sand Count Almanac and Sketches Here and There (Leopold) ..... R.S. Campbell 325
Conservation and Nevada-A Textbook for Use in the Public Schools of Nevada (Wheeler et al.) Jos. H. Robertson 325
Current Literature..... Grant A. Harris 327
News and Notes 337
With the Sections..... 345
Society Business 348
Membership List as of July 1, 1950..... 352
Index to Volume 3, 1950..... 381

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Journal of
RANGE MANAGEMENT

Editorial
Opportunities for Students in the American Society for Range Management

THE American Society of Range Management is a young organization but it has had phenomenal growth in membership. The number of members increased from 753 on January 1, 1949, to more than 1800 on July 1, 1950. This rapidly increasing membership reflects, in a way the importance of the objectives of the Society in their relationship to the needs of the people in the extensive range areas of our continent.

No country or organization can long function at its best unless it has a program for educating its youth. In order to further increase the effectiveness of our Society, a program has been initiated to stimulate active participation by young people interested in range management. For example, any college student in range management may become a member of the Society for only $3.00 per year, which is about actual cost. Nevertheless, student members receive the Journal; they have full privileges of voting and enjoy all other regular Society activities.

Student local chapters are being encouraged. Any institution offering studies in range management is requested to consider the possibility of organizing a student chapter. At present, there are recognized student chapters in Wyoming and Arizona, and formation of others in these and other states doubtless will add much to the development of young range men and to the vigorous functioning of the Society. Pending amendments to the Society By-laws provide that student chapters may be organized under sponsorship of the parent Section upon the presentation of a petition signed by at least ten student members of the Society.

A student essay contest has been announced. Prizes varying from one to ten years free subscriptions to the Journal are being offered for the best essays on some phase of range management. Any graduate or undergraduate student who has completed one or more courses in range management is eligible to participate. In fact, he is *urged* to do so! The topic selected may be general or specific in nature but must deal with some phase of range management. The paper should not exceed 2,500 words, and should follow the standards given on the last page of this issue of the Journal, entitled "Information for Authors." The completed essay should be mailed to the undersigned before November 15, 1950. Winners of the contest will be announced in January at the Fourth Annual Meeting of the Society at Billings, Montana. The top ranking essay will be published in the Journal.

The pages of the Journal are open to abstracts of masters or doctors theses in range management, and to articles based on theses, if accepted by the Editorial Board. Range schools and graduate stu-

dents are urged to submit suitable papers and abstracts of theses to the Editor.

It is the sincere desire of the officers that all members will contact young people in the range country and discuss with them the objectives of the Society in order to help them see the value of being a part of this rapidly growing organization. It is especially important to assist range management students in forming student chapters and encourage them to participate in the essay contest and other Society activities.

The chief objective of the Society is to "foster advancement in the science and art of grazing land management." This is, indeed, a worthy objective and should attract the interest of all young people who are engaged in making preparation for a life's work in one of the many fields of range management. Numerous problems confront those who are engaged directly or indirectly in proper utilization of our ranges. Many of these problems can be solved in part at least by students through research in the various colleges and universities. Students are much more interested in this practical type of study than in routine laboratory exercises. The net result is that the student attacks his work with greater enthusiasm and more is accomplished. Furthermore, it is through this training and background that our youth will develop habits of straight thinking which in a few years will be extremely valuable when they have the responsibility of directing the program that now rests very largely with older members of the Society.

F. W. Albertson, Department of Botany
Fort Hays Kansas State College, Hays, Kansas

The Challenge of the Range Researcher

RADFORD S. HALL

Assistant Executive Secretary, American National Live Stock Association, Denver, Colorado

MOST people, upon reading or hearing the subject of this talk, immediately visualize it as a dissertation on the scientific job ahead of the researcher. As a matter of fact, the officer of the American Society of Range Management who invited me to appear on your program here in San Antonio had that in mind, I am sure.

However, far be it from me to attempt to tell you men what you need to do in a scientific way. That is your job. You have a long-time program upon which you have spent years of planning and study. You know your work and know it well. I have spent hours and weeks reading your reports trying to keep up with you. I would be worse than foolish were I to attempt to tell you what to do from a scientific standpoint.

So—I am not going to talk scientific programs at all.

As you all know, I am here because of my connection with the American National Live Stock Association, an organization of practical range users. I hope and sincerely believe that I will speak from their viewpoint. These men have been under serious attack during recent years as despoilers of the range. Some reaction from that charge may creep into this talk, but not too much I hope, for if I were to permit it to do so it would completely destroy the usefulness of my appearing on your program.

The real challenge to the range researcher, as I see it, is now SALESMANSHIP.

Perhaps many of you are surprised, as salesmanship is certainly not elected as one of the courses leading to a scientific degree nor is it generally regarded as a requisite for a successful scientific career. However, your profession is in a somewhat different position than any other science of which I know. Most scientific researchers pass their findings on to other trained technicians who, in turn, transpose them to practical use in everyday life. For example, medical researchers have absolutely no contact with the patients who receive the benefits of their discoveries. New techniques perfected in the research laboratory are passed on to the trained doctors and often the patient who benefits from the researchers' findings has no knowledge whatever of them nor of their being put to use on him.

Not so in your profession. You must do the contact job directly. For that reason you need a qualification not required of most researchers—Salesmanship.

I am sure that some among you will say that many of the things I am going to mention are nigh onto impossible of attainment. That is why they present such a challenge to your group to do something about them, for no matter how successful you are as researchers it will all go for naught if you do not get it sold.

Now it has not taken me very long to tell you what the challenge is. It will take me a little longer to suggest some of the "angles" to be used in getting the job done.

As you are scientists and not accustomed to the vernacular of the salesman that word "angles" may be strange to you. It is a term frequently used by salesmen, particularly high-pressure, to

mean the various approaches used in clinching a sale.

There are so many angles to the selling job ahead of you that I hardly know which to bring up first. I am not going to attempt to mention all of them. In fact I don't know all of them but I will attempt to point out a few of the most obvious and most important.

Facts and figures mean practically nothing in an economic way so long as they are related only to small areas and few animals involved in experimental projects. Obviously, to be of any real worth the conclusions of research must be translated into actual volume production by thousands of range users both large and small, and therein lies your task of salesmanship.

I am going to mention some do's and some don'ts. If some of the don'ts seem critical, please be assured that they are offered in a friendly manner and are generally directed at only a few persons and are not general.

A Practical, Logical Program

First, in order to do a good job of selling to the range man, I believe you need to have a practical, logical program. You must combine the experience of the range user down thru the years with the experiments of your work. Notice the similarity of those two words—experience and experiments—almost the same, aren't they? Both in sound and meaning. Yet we often hear of experiments which end with findings at considerable variance with the experience of the range user. Such findings should be checked very carefully for error, and if and when advanced to the users should be put forth very skillfully.

There is a story that is widely circulated that two researchers made a study of the amount of forage taken off a certain range by rodents. After an extensive survey of the number of rodents on the range and the consumption of each rodent the surprising results were that the rodents ate more forage than was produced on this range. Obviously some mistake was made, but such startling and unbelieveable results do untold harm to the general acceptance of accurate and worthwhile progressive research.

Sensationalism will get you headlines but logic will get you results on the range. This will also apply to sentimentalism and emotionalism. These should be divorced from your approach to the user. These approaches, sensationalism, sentimentalism and emotionalism are of benefit in publicizing the range problems to organizations of do-gooders in the East, but of little avail to putting a range program over with the range man. Included in this category should be the blind worship of trees and nature in the raw. The fact should be recognized and acknowledged that many of our trees are water wasters and not water conservers and serve no economic purpose whatever. It should be recognized that many of our forests are composed largely of weed trees and are of no more value than any other weed.

One college professor, in telling about the Mongolian desert, described it as a lush tropical swamp many centuries ago and blamed over-grazing for its transition to the desert it is now. When asked by a businessman if change in climate wasn't largely responsible for the difference, he replied that that was a factor, but that over-grazing was the real culprit. Such statements only infuriate the users of the land and make it harder for you gentlemen to get your selling job done. Such statements harm your cause and should be discouraged.

I have been highly pleased by the recent denouncements by a high-up member of your profession of the fear tactics which have been used so successfully by a

few writers and journalists to turn the spotlight on themselves and to reap profits from the sale of their writings. I believe this man and his methods are doing much to instill faith on the part of the range users in scientific soil practices, a faith which pseudo-scientists were destroying. He is practicing salesmanship—he is instilling confidence in the land user toward the soil scientist. On the other hand a few writers harking back to the Maltheusian theory of a century ago have done untold damage to your cause.

Simple and Direct Approach

It is important that the techniques and methods you devise should be simple and direct. Do not allow your scientific and technical training to cause you to lose sight of the simple methods.

To illustrate, I might repeat a tale I heard several years ago. According to the story a large truck carrying a high steel drum came to a bridge across a river over which it had to cross. Before proceeding the truck and load were compared with the super structure of the bridge. The load proved to be a couple of inches higher than the clearance. Several experts were called in including a structural engineer, a hydraulic engineer and a carpenter. The structural engineer immediately started laying plans to raise the top of the bridge, the carpenter suggested lowering the wooden floor and the hydraulic engineer wanted to unload the drum, float it across the river and then reload it. While the experts were discussing the subject, a truck driver came along and said, "Let some air out of your tires and go on thru." In order to sell, your methods must be direct and simple.

On the other hand, while avoiding sensationalism I believe you can well use more showmanship. The two are closely related but greatly different. You should dramatize your findings in terms that are readily understood by the layman. Many a splendid, successfully carried out research program lies buried under a mountain of mimeographed technical phrases. Scientific names, complicated formulas and endless tables can often be supplanted by a few well chosen, few-syllabled words that will convey the method and purpose of a range improvement technique.

Reports to the range-using public need to be stated in concise, concrete, readily understandable language. Put the basic thought across so we common people can catch on quick.

Treat your range improvement program as you would a debutante at a coming-out party. Avoid the cheap and gaudy garb that will attract attention, but cast a reflection on her character. In other words, avoid the sensational, emotional writings of the headline grabber, but also avoid the dull, drab garb of a Mother Hubbard as represented by a verbosity of words and statistics that will completely cover and shield from view the charm of your program in the debutante stage. In other words, dress her (your program) in the attractive, revealing way that men go for most, bring out the attractive high points, but let your customers seek out the details after you have aroused their interest.

Violent arguments have no place in this selling job that is ahead of you. Selling was my first real job and I still remember well one of the instructions given me by the man who was my tutor. It is so true. "Rad," he said, "never argue with a prospect. A salesman cannot possibly profit from an argument. He may win the argument but the prospect will be so irritated at losing that he will still refuse to buy." Your job of selling is definitely to convince. To win

over by showing definite advantages to accrue to the land-user. Nothing can be gained by running down past methods or their proponents and users.

The same is also true of ridicule only to a greater extent. Only harm to your real program can result from any form of ridicule, you must have the cooperation of the man on the soil, and ridicule and argument certainly will not get it.

Avoid the "There ought to be a law" attitude, for to resort to this is to openly admit that you have failed to sell your program. You have failed to convince the user of the wisdom of your methods. The "pass a law" method is the device of the dictator. Cooperation is what you need and you cannot legislate cooperation.

Go easy on the stewardship theory. The idea so frequently expressed now that "we hold this land in trust for future generations." It is true, perhaps, but few land owners like to hear it and it comes perilously close to the socialistic law of England that provides for the confiscation of land not used according to the government's ideas of its proper use.

And now the most effective angle of all which is at your disposal in selling your program—The profit motive.

Show the average American—or any other person for that matter, where he can make more money and he will immediately adopt your method. Look at the way hybrid corn and other improved varieties of grains were adopted by farmers. Note the rapidly expanding areas of irrigated pasture, and the cotton to grass movement in the South. The dollars incentive is what made America great and it is the best tool you have to put your improved management programs into operation on the ranches.

RESEARCH

Research is a gamble. It cannot be conducted according to the rules of efficiency engineering. . . . Research must be lavish of ideas, money and time. The best advice that I can give is don't quit easily, don't trust anybody's judgment but your own; especially don't take any advice from any commercial person or financial expert, and, finally, if you really don't know what to do, match for it. . . . The best person to decide what research work shall be done is the man who is doing the research. The next best is the head of the department. After that you leave the field of best persons and meet increasingly worse groups. The first of these is the research director, who is probably wrong more than half the time. Then comes a committee, which is wrong most of the time. Finally there is the committee of company vice presidents, which is wrong all the time.

C. E. K. Mees, Director of Research
Eastman Kodak Company

Mortality of Velvet Mesquite Seedlings

HAROLD A. PAULSEN, JR.

Range Conservationist, Southwestern Forest and Range Experiment Station, Tucson, Arizona[1]

Introduction

RECENT years have seen an invasion of mesquite, *Prosopis* spp., on the range lands of the Southwest which in some areas has been at a phenomenal rate. In many cases this invasion has resulted in range lands becoming almost worthless for livestock grazing and has accelerated soil erosion.

Mesquite has appreciably extended its geographical range, and within this area has spread out from the drainage bottoms, which were its original habitat, to the ridges and mesa uplands. It is estimated that mesquite now occurs on at least 60 million acres in Arizona, New Mexico, and Texas.

Mesquite seedlings occur in great numbers during favorable years. For example, Fisher (1947) has reported over 1,200 young mesquite seedlings per acre in Texas, while in southern Arizona 416 new seedlings per acre were counted.

It is the purpose of this paper to present some of the findings on the mortality of naturally occurring young mesquite seedlings as a background for a better understanding of an attack on this serious range problem. This study is part of investigations being conducted by the Southwestern Forest and Range Experiment Station in cooperation with the University of Arizona under RMA Project RM:b-4 on ecology and physiology of undesirable range plants.

The study was conducted on the Santa Rita Experimental Range, about 30 miles south of Tucson, Arizona, where the mesquite invasion problem is represented. The study site is typical of much of the semidesert range in the Southwest covered with the tree form of mesquite.

[1] Maintained by the Forest Service, U. S. Department of Agriculture for Arizona, New Mexico, and West Texas, with headquarters at Tucson.

Experimental Procedure

Origin of Mesquite Seedlings Studied

During late July 1948 a considerable number of recently emerged velvet mesquite seedlings (*Prosopis juliflora velutina* (Woot.)) were found on the Santa Rita Experimental Range shortly after the start of summer rains. Only 16 per cent of the seedlings occurred under the crowns of seed-bearing mesquites, with the remainder being found in small, sandy washes and gravel fans and on the open, more porous soils. Many of the seedlings were in clusters ranging up to 13 seedlings per cluster. In each cluster the seedlings emerged from an area approximately 1 inch in diameter. An examination of several of these seedling clusters and data on population and food habits of the Merriam kangaroo rat by Reynolds and Glendening (1949) indicates that the caches of this rodent are important in the spread of mesquite. The numbers of July 1948 seedlings on this and similar sites were 22 per acre under cattle and rodent protection; 129 under cattle exclusion; and 269 under grazing by cattle and rodents. Seedling numbers on the above sites were in direct proportion to the number of the Merriam kangaroo rats which averaged 1.1, 1.5, and 3.5 rats per acre, respectively. Germination from these seed spots occurred at least over a period of two growing seasons as

evidenced by the presence of new and old seedlings from the same cluster and also the presence of sound seeds which had as yet not germinated (Fig. 1).

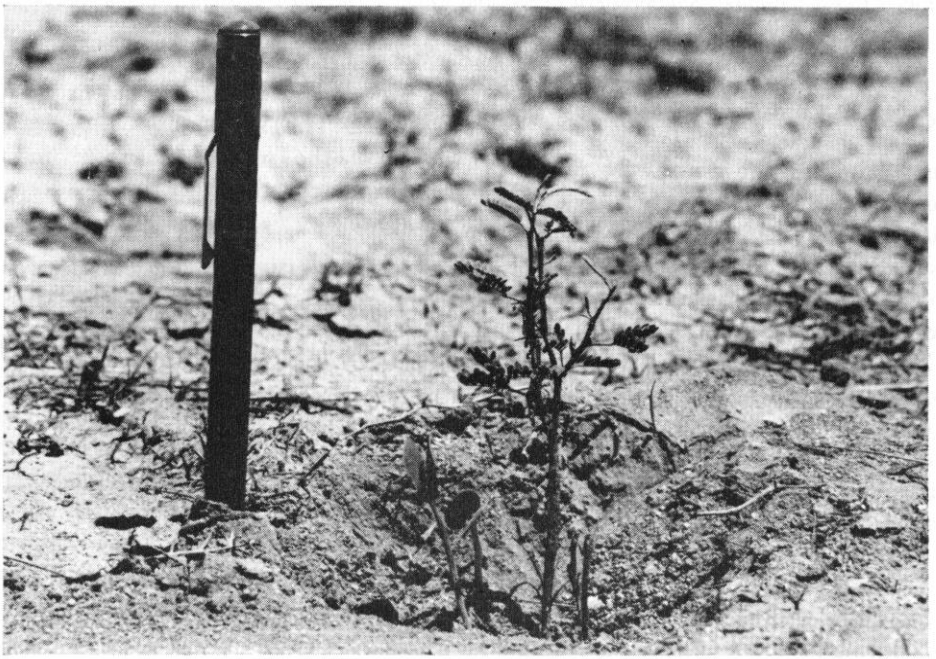

FIG. 1. Two recently emerged 1949 mesquite seedlings, one live 1948 seedling and two dead 1948 seedlings in one seed cache. Eight dead 1948 seedlings and six sound seeds were also found but are not shown in the photograph.

The area on which mesquite seedling mortality was studied is located at an elevation of 3,700 feet, and receives an average of 14.5 inches of annual rainfall. The surface soil is coarse and open and is underlain by a tight, rocky subsoil at approximately 16–20 inches.

On July 29, 1948, when the mesquite seedlings were 10 to 15 days old, 100 seedlings were staked out for observation under each of three conditions as follows: (1) protection from cattle and rodents, obtained by placing small cones of $\frac{1}{4}$-inch wire mesh over seedlings located within a cattle exclosure, (2) protection from cattle but subjected to yearlong rodent grazing as existed on seedlings within the cattle exclosure, and (3) no protection from cattle or rodents, as existed in the moderately grazed pasture in which the exclosure was situated.

At the time the seedlings were staked out, the following observations and measurements were made:

1. Number of seedlings per cluster
2. Height of the tallest seedling
3. Evidence and cause of grazing damage
4. Perennial vegetation within twelve inches of the seedlings
5. Distance to base of nearest seed-bearing mesquite

Subsequent observations were made on all seedlings at weekly intervals through September 1948, and monthly observations after that time.

Measurements of root and stem lengths were made five times during the 15 months the seedlings were under observation. These measurements were made at

times when the seedlings had just completed a critical period in their growth cycle, when an appreciable difference might be expected in the root and stem lengths. Root lengths were obtained by excavating seedlings of the same age located adjacent to those followed in the the study.

Pertinent Findings

Mesquite seedling mortality begins shortly after germination and emergence, which follows soon after the start of effective summer rains. By the end of the first two growing seasons, the large majority of mesquite seedlings were eliminated (Fig. 2). It was impossible to determine the specific cause for each loss because grazing and drought damage often occurred coincidentally on the same plant. However, rodent grazing appeared to be the main cause in these high initial losses since many of the seedlings lost either were entirely removed or had been cut off at the ground level. At this time the plants are green and succulent and are sought out by the rodents in the area. Leaf cutting and feeding by ants and other insects also occur at this time.

The effect of rodent grazing in reducing mesquite seedling numbers is readily seen by a comparison of the mortality curves (Fig. 2). While the early loss of seedlings in the cattle protected area was much less than on the area open to grazing, in both cases mortality of the seedlings at the end of the second growing season amounted to about 95 percent. The lower mortality rate under cattle protection is due to a lesser degree of rodent pressure rather than elimination of the cattle grazing factor. Mortality of seedlings under total protection, however, was considerably lower throughout the entire period of study and more than

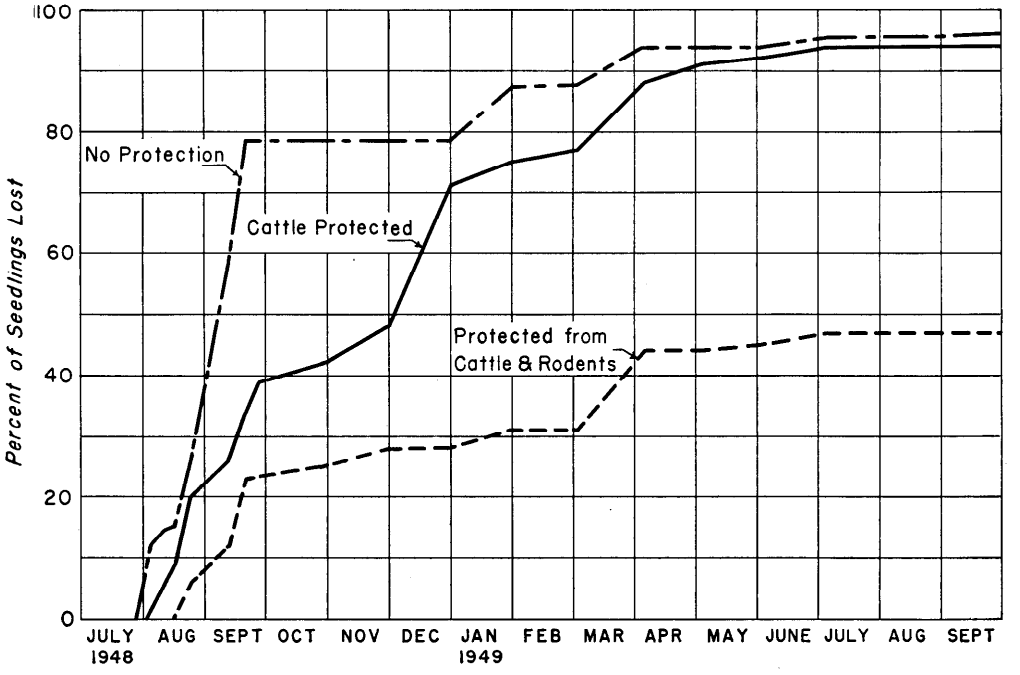

Fig. 2. Cumulative mesquite seedling mortality from August 1948 through September 1949 under three levels of protection.

half survived the second summer. Seedling mortality by this time is believed to have reached the maximum and will level off at approximately 47 percent under protection from cattle and rodents, 94 percent under cattle protection, and 96 percent under open grazing.

The above data on mortality when viewed in light of the emergence of 22, 129, and 269 seedlings per acre, as reported by Reynolds and Glendening, indicate that the ultimate rate of establishment of mesquite seedlings could be in the order 12, 8, and 10 per acre on areas protected from cattle and rodents, protected from cattle only, and on areas open to grazing by cattle and rodents.

Drought and unusually low winter temperatures during the period the study was in progress doubtless contributed to the high seedling losses. Rainfall during July of 1948 was 23 percent above the long-time average. This plentiful moisture brought about germination of mesquite seeds which, since the 1948 spring bean crop did not mature, must have been stored in the soil at least since 1947. During August, however, only 48 percent of the average precipitation fell. As a result many of the seedlings began showing signs of wilting within three weeks after emergence. Losses continued high until rains occurred late in September at which time the mortality rate generally leveled off under all degrees of protection (Fig. 2).

Seedling losses were low in October and November but increased during the winter months. The seedlings dropped their leaves in December and appeared to have hardened off. A low temperature of 15°F. in January resulted in additional losses from frost heaving under all degrees of protection. Climatic data show such a low temperature only once in the last 16 years, and losses from frost heaving are believed to be unusual on mesquite.

Additional seedling losses occurred with releafing in the spring. Rodent and insect grazing is believed largely responsible. Some plants recorded as having died in the spring probably died sometime earlier but unless there was clear evidence of death, the plants were carried on the records as living until they failed to leaf out in the spring and the loss was definite. Since these losses during the spring of 1949, there has been very little change in numbers surviving. Occasional losses occurred through the summer of 1949, evidently from a combination of grazing and drought. By this time, however, the seedlings were sufficiently well established to withstand any grazing short of actual decapitation below the cotyledonary node, and the root system had developed enough that complete drought kill was not common.

TABLE 1

Stem and root lengths of mesquite seedlings at the end of critical seasonal growing periods

PERIOD	STEM LENGTH	TAP ROOT LENGTH
	inches	*inches*
Initial Measurement (July 29, 1948)	2.2	3.7
End of First Summer Growing Period (September 1948)	2.2	15.0
End of Winter (March 1949)	2.0	20.6
End of Dry Spring (June 1949)	2.2	22.2
End of Second Summer Growing Period (September 1949)	3.0	27.1

As shown in Table 1, growth of the above-ground portion of the mesquite seedlings was slow throughout the entire year. Observations indicated that this is the usual behavior on semidesert ranges during drought periods. After an initial rapid elongation of the hypocotyl and stem, very little additional above-ground growth was made during the first growing season. Root lengths did increase

appreciably, however, throughout the period. Excavation of representative seedlings only 3 weeks after emergence showed that tap roots averaged 13.1 inches in length (Fig. 3). This rapid elongation of the tap root immediately following germination is probably important in the successful establishment of the seedlings which survived. Measurement of the root systems in late September 1948, showed tap roots to be 15.0 inches in length with very little lateral development. At the end of the second growing season many lateral roots were found. These originated about 12 to 14 inches below the surface of the soil. Tap roots at this time had penetrated to a depth of 27.1 inches.

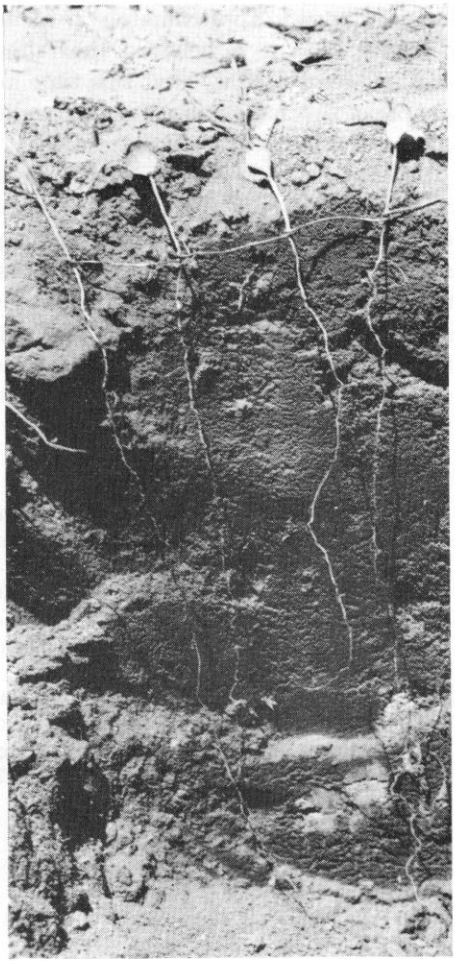

FIG. 3. Mesquite seedlings excavated three weeks after emergence. Tap roots average 13.1 inches in length.

When the seedlings leafed out in the spring of 1949, dieback to the first node below the terminal bud was noticed in almost all cases. This resulted in the formation of several new branches from lateral buds. Fisher, Fults, and Hopp (1946) have reported multiple branching of honey mesquite trees following severe frost injury in Texas. Grazing, drought, frost, or other factors which result in dieback will lead to the development of velvet mesquite seedlings with more than one main stem. These factors, operating in the past, doubtless account in part for the presence of many of the multiple-stemmed trees now present in southern Arizona.

There was no difference in seedling survival or mortality associated with proximity of other perennial vegetation, which consisted primarily of scattered burroweed; the distance to the nearest plant averaging 7.8 inches for both surviving and eliminated seedlings. Losses of single seedlings were 77 percent. In seedling clusters of 2, 3, and 4, losses were 64, 80, and 67 percent, respectively. This would seem to indicate that under the conditions of this study neither inter- nor intra-specific competition was as important in causing seedling loss as were the factors of rodent grazing and the generally low soil moisture conditions during the study.

Despite a high rate of mortality through the first two growing seasons, enough well established seedlings remain to increase the mesquite stand at the rate of at least 8 trees per acre per year. An annual increase of this magnitude for comparable range sites would rapidly

intensify the mesquite problem and is cause for even greater concern when it is realized that the rate of increase will become progressively larger as new trees reach seed-bearing size.

Summary

The mesquite invasion of range lands in the Southwest has progressed rapidly in spite of a high rate of seedling mortality. A study of some of the factors affecting the mortality of velvet mesquite seedlings which emerged during the summer of 1948 on the Santa Rita Experimental Range showed that at the close of the second growing season, seedling mortality was 96, 94, and 47 percent under the following levels of protection: open to yearlong grazing by cattle and rodents, cattle exclusion, and protection from cattle and rodents.

Grazing by several species of native rodents present on the area was the most important factor in eliminating mesquite seedlings during the first two growing seasons. Previous work has shown that one of these, the Merriam kangaroo rat, helps to disseminate the seeds and is associated with the occurrence of great numbers of mesquite seedlings.

Subnormal rainfall, especially during the first summer growing season, and unusually low winter temperatures which occurred during the study period, were also important factors which contributed to the high mortality rate.

After two growing seasons, tap roots had developed to approximately 27 inches in length, and it is believed that those seedlings remaining alive at this time are capable of surviving subsequent droughts and developing into mature trees.

The increase in the mesquite stand which would result from the successful establishment of the remaining seedlings as shown in this study would be not less than eight trees per acre per year. As additional trees reach seed-bearing size, the rate of increase may be expected to become progressively more rapid and to intensify the problem even further.

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BRIEFS

The Arizona Cattlelog, of the Arizona Cattle Growers Association, goes contrary to a popular trend with this advice: "The best place to find a helping hand is at the end of your own arm."

The success of ranching is in relation to the degree you practice selective neglect.—J. Bruce Orcutt, Miles City, Montana.

Why Haven't Farmers and Ranchers Taken to Regrassing?

HARVEY L. HARRIS

Rancher, Sterling, Colorado

MILLIONS of acres in the West are lying almost worthless. With the million dollar new wheatgrass and other grasses having proven their value as the best possible crops for these acres, why is there such a lethargy? Why haven't we ranchers and farmers taken the ball as all the facts and figures show we should?

Selfishness, yes! But it goes a lot deeper. Many individuals who have not been sold on the income-producing values of regrassing are naturally holding back because of the high prices for farm products. Why haven't they been sold? The day of reckoning is near when wheat and other crop acreages must be cut. Many of us will be much sadder than if we had been told in time. And why haven't we? Maybe, because too many researchers read and write only research papers, while ranchers and farmers read or hear only popular farm or livestock articles or reports.

Our Technicians Are Not Salesmen

By very definition, our technical men in the agricultural colleges and various experiment stations are trained for research, for the test tubes and small plots. To them has fallen the job of analyzing and visualizing the problems, and then, *with limited funds, always limited funds*, of trying to get the most enterprising cooperators in their districts to experiment in the field with actual plantings. And too many researchers are not yet doing enough outfield tests. Instead, they are trying to develop a perfect experiment on a limited or non-typical acreage. Then, finding a special problem such as seepage or low fertility, they allow this red herring to get them off the main track.

The best engineers in any industry do not have to sell their own "brainchildren." Mr. Kettering of General Motors probably couldn't sell newspapers in competition with modern newsboys. But our splendidly trained and loyal technicians have been forced to try and get the whole job done. The result—a big array of proven facts on every phase of the regrassing problems is in USDA bulletins, college publications, and available in every County Agent's office. And there they stay. Columns, tables of facts, pages of small print, all chock-full of money for the mere study of them. But they are unused, unasked for—just like Ford building up a daily manufacturing capacity of 10,000 cars without hiring a sales force to sell them.

Technicians Are Conservative

Our technicians are true scientists. They know the results of various new grasses sometimes for years before they will release them. Their training has made them so. They want to be letter perfect with no comebacks. They will not take the calculated risk. In far more important matters, as the winning of wars or our international policies, we must take these risks. Our researchers could merely preface their 99.44 percent findings with "it is believed"—and we out on the ranches and farms will take

them at that, then start and get the job done. We take a 51 percent chance every day with the weather, the wind, and the elements. The technicians should raise their sights and instead of working on a 5 percent level of significance, report their results at a 25 percent or 30 percent level.

Five years ago in those laboratories it was known that intermediate wheatgrass was a wonderful grass, but if I had not heard of it through a keyhole, I'd still be trying to get some seed to plant. I have been raising it now for 3 years. Right at this moment there are probably newer and better grasses, 95 percent proven, that will not get off the small plots and that we will not hear of for years, because the last minutia has not been nailed down.

Lay it on the line and let us decide. There will be failures, but immeasurably more will be accomplished. Take crested wheatgrass. In their efforts to be careful the technicians have sung from the housetops that crested wheatgrass was the perfect grass for the "go-back," or the abandoned croplands, where you can't or wouldn't plant anything else. Actually, crested wheatgrass was always worthy of our BEST LAND. But now with crop acreages to be cut, there will have to be a lot of reselling to get it onto our best wheatlands.

Lazy Mental Acrobats

We ranchers and farmers are generally too cumbersome and mentally lazy to take advantage of the wonderful array of data which has been gotten together for us. We do not like to fight through any article that issues a mental challenge. We generally would rather do without something very vital for our good, if it requires sitting down and having to write a letter or even a postal card (except to a mail-order house).

A leading advertising authority once said, "If you want to get your advertising message across, write it for a 10-year-old mentality." For most of us out in the fields that is a maximum. Most bulletins are written for fellow specialists, not for us. The obligation of state and Federal research should be to get all data to those who can and will have to use it. We need the practical significance. Aim it at us very simply. Put it cryptically, point by point, in short sentences and simple words.

If all these data are to be used, get them to us automatically. Every time I write to a new source for a bulletin, I run into new untapped fields of knowledge. But how did I know? Having some engineering background I am luckily a little tainted too with the technique of research; I wrote Washington for a bibliography of publications. But most of us will not do this, partly because, from Washington down to the local county agent, everything is tuned for the research-minded. Since we will not ask for it, this information should be assembled at timely intervals in a single bulletin or progress report, and funnelled through some agency trained in salesmanship and advertising, direct to the users—the ranchers and farmers.

The Native Range Bogey

In the last dust-bowl days, with poorer methods, we were told it was a cardinal sin to plow up any native range for regrassing. After each war we did plow up native sod, to the tune of $2.00 per bushel wheat, and the plaudits of politicians who glorified our efforts of increasing production. But should we never do it, regardless of the soil, or the size of the area, if the operator is a good one and knows the dangers? Can our efforts to increase our grass for longtime range improvement, be any more dangerous

than breaking out hundreds of thousands of acres for wheat? When sound grazing tests carried on by some of our U. S. Stations have proven that native range reseeded with some of the newer grasses will produce 3 to 4 times as much beef gain per acre as good native range, should we still do nothing about it? Wouldn't I be silly not to plow up some of my native range when for 3 years of testing I averaged over 130 pounds of cattle gain per acre on crested wheatgrass, while on my best native grass, with the same type of steers, I got only 30 pounds per acre. Sure, the new grasses must be used conservatively, but with deeper roots and more stubble, why the delay in doing something about it, and in a big way?

I think we all know enough about the dangers of blowing for each of us to do regrassing work within our own limitations. When I told one leading grass technician that I planned on breaking 100 acres of native range for regrassing, he said wryly, "Swell! But don't talk about it. We could get our throats cut for that!"

Let's let our technicians be honest. There will be failures, but the benefits will far exceed the damages. Tell us about the use of fertilizer on dry land. There must be some formula for its safe use where precipitation is 15 inches or less per year. What about the studies on legumes which have been in the nurseries for 10 years, but still are not ready for field use?

Lack of Seed

The bottleneck is the lack of seed, and it will always be, until we get the ideas across. If we have a problem of surpluses, it will become worse before it gets better, so this is no time for too much theory. 1951 will be bad. 1952 will be terrible; dust-bowls everywhere or farmers suddenly awakened to the fact that their income is gone. And all in a matter of months, not years. We know enough to start the job NOW. Give us efficiency experts who will act as liaison to take the data from the technicians and sell it to the men out on the land. Free them from red tape, except the urgent job which must be done. In 1949, there were 200,000 acres seeded in Colorado, but 600,000 acres will go out of wheat in 1950 and 1951. At least 3,000,000 and maybe closer to 5,000,000 acres need seeding. We'll never catch up at the present rate and not a minute should be lost in selling the program.

The Production and Marketing Administration, knowing that something should be done, has decided to support the price of grass seeds in a similar fashion to the support of other crops. Among other grasses they placed a support price of 10 cents a pound on crested wheatgrass, but only if it was just about perfect seed, with 95 percent purity and germination, and if beautifully bagged and delivered to the PMA warehouses. Wheat is still supported at $1.85 per bushel, or somewhere near that figure. But the grass seed to supplant wheat, to save our hides and keep us all happy and thriving is supported at a price that wouldn't even interest a banker. That is no support price if we want action. It is an open invitation to a certain loss. Such seed quality does not often happen except in a nursery. So, who is being fooled, if we really want the job done, and quickly?

The Brannan plan does not pretend to know within billions of dollars what its program would cost; and yet many, up to and including the President, herald it as a panacea for our ills. By the same accurate method of figuring, let us spend just as many unknown dollars on a carefully thought out, non-political program of regrassing. If half is a complete failure

the balance will still be here for cattle forage 100 years from now.

What to Do About It

Get eight men of the right type together around a table, have them decide each step that should be taken—then let's go. Get eight men of the Billy Mitchell and George Patton type—men who know their subject better than anyone else; who will take a court martial rather than be "yes" men, and who do do not have to worry about their jobs, if their ideas do not happen to jibe with Department of Agriculture regulation No. PBX73. In 60 days they would have the program visualized and the organization set up to carry it out.

In an attempt to help these eight men, the following suggestions might give them a starting point.

1. Let's do as we preach. How many higher-ups in the bureaucracy have land and have planted any of the new grasses, or undertaken any of the newer methods?

2. Let the right hand know what the left is doing. Let's have some liaison. Take the fetters away from our technicians and let them say what they know and think, but make them keep up-to-date too!

3. Organize the whole effort with duties where they should be; technical matters and experiments to be conducted by those who know how; promotion and selling of the ideas to be in the hands of men who know just as much of those phases of the problem—with all the wonderful results achieved by the technical men put at the disposal of this master sales group.

4. Remember the market. The selling approach hasn't been too effective. Ranchers and farmers are now rather dubious, so some reselling is needed.

5. Have bulletins timely and on time. If a new idea has a 50-50 chance, don't hold it up because of some petty insignificance. Grab a hold of present problems like one U. S. Station which picked up the gossip that a light colored steer did better than a dark colored one. They quickly proved it did if it was of better quality originally but not because of color. That data was in the hands of the ranchers as soon as the experiment was completed.

6. If a bonus of $5.00 per acre for every acre planted is needed to encourage regrassing, then pay it. What would $5,000,000 for reseeding amount to compared with the increased value on 1,000,000 acres? Especially when we are going to spend $200,000,000 on some irrigation projects in Italy, and billions all over the world for the help of all underprivileged! Let's give the "offal" of all this money to our own right here in this country.

7. If the price of grass seed needs support so that it will be planted, it should have enough of a support that will get results.

8. Spend some of this for more grass nurseries, land capability classifiers, agronomists, economists, farm planners and range managers.

9. Give the State of Colorado, and maybe your state too, *just one Extension Range Management Specialist.* Three-fourths of this state is chiefly suitable for grazing; income from livestock exceeds all other crops (most of it comes from grass), and there is no one authority functioning on this tremendous industry from this standpoint.

10. Be honest about regrassing. Take the halo from the native grass and put it where it belongs. Give us a better chance to compete with "wheaties" and the "macaronis" and reduce the price of meat, by doubling our yield per acre. The new grasses will do it.

Wildlife Depredations on Broadcast Seedings of Burned Brushlands

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Introduction

IN California, dense stands of undesirable woody vegetation or "brush" are being removed by burning, followed by seeding of forage grasses or legumes where natural reseeding of herbaceous vegetation will not occur. This is part of a range improvement program to convert some of the 10 or more millions of acres of brushland in California into more productive grasslands (Love and Jones, 1947). Depredations by seed-eating rodents, birds, and harvester ants may prevent a broadcast seeding from being successful. Such failures frequently have been wrongfully ascribed to unfavorable weather, adverse site conditions or poor germination, since these factors are the more obvious causes of failures and loss of seed is not easily observed.

All tests included in this report were made in Madera County while the author was stationed at the San Joaquin Experimental Range; field observations were made in other parts of California also. Acknowledgments are due many ranchers and county, state, and federal personnel for their assistance and comments on the depredations by wildlife in their respective localities. The material used in Table 2 and some of the field trials were done in cooperation with Jay R. Bentley of the California Forest and Range Experiment Station. Assistance on methods of treating seeds was provided by the Wildlife Research Laboratory of the U. S. Fish and Wildlife Service, California Department of Agriculture, and County Agricultural Commissioners. Milton A. Miller and other Farm Advisors of the University of California Agricultural Extension Service provided valuable information to this study, and individuals of the U. S. Forest Service and the California Division of Forestry gave frequent help.

Seed Treatment

A satisfactory repellent is needed to protect broadcasted seeds from rodents, birds, and harvester ants. Since no effective repellent is now known, dyes and rodenticides are being employed as a temporary expedient for protecting seeds.

Birds are extremely hesitant to eat seeds that are abnormally colored. During the nineteenth century, brilliant dyes were applied to seed grain in Europe to prevent its being "pulled" by rooks, jackdaws, and other species. More recently, Kalmbach (1943), Glading, Enderlin, and Hjersman (1945), and Kalmbach and Welch (1946) have studied the coloring of cereal baits for rodent control to deter beneficial birds from eating the poisoned materials. A yellow aniline dye named National Brilliant Yellow S.P. has proven most satisfactory. Hard, waxy-coated seeds are difficult to dye. The dye is used to protect the seeds from birds when seeding ranges, whereas in rodent control, the dye is used to protect birds from the poisoned seeds. Presumably, birds can learn to eat colored seeds, but an adult song sparrow and crown sparrow did not become accustomed to eating yellow ryegrass seeds after being

offered a mixture of dyed and plain seeds for three and four weeks, respectively. Both birds died of starvation when the uncolored ryegrass seeds were removed, even though yellow seeds covered the entire floor of the cage.

rodents in control operations but, mainly, to protect the seeds in range seeding. Not all small rodents are poisoned, but those not killed are largely repelled.

Compound "1080" (sodium fluoroacetate) has proven more effective than

TABLE 1

Germination of seeds, in percent, treated with dye, poisons, and a lecithin-mineral oil spreader, as determined by tests with petri dishes (P), sand (S), and 5 months after storage (5).[1]

SPECIES TESTED	LENGTH OF TEST IN DAYS	TYPE OF TEST	CONTROL	STRYCHNINE AND DYE	"1080" AND DYE	DDT AND DYE	DYE
Harding grass	28	S	46.50	42.50			
Phalaris tuberosa		5	47.50	32.25			
Rhodes grass	14	P	73.00	68.25	65.75		
Chloris gayana		5	67.50	62.25	65.00		
Orchard grass	18	S	72.00	73.00	66.50		
Dactylis glomerata		5	70.00	67.25	68.50		
Ryegrass	14	P	96.25	[2]93.25	[2]93.50	96.00	93.75
Lolium sp		5	95.25	79.50	85.25	88.50	94.25
Subterranean clover	14	S	[3]66.00	[3]53.50	[3]57.50		
Trifolium subterraneum		5	65.75	57.50	57.25		
Yellow sweetclover	7	S	[3]94.50	[3]90.50			
Melilotus officinalis		5	95.25	89.00			
Bur clover	14	S	[3]51.00	[3]42.00			
Medicago hispida		5	55.00	45.75			
Alfalfa	7	S	[3]92.50		[3]91.50		
Medicago sativa		5	92.00		86.50		
Purple and common vetches	10	S	96.00	95.00			
Vicia spp.		5	96.00	93.00			

[1] The seeds were treated by H. T. McLean, Agricultural Commissioner of Madera County and tested by the Seed Laboratory of the California Department of Agriculture.

[2] Roots very short. In petri dish tests, the poison accumulates around the roots.

[3] Percentage of legumenous seeds having unusually hard seed coats and abnormal sprouts are not included.

Artificially colored seeds are not protected from rodents for these animals are color-blind, but when also treated with rodenticides, in the same manner as in preparing cereal rodent baits, they are less likely to be destroyed by rodents. Seeds are treated with poisons to kill

strychnine in protecting seeds from rodents and ants, and it is much cheaper. Unfortunately "1080" is extremely poisonous and there is no known antidote. No one should treat forage seeds with any rodent poison without first consulting his local rodent control official. He is

authorized to handle rodent poisons and may be able to control the rodents and harvester ants either before the brush is burned or just before the area is seeded. Use of "1080" for protecting seeds is justified only until a cheaper and less-toxic repellent for rodents, ants, and possibly birds can be found.

Since it is important that neither dye nor poison impair the viability of seeds used for range improvement, germination tests were made immediately after applying the dye and poison and again after five months of storage on nine species (Table 1). Dye was used at the rate of two ounces per 100 pounds of seed; the poisons were 10 ounces of strychnine, two ounces of "1080," or 10 ounces of DDT per 100 pounds of seed. There was no appreciable difference in germination as a result of the treatments or of five months of storage.

FIG. 1. Destruction of seedlings by frost heaving. Occurs during certain years in some localities, where insulation provided by the canopy or litter has been removed by fire.

WILDLIFE DEPREDATIONS ON SEEDINGS

Treatment with a yellow dye and either strychnine or "1080" materially reduced the rate which birds, rodents, and harvester ants took seeds broadcasted on burns in Madera County during 1948–50. About 400 pounds of forage seeds treated with dye, poison, or both, were exposed in comparison with larger amounts of untreated seeds on 20 plots varying in size from a few square yards to about ten acres, and at elevations of 1,000 to 3,000 feet. In all instances properly treated seeds received marked benefit; however, some of these seedings still were not successful because of drought or frost upheaval (Fig. 1).

The rate which broadcasted seeds are removed by wildlife is variable. Many areas do not have harvester ants. Dense stands of a single species of brush, particularly chamise (*Adenostoma fasciculatum*), support but a sparse population of birds and rodents and in such regions loss of seeds may not be excessive. In the proximity of cover for birds, rodent burrows, or ant colonies, seeds may disappear rapidly. One of the better patches of ryegrass that occurred on the seeding

plots put out in 1949 was from untreated seeds on digger pine (*Pinus sabiniana*) ash; however, the ryegrass seeds near brush and oaks on the remainder of this plot largely disappeared and most of the bur clover was lost on the entire plot.

On one plot with seeds treated by yellow dye and "1080," very few were missing 111 days after sowing. There was no rain during the interval and seeds remained in place where they fell, even on top of rocks and other exposed places. On a control area planted at the same time, most of the untreated seeds were gone when next examined 44 days later, although a few ryegrass seeds still were present after 111 days.

In another test about 150 pounds of six species of annual and perennial range-plant seeds were broadcast on 30 acres of ash: 10 pounds of this seed were treated with yellow dye and strychnine and were sowed on a one-acre plot. Forty-five days later only the treated seeds could be found, even in deep ash, except for some untreated seeds adjacent to the one-acre plot of treated seeds. Some of these one-acre plots lacking visible seeds had received as much as 16 pounds. Three months after the seeding only treated seeds could be found, but even most of them, which had been treated with strychnine, were missing also. Several rains had occurred but it had been too cold for germination. Among the seed-eating animals living on the plots were pocket mice, kangaroo rats, white-footed mice, a covey of quail, and harvester ants. The day after the treated seeds were put out one dead kangaroo rat was found; its cheek pouches were full of broadcasted seeds but the strychnine had acted before the animal could cache them.

One of the most successful seedings of a small brush burn was on a ranch near North Fork, California. A good burn furnished deep ash, and rain two or three days after sowing afforded the seeds considerable protection from wildlife. The rancher protected the perennials after they germinated by having his son regularly shoot rabbits and rodents. That portion of the seeding which was not successful the first year was reseeded the following year and this seed covered by trampling with livestock. In the second year after the burn the remaining dead brush and trees were cut, piled and burned, and the ash spots were seeded. There was a rather rapid and complete disappearance of the seeds because rains were late, thus enabling birds and rodents to take them. The rancher reseeded the area again, in the snow, and the following spring many plants had germinated.

Seeds treated with strychnine are more vulnerable to harvester ants than those poisoned with "1080." Of six plots where seeds treated with strychnine and yellow dye were broadcasted on thick ash, two were devoid of seeds when examined one and one-half months later. Near each of these plots was a colony of harvester ants having colored hulls and seeds in their nests. On a three and one-half acre plot broadcasted with "1080"-coated seeds, all nearby ant colonies were inactive when next examined a month and a half later. Several thousand dead ants were counted on one ant hill. On another area that received "1080" seeds, and that was examined the next day, there were hundreds of dead and dying harvester ants at each colony.

Discussion

If seeds can be covered by use of drill, drag, or harrow, or by trampling of livestock, they will be less exposed to removal by rodents, birds, and ants; often, however, none of these methods is practicable in rugged terrain. Seeds broadcasted into soft ash immediately after burning ac-

quired partial immunity from wildlife, but only until the more exposed seeds were taken. Seedings delayed until the first fall rains were more successful than seedings made immediately after the fire because they were available to seed-eating wildlife for a shorter time before germinating. The earlier that seedings are made during the summer the longer the seeds are exposed to the ravages of wildlife. When unfavorable weather delays germination until the following spring, seeds may be exposed to wildlife for many months, seven months being the longest interval observed by the author.

Rodents, birds, and harvester ants were found still living in the same general areas following controlled burns. Apparently most rodents and ants are able to escape the fires by going below ground, while birds are able to fly out and return after the ash cools or escape to islands missed by the fires. Burned areas which require seeding are those that would otherwise be largely devoid of herbaceous vegetation; thus, in such instances, the seed-eating animals survive the fires but their food supply does not. Birds and harvester ants have been observed eating broadcasted seeds; rodents have had them in their pouches when trapped or poisoned.

Ground squirrels, although sometimes most in evidence, usually are not as important as seed eaters as the less conspicuous and more abundant white-footed mice, pocket mice, kangaroo rats, kangaroo mice, and grasshopper mice. Woodrats, chipmunks, and tree squirrels when present will take seeds. The larger rodents, like squirrels, do not appear to feed on small seeds as readily as do mice. Little is known regarding the rate which rodents gather seeds. A family of about twelve deermice (*Peromyscus maniculatus*) living in a Michigan grassland cached, in less than one month, 1,050 cc. of small weed seeds and 565 acorns, all in one nest. Each acorn was carried at least 120 feet, the distance from the nearest branch of an oak tree to the nest (Howard, 1949). Rodents not only remove seeds from sowings on range lands but they often are an important obstacle to reforestation for the same reasons (Bramble, et al, 1949; Horn, 1938).

Birds must eat seeds one by one, thus individually remove them at a slower rate than rodents which are able to transport seeds in their pouches and cache them. However, in many localities there may be present, at some seasons of the year, flocks of crowned sparrows (*Zonotrichia*), other sparrow-sized birds, mourning doves, valley quail, or towhees to pick up seeds.

The number of harvester ants (*Veromessor andrei*) present in any of the burned areas has not been determined but colonies often are only fifty feet or less apart. More than 2,000 dead ants were near the entrance of one colony that had gathered seeds treated with the rodenticide "1080". Ant hills, which actually are not much of a hill, can readily be located from more than one hundred feet away a short time after seeding by the presence of seed hulls around the entrance of the colonies (Fig. 2). The hills become most conspicuous when dyed seeds are broadcasted, for the colony entrances then become yellow.

In some areas rodents require controlling at the time seeds germinate, if the animals have not been effectively reduced in numbers by earlier operations (also mentioned by Bridges, 1942). Where perennials have been seeded, control of both rodents and rabbits may be necessary, especially later in the year after the annual forage becomes dry. Control of pocket gophers often is needed before

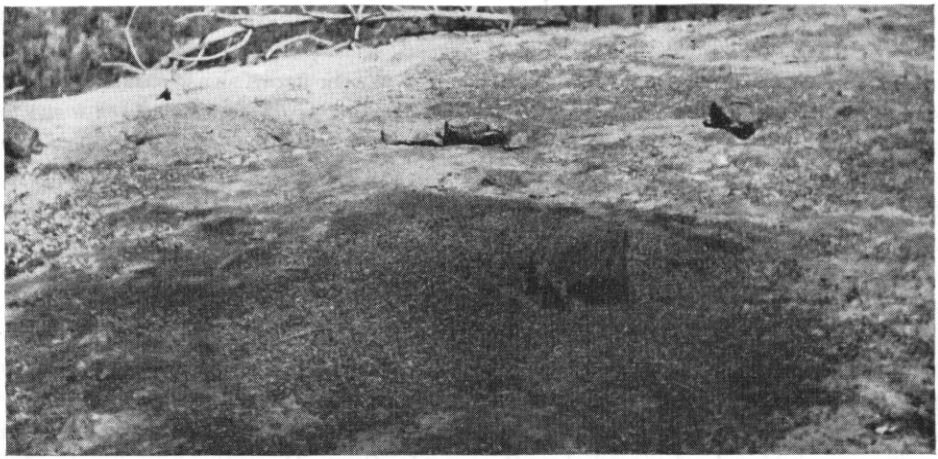

FIG. 2. Harvester ant mound, surrounded by hulls and seeds (dark area) gathered by the ants from broadcast seeding on a controlled burn above O'Neals, California.

TABLE 2

Forage seedling survival on plots with and without rodents and rabbits. Plots seeded October 25, 1947.

SPECIES SEEDED	POUNDS PER ACRE SEEDED	NUMBER OF PLANTS OBSERVED SEPT. 17, 1948.	
		No rodents	Rodents
H. ryegrass (*Lolium sp.*)	1	74+	31
Harding grass (*Phalaris tuberosa*)	1	20	5
Smilo (*Oryzopsis miliacea*)	1	17	20
Ladak alfalfa (*Medicago sativa*)	1	12	0
Burnet (*Sanguisorba minor*)	$\frac{1}{16}$	6	0
Others	5	18	3
		[1]147+	[2]63

[1] Nine per cent of the 147+ plants were grazed but only one was grazed to the ground. Two were killed by a pocket gopher that got in the enclosure.

[2] Of the 63 plants, 100 per cent were grazed and 51 of them were grazed to the ground.

a successful stand of perennials can be established (Love and Jones, 1947). Deer, on occasion, will graze heavily on seeded plants.

An example of damage rodents and rabbits may inflict on mature forage was obtained from two adjacent plots where a similar mixture of seeds were broadcasted over each plot (Table 2). Brush was piled and burned on two 12 x 50-foot plots between O'Neals and North Fork, Madera County, California on October 25, 1947. Seeds were broadcast into the soft ash two days later. Livestock were excluded from both plots. Rodents and rabbits were excluded from one of the plots (except for at least one pocket gopher and one ground squirrel that managed to get in). Deer grazed in both of them. The seeds were exposed to birds and ants in both plots, but to rodents only in one plot.

A useful method to learn the fate of seeds that have been broadcast is to construct wire cages of $\frac{1}{4}$-inch hardware cloth and place them over known amounts and kinds of seeds with similar samples adjacent outside the cages (Fig. 3). The resultant growth of grasses is ranker

under the cages because of insulation by the wire. The cages had little effect when placed over forage that had already germinated and was about $\frac{1}{2}$-inch high.

Further studies are needed to learn more effective methods for treating seeds to reduce losses by rodents, birds, and ants, especially to obviate use of substances as toxic as "1080". A need for better methods of controlling range rodents, rabbits, and harvester ants with poisons also is indicated.

FIG. 3. Wire cages protect seeds from rodents and birds. Known numbers and kinds of seeds can be placed under wire cages and their survival compared with similar quantities of seed placed on an adjacent, unprotected site. However, wire cages do not protect from ants.

CONCLUSION

Some brush-covered lands in California are being made more productive by controlled burning followed by broadcast seeding of desirable forage species. Many such efforts have been unsuccessful because rodents, birds, and harvester ants removed most of the seeds before germination. Hard smooth-coated seeds are preferred over chaffy, soft seeds, such as ryegrass. Ryegrass seeds are not likely to be taken if other foods are available. If the seeds are dyed yellow, bird depredations are considerably reduced. If also treated with a rodenticide, such as "1080", harvester ants are killed and rodents are either killed or effectively repelled. An effective and economical repellent to replace the dye and highly toxic poison is needed.

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WORLD FOOD SUPPLIES

Agriculturists have long been trying to bring into cultivation the marginal and waste lands of their time—so that land which two generations ago seemed hopeless is now in cultivation. The zone of cultivation has greatly widened. But what of the land beyond, that seems hopeless to us? Will our children be able to cultivate it if they want to do so?

There are three great difficulties which we have not been able completely to overcome: drought, the uncertainty and variation of yields, and soil erosion. But a good start has been made. It is the combination of soil and climate, and not climate alone, that in many parts of these marginal regions determines the possibility of food production. We may not be able to change the climate, but the soil certainly can be altered by the growth of grass. Experiments with this purpose in mind are in progress in many countries on marginal lands. The world has been ransacked for drought resistant grasses and improvement has begun on the same lines as were used for wheat including choice of promising varieties, selection of most suitable sorts, and cross-breeding to produce better varieties which has not yet got very far. Crested wheatgrass in America, some of the agropyrons in parts of Africa, and other grasses, have already enabled large areas of waste lands to provide far better grazing than before. Erosion has been better brought under control through the use of proper land utilization programs in which adapted grasses figure largely. There is little doubt that when the need arises, more land can be brought into cultivation.

Science can be relied upon to solve the material problems of mankind but we must not think that it can clear up all our difficulties. The hardest and most serious problems of today are essentially moral and spiritual, and with these science can give but little help.

Sir John Russell
from Presidential address to the British Association for the Advancement of Science, September, 1949. Prepared for Farm Forum.

Ranching Services: A Challenge to Rangemen

R. B. PECK

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THE West has long had easy leadership in the livestock production field. But such a condition appears about to change if the following four important trends continue.

1. A well balanced livestock-pasture-farming economy is building up in the South and Middlewest. Need of soil revitalization resulting in comparatively rapid adjustments in land use is bringing about the picturesque and economic change. Investments in fertilizer, seed, and fencing in these high rainfall regions will produce 300 to 600 pounds of beef per acre, as against 10 to 40 pounds per acre on most western native ranges.

2. A major shift of national population toward the West has been apparent during the last decade. Relocation of industrial and technical plants away from over-crowded centers of the East, together with promising new industries, holds forth a bright picture for western development, where water and raw materials hold key influence.

3. Our western ranges, while possessing tremendous potential productive capacity, have seriously declined during the past half-century. Only the phenomenal improvement in breeds and more intensive feeding methods stemming from the hundreds of thousands of cultivated acres producing feeds have offset and actually drawn attention away from this decline in range condition.

4. The paradoxical result is that of ranchers paying competitively higher and higher prices per acre on a more populous market, while each range acre continues to decline in productive earnings. Five hundred dollars per animal unit is not an uncommon investment in land, with the average running around two to three hundred.

Put the four above trends side by side and the result is significant. Western grasslands, as a major basic resource, must be given the spotlight in the stockmen's affairs, or be relegated to a position of ever increasing dependence on other agricultural lands. The former would mean stability for the livestock industry. The latter could lead to Federal control. But these matters are relative and are influenced by many other human factors.

The one fact remains, however, that management of ranges and the restoration of grasses of highest productivity as a science must gain the attention of stockmen's groups on an equal footing with markets and livestock management if the industry is to keep pace with other agricultural and industrial development in the West. The study and application of grass improvement and management knowledge by the individual rancher must become as much a part of his daily thoughts as his concern over market reports, or the daily care and handling of livestock. Making each part of the range produce as much palatable forage as it is capable is as important as making steers gain 350 pounds or more by fall.

We need not pause over how far we are from this goal. To state that the distance can be bridged by existing educational facilities is to admit a shallow understanding of the problem. To doubt the possibility of a practical, low-cost range plan adapted to each rancher's operations is to deny the undisputable progress of range research.

Substantial advances have been made over the past forty years in plant breeding and world-wide selection, range seeding methods, soil control, natural revegetation and grazing management, as well as the recent advent of improved agricultural chemicals.

Now let us look a little farther ahead. Supposing you, as a rancher, and the livestock organizations to which you belong, have adopted an all-out policy of range betterment as a result of your joint study of the range problem.

Existing educational facilities of each state and Federal range agency are barely sufficient to carry out a well rounded program of education from the higher levels of organization within the livestock industry. The individual ranch has a different and more pressing requirement: i.e. a tangible facility for getting the job done within the framework of a sound plan over a period of years.

It is generally accepted that there is a wide gap between technological knowledge and actual practices in range management—a gap which cannot be filled by Government range technicians. The technicians services are truly educational and they are doing an admirable job in bringing technical advice to the rancher. But the lag in actual range management remains.

Ranching Services Needed

A third participant is needed to achieve range management and improvement. This is readily evident from a look at other agricultural industries such as forestry, farming, marketing, etc. Where government conservation activities have been most numerous, there have sprung up private consulting and farm management services in forestry, plant breeding, feed-seed-fertilizer firms, and other custom services. Once the problems and needs were understood, there was a demand for private services in getting the results. The same relationship is being found necessary in carrying out a well-balanced range program of development and management—a range consulting service. Fortunately, the facilities of the Government for technical advice and information are fully as available to the range consultant as to the individual rancher.

Let us briefly examine a few of the many varied services which a private Range or Ranching Service can bring to the rancher.

1. *Range Analysis and Planning:* An inventory of range resources and potentials is the first important step in any range improvement program: finding out the present range condition, analyzing causes of any deterioration, determining practical corrective and improvement measures of management, and outlining the long-range objectives; considering the need for brush control or range reseeding.

2. *Improvement Contractors:* The job of reseeding, brush or weed control, water development, irrigation development, in connection with the above "blueprint" of operations, is something which pays to have done by an expert who knows how it fits into the over-all plan of management.

3. *Range Consultants:* Competent counsel and advice to the ranchowner should always be available on a follow-through basis, and if possible, by the same persons or firm which carried out the original plan of improvement. Plans have a habit of changing, and a personal counsel on whom the rancher can always call, can be of real value.

4. *Ranch Property Management:* Nonresident owners, such as business and professional men, investment buyers, ranch estates, and corporations, need competent and experienced management.

A ranching service company can provide this managerial service by providing a trained manager. Not only can this service be rendered to the owner on a higher standard of performance than is usually obtained through the individual ranch manager, but it assures the backing of a technical organization, capable of giving the ranch a broad scope of experience usually beyond the ability of any one man, and at lower cost.

5. *Ranch Supervision:* Technical counsel incorporated into ranch supervision is a decided asset to the non-resident owner. Such service can save the owner much time and expense in travel and worry. He can rest assured that his plans for the ranch are being carried out the way he would want them, by the ranch lessee or operator.

6. *Investment Consultants:* Investors in land often need competent technical advice in the selection of ranch lands which offer an opportunity for a good return on the investment. Many times a good capital gains investment is overlooked by the prospective buyer due to lack of recognition of potential production which a trained rangeman is quick to evaluate.

Problems of the Ranching Service

And now a few remarks are in order to those readers of the Journal who are interested in this work as a business.

Any one of the many ranching services might be considered a business in itself. Still there is something to be said for providing all these services through one company, a complete ranching facility. Unless each range practice is integrated with the over-all plan of management, effectiveness is very often lost. For example, water development can lead to maldistribution of grazing. Control of sagebrush by chemicals, unless followed by a deliberate plan of management, can lead to serious loss of grass and soil. Reseeding, unless the grazing plan is adjusted to it, can often result in loss of the investment in this practice.

There is a need for more firms of a purely range-management nature, offering trained technicians as well as ranch managers. The need, while real enough, is far from recognition by the average resident or non-resident rancher. It is, therefore, a field which will be necessarily slow in becoming established, because: (1) It will grow only on the merits of work established, and (2) Nature's response on the western range is slow.

The progress of such a company requires salesmanship of the highest order, plus the experience and ability to reproduce results. Most important in acquiring the confidence of the ranch-owner is the intermediate contact: an impartial friend or acquaintance of both parties, who has an appreciation of the need and what is required to fill it.

To get by the first five years requires a considerable original capital. Operations can be begun on the basis of improvement contractors in an area of demanding need, in order to pass the "apprentice" stage.

One great hazard confronting the young ranching service company is unfavorable weather cycles. If the service happens to hit a few good years while starting out, it is not too difficult. If the new service hits a dry year or two at the beginning, it is out of business. If a problem is very widespread over a ranch, it is nearly always the wise course to spread the work out over several years. This allows no major change in type of grazing management, allows for improvement in methods and lowering of costs, and means less gamble with drought.

The ranching service technician can be of material help in closing the gap between new technological advances and

daily ranch operations. The experimental and scientific world is traveling faster day by day. So many ideas are coming out about new products and new methods that a person could spend most of his time keeping up with them. The consultant can serve as a screen between the rancher and the unscrupulous operator who would exploit unproven new ideas. Quite often new ideas and methods have merit and economic benefit if applied by someone trained in technical range work. Certainly the next few years will see problems solved by technological processes which we would consider fantastic or phenomenal at present.

It is of vital importance to western rangeland maintenance and development for the American Society of Range Management to seriously consider and study the need of a sound and responsible group in the ranching services field. A basic treatment of the subject would render a real service to the western livestock industry.

MAKING MONEY ON BEEF

The cheapest way to make beef is to let the cattle do as much of the work as possible. Let them harvest a lot of the feed that goes into them, and let them spread their own manure.

That means *grass*. There are a great many good grasses, and a great many ways of using them, to make beef.

A system recommended and used at the University of Missouri for making fat 2-year-olds, starts with calves, roughs them two winters, grasses them two summers, and finishes on grain.

A. J. Dyer, research cattle feeder at the University, told me that with this method 80 percent of the gain is made from roughage and grass (60 percent just from grass), and the finishing 20 percent from about 10 bushels of corn per head, plus the supplementing concentrates.

With this system of maximum forage and grass and minimum grain it is possible to sell on a minus margin, and still make money on your steers.

In Illinois it is called "delayed feeding." In Kansas a similar system is known as "deferred feeding."

Whatever the name, it lets you use the greatest amount of cheap roughage, and the smallest amount of expensive grain. You take on the least risk, and you can decide any time whether to keep on feeding cheap roughage, or start pouring on the grain to finish them for market. A lot of smart cattle feeders follow this system year after year.

Ray Anderson
Farm Journal
from a condensation in the Farmers Digest
February, 1950

Condition and Grazing Capacity of Wet Meadows on the East Slope of the Sierra Nevada Mountains

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DURING the years 1946, 1947, 1948 and 1949 a range survey was made on that portion of the Sierra Nevada Mountains included in the Toiyabe National Forest. Roughly, this includes the east slope of the Sierra Nevada Mountains from Beckwith Pass north of Reno, Nevada to Conway Summit south of Bridgeport, California. The topography is generally rough with steep slopes and deep canyons. The bulk of the soils is derived from granitic rock, although there are local areas where they developed from parent rock of volcanic origin. The valleys east of the range have an average elevation of 5,000 feet, and the mountains rise abruptly to an elevation of 9,000 to 10,000 feet in a horizontal distance of only a few miles. Average annual precipitation varies from 8 to 12 inches near the valley floor to 50 to 60 inches at some of the higher elevations. Most of this comes as snow during the winter months. Summers are dry, with considerable wind and infrequent storms.

These mountains were originally covered with forest. This varied from pinon pine (*Pinus monophylla*) at the lower elevations, through Jeffrey pine (*Pinus jeffreyi*) and lodgepole pine (*Pinus contorta*) at the middle elevations, to fir (*Abies sp.*) on the higher slopes. Wet meadows occurred along the streams.

Most of the forest was logged, beginning about 1870, and used for lumber and fuel in the mining camps from Virginia City to Bodie. Even the pinon pine was cut for fuel in many places. After logging it was burned, sometimes repeatedly, and heavily grazed. The original forested area now has some good stands of second growth timber, large areas of manzanita (*Arctostaphylos spp.*), snowbush (*Ceanothus velutinus*), some sagebrush (*Artemisia tridentata*), and aspen types (*Populus tremuloides*) that invaded the cut-over areas. These latter types were probably present in the original vegetation, but on a much smaller area than they now occupy. Most of the forage is still produced on wet meadows.

After examining a number of meadows at the beginning of the survey, it was decided to classify them according to conditon, and if possible, determine the grazing capacity for each condition class. Using as guides the criteria developed by Ellison and Croft in Utah (1944) and Reid and Pickford in Oregon and Washington (1946), tentative condition classes were set up. These were based upon the density of the plant cover, the floristic composition, the amount and dispersion of litter, and the presence, absence or degree of accelerated erosion. During the seasons of 1946 and 1947, 206 meadows were classified according to these criteria. Of these, 48 were classed as excellent, 71 as good, 44 as fair, 32 as poor and 11 as very poor, or depleted. A large proportion of those classed as excellent were cultivated and irrigated meadows. There were relatively few natural, wild meadows that rated excellent, but many of them rated good. At the end of each of these years some

small changes were made in the requirements for each condition class. During the years 1948 and 1949 approximately the same number of meadows were classified as during the previous 2 years, but no further changes were made in the requirements.

Grazing capacity studies were started in 1946 by keeping actual use records and checking utilization on nine meadow pastures that had been classified by the range survey crew. Seven of these were between 5,500 and 6,000 feet elevation, and two were between 7,500 and 8,000 feet elevation. Only three of these, one at the higher and two at the lower elevations, were natural, wet meadows. The others were subject to various systems of irrigation. The irrigated meadows had a much higher grazing capacity than the natural, wet meadows, some as high as 230 percent. This is because natural meadows are usually cold and waterlogged in the spring and tend to become dry in the fall, whereas the irrigated meadows can be kept at nearly optimum growing condition as far as water is concerned. However, the grazing capacity varied so widely with the care used in irrigating that these meadows were not included in the table of grazing capacities.

The two natural, wet meadows at the lower elevations were both classed as excellent. One contained 26 acres and the other 16 acres. They had a grazing capacity of 3.4 cow months per acre, based on moderate utilization.

The natural, wet meadow at the higher elevation contained 146 acres and was classed as good. It had a grazing capacity of 1.6 cow months per acre, based on the same degree of utilization. Checks were made on these pastures for the next 3 years. In 1948 a pasture was constructed at an elevation between 8,500 and 9,000 feet containing 152 acres of good meadow. This was moderately grazed and had a grazing capacity of 1.1 cow months per acre.

TABLE 1

Grazing capacity in cow months per acre for the different condition classes of meadow at various elevations

CONDITION CLASS	AVERAGE FORAGE ACRE FACTOR	ELEVATION IN HUNDREDS OF FEET						
		55–60	60–65	65–70	70–75	75–80	80–85	85–90
		Cow Months Per Acre						
Excellent	.323	3.4	3.1	2.9	2.7	2.5	1.9	1.7
Good	.206	2.2	2.0	1.9	1.8	1.6	1.2	1.1
Fair	.144	1.5	1.4	1.3	1.2	1.1	.8	.7
Poor	.080	.84	.78	.73	.68	.63	.47	.42

The lower grazing capacities at higher elevations appear to be due to shorter growing seasons and lower temperatures which result in a smaller volume of forage being produced. Truly alpine meadows with dwarf species were not included in this study but would probably show a still smaller grazing capacity.

The average forage acre factors were determined from the 206 meadows covered by the range survey in 1946 and 1947 and used, along with the grazing capacity figures obtained from the four natural, wet meadow pastures, to build a table of grazing capacities for the four major condition classes at 500-foot elevation intervals. These are shown in Table 1. Grazing capacity figures

shown for condition classes and elevations not tested were arrived at by interpolation. No figures were obtained for the depleted class because these meadows usually require complete rest or other special treatment. The capacities shown in this table must be regarded as approximations only. The few tests made can be used as rough guides for stocking meadows in this area, and, as such, proved very useful.

The figures in Table 1 were used, along with a forage acre requirement for the other types (timber, sagebrush, aspen, etc.), to check the grazing capacity of 38 cattle allotments included in the area covered by the range survey. Some allotments were checked 3 consecutive years, some 2 years and some only 1 year. This check was made by comparing the calculated grazing capacity for the allotment with the current utilization of forage under the present rate of stocking. There was a high proportion of meadow forage on most of the allotments. The estimated capacities checked very well, using these figures, with our concept of proper utilization of meadows. They were considered properly utilized when 60 to 70 percent by weight of the forage produced, by the species listed under palatable plants, had been taken by livestock.

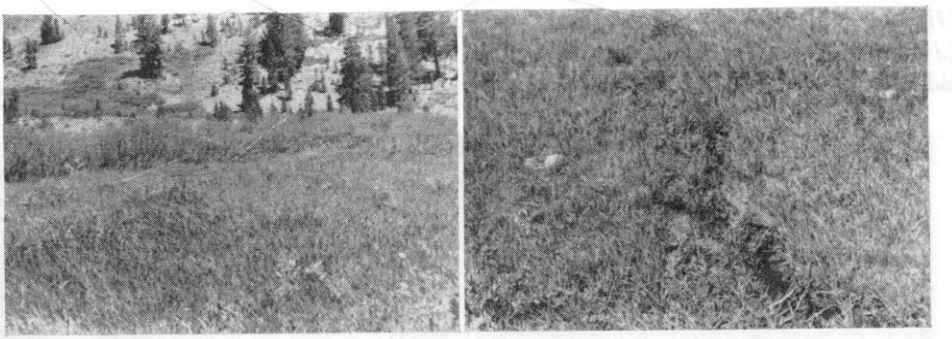
The condition classes established for meadows in this area are as follows:

Excellent Condition

Density—0.7 or more.

Composition—Palatable grasses and weeds must make up at least 70 percent of the plant cover (Fig. 1A). These should include all species of sedge (*Carex spp.*), bluegrass (*Poa spp.*), bentgrass (*Agrostis*), tufted hairgrass (*Deschampsia caespitosa*), timothy (*Phleum pratense*), mannagrass (*Glyceria striata*), velvetgrass (*Holcus lanatus*), orchardgrass (*Dactylis glomerata*), sweet anise (*Osmorhiza occidentalis*), and all species of clover (*Trifolium spp.*) found in these meadows. Mat muhly (*Muhlenbergia squarrosa*) and pull-up muhly (*Muhlenbergia filiformis*) should be confined to meadow edges and should make up no more than 5 percent of the composition. Sweet anise occurs only under dense willow patches.

Litter and Soil—Normally over 75 percent of the ground is covered with litter, but this may be lower if the meadow was heavily utilized the previous year. There must be a well developed layer of humus and unbroken



A B

Fig. 1. Meadow in excellent condition. A. General aspect, more than 0.7 density, with some willows present. B. Vegetated drainage channel with no visible erosion.

sod, with no visible erosion resulting from conditions on the meadow (Fig. 1B).

Good Condition

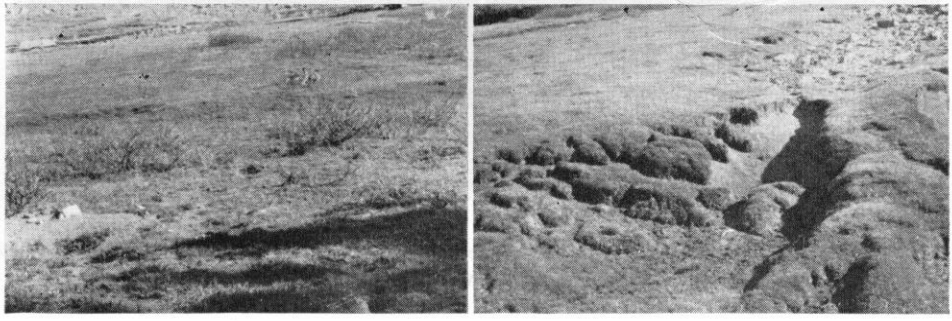
Density—0.5 or more.

Composition—Palatable grasses and weeds must make up at least 45 percent of the plant cover. Where the proportion of these falls below 60 percent the difference must be made up with less palatable, perennial grasses such as meadow barley (*Hordeum nodosum*), muhly, and rush (*Juncus spp.*). No forbs may be considered except clover or sweet anise

Fair Condition

Density—0.4 or more.

Composition—Palatable grasses and weeds make up at least 35 percent of the plant cover. Where the proportion of these falls below 45 percent the difference must be made up with less palatable, perennial grasses such as meadow barley, muhly and rush. Meadows in this condition are less dense than those in good condition and have a greater variety of unpalatable weeds. These include those listed under good condition and



A B

Fig. 2. Meadow in poor condition. A. General aspect, density 0.25 to 0.35. Willows show effects of continuous heavy browsing. B. Meadow edge; broken sod and bare ground.

when it is confined to areas under willow patches. These meadows are similar to those in excellent condition except that they are less dense and have more unpalatable or less desirable species such as rush, meadow barley, buttercup (*Ranunculus*), dandelion (*Taraxacum officinale*, cinquefoil (*Potentilla*), yarrow (*Achillea lanulosa*) and bistort (*Polygonum bistortoides*).

Litter and Soil—Normally over 60 percent of the ground is covered with litter, but this may vary with the previous year's utilization. There is a well developed layer of humus and unbroken sod, with no visible erosion resulting from conditions on the meadow.

others such as penstemon (*Penstemon*), falsehellebore (*Veratrum californicum*), aster (*Aster*), iris (*Iris missouriensis*), paintbrush (*Castilleja*) and monkeyflower (*Mimulus*). They may also have considerable rush, meadow barley and muhly.

Litter and Soil—Normally about 45 percent of the ground is covered with litter, but this may vary with last year's utilization. Sod may be broken with small, bare areas showing. The edges of some stream banks may be bare. Visible erosion is confined to movement of soil from bare areas to sod areas during storms. There must be no well developed rills or erosion pavement or gullies resulting from conditions on the meadow.

The only soil loss will be very light wind erosion from small, bare areas, or light water erosion around meadow edges during storms.

Poor Condition

Density—0.25 or more.

Composition—Palatable grasses and weeds must make up at least 25 percent of the plant cover (Fig. 2A). Where the proportion of these falls below 35 percent the difference must be made up with less palatable, perennial grasses such as meadow barley, muhly and rush. These meadows usually have a large proportion of meadow barley, rush or willow (*Salix spp.*) with many unpalatable weeds such as iris, buttercup, lupine (*Lupinus*), aster and penstemon.

Litter and Soil—The litter is usually sparse and poorly dispersed. The sod is patchy and broken. Regular drainage channels are scoured and have bare edges (Fig. 2B). There are patches of exposed soil with some erosion by wind and water, but no gullies due to conditions on the meadow.

Very Poor or Depleted Condition

Density—Less than 0.25.

Composition—Less than 25 percent of the plant cover is made up of palatable grasses and weeds. These meadows have a high proportion of willows or rush, with many unpalatable weeds of the same species listed under poor condition, together with numerous annuals.

Litter and Soil—The litter is sparse or nonexistent if the meadow is being grazed. The sod is broken with large, bare areas. Erosion pavement may be present or forming, and loss of soil is shown by topsoil remnants or pedestalled plants. There is heavy sheet erosion or well developed rills or gullies.

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FOOD

The future not just of America but of mankind is, Eisenhower feels, jeopardized by hunger. Two-thirds of the world's total population is underfed. At least a billion people never get enough to eat. If improvements in agriculture can help relieve the economic pressures which in turn produce political conflicts, the chances of war are lessened. . . . "Nothing is more important to the future of the United States than helping to feed the world's hungry people. Food means peace and freedom. Starvation is the weapon of communism."

John Gunther *in* McCalls, May 1950

Effects of Spring and Fall Grazing by Sheep on Vegetation of the Upper Snake River Plains[1]

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SAGEBRUSH-GRASS range plays an important part in the western sheep industry. Because of its topographical location between low wintering areas and high summer ranges it receives use during two separate periods of the year. This use occurs in the spring prior to readiness of the summer range, at which time ewes with young lambs require abundant succulent feed, and again in the fall when ewes need conditioning for breeding.

This study of the effects of spring and fall grazing on sagebrush-grass range was conducted at the U. S. Sheep Experiment Station near Dubois, Idaho. It is based upon changes in vegetal composition over a 25-year period (1924–49). A similar comparison was made by Craddock and Forsling (1938) over a 9-year period from 1924 through 1932. They not only found that heavy spring stocking reduced grasses and forbs while unpalatable shrubs greatly increased, but that heavy fall grazing alone caused an increase in palatable grasses and forbs while shrubs, chiefly threetip sagebrush (*Artemisia tripartita*), were slightly decreased. They concluded that fall stocking alone is a method of improving depleted sagebrush-grass lands without sacrificing current forage production.

Besides covering changes over a much longer period than those described rather briefly by Craddock and Forsling, the present study gives a more detailed account of trends and changes in individual species.

Methods

In 1920 two adjacent 80-acre pastures (Paddocks 1 and 2) were established near the U. S. Sheep Experiment Station headquarters on sagebrush-grass range. These pastures have been grazed by sheep since that time.

From 1923 to 1948 Paddock 1 was grazed only in the fall of the year while Paddock 2 was grazed both in spring and fall. Average rates of stocking for each of four periods prior to vegetal inventories are given in Table 1. It can be seen from this table that the stocking rate of both pastures was decreased during the study and that the over-all stocking of Paddock 1 was always considerably greater than of Paddock 2.

TABLE 1

Average stocking rates of Paddocks 1 and 2 in periods prior to inventory years

PERIOD	PADDOCK 1 (FALL USE ONLY)	PADDOCK 2 (SPRING AND FALL USE)		
	Total	Spring	Fall	Total
	Sheep days per acre			
1923–1929	61.8	34.0	12.8	46.8
1930–1935	40.0	16.7	6.8	23.5
1936–1940	38.2	9.6	8.0	17.6
1941–1948	30.6	14.3	11.1	25.4
1923–1948	42.6	19.2	10.0	29.2

During the study the two pastures were used by the Bureau of Animal

[1] This study was conducted by the Intermountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, in cooperation with the Bureau of Animal Industry, at the U. S. Sheep Experiment Station, Dubois, Idaho.

Industry for breeding pens, holding pastures, and other similar purposes. These uses, rather than actual grazing capacities, largely determined the stocking rates. Concurrent studies indicate that proper grazing capacity of such sagebrush-grass range in good condition is about 18 sheep days per acre in the spring and an equal amount in the fall, or a total of approximately 36 sheep days per acre each year. Obviously these pastures received heavier use than this during the initial 7-year period. It is not possible to provide a reliable picture of actual forage use during the study as utilization records were made in only a few of the years.

Vegetation of the two pastures was inventoried in 1924, 1930, 1936, 1941, and 1949. In 1924 the vegetation was compared as to density and composition by use of the general reconnaissance method of range inventory (Stoddart and Smith, 1943). It was inventoried in 1930 by the point-observation-plot (square-foot-density) method (Stewart and Hutchings, 1936), by which forty 100-square-foot plots were estimated in each pasture. Inventories were made in the years 1936, 1941, and 1949 by use of the weight-estimate method (Pechanec and Pickford, 1936). In using this method forty 100-square-foot plots in each pasture, different from those used in 1930, were estimated.

Direct comparisons of herbage production are not possible between the various years because of differences in inventory methods and because of herbage fluctuations due to weather. However, it is possible to compare vegetal production throughout the entire period by converting individual species production to a percent of the total. Percentage compositions computed from density and weight estimates were shown to be comparable by the 1936 data in which both density and weight estimates were made on the same plots. In addition to following the changes in either pasture through the course of the study by use of percentage composition, it is possible to make direct comparisons of herbage production between pastures in any one year.

Fall Versus Spring-Fall Use

Paddocks 1 and 2 were similar at the beginning of the study in 1924 both as to species present and quantities of vegetation produced (Table 2). In both areas the grasses and shrubs each composed roughly 40 percent and the forbs 20 percent of the total vegetation (Fig. 1). The 1924 data, as judged by standards set up by Pechanec and Stewart (1949) for sagebrush-grass range, indicate that both pastures were originally in good condition.

Twenty-five years later, in 1949, the two pastures differed greatly (Table 2 and Fig. 1). In Paddock 2 the proportion of shrubs had increased to more than three-quarters of the total vegetation while Paddock 1 shrub production remained less than half of the total vegetation. All of the shrub species except plains pricklypear (*Opuntia polyacantha*) were more abundant in Paddock 2 than in Paddock 1. Production of antelope bitterbrush (*Purshia tridentata*) and granite gilia (*Gilia pungens*) was more than double that in Paddock 1.

By 1949 forb production in Paddock 2 had decreased to 5 percent of the total while it increased to 29 percent in Paddock 1. The forbs that suffered most in Paddock 2 were arrowleaf balsamroot (*Balsamorhiza sagittata*), tapertip hawksbeard (*Crepis acuminata*), common comandra (*Comandra umbellata*), and tailcup lupine (*Lupinus caudatus*). All of these are fairly good forage species. Herbage production of balsamroot, the most important forb on sagebrush-grass

TABLE 2

Density estimates in 1924 and weight estimates in 1949 of plant species in Paddock 1 and 2, together with vegetal composition by classes

SPECIES	HERBAGE DENSITY, 1924		HERBAGE DRY WEIGHT, 1949	
	Paddock 1 (Fall use only)	Paddock 2 (Spring and fall use)	Paddock 1 (Fall use only)	Paddock 2 (Spring and fall use)
	Percent	*Percent*	*Lbs/acre*	*Lbs/acre*
Grasses:				
Agropyron dasystachyum	2.64	2.53	10.41	6.15
Agropyron spicatum	7.32	7.63	74.50	50.04
Bromus tectorum	—	—	1.97	6.37
Carex spp.	0.16	0.08	0.62	0.12
Elymus condensatus	0.46	0.22	0.49	0.00
Koeleria cristata	—	—	4.74	2.28
Oryzopsis hymenoides	1.57	1.58	17.40	8.94
Poa nevadensis	1.86	1.92	9.86	5.57
Poa secunda			4.76	3.59
Sitanion hystrix	0.54	0.34	10.25	18.66
Stipa comata	1.83	1.91	19.16	9.94
Other grasses	—	—	1.35	0.00
All grasses	16.38	16.21	155.51	111.66
Forbs:				
Antennaria dimorpha	—	—	1.22	4.70
Antennaria microphylla	0.97	1.09	0.40	2.93
Astragalus convallarius diversifolius	—	—	2.83	2.49
Astragalus stenophyllus	—	—	2.82	0.00
Balsamorhiza sagittata	4.19	3.69	110.98	0.73
Comandra umbellata	0.16	0.08	11.75	0.26
Crepis acuminata	0.85	0.82	15.04	2.45
Erigeron corymbosus	—	—	2.98	1.68
Erigeron engelmanni	—	—	5.13	3.33
Eriogonum heracleoides	—	—	5.35	2.59
Lupinus caudatus	0.31	0.15	3.03	0.00
Penstemon speciosus	—	—	2.30	0.42
Phlox canescens	0.70	0.75	10.18	6.46
Sphaeralcea munroana	0.27	0.34	0.49	0.64
Other forbs	1.91	1.75	10.62	7.91
All forbs	9.36	8.67	185.12	36.59
Shrubs:				
Amelanchier alnifolia	0.43	0.41	0.00	0.41
Artemisia tripartita	9.95	9.99	195.79	317.14
Chrysothamnus puberulus	0.62	0.49	20.69	36.46
Eriogonum microthecum	—	—	2.29	5.98
Gilia pungens	0.59	0.49	3.48	11.98
Gutierrezia sarothrae	0.43	0.43	17.14	30.26
Opuntia polyacantha	—	—	18.36	17.55
Purshia tridentata	2.44	2.22	35.00	88.18
Tetradymia canescens inermis	2.74	2.56	13.71	22.81
Other shrubs	—	—	0.00	0.79
All shrubs	17.20	16.59	306.46	531.56
Total	42.94	41.47	647.09	679.81
Grass composition (percent of total)	38.15	39.09	24.03	16.42
Forb composition (percent of total)	21.80	20.91	28.61	5.39
Shrub composition (percent of total)	40.05	40.00	47.36	78.19

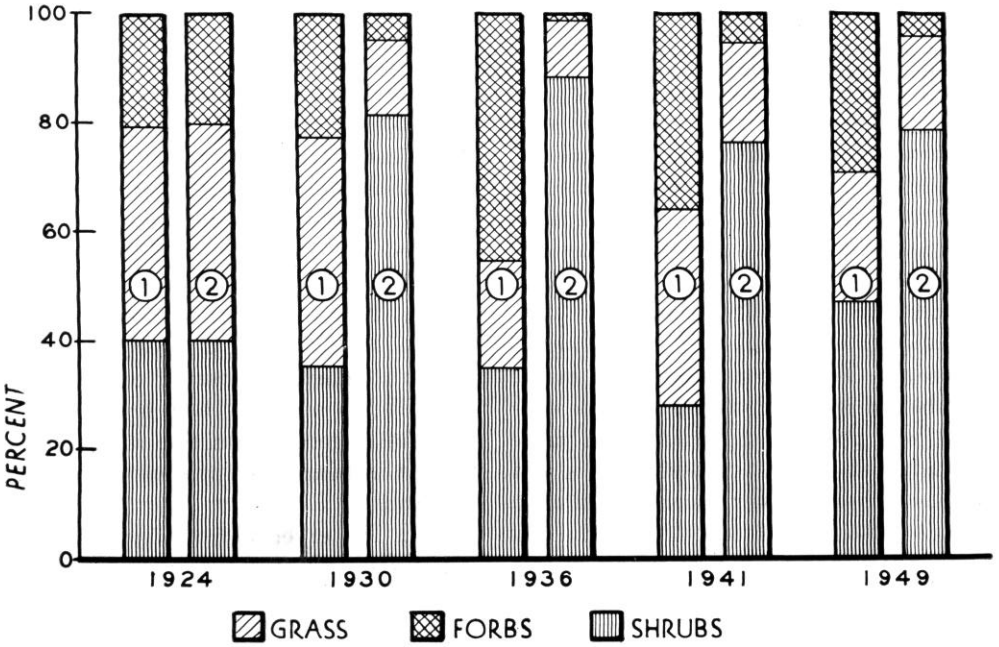

FIG. 1. Changes in proportions of forbs, grasses, and shrubs within two paddocks, 1924–49. Paddock 1 grazed by sheep in the fall only; Paddock 2 in spring and fall.

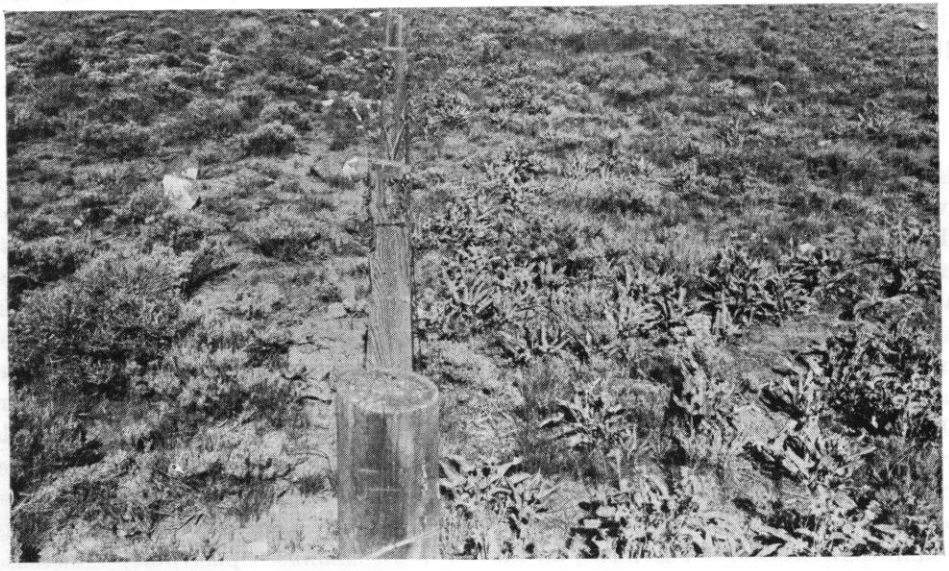

FIG. 2. Fenceline between Paddocks 1 (right) and 2 (left) in May 1950. There is an abundance of forbs in Paddock 1, but scarcely any in Paddock 2.

range in good condition, was reduced in Paddock 2 to less than 1 percent of that in Paddock 1 (Fig. 2).

Grass production also differed markedly by 1949: the vegetation in Paddock 1 contained 24 percent grass while that in Paddock 2 contained only 16 percent. All of the desirable grasses were more

abundant in Paddock 1. It is also notable that the relatively undesirable bottlebrush squirreltail (*Sitanion hystrix*) and cheatgrass brome (*Bromus tectorum*) were definitely more abundant in Paddock 2.

Little significance can be attached to apparent differences in plant species composing less than 1 percent of the total vegetation. Distribution of most of these species was so erratic that they were not adequately sampled by the technique employed. The apparent increase in the number of species present in 1949 over 1924 was possibly the result of a more intensive inventory in 1949. It is not probable that so many species could have invaded the area during this period; it is therefore assumed that many of the minor species were overlooked in 1924. Some note should be taken, however, of the presence of certain species in one pasture and not in the other. Apparently grazing pressure had driven some species such as lupine out of Paddock 2 and allowed less desirable species to invade.

Trend Under Fall Use

The proportions of the vegetation classes in Paddock 1 changed comparatively little throughout the study. Changes that did occur are, for the most part, attributed to weather fluctuations rather than grazing use. It is thought the sharp decrease in percent of grass and increase of forbs in 1936 (Fig. 1) was the result of a severe drought in 1934. Pechanec (1937) reported that this drought caused the breaking up of major grass clumps and surmised that they were so severely damaged as to be incapable of immediate recovery. The forbs, on the other hand, recovered from the drought very rapidly and thus by 1936 gained a temporary advantage over the grass.

The 1941 inventory showed a considerable decrease of shrub production in Paddock 1. This was probably the result of two separate factors. Deep snows in the fall of 1940 caused exceptionally heavy utilization of shrubs which tended to reduce their vigor the following year. This, combined with very favorable moisture conditions for grass and forb growth in the spring of 1941, resulted in an unusual abundance of herbs. In contrast the inventory in 1949 appeared to be slightly biased in favor of the shrubs. Spring precipitation in 1949 was unfavorable for the early growth of herbs; as a result their proportion of the total vegetal production was reduced, thus increasing the apparent proportion of shrubs.

With the exception of the year 1940, fall utilization of shrubs was too slight to have much effect; however, the heavy utilization in 1940 indicates that if it is possible to utilize shrubs heavily in the fall over a period of years, a substantial lowering of their production may occur with a corresponding increase in the production of herbs.

During the study period a number of the principal species in Paddock 1 showed unusual variations. Some of these deviations are believed to be the result of fall grazing pressures. Bitterbrush and broom snakeweed (*Gutierrezia sarothrae*) were reduced by heavy stocking and were only able to increase during the 1941–49 period of comparatively light use. Both of these species are moderately palatable on this range and at times receive heavy use. Gilia also decreased under heavy fall stocking, but it remained at a low level for the rest of the study period. Downy rabbitbrush (*Chrysothamnus puberulus*) increased while the area was heavily stocked and began to decrease upon the reduction of stocking. Fall stocking had little effect upon spineless gray horsebrush (*Tetradymia canescens inermis*) until the latter period of reduced stocking at which time

it decreased markedly. The only major grass species severely reduced in Paddock 1 was thickspike wheatgrass (*Agropyron dasystachyum*). Both squirreltail and needleandthread (*Stipa comata*) also decreased markedly during the first period of heavy stocking, but increased considerably with a reduction in stocking after 1936. Hoary phlox (*Phlox canescens*) was one of the few principal forb species that noticeably deviated from the class trend. It continued to decrease until stocking had been considerably reduced, and then began to increase. The pussytoes (*Antennaria spp.*), however, were decreased and did not recover.

At the end of the study Paddock 1 as a whole, was in good condition, having neither noticeably suffered from fall grazing nor markedly benefited.

Trend Under Spring Use

By expressing actual herbage production of Paddock 2 in each inventory year as a percentage of the production of Paddock 1 in the same year, factors other than grazing that influence trend may be minimized (Fig. 3). The greatest change occurred in Paddock 2 within the period of severe spring use from 1923 through 1929. In this 7-year interval, shrub production increased to 176 percent of that in Paddock 1 while grass and forb productions were reduced to 26 and 16 percent, respectively. Production of shrubs continued to increase until 1941, at which time it was 224 percent of that in Paddock 1. Figures 1 and 3 both show that this increase in proportion of shrubs near the beginning of the study has persisted as a major difference between the pastures.

Lesser trends are apparent, however. With reduction of spring stocking after 1930 by more than half, grass production began to increase. Forb production began to increase during the 1937–41 period when spring stocking was reduced to one-third the original rate. The improvement in Paddock 2 was only achieved after a long period of comparatively light stocking. This indicates that although heavy spring use can deplete a range rapidly, restoration of the range under proper use is a very slow process.

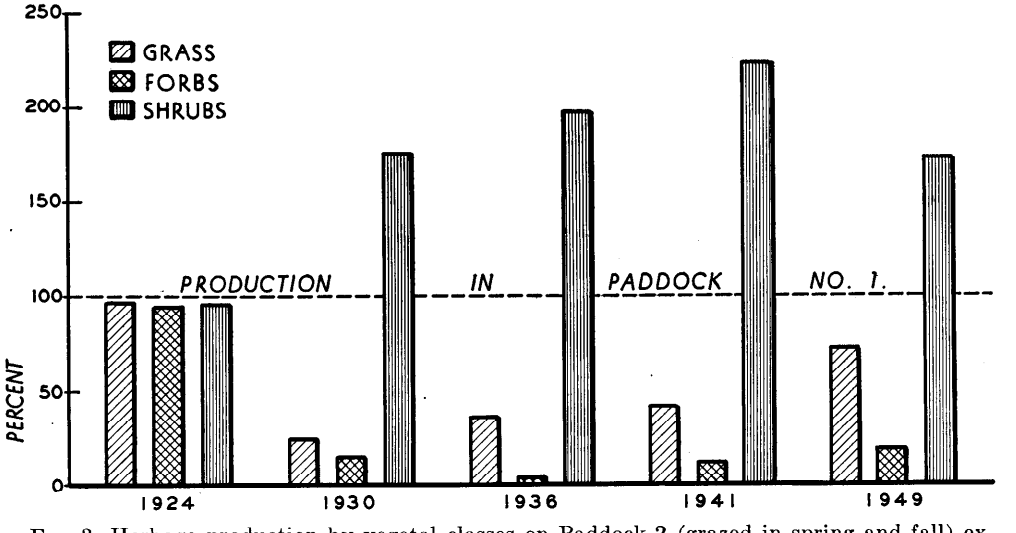

Fig. 3. Herbage production by vegetal classes on Paddock 2 (grazed in spring and fall) expressed as a percent of production on Paddock 1 (grazed in fall only), 1924–49.

Few major species in Paddock 2 deviated from these class trends. Bitterbrush and snakeweed reacted just opposite to the shrub class as a whole; they were reduced considerably during the period of heavy spring use, but were able to increase greatly under lighter spring stocking after 1936. Squirreltail and cheatgrass were the only grasses that increased under spring stocking. During the period of heavy use squirreltail was reduced in the same way as the other grass species, but lighter stocking enabled it to increase rapidly. Cheatgrass increased throughout the study.

Although the trend in Paddock 2 was upward after 18 years of comparatively light stocking, this paddock was still in poor condition at the end of the study.

The difference between the two pastures in 1949 is even more pronounced when availability of the vegetation is considered. Availability of herbs is largely determined by the abundance of shrubs, almost all of which are undesirable. In 1949 Paddock 2 had 72 percent as much total grass as Paddock 1, but only 56 percent as much available grass. The total forb production was 20 percent of that in Paddock 1, but the available forb production was only 16 percent. This large difference was reflected in the 1949 grazing capacity which was three times greater in Paddock 1 than in Paddock 2.

Summary and Conclusions

Studies were conducted on spring-fall sheep range at the U. S. Sheep Experiment Station near Dubois, Idaho to determine the relative effect of fall and spring-fall grazing on vegetation of sagebrush-grass range.

During the 25-year study period vegetal inventories were made on one area that was grazed only in the fall, and on a similar area that was grazed in the spring and again very lightly in the fall. Because of differences in methods of inventory, comparison of the areas from year to year is based on percent of herbage composition. Direct comparison of the area is possible in any one year.

After 25 years of treatment, the two areas that were originally similar differed greatly. Heavy fall stocking did not markedly affect the area in good condition. The shrubs were utilized very lightly, and the proportions of shrubs, grasses, and forbs remained more or less constant. This area was considered to be in good condition throughout the study period.

The area grazed in both the spring and fall, however, contained 173 percent as much brush, 72 percent as much grass, and 20 percent as much forbs as the fall-grazed area at the end of the study period. This area changed from good to poor condition. Heavy spring stocking during the initial 7-year period greatly reduced the production of grass and forbs and increased that of shrubs. During the following 18 years of comparatively light spring stocking the grasses made a substantial increase while the forbs improved slightly. By the end of the study 78 percent of the vegetation in the spring- and fall-grazed pasture was undesirable brush, whereas the fall-grazed pasture contained only 47 percent brush. The grazing capacity of the spring- and fall-grazed pasture was less than one-third that of the fall-grazed pasture.

The results of this study suggest the following conclusions regarding sagebrush-grass range of the upper Snake River plains:

1. Heavy stocking in the fall will not markedly affect grass and forb production; it may cause a decrease

in shrubs if they are heavily utilized.

2. Heavy spring stocking will severely reduce grass and forb production and greatly increase the abundance of undesirable shrubs.
3. A range in poor condition will improve very slowly if it is continually grazed in the spring at even a light stocking rate.
4. It would appear that a well-planned rotation system of grazing in which areas in poor condition are grazed only in the fall is one method of improving sagebrush-grass range without necessitating a heavy reduction in stocking.

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A TRIP TO AUSTRALIAN SHEEP COUNTRY

The continent of Australia is about the same size as the United States. It lies somewhat closer to the equator than the United States and no part of Australia has the winter conditions of northern United States. The result is that winter feeding is unnecessary anywhere in Australia. There is a range of mountains, called the Dividing Range, which roughly parallels the east coast. West of the mountains there is a great central plain, with a smaller range of mountains near the center of the continent. There is also some high country in the northwestern part of western Australia. Rainfall is the all-important factor in the climate. There is a large area in the north central part, constituting about one-third of the total area of the country, which has less than ten inches of rainfall, and more than half of this area is so dry as to be uninhabitable. There is a narrow strip on the coast having forty to fifty inches; then a zone of thirty to forty inches on the east slope of the mountains; twenty to thirty inches on the western slopes; and from twenty inches down to five inches or less on the great central plain.

Dr. Hadleigh Marsh
Montana State College, Bozeman
in Sheep and Goat Raiser
February, 1950

Pollarding—Age-Old Practice Permits Grazing in Pays Basque Forests

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PROBABLY no other section of Europe is as steeped in tradition as the Basque country. Nestled in the Pyrenees Mountains of southwestern France and northeastern Spain, Pays Basque has never been completely dominated by either of those countries. Basque language, customs, habits and racial purity are unique today in having remained nearly unchanged for many centuries, although Pays Basque has never reached sovereignty.

It is not surprising that a people so independent and resourceful as the Basques have their own agricultural pursuits, especially adapted to local conditions. Pollarding is one of these unusual practices.

Sometimes thought of as high coppice or topping, pollarding allows multiple use of forested lands. Trees are pollarded at a height of eight feet (two and a half meters) above ground level (Fig. 1), usually done for the first time when trees are about twenty-five years old. Axes are used for cutting rather than saws, because sawteeth, when dragged back and forth across the cut, will pull the bark loose and prevent most of the dormant buds from growing. In two or three years the pollards are crowned with profuse numbers of branches, from which all but eight or ten of the larger, most vigorous and best positioned branches are thinned out.

The first of the three uses derived from Pyrenees forests is to provide grazing for domestic animals. By all odds, the great percentage of this mountainous nation is best suited to forests. The wood produced here, although important in Basque economy, is secondary to the need for pasturage. It is, in fact, the urgency of the need for pasture that long ago prompted the development of pollarding, through which both requirements are met simultaneously.

FIG. 1. This veteran tree was recently pollarded and the young branches are now growing into stovewood bolts, out of reach of grazing animals. *Photo by Chas. M. Genaux.*

Second of the uses coming from pollarded stands is the constant supply of young, sound stovewood bolts for domestic consumption. In a cycle varying from twelve to fifteen years, trees are cut back to the pollards, the entire

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yield being used domestically. The ordinary method of fuelwood production through tree selection and cutting is impractical here. Forest reproduction is eliminated by the grazing animals, and were the knotted, knarled veteran trees removed for wood, replacement would be impossible. It is necessary from time to time to curtail grazing for three or four years to allow reproduction to take place and the young trees to grow out of reach of the animals (Fig. 2).

The third use obtained from Basque forested areas is the production of litter material. Bracken fern (*Pteridium aquilinum*), which grows abundantly throughout the Pyrenees, has no value for feed, but here again the ingenious Basques have found a way to utilize this ever-present plant. Ferns are cut in the autumn, poled for drying (Fig. 3A), and later carted to the stock barns for floor litter. Used litter is stacked in compost piles and becomes the source of rich fertilizer and soil conditioner (Fig. 3B).

FIG. 2. Grazing animals were kept out of this pollarded grove long enough to allow oak reproduction to grow out of reach. *Photo by R. H. Eastman.*

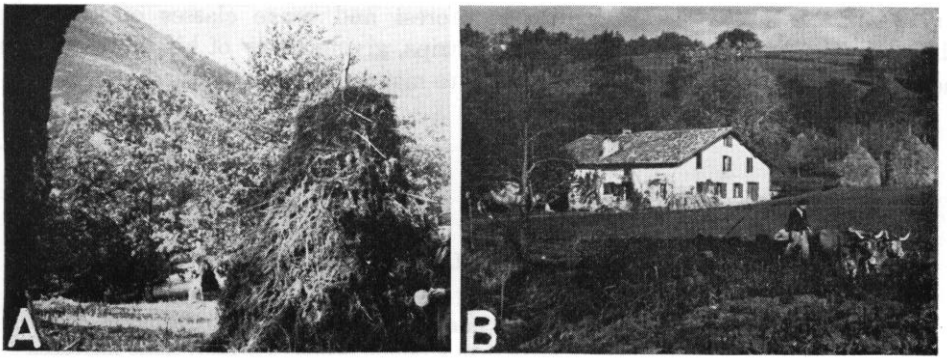

FIG. 3. Use of bracken fern. A. Ferns cut and stacked for drying. Before winter sets in, they will be hauled to the farmstead for use as floor litter in the livestock barns. *Photo by H. R. Huff.* B. Every Basque farm has its compost pile where soiled litter decomposes into excellent fertilizer. *Photo by A. P. French.*

Relatively little of the Basque country is suitable for farming. Arable land consists mainly of small level or gently rolling areas, intensively cultivated. Some sites, level enough for tillage, have very unfertile soil, coarse in texture and low in humus content. This mantle type, called "cold soil" by the Basques, requires application of rather large quantities of organic material over a period of years to build up fertility sufficient for crop production. Litter compost serves this purpose admirably.

Maintenance of steady production of stovewood, forage, and litter material, through pollarding, apparently has reached a balance that has remained constant through the centuries. Excessive use of any one of the three resources would have serious consequences in the Basque economy.

Originally the forests were primarily of Pyrenean oak (*Quercus tozza*) and pedunculate oak (*Q. pedunculata*). About fifty years ago a leaf disease known as white rot (*Oidium* spp.) spread through the region, seriously damaging the native oaks, especially the young leaves of early spring. The French waters and forest service later began trials of several exotic oaks in a search to find one that would not only meet the requirements for pollarding but would withstand the leaf disease. Outstanding among those tried, the American northern red oak (*Q. borealis*) appears to be well adapted to the open stands of the Basque country. Because it greens out late in the spring, northern red oak is highly resistant to white rot. It is easy to transplant, and although it has an unusually long life, it is a rapid grower. Where Pyrenees plantings have been made with this oak, the cutting cycle for pollarding can be shortened by four or five years.

The writer wishes to express his gratitude and acknowledgement to Monsieur Louis Barriety, French forest official of Bayonne, Basses Pyrenees. For three terms of the American University at Biarritz, M. Barriety accompanied the forest and range classes on their field trips, giving freely of his time and effort to make each trip a success.

POPULATION AND LAST FRONTIERS

Unquestionably one of the great factors of change is the explosive upsurge in population in virtually all countries, resulting in a doubling of the world population within the last century, or an increase of more than a billion people. Further, these increases are continuing, with the prospect, barring some cataclysm, of a world population of three billion or more people at the end of the century—only fifty years from today. Already one result of these increases has been that the habitable and cultivable areas of the earth are now largely occupied, leaving certain tropical and very northerly regions as the last remaining frontiers.—From Annual Report of The Conservation Foundation. For the year 1949.

BOOK REVIEWS

Missouri River Basin Agricultural Program

By U. S. Department of Agriculture. 183 pp., 38 tables, 23 figures. House Doc. No. 373, 81st Cong., 1st Sess. U. S. Government Printing Office. 1949.

This is a report of the proposed program of the USDA to complement the already authorized engineering works of the Pick-Sloan plan of the Corps of Engineers and the Bureau of Reclamation. With this background, and bureaucratic rivalry being what it is (to say nothing about the voters), it would be surprising if there were not some "pork barrel" elements involved. No doubt there are such elements in the report.

It is a well prepared document and will be of interest to anyone living or working within the Missouri River Basin area covered by the report. The basic premise of the Letter of Transmittal, that the agricultural and engineering phases of development of the area should move forward together, is undoubtedly sound. A letter from the Secretary of Interior indicates a healthy difference of opinion on some phases of the proposed program.

A few disconnected quotes from the Foreword and Summary are of particular interest. "Whether we conserve and use our resources in this rewarding manner will be determined ultimately with finality by what the people themselves do with their land. . . . The program recognizes that farmers and landowners, by and large, are willing to apply the best in practical land treatment—because it enriches productivity and contributes to security in land values. . . . Without their participation, this program, or any other plan would be largely worthless." These fundamental premises seem undebatable.

The General Description of the Basin which makes up Section 1 of the report might well be the most valuable portion. In this section, a mass of information concerning the physical characteristics and economic development of the area has been boiled down to useable dimensions in a generally scholarly and objective manner. Some ecologists may object to the listing of the short grasses as the dominants of the western grasslands.

Assessing the rest of the report, particularly Section III, which is the recommended agricultural program, in the light of the basic premises of the report itself and the character of the area and its inhabitants, had best not be done by those with high blood pressure.

For example, in Section I, we find, "conservation programs can be accelerated when problems of . . . equitable landlord-tenant relationships, and increased ownership by operators receive adequate consideration" but in the program portion we find nothing in regard to landlord-tenant relations between the Federal government, which is the "biggest" landlord of the area, and its tenants. Neither do we find any plans for increased ownership by those tenants, even in cases where conservation and public interest would plainly be best served by

such ownership. The program does mention additional Federal land acquisitions and this would probably further reduce operator ownership in the area.

Some portions of the program which are of especial interest to range men are not entirely clear. Range Management practices and related subjects come under two headings: "A program of conservation and improvement measures for grass land and cropland" and "A program for forest and forest range lands." The discussion under the first heading states that it deals primarily with individually owned and operated farms and ranches but it also mentions "fullest use of public lands" consistent with sound conservation, etc., as a part of this program. Under the second heading, "A program for forest and forest range lands" are listed: (1) national forests including lands to be acquired within the forest boundaries, (2) State, county and municipal lands, (3) lands outside national forest boundaries to be acquired by Federal, State or local governments, and (4) lands to remain in private ownership. The criteria as to what lands come under each of the two general headings is not clear. Possibly the intent is to include all non-forested lands without direct public uses, such as watershed and recreation, under the forest and forest ranges heading.

But the situation becomes even more confused under the research headings. Under the research heading, "Conservation and management of farm and ranch land," there is no specific subheading of range management. The estimated Federal cost of the "accelerated" research under the general heading is $10,248,000 for installation and 10 years operating cost. An additional $4,506,000 is expected to be contributed by the states. Under the "forest and range research" heading $17,800,000 is allotted for Federal installation and 10 years operation, while only $65,000 is expected to be contributed by the states. Nothing is expected to be contributed by the states under the specific range management subhead. Apparently this lack of state contribution for range management research is based on the assumption that range management is for the primary purpose of improving the management and use of Federal lands. Most of the grazing acreage and more of the grazing values of the area are now in ownership other than Federal. Are the administrators of this non-federal land good enough to operate without benefit of research, whereas the Federal administrators are not? Or is the Federal Government expected to acquire and manage all of the grazing land in the area? The report does not say.

All in all range management does not receive the attention in the program that it deserves, nor has it been very well fitted into the general plan. Section II, Problems and Goals, is stated in general terms, but even there range management fares poorly. There appears discussion of the "open range" as if such a thing existed in the area. The term "open range" still appears on some of our state statute books but the real thing has been about as alive as the dodo bird since the passage of the Taylor Grazing Act. Also in this section appears a long list of agricultural programs, with little mention of range management or natural vegetation, (except forests).

One other specific phase of the program should be mentioned. It is requested that the limitations on funds for "conservation payments" be removed. It is not explained what "conservation payments" are. Inhabitants of the region commonly think of "conservation payments" as price support payments. So long as this is the case, any connection

which "conservation payments" may have with good land use is purely coincidental. In fact, in the drier portion of the area, these payments have frequently been a deterrent to what is generally considered good land use.

Any accelerated development of the area (or any area) intensifies the conservation problems. As the report points out, soil deterioration too often accompanies irrigation. This is true not only of the irrigated lands, but of the surrounding grazing land as well. Whether or not the necessary techniques can be developed and passed on to the land owners and users rapidly enough to prevent the overall development program (including the Pick-Sloan plan), from being anti-conservation during the accelerated development period is at least debatable, if not doubtful. A large part of Pick-Sloan is already under construction and more under contract. There is clear need, at this time, of increased research and education directed specifically toward good land use.

Because of the great amount of able work and thought from many sources which has gone into the preparation of most parts of this report it may well serve as a good starting point in developing a much needed agricultural program for the area. By logical reasoning, from the basic tenets of the report itself, the suggested program has two basic and fundamental weaknesses which probably would require departmental reorganization for their correction. "Conservation payments" should be for conservation and should not be disguised price supports or subsidies for other purposes. Range management research should be organized so that it will provide for more research and so that it cannot be confined to studies which might be designed to provide public land administrators with facilities for covering up their mistakes.—*Dan Fulton*, Rancher, Ismay, Montana.

Pigs—From Cave to Corn Belt

By Charles Wayland Towne and Edward Norris Wentworth. 305 pp. University of Oklahoma Press, Norman, Oklahoma, 1950. $4.00.

Many writers have given the horse, ewe, and cow their day. Now the porker gets his in a very readable and informative fashion. Even if he seldom sees a hog, the range manager will welcome "PIGS" to his library, because of his general interest in all livestock.

The authors have made an exhaustive study into the porker's past and econonomics, and have come up with quite a history. Many customs, legends, and unusual facts surround the hog. For instance: Did you know that hogs have been trained to hunt and point birds? That it takes 3 months, 3 weeks, and 3 days to deliver a litter of pigs; and 6 or 7 months later they are wrapped in cellophane at the corner grocer's? (The same cycle takes $2\frac{1}{2}$ times as long for "baby beef.") That championship hog calling contestants are judged on strength of tone, quality of tone, originality of call, persuasiveness of call, variety and command? That pork constitutes 55% of all the meat consumed in the United States? That pet hogs have even been house broken?

The domestic hog of 1950 is quite an improvement over his wild boar ancestors. In fact, the "woods" hog belonging to the 19th century emigrant was no

show animal, but he was a great traveler with remarkable ability to live off the land. As a result the hog played an important part in the winning of the West. In the Gulf States his razorback progeny exist today—still living off the land.

The southern forester has a less sympathetic feeling toward the hog than the authors, and he believes the "woods" hog has served his purpose, especially when he sees these rooters destroy young pines. —*Walt Hopkins*, Southern Forest Experiment Station, U. S. Forest Service, Alexandria, Louisiana.

The Soil Science Society of America

Proceedings 1948

Published by the Soil Science Society of America, Madison, Wisc. Vol. 13, 587 pp. 1949. $7.50.

The book is large (8½ x 11), cloth bound, and printed on slick paper. It contains 103 papers presented at the twelfth annual meeting of the Soil Science Society of America at Fort Collins, Colorado, August 24 to 27, 1948. It also contains a good subject matter and author index, minutes, and names of officers and members of 12 standing committees.

Volume 13 of the *Proceedings* is divided into six parts as follows: Soil Physics, Soil Chemistry, Soil Microbiology, Soil Fertility, Soil Genesis Morphology and Cartography, and Soil Technology. Two special papers are included, namely: Japan's Dilemma is Our Dilemma by T. M. Bushnell, and Technical Collaboration in Agriculture in the Western Hemisphere by B. J. Birdsall. Virtually all the authors present their material in the systematic order of introduction, method, results, discussion, summary, and literature cited. Conclusions or recommendations replace summaries in some instances. The papers, particularly their titles and summaries, portray the forefront of a rapidly advancing science and the points along that front where most interest is centered currently. Thus we note that in 1948 there were 12 papers in the section on soil physics while there were 24 in the section on soil fertility.

The data are indispensable for research in soils and are of interest to soils workers in all fields. Range conservationists will find a valuable reference for recent advances in soil science as it relates to plant production. Papers of outstanding interest to this "range man" and therefore possibly of interest to you, included: "Soil puddling"; "Experiments in the use of the microscope for the study of soil structure"; "Phosphate fixation by soil minerals"; "The decomposition of *Carex filifolia*"; "Yield and protein content of pasture herbage as influenced by nitrogen fertilization and frequency of clipping"; "Some effects of crude petroleum on soil fertility"; "Soil Zones of the Great Plains states—Kansas to Canada"; "Soil development in the Rocky Mountains"; and "Preliminary hydrologic results, 1935–48, 'Base Rock' undisturbed soil lysimeters in the grassland type, Arizona."

Among the 103 articles range managers are certain to find knowledge with immediate usefulness.—*E. J. Dyksterhuis*, Soil Conservation Service, Lincoln, Nebraska.

Farm Structures

By H. J. Barre and L. L. Sammet. 650 pp. John Wiley and Sons, New York, N. Y. 1950. $7.00.

The book is intended as a text for students seeking a professional degree in agricultural engineering. The authors H. J. Barre, Professor and head of the Agricultural Engineering Department at Purdue University, and L. L. Sammet, formerly Associate Professor of Agricultural Engineering at Purdue University, appear eminently qualified to write such a treatise. Dr. Barre is known for his research in heat moisture transfer and materials of construction as related to farm buildings.

The book is not a handy reference book for the average dirt farmer. In most cases it is too technical for a practical application of this kind and it was not the intention of the authors to make it so.

The subject matter is divided into 29 chapters and an appendix. Included is information on:

1. The functional analysis of farm structures.
2. Space utilization and equipment arrangement in a functional plan.
3. The selection and utilization of materials for farm structures.
4. The design of ventilation systems and crop storage structures.
5. Economic aspects of farm structures.
6. The elements of structural design for light frame buildings.

Representative practical problems follow at the end of each chapter as well as numerous references for further study.

It is natural that the authors have devoted considerable space to heating and ventilating farm buildings, because of their background in heat research. A thorough treatment of these elements is highly essential in any treatment of structures where housing of farm animals and products is the paramount purpose.

Some building engineers might criticize some of the structural details. For instance the illustration on page 74 of a plastered wall detail shows a doubled stud at an interior corner. A tripled stud will be required here to provide a nailing surface for the sheathing or plaster base.

The use of beveled sleeper strips in illustration (b) on page 81 is somewhat obsolete. A better and cheaper method is to use 2 x 2 sleepers held in place with Bull-Dog Floor Clips imbedded in concrete.

The chimney flashing shown on page 80 omits any reference to counter flashing, which is highly important. The drawing also indicates that the flashing is fastened to the roof and built-in to the chimney. This is not standard practice because any roof settlement will cause the flashing to pull loose from the roof or the chimney. Hence, the need for counter flashing.

Considerable space is devoted to carpentry but the text is lacking on chimney construction. A brief mention of the need for flue lining, its projection above the top of the chimney and the need to maintain a 2″ clearance between the chimney and all combustible material would have sufficed.

The conscientious student will pick up these details, however, if he makes full and complete use of the reference material cited.

The authors for some reason have omitted any reference to sewage disposal

and water supply. These items are highly important in any farm development and it would seem that some mention would have been merited.

Farm structures is the first book in a series sponsored by the Ferguson Foundation, Detroit, Michigan, for the purpose of advancing the agricultural engineering profession and assisting the development of agricultural engineering education. If subsequent volumes achieve their purpose as well as this first volume, they will become an invaluable aid to the engineering profession.—*L. H. LaFaver*, Structural Engineer, U. S. Forest Service, Missoula, Montana.

Principles of Field Crop Production

By John H. Martin and Warren H. Leonard. 1176 pp., 305 figures. The Macmillan Company, New York, 1949. $6.00.

Intended to be a college text, this book is the most complete single reference on the subject and so has value for all agricultural workers, writers, and those in commercial fields who need handy reference material. It is of only limited value to ranchers and farmers, not because it is too technical, but because their problems are local and one book cannot possibly cover every detail of every crop in every locality.

Part I covers principles of growth of all crops, such as tillage, botany, fertilizers, seed production, marketing and competition. The chapter on environment is especially good, discussing climate, light, air, soils, insects, the wide crop areas, growing season and the like. The tillage chapter is especially good.

The other three large divisions of the book are:

Part II— Crops of the Grass Family; (Grains, Sorghums, Millets, Corn, Grasses).

Part III—Legumes

Part IV— Other Plant Families; (Buckwheat, Flax, Cotton, Tobacco, Sugar Beets, Potatoes, Industrial and Condiment Crops).

Since every crop commercially grown in the United States is covered, it is almost inevitable that crops of limited use will have space out of all proportion to the acreage they occupy. Thus, two pages are devoted to ramie and six to the castor bean, whereas crimson clover gets a page and a half, alsike clover a page, and Kentucky bluegrass three pages. The grasses, especially in view of the present wide interest in them, are short changed in the book. Other crops are adequately—even beautifully—handled.

A remarkable job has been done in avoiding sectional interest or bias. A usable appendix gives the reader:

1. A complete table of characteristics of all of the plants used in the U. S.;
2. The chemical composition of all crop products;
3. Conversion tables of mass, avoirdupois, length, area, volume, temperature, etc.; and
4. A really good glossary of agronomic terms—everything from apogeotropic to godevil.

Every chapter is followed by a complete list of references, mostly federal and state bulletins and articles in the *Journal of the American Society of Agronomy*.

Without much question, this is the most complete book in existence on crops of this country.—*E. R. Jackman*, Farm Crops Specialist, Extension Service, Oregon State College, Corvallis, Oregon.

A Sand County Almanac and Sketches Here and There

By Aldo Leopold. 226 pp. Oxford University Press, New York. 1949. $3.50

Do you enjoy reading aloud from an absorbing "nature" book when the family is gathered around the fireplace on a winter evening, or when they are lolling on the veranda in the fading summer twilight? Do you need ideas on how to relax from "The Job," ideas described in detail by a busy professor who spent week ends on his farm in the Sand Counties of Wisconsin? In Almanac form, the author describes specifically his activities and his observations pertaining to soil and water, crops, flowers, trees, game, birds, and other wildlife. He even found time to hunt and fish!

Do you thrill when an old-timer recounts his early days roaming the prairies in Iowa, riding ranges and trails in the mountains of Arizona and New Mexico, exploring the wilds of Chihuahua and Sonora, or watching changes in ranges, prairies, marshes and wildlife from Utah to Manitoba? Do you read on when an authority points an accusing finger at the white man for extinguishing or threatening the passenger pigeon, the grizzly bear, the Texas mountain sheep, the desert fox and many others through overhunting, deliberate eradication or reduction of food; accompanied by the spread of such low-value plants as Russian thistle and cheatgrass; and that the whole process is still going on?

If these topics intrigue you, then you will want to read this book, which touches on those mentioned and many more. It is written in prose, but much of it sings with a poetry of the range and sky and mountain that will appeal to the range man, whether or not he agrees with all of Leopold's philosophy. The book is illustrated with attractive drawings by Charles W. Schwartz.

This book contains information, it is enjoyable and it has food for serious thought. Leopold was a man of the outdoors. He met his untimely death from heart failure after fighting a neighbor's grass fire. Like the serious thinker he was, the author tells you what it all meant to him in his third and concluding chapter, entitled "The Upshot." This essay promotes constructive analysis of true conservation, under which heading are grouped such heterogeneous folks as the hunter and sportsman, the lay nature lover and recreationist, the technical ecologist and the practicing conservationists on farms, forests, and ranges, public and private. The author shows the basic fallacy of attempting to cover all these lines under a definition of conservation as merely good economics. He feels that until we love, respect and understand the land, there is no chance for it to survive the battering of mechanized land use, or for us to retain and enjoy our own physical and mental health which can come only from close contact with a healthy land. "The bulk of all land relations hinges on investments of time, forethought, skill, and faith rather than on investments in cash. As a land-user thinketh, so is he."—*R. S. Campbell*, Southern Forest Exp. Sta., New Orleans, La.

Conservation and Nevada—A Textbook For Use in the Public Schools of Nevada

By S. S. Wheeler *et al.* 131 pp. Illus. State Printing Office, Carson City, Nevada. 1949.

This new high school text is designed to improve the conservation curriculum in Nevada schools. It is dedicated "To

the youth of Nevada—who must study today to become the conservationists of tomorrow."

The introduction is by S. S. Wheeler, Chairman of the authorship committee and Director of the Nevada Fish and Game Commission. It traces the path of exploitation of our natural resources and poses the problem of conservation.

The content is suggested by the eight chapter headings. Chapter one, entitled "The Great Basin", is on the geologic history of Nevada. Also mentioned are a number of interesting natural phenomena and facts of biology peculiar to Nevada. This Chapter was written by R. G. Miller, formerly Director of the Nevada State museum.

The importance of soil and the kinds of soils in relation to physical features, irrigation, and cropping practices are discussed under the heading of "Conserving Nevada Soil Resources." The author, George Hardman, State Conservationist, U. S. Soil Conservation Service, discusses efficient use of water, and land conservation through reclamation of alkali lands.

In Conserving Nevada Water Resources, H. A. Shamberger, Assistant State Engineer includes the water cycle, watersheds, engineering structures, stream flow, snow surveys, ground water and water law.

Conserving Nevada Forests, is ably handled by District Ranger E. A. Hanson, U. S. Forest Service.

The chapter on Conserving Nevada Livestock Ranges begins with the mustang and traces the rise of the range livestock industries. Present conditions, including feed and forage balance, range plant environment, and grazing influences follow. The concepts of range condition and the use of range condition indicators are given the student as an approach to his responsibility for better management. Need for protection of range soils through proper use, fire control, and artificial reseeding are followed by statements of the necessity and possibilities for improved management. The chapter was written by J. H. Robertson, a charter member of the American Society of Range Management.

Conserving Nevada Fish and Wildlife is by S. S. Wheeler. The chapter covers the importance and natural history of many Nevada fish, game animals, and upland game birds. There are sections on conservation of waterfowl, song birds, reptiles and furbearing animals. Predators are discussed.

The book is concluded with an explanation of sportmanship and game conservation.

A short list of references follows each chapter. Previously published contour, precipitation, irrigation aud growing season maps of Nevada are among the 56 unnumbered figures. A map of the Great Basin by Extension Forester Don M. Drummond, who served as editor of the book shows the boundaries of prehistoric lakes, Bonneville and Lahontan. The illustrations doubtless deserve much of the credit for the quick reception of this book. It is being used in various high school classes, e.g., Nevada history, civics and biology.

This text was sponsored and issued by the Nevada State Department of Public Instruction for free distribution to Nevada schools. However, a few copies are available to other persons vitally interested in developing conservation education. Requests may be addressed to the Nevada Fish and Game Commission, Box 678, Reno, Nevada.—*Jos. H. Robertson*, Associate Professor of Range Management and Agronomy, University of Nevada, Reno, Nevada.

CURRENT LITERATURE

Prepared by Grant A. Harris, *Range Conservationist,* Northern Rocky Mountain Forest and Range Experiment Station, 157 South Howard St., Spokane 8, Washington.

Members are invited to submit references for inclusion in the current literature section. The national periodicals are being covered. However, it seems desirable to include references in local, state, and regional publications. Attention should be given to correct spelling of authors' names, and correct enumeration of volume, number, and pages of the reference. For proper form, note the references given in this issue. Send material to Grant A. Harris.

RANGE PLANTS: *Forage value, chemical composition, ecology, physiology, systematics*

ALBERTSON, F. W. Man's disorder of nature's design in the Great Plains. A presidential address. Trans. Kansas Acad. Sci 52(2): 117–131. Illus. 1949. —An ecological survey of what man has done on the High Plains and some suggestions as to what can be done about it.

ARNOLD, J. F. Changes in ponderosa pine bunchgrass ranges in northern Arizona resulting from pine regeneration and grazing. J. Forestry 48: 118–126. Biblio. February 1950.

BARTLETT, M. S. Determination of plant densities. Nature (London) 162(4120): 621. 1948—Reaffirms that the most efficient size of quadrat is with about 20 percent absence (product of quadrat size and plant density about 1.6; there is reasonable efficiency from 0.7 to 3).—Roland Walker.

BEETLE, ALAN A. Buffalograss—native of the shortgrass plains. Wyoming Agri. Expt. Sta., Laramie, Wyo. Bull. 293, 31 pp., illus., biblio. March 1950.—A rather complete discussion of the characteristics and qualities of Buffalograss. Includes a bibliography of 177 references.

BEETLE, ALAN A. Range condition classes on the Laramie Plains, Wyoming. Wyo. Agri. Expt. Sta., Laramie, Wyo., Circ. 37, 7 pp., tabs., biblio. April 1950.—Classifies range into four condition classes on the basis of kind of cover, amount of cover, type and amount of erosion, litter, and plant vitality.

BILLINGS, W. D. The shadscale vegetation zone of Nevada and eastern California in relation to climate and soils. Amer. Midl. Nat. 42(1): 87–109.

BILLINGS, W. D. Vegetation and plant growth as affected by chemically altered rocks in the western Great Basin. Ecol. 31(1): 62–74, tabs., illus., biblio. January 1950.—The presence of isolated patches of ponderosa pine is related to the presence of certain volcanic rock as soil parent material.

BLAZER, R. E. AND N. C. BRADY. Nutrient competition in plant associations. Agron. Jour. 42(3): 128–135, tabs., figs., biblio. March 1950.—There is strong competition between grasses and legumes, in mixtures, for the available potassium especially where soil potassium is low. In a

mixed association, addition of nitrogen fertilizer increased growth of grasses at the expense of the legumes, while addition of potassium stimulated growth of legumes but not grasses.

BOUYOUCOS, G. J. AND G. A. CRABB, JR. Measurement of soil moisture by the electrical resistance method. Ag. Eng. 30(12): 581–583, fig., biblio. December 1949.—Paper presented before the A.S.A.E. describing the theory and use of plaster of Paris and nylon blocks for the electrical determination of soil moisture. A bibliography of 50 references is presented.

BOYKO, H. On the climax-vegetation of the Negev with special reference to arid pasture problems. Palestine Jour. Bot., Rehovot Ser. 7: 17–35, tabs., figs., illus., biblio. 1949.

BOYKO, H. On the climatic extremes as decisive factors for plant distribution. Palestine Jour. Bot., Rehovot Ser., 7: 41–52, tabs., illus., biblio. 1949.—The intensity and frequency of occurrence of extreme climatic conditions have important influences on the distribution of plants near the borders of their range.

COUPLAND, R. T. Ecology of mixed prairie in Canada. Nebr. U. Abs. Doct. Diss.10: 31–38. 1949.

DOUGLAS, LYNN H. The bunchgrass fetish. Amer. Cattle Prod. 31(10): 9, 10, 32, 33, illus. March 1950.—Climax bunchgrasses are poor range plants. They must be "babied" or they are readily eliminated. They are poor or worthless in the fall or winter. They are not used in reseeding programs, which makes another case against them. "Range ecologists have never ceased to marvel at the apparent contradiction in nature of the climax bunchgrass being replaced by a better and more resistant grass." "If all of the bunchgrasses (Colorado-Wyoming region) could be replaced by Kentucky bluegrass the livestock industry and the watersheds of the mountains would be greatly benefited." "It regrows rapidly when grazed and it makes a fine sod as it does in lawns."

GRAY, BOB. Crimson clover—winter grazing. Cattleman 37(1): 22, 52, 54, illus. June 1950.—Crimson clover winter pasture in Texas.

HARNESS, JOHN R., JR. The mystery of trace elements. Soil Conserv. 15(12): 282, 283. July 1950.—Addition of certain "trace elements" to soils lacking them holds promise of greatly increasing nutrient quality and yield of crops. "Twenty-five cents worth of mineral adds as much as $35 per acre to the value of the pasture," on some Australian land. Consult local technicians before spending much money for "shotgun" mixtures.

HOLT, E. C. AND R. C. POTTS. Yield and adaptability of some cool season grasses at the Brazos River Field Laboratory, 1948–1949. Tex. Agr. Expt. Sta. Progress Report 1205, 3 pp. December 1949.

HUBBARD, WM. A., Results of studies of crested wheatgrass. Scientific Agri. 29(8): 385–395, illus., tabs., biblio. August 1949.

KNOWLES, R. P. AND W. J. WHITE. The performance of southern strains of brome grass in western Canada. Sci. Agri. 29(9): 437–450, tabs., biblio. September 1949.—Southern strains produced as much forage but less seed than northern strains when both were tested in western Canada.

MARKS, JOHN BRADY. Vegetation and soil relations in the lower Colorado Desert. Ecology 31(2): 176–193. April 1950.

MILLIN, RICHARD B. Observations on sagebrush succession. Nat'l. Woolgr. 60(4): 19, 37., biblio. April 1950.—Big sagebrush may be crowded out by grass (especially western wheatgrass) under certain conditions.

NORRIS, J. J. Effect of rodents, rabbits, and cattle on two vegetation types in semidesert range land. N. Mex. Agri. Expt. Sta. Bull. 353, 23 pp., biblio. January 1950.

PLUMMER, A. P. AND J. M. FENLEY. Seasonal periods for planting grasses in the subalpine zone of central Utah. U. S. For. Serv., Intermountain Forest and Range Expt. Sta., Ogden, Utah, Research Paper No. 18. February 1950.—Best seasons of planting, listed in order of greatest success, are as follows: late spring, early summer, early spring, late fall, late summer, and early fall. Seedlings from fall plantings were damaged by frost heaving and other effects of winter.

RECHENTHIN, C. A. Range grasses. Cattleman 36(7): 94, 95., illus. December 1949.—The first in a series of articles on important range grasses. This article is an introduction to the series and discusses range grasses in general.

RECHENTHIN, C. A. Range grasses. Cool season grasses—wildryes, wheatgrasses, Texas bluegrass, Texas wintergrass, sleepygrass, fescuegrass, smooth brome, melic grass. Cattleman 36(11): 73–77, illus. April 1950.

RECHENTHIN, C. A. Range grasses—the lovegrasses. Cattleman 36(12): 24, 26, 28, 30, 32, illus. May 1950.—Lovegrasses are becoming increasingly more important in the Southwest.

RECHENTHIN, C. A. Range grasses—the dropseeds are important in the Southwest. Cattleman 37(1): 26, 28, 30, 32, 34, 36, illus. June 1950.

STARK, R. H., A. L. HAFENRICHTER, AND W. A. MOSS. Adaptation of grasses for soil and water conservation at high altitudes. Agron. Jour. 42(3): 124–127, tabs., biblio. March 1950.—Experiments were conducted on abandoned wheat land at the Tetonia Branch Station of the Idaho Agricultural Experiment Station. Eleven species were tested. Big bluegrass, pubescent wheatgrass, smooth bromegrass, Fairway crested wheatgrass and intermediate wheatgrass were found best for restoring organic matter to the soils. Sherman big bluegrass produced the highest total yield and greatest increase in soil organic matter. Other conclusions.

SULLIVAN, J. T. AND V. G. SPRAGUE. The effect of temperature on the growth and composition of the stubble and roots of perennial ryegrass. Plant Physiol. 24(4): 706–719. 1949.—Perennial ryegrass plants were clipped at a height of 1.5 inches above the surface of the soil and allowed to recover under controlled environmental conditions.

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WARE, GEORGE H. AND WM. T. PENFOUND. The vegetation of the lower levels of the South Canadian River in central Oklahoma. Ecology 30(4): 478–484, illus. 1949.

WEAVER, J. E. AND R. W. DARLAND. Soil-root relationships of certain native grasses in various soil types. Ecol. Monographs 19(4): 303–338, illus., tabs., biblio. October 1949.—The soil monolith method of studying grass roots was used to get informa-

tion on root relationships in various prairie soils.

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RANGE AND PASTURE MANAGEMENT: *Management plans, surveys, utilization, maintenance*

AAMODT, O. S. AND D. A. SAVAGE. Cereal, forage, and range problems and possibilities in Alaska. USDA A.R.A. Misc. Pub. 700, Report on Exploratory Investigations of Agricultural Problems of Alaska, p. 87–124, illus. 1949.

BEAR, FIRMAN E. et al. Hunger signs in crops. Amer. Soc. of Agron. & Natl. Fertilizer Assoc. 390 pp., revised edition. 1949.

BRASINGTON, J. J. Forest grazing in south Alabama and west Florida. Forest Farmer 9(3): 8. December 1949.

DOTZENKO, ALEX AND GILBERT H. AHLGREN. Response of alfalfa in an alfalfa-bromegrass mixture to various cutting treatments. Agron. Jour. 42(5): 246–247, biblio. May 1950.—Cutting earlier than 1/10 bloom reduced the yield of alfalfa in an alfalfa-bromegrass mixture.

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PITTMAN, D. W. AND R. F. NIELSON. Mountain meadows respond to proper management. Farm and Home Sci. (Utah Sta.) 11: 10 11, 21. March 1950.

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SMITH, LLOYD F. Timber density important factor in forest grazing. Mississippi Farm Research 12(12): 6, 8, illus. December 1949.—Density of timber stand was the most important influence on forage production in long leaf pine stands at McNeill, Mississippi.

U. S. FOREST SERVICE. Questions and answers about grazing on national forests. U. S. Dept. of Agri. AB ✱9, 18 pp. 1949.—Forest Service grazing policies on national forests.

WHITE, W. T. Erosion on mountain pastures in Italy. Soil Conserv. 15(10): 230–232, illus. May 1950.—Erosion is very common on Italian mountain pastures, especially on the dry meadow and grass-timber meadow types. The wet meadow type is generally less eroded. Suggested remedial practices include: application of good grazing practices, action to build up organic matter, reseeding of certain areas, development of water, and frequent shifting of night corrals.

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RANGE IMPROVEMENT: *Natural and artificial revegetation, noxious plant control, mechanical improvements*

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ALLEN, C. E. A comparison of two types of crested wheatgrass (Agropyron cristatum) pellets. Assoc. Off. Seed Anal. Proc. 39: 73–74. 1949.

BARNARD, D. M. An evaluation of pellet seeding as it applies to range land. Wyo. Range Mangt. 21, 6 pp., (Abstract of Ms thesis.) March 1950.—Range forage plant seeds have been variously coated with clay, a mixture of glue, feldspar and fly ash, colloidal montmorillonite, calcium carbonate, gelatin capsules, powdered sugar, and other materials, in an attempt to increase individual seed weight and thus improve distribution characteristics of the small, light seeds. Special ingredients such as bird, rodent and insect repellents, plant stimulants, fertilizers, and pH buffers were added to assist the seed to germinate and the seedling to grow. To date, seedings made with pelletized seed have not been as successful as check seedings made with naked seed. Only the clay pellets have been widely planted in field trials and results with these have been markedly unsuccessful. In tests it was found that crested wheatgrass dropped from a germination of 86 percent before pelleting to 14.7 percent afterward. Pellets do not penetrate the soil on unprepared seedbeds, such as most ranges present.

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BEATH, O. A. Death stalks the range. Rec. Stockman, Am. Ed. (1950) 60

(52): 56, 57, 78. December 1949.—Discusses poisonous plants.

BLAISDELL, J. P. Effects of controlled burning on bitterbrush on the Upper Snake River plains. U. S. Forest Service, Intermountain Forest & Range Exp. Sta., Ogden, Utah, Research Paper No. 20, 3 pp. April 1950.

CALDWELL, THOMAS AND JOSEPH F. PECHANEC. The brushland plow. U. S. Forest Service, Pacific Northwest For. & Range Expt. Sta. Research Note No. 64, Portland, Oregon. Illus., drawing. May 1950.—The brushland plow is a disk type plow, with pairs of disks independently sprung, which allows the implement to pass over obstructions with a minimum of breakage. It is designed for use on rocky, brush-covered range.

ELAM, F. L. From sage brush (Artemisia) to pasture. West. Livestock J. 28(11): 34, 46, 48, 50. January 1950.

ELWELL, H. M., AND M. B. COX. Brush control research at the Red Plains Conservation Experiment Station; progress report, 1950. Okla. Agri. Expt. Sta. Mimeo. C. M-192, 7 pp. February 1950.

GALVIN, P. J. Brush and the reconquest of Texas. Tex. Livestock J. 9(3): 4, 31–32. March 1950.

GARDNER, J. L. Effects of thirty years of protection from grazing in desert grassland. Ecol. 31(1): 44–50, tabs., illus., biblio. January 1950.—Observations made near Silver City, N. Mex. indicate that protection from grazing since 1918 has increased grass density 110 percent, but changed species composition very little on the upland type. Gullies are healing under protection.

GRIGSBY, B. H. AND E. D. FARWELL. Some effects of herbicides on pasture and on grazing livestock. Mich. Agri. Expt. Sta., Quar. Bul. Vol. 32(3): 378–385. February 1950.

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HARRIS, G. A. Brush problem on Ferry County grazing lands. (Abs.) Northwest Sci. 24: 33. February 1950.

HINTZ, H. L. Range program will be expanded; brush burning averages $1.75 per acre; good start has been made in returning overgrown land to useful production. Calif. Wool Grower 36(7): 4. February 1950.

HOLTAN, H. N. Sealing farm ponds. Ag. Engineering 31(3): 125–130. March 1950.

LAMBERT, D. W. ET AL. Devitalization of cereal and weed seeds by high frequency. Agron. Jour. 42(6): 304–306. Figs., illus. June 1950.—The authors attempted to kill weed seeds contaminating cereal grains, without harming the germinative powers of the grains. This was done by exposing weed and grain seeds to high frequency radio waves. However, both weed and grain seeds were killed in the frequency ranges tested. This method may have application in range weed control after it has been developed further.

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NEWS AND NOTES

Land Ownership Carries A Public Responsibility

A two-line decision handed down by the United States Supreme Court affirms a principle of vast importance to our country's security and progress. The ruling simply upheld the constitutionality of a law enacted by the State of Washington to conserve its forest resources, a law based upon the premise that land ownership involves a trusteeship for the common weal.

The state's Supreme Court, in the course of a memorable opinion, declared:

"We do not think a state is required to stand idly by while its natural resources are depleted. High authority supports our view. Edmund Burke once said that a great unwritten compact existed between the dead, the living and the unborn. We leave to the unborn a colossal financial debt, perhaps inescapable, but incurred nonetheless in our time and for our immediate benefit. Such an inviolate compact requires that we leave to the unborn something more than debts and depleted natural resources . . . Surely, where natural resources can be utilized and at the same time perpetuated for future generations, what has been called 'constitutional morality' requires that we do so."

This decision, now endorsed by the nation's highest tribunal, is noteworthy . . . for its application to the field of forest conservation. How far can government go in protecting a natural resource without which our prosperity and eventually our civilization would be lost? The logical answer is, it can go as far for this purpose as it does for the prevention of any obvious hazard to public safety, public health and human life.

Forests are much more than a source of material wealth. They are indispensable safeguards to soil and water and, therefore, to agriculture, industry and the entire structure of civilized living.—Editorial, Atlanta Journal.

Navajo Sheep Improvement Extended to Guatemala

The U. S. Department of Agriculture has set up a cooperative project with the Ministry of Agriculture of Guatemala to improve breeding and management of native sheep whose long coarse wool is important to the Indian handicrafts of that country.

Animal husbandmen in charge of the work expect to apply the 14 years of experience gained by the Departments of Agriculture and Interior in improving similar sheep of Navajo Indians in southwestern United States. The Guatemalan project is one of a number in which this Department is participating, under its program of technical cooperation in agriculture with foreign countries.

The sheep improvement work is being carried out under the direction of Guatemala's cooperative agricultural station of which Rolland C. Lorenz is director. Dr. Robert L. Squibb is in charge of the sheep project. Both U.S.D.A. scientists are stationed in Guatemala.

As an early step in getting the project started, the station has imported four high-quality cross-bred rams from the

Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, New Mexico, a cooperative research agency of the Bureau of Animal Industry of the Department of Agriculture and the Indian Service of the Department of the Interior.

These animals incorporate characteristics of native Navajo sheep, mixed with selected lines of Lincoln, Cotswold, Corriedale, and Romney. They are representative of the improved stock emerging from breeding developments at Fort Wingate, where work is aimed at increasing yield and quality of wool from sheep of the Navajo Indians of Arizona, New Mexico, and Utah. Like the Indians of Guatemala, the Navajos are recognized for their hand-weaving ability, and they share a similar problem of obtaining enough long coarse wools for their looms. The Navajo and Guatemalan sheep are similar in that both are descended from stock brought to the Americas by early Spaniards.—From Office of Foreign Agricultural Relations. U.S.D.A.

J. Byron Wilson of McKinley, Wyoming received an honorary doctor of laws degree at June commencement exercises of the University of Wyoming. Mr. Wilson has served more than 30 years as secretary of the Wyoming Wool Growers' Association and has been a tireless worker for the advancement of the wool growing industry in Wyoming and the nation. He was one of the leaders who secured the Wyoming Truth in Fabric Law, which became the pattern for the National Wool Labeling Act of 1940. He helped organize the Wyoming Wool Marketing Association and in founding the American Wool Council, an organization in which the sheepmen, manufacturers and the merchants all work together. Mr. Wilson is a member of this Society and the Wyoming Section.

Truman Discusses Flood Control Act

In identical letters dated May 19, 1950, to the Departments of Agriculture, the Army, Commerce, and Interior, and to the Federal Power Commission, and to the Federal Security Agency, President Truman discussed the River and Harbor and Flood Control Act of 1950.

"The procedure authorized by the Act is in lieu of a special study commission included in earlier versions of the bill, which would have been preferable. It is significant, however, that for the first time there is specifically recognized in legislation of this type the need for a broad-scale study of the multiple uses of the land and water resources of a river basin. It is essential that the Executive agencies organize their efforts to realize, as far as possible under existing law, the potentialities of the broad-scale, integrated resources study for the Arkansas-White and Red River Basins authorized (in the Act). . . ."—Natural Resources Committee.

Colorado Range Conditions

Field conditions up until the last few days (July 21) have been a repetition quite parallel to our drouth year of 1934. The entire southeastern section of our state, according to the reports of field men, rangers, and livestock men, has been in a most critical condition so far as concerns range and range feeds. It has been necessary for many of our people in this section to reduce their herds, others have sold outright, and a goodly number have shipped their stock to adjacent sections of the state or into western Kansas. In such instances where Kansas pastures are utilized, it is reported that wheat lands, due to weather conditions, will produce better pasture and forage than grain crops.

A late start of feed is definitely curtailing overall carrying capacity of ranges in the central eastern and northeastern

sections. High altitude ranges are nearly normal. Having just returned from along the Colorado-Utah border I am in no position to brag about the appearances of our winter range. Unless sufficient seasonal moisture is our good fortune there will definitely be a shortage, particularly in the desert and semi-desert areas.—*J. D. Hart*, Colorado Game and Fish Commission.

A Plea for More and Larger Range Demonstration Plots

Realistic range management is handicapped by the honest differences in judgment between people having responsibility for use and management of land. This is more generally true as between range users and officials of land managing agencies, but there are often differences between professional range managers themselves. In my humble opinion, most of us have our sights set too low, so far as the objective of optimum resource conditions are concerned. The reason is that our appraisals of conditions are relative and are based too much on comparison with conditions which for several decades we have been seeing all around us. Few people now living have seen really good land conditions. Anything that will help develop positive facts as to potentials of the land should be welcomed by all concerned. In my experience, fenced protected plots have been most helpful guides. By follow-up observations over several years they reveal what the conditions can be as to plant density, composition, vigor, growth and yield, mulch cover, water absorbing capacity of the soil, soil temperatures and other related factors. These plots also indicate how much time is required to bring about substantial resource repairs; and, finally, how much grazing use they will stand and yet keep the trend upward.

The small one-fourth to one acre plots which several land managing agencies have are helpful but they fall far short of furnishing all the useful information that can be had. As soon as small protected plots within areas of depletion begin to gain in vegetative cover, they attract rodents, birds, and insects to an extent that materially retards full recovery. There also is usually a much heavier population of field mice and a concentration of use by birds. This excessive use by rabbits, mice, and birds results from the "slim pickings" in the way of food on the more severely depleted adjacent land.

Protected plots of from 50 to 200 or more acres are much more satisfactory than smaller plots (Fig. 1). These larger plots can be placed so as to take in a greater variety of slopes, exposures, soils, and other situations. The larger areas are affected much less by disturbing outside influences. One important advantage of the larger units is that after vegetative recovery is definitely and substantially on its way they can be stocked with grazing animals. The stocking should be on a sufficiently conservative basis so that vegetative gains will be continued.

Representatives of public land managing agencies have many tough and difficult problems. Too often a job that starts out with analysis of range and land resource conditions turns into disagreement and controversy. The considerations of conditions and trend become eclipsed by human differences in judgment. The differences are usually widest where the problem is one of repair of damaged land resources rather than maintenance management of conditions already satisfactory. For these reasons it is imperative that both public land managers and users be as nearly right

in their analysis of conditions and prescribed remedial treatment as is humanly possible. We need every dependable guide that can be had. In my opinion, the most reliable evidence we can have is inside large fenced protected plots. I base this statement on personal experience with a dozen or more plots, each forty acres or larger. Their value increases with age.

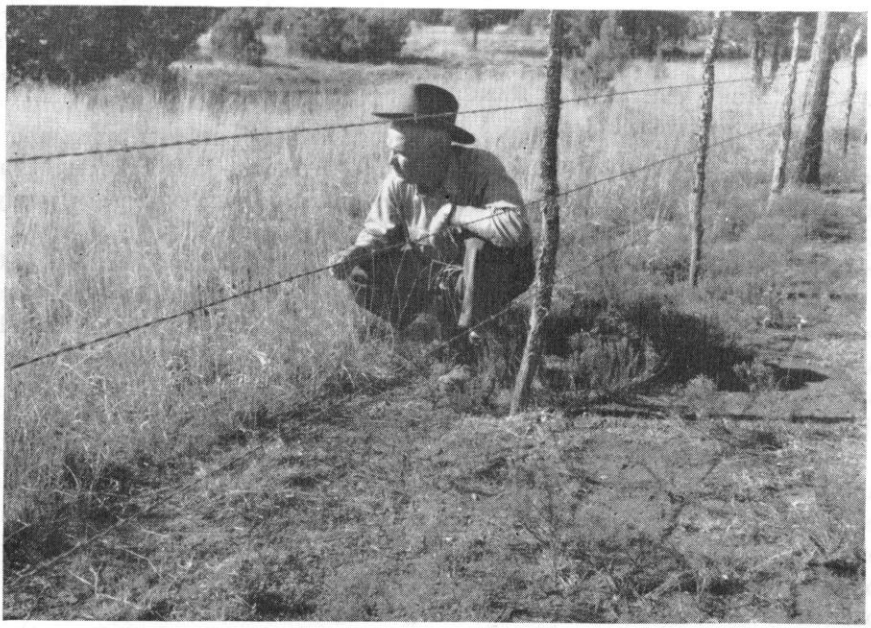

FIG. 1. Fence-line facts of life, in central Arizona. Same soil, same slope and same rainfall inside and outside of large enclosure. Good grass yield on protected area at left; mostly snakeweed on overgrazed area at right.

In summary, the factual information which protected plots—particularly the larger ones—produce includes: (1) What period of protection is required to get resource repairs *started* on damaged lands. (2) We eventually find out what the optimum conditions of vegetation density, plant vigor, and soil stability can be. (3) The forage yield from healthy land and vigorous plants as compared to yield from sick plants on starved land is revealed. (4) By stocking the plots after recovery is well started, information is developed as to what degree of grazing use they will stand and yet keep the trend upward.

There is a definite self educational value in large range plots. They true up our conceptions, make us more realistic, and give us a measure of needed confidence. They are convincing to the public and create a faith in our objective.

—*F. Lee Kirby*, Forester. U. S. Forest Service, Denver, Colorado.

CONSERVATION FIELD DAY IN TEXAS

The annual conservation field day on D.C.O. Wilson Ranch near Fort McKavitt was attended by some 225 ranchers and range conservationists. The day was sponsored by Wilson in cooperation with the Eldorado Divide SCD.

The days activities included a barbecue lunch, a demonstration by the SCS

rain making machine used to check infiltration rates, and a tour over Wilson's Ranch. Short talks were made by Dave Foster, Ben Osborn, and E. B. Keng, of SCS, and Dr. V. A. Young from Texas A & M. Bill Roundtree, Work Unit Conservationist at Eldordo, did a good job as Master of Ceremonies.—Harold F. Heady.

Which End of the Grass is the Best Feed

Whether the tip or oldest part of a grass blade is higher in feeding value than the tender yellow young growth next to the stem or crown bud is a disputed point. The grass grows upward from the bud, hence the youngest part is nearest the bud. Generally, the cow gathers both parts when she grazes.

Chemical analysis of little bluestem shows that crude protein is highest in the leaf tips and potassium is highest in the new growth. Calcium content is about the same for both ends of the leaf. Phosphorus content is variable, indicating a freer movement of phosphorus within the plant.

The percent of phosphorus is progressively lower from flower to basal stem at flowering time. When the grass blooms, phosphorus is scarified by the remainder of the plant to further flowering and seed development. After seed development, much of the plant's phosphorus is transferred to the roots and stored to start grass growth the next spring.—*M. F. Wichman*, Soil Conservation Service, Fort Worth, Texas.

Texas Annual Range School Held

The annual range school for county agents and vocational agricultural teachers in Texas was successfully held June 24 to July 14. The group of 29 men were under the supervision of Dr. V. A. Young and Dr. O. E. Sperry of the Range and Forestry Department, A & M College of Texas. They listened to class work and to field demonstrations over this period of three weeks, also studied basic ecology and agrostology, and visited many ranches. On these ranches they reviewed the management program that had been followed and discussed in each case ways and means of improving range management.—Harold F. Heady.

Water Conservation

"In thinking about food, let us start with the one essential ingredient: water. In thinking about soil conservation, let us start with the element which is the greatest friend or the most ruthless foe of soil formation: water. And in thinking about water, let us start, not at the tap or at the river-mouth, but away back where the flow begins, on the mountain tops and hillsides. . . .

"Conserving water nature's way is no mean objective. To unriddle the subtle aspects of the soil-water-plant-animal complex offers the natural science an exciting cooperative adventure. To persuade men of the wisdom of cooperation and forward-looking, slighting their immediate good for the good of all, is an objective worthy of the best in the social sciences. To deal wisely with the varying needs of agriculture and industry in the present and for the future: that is a challenge to governments worthy of the best that is in them."—Excerpt from Monthly Letter of the Royal Bank of Canada, March 1950.—*in* Outdoor News Bulletin.

Superior Service Award

Reed W. Bailey, Director of the Intermountain Forest Experiment Station of

the U. S. Forest Service, received the Superior Service Award at the annual presentation of the U. S. Department of Agriculture Honor Awards in Washington, D. C., May 25. The award was given for creative thinking and dynamic leadership in research in watershed management, especially in the fields of range land rehabilitation and flood and erosion control.

Michigan School of Natural Resources

The world's first School of Natural Resources will be established at the University of Michigan in the fall. President Alexander G. Ruthven announced that it will expand the activities of the present School of Forestry and Conservation which it will replace. "Through the new school, teaching and research will be widened to consider everything which nature had placed on, under and over the earth in their relation to man." Conservation eduction will occupy an important place in the new school under provision of a ten-year $100,000 grant from the Charles Lathrop Pack Forestry Foundation of which Randolph G. Pack, of New York City, is president.

The grant provides for an additional faculty member, the Pack Professor of Conservation, who will develop comprehensive graduate and undergraduate programs in the conservation of natural resources along much broader lines than those traditionally followed in the train- of the forester, wildlife manager or other other specialists. Dr. Stanley A. Cain, now in charge of botanical research at the Cranbrook Institute of Science has been appointed to this position.

Natural Resources Council Meeting

The Natural Resources Council of America scheduled a meeting October 2 and 3 at the Tennessee Valley Authority headquarters, Knoxville. The agenda included a proposal to adopt "A platform and suggested plan of action for the scientific use and development of natural resources."

Great Plains Soils

B. T. Shaw, deputy administrator of the Agricultural Research Administration, said recently, while discussing soil fertility in the Great Plains and future "Dust Bowl" possibilities at a Secretary's staff conference, that no system of farming there in use would maintain soil fertility and there was none on the drawing boards. Soils cropped continuously to wheat have lost a quarter of their organic matter, to small grains and fallow 35 percent, and to row crops or row crops and fallow one-half. The soil holds its own while in grass but goes downhill each time it is plowed for a crop. The stubble-mulch system halts wind and water erosion losses but not the decline in organic matter—nor does plowing under green manure crops.

Until about a decade ago this loss in organic matter had little influence on yields for there was still sufficient soil fertility to balance the available moisture supply. Moisture supply is still the main factor, but soil fertility is now limiting yields of most crops in years of above-average rainfall and of some crops, like grass seed, in all years. What we have learned about the use of fertilizers in humid regions and under irrigation is not applicable in the Great Plains. We have hopes of working our way out of this dilemma but the road is long and the research budget is limited.—USDA Employee News Bulletin, May 22, 1950.

Soils and Wildlife in Missouri

In animal husbandry, it has been repeatedly shown that with the application of lime, phosphate and other fertili-

zers, response by animals has been shown: (a) by their choice in grazing of the treated soils first; (b) by their greater gains or young animal growth on forages from fertilized soils; and (c) by better reproduction on treated soils.

With the evidence we have at hand on various wild forms including the rabbit, (also raccoon, muskrat, opossum, and squirrel), the response to fertilized soils appears to be much the same as domestic livestock. In making practical application of these facts, it is possible to increase population levels and quality of game species by raising fertility levels of the land, providing other habitat conditions are not allowed to deteriorate.

These and similar evidences of the effect of soil upon game populations and quality indicate the desirability of a deeper perspective regarding the intricacies of land-wildlife relationship. We are becoming increasingly aware of what good nutrition means to humans, domestic animals and plants—and wild animals are no exception. As studies continue to disclose facts, the knowledge will eventually form an even more substantial basis for the statement, "As our soil goes, so goes wildlife."—Bill T. Crawford *in* Journal of Wildlife Management April 1950.

Wildlife Conference

The Wildlife Management Institute has called for papers for presentation at the Sixteenth North American Wildlife Conference, which will be held next March 5, 6, and 7, in Milwaukee's Hotel Schroeder. The program is being planned around the general theme "What is wildlife worth to you?" The deadline for acceptance is November 15.

Forage Resources of Alaska

Native grasses and many other range forage plants are widely distributed in Alaska, even north of the Arctic Circle. Grasses occur sparingly in the vast stretches of sedge-dominated tundra in northern and northwestern districts, becoming successively thicker and more thrifty from the Arctic Circle southward and from higher to lower elevations. Native grasses make quick growth and mature early, but they deteriorate rapidly with the advance of the growing season. Cutting or pasturing the native grasses year after year quickly depletes the stand. Overgrazing kills all the plants and starts wind and water erosion of the soil.

The grasses grow surprisingly fast, tall, and vigorously on nearly all open areas of well-drained or partially drained soils, but a dense covering of other vegetation often insulates and holds the permanent ice layer or cold soil zone near the surface and retards grass development.

Efficient use of the ranges and tame pastures of Alaska depends upon the development and preservation of adequate winter feed supplies. This is the principal problem confronting the livestock producer. It can be solved best through the use of trench silos, but much needs to be learned about the combination of forage crops that gives the highest yield and most nutritive silage.—*from* Report on Exploratory Investigations of Agricultural Problems of Alaska (USDA Misc. Pub. No. 700).

Science Foundation

The President has signed the bill establishing a National Science Foundation. The Director of the Foundation, to be appointed by the President with the advice and consent of the Senate, is responsible to the President. A board of 24 members, eminent in basic science, medical science, engineering, agriculture, education, or public affairs, is also to be

appointed by the President with the advice and consent of the Senate. Authorization is for the appropriation of 15 million dollars annually.

Functions of the Foundation will be to support basic research through contracts, grants, or fellowships; to evaluate the Federal research program; and to act as a central clearing house on scientific personnel. It will have four major divisions—medical research; mathematical, physical, and engineering science; biological science; and scientific personnel.

In Memoriam

Enoch W. Nelson, member of the Colorado A. & M. College Forestry faculty since 1936, died June 25. He had been in failing health for some time but had finished the spring term at the college and on June 13 attended a forestry—range field day.

A native of Iowa, he spent his boyhood at Lincoln, Nebraska. He received a bachelor's degree in forestry from the University of Nebraska in 1913 and two years later a master's degree in plant ecology. He was appointed an assistant in experimental agronomy at the University for the 1916–17 term while he studied for a doctorate. At the end of that term he enlisted in the 10th Engineers, a forestry unit. He served 18 months overseas with the 10th and the 20th Engineers, returning to the United States in 1919.

Following his discharge from the Army, he took a position with the U. S. Forest Service. He did range research and administrative work for the Forest Service in New Mexico, Arizona, and Utah until October 1933, when he joined the Montana State University faculty as associate professor of range management. While there he also was in charge of several range research projects.

Coming to Fort Collins in 1936 he established a grazing and range management department in the Experiment station. That department was later expanded into a teaching and research department in the forestry division. His major field was range and pasture management. He was the author of many articles based on research work he had done in range management and the rehabilitation of abandoned crop lands. His publications include a U.S.D.A. technical bulletin on the influence of precipitation and grazing upon black grama grass range, and co-authorship of a Station bulletin on restoring Colorado's range and abandoned crop land.

WITH THE SECTIONS

Arizona

Over 60 interested people attended the joint meeting of the Arizona Section of the American Society of Range Management and the Interagency Range and Livestock Committee held at the Fort Valley Experimental Forest near Flagstaff June 13 and 14.

The technical field of the range management agencies included the Forest Service, Bureau of Land Management, Agricultural Extension Service, the Soil Conservation Service, the University of Arizona, the Indian Service, the State Land Department and the Game Department. A dozen or more ranchers or commercial stockmen attended and four from financial fields.

The morning session on June 13 included five principal addresses dealing with important range problems: "Range problems of a northern Arizona ranch", John Babbitt, President of the Arizona Cattle Growers Association; "How far will the cow dollar stretch", John McLernon, Agricultural Advisor, Bank of Arizona; "Effects of fire on perennial grasses of the ponderosa pine woods", Harold Weaver, Area Forester, U. S. Indian Service; "Estimating perennial grass utilization on semidesert cattle ranges by percentage of ungrazed plants", Mack Roach, Southwestern Forest and Range Experiment Station; "Big game problems in the southwest", O. N. Arrington, State Game and Fish Commission.

The afternoon was given over to two panel discussions. "Range Improvement" was discussed by G. E. Glendening and Fred Lavin of the Southwestern Forest and Range Experiment Station, Joe Wagner of the U. S. Indian Service and A. L. Brown of the University of Arizona. The panel on "Range Condition" was made up of C. E. McDuff, U. S. Forest Service, Administration, J. F. Arnold, U. S. Forest Service, Research, J. S. McCorkle, Soil Conservation Service and R. R. Humphrey, University of Arizona.

June 14 was devoted to an all day field trip to observe reseeding and management practices and problems.

This stimulating meeting indicated how the local sections can provide the common ground upon which the technical workers and the practicing range and stock men can meet, and thus further the aims of the parent Society. The Arizona Farmer-Ranchman which covered the two-day meeting had this to say about the spirit, aims, and accomplishments of the meeting so excellently planned by R. R. Humphrey, chairman of the Section and University of Arizona range ecologist:

"Generally speaking, associations and their inevitable conventions and meetings waste more valuable time for people than any other activity in which they might indulge.

"We have to have organized groups representing special interests, I admit, but why can't all of them be as productive, as interesting and as valuable to the membership as the Arizona Section of the American Society of Range Management proved itself to be at its Flagstaff meeting June 13–14?

"It was nothing short of amazing the

amount of down-to-earth practical information the officers and committees of the Arizona Section managed to cram into the two-day session—information every cowman in the State needs to have, and all aimed directly for the cowman. Sure, there were many Forest Service, Soil Conservation Service and Extension Service men there, but from the beginning it was obvious that they were taking their hair down to give commercial stockmen the best answers they have to the knottiest problems of the range.

"This was the first meeting of the Society in Arizona since its organization early this spring, which explains why there were not more commercial stockmen on hand. Apparently they just haven't heard of the Society yet, or have put off joining on the theory that it was just another body of graybeards getting set to chew the same old cud. When the commercial men who were there spread the news of what went on at the meeting there will surely be a flood of applications for membership. . . .

"In some ways the field trip was the most valuable part of the meeting, for it was during the trip and the stops that ranchers put the test of practicality to the talks the experts had given the day before. . . .

"We recommend that every range stockman in the State join the Arizona Section, American Society of Range Management now and plan to attend the next meeting without fail."

President Savage sent to the Board of Directors on May 1 a request for approval of a student chapter at the University of Arizona. Officers of the student group are: Chairman A. Mark McKinney; Vice-Chairman Lawrence E. Perry; Secretary-Treasurer Richard Oxnam. Councilmen: H. H. Metzger, John R. Moser, Thomas N. Johnson, William L. Hunt, Vernon F. VanCleve. Faculty Advisor is Albert L. Brown, Department of Botany and Range Ecology, who is also Chairman of the Local Sections Committee of the Society.

Colorado

By the time the October issue of the Journal comes off the press this Section will have had its second annual summer meeting at the Manitou Experimental Forest. Members of the society will meet at the Experimental Station, out of Woodland Park, Colorado, and enjoy a tour of various studies and demonstrations. On Sunday morning, August 27, we are looking forward to a trip of nearby watershed areas under guidance of Forest Supervisor McKennan.

There is no reason to expect other than a good attendance in the face of the instructive and enlightening program that has been made available to us.

At the present time we are proud to report that we are rapidly approaching the 150 membership mark for the Colorado Section. We do report this with pride, because considering the geographical area of the state and the necessity for us to cross the Continental Divide to meet with each other on such occasions, it speaks high of the keen interest of the members both on the east and west slopes of the state,—*J. D. Hart*, Secretary.

Northwest

The first summer meeting and tour of this Section was set for August 18 and 19. The committee, of which Joe Oliver was chairman, planned a program that would be of interest to everyone concerned with forage and livestock production.

The tour was to include pasture studies: spring, summer forest range

allotment, and late fall—aftermath; grouping for fall and winter feeding; calf percent-weights; gunbarrel fire and reseeding.

The second day was to see work demonstrated at Squaw Butte Experiment Station: field work on sagebrush removal, chemical treatment—operation of Texas brush cutter, forage utilization and inventory, the corrals and grass nursery.

A plant identification contest for boys is included in future plans. C. E. Poulton heads the project committee.

The annual meeting of the Section is to be held at Yakima, Washington, November 13 and 14. John Chohlis is chairman of the arrangements committee, and Dr. A. L. Hafenrichter, chairman of the program committee.

Northern International Mountain

Another big step for furthering range management was taken April 29 when this Section was formally organized at Helena, Montana. The Section will devote itself to furthering understanding of range land-management problems, especially in the northern mountain area. 26 members participated in the meeting, despite an unseasonal snowstorm which blocked several roads.

One general meeting and one field meeting is planned for each year. The field meeting was scheduled for early September at Waterton Park, Alberta, and was to include a trip over ranges in the Alberta National Forest.

South Dakota

A request for approval of a South Dakota Section was made July 10 by President Savage to the Board of Directors. This group has been an active subsection of the Northern Great Plains Section and has expanded to the point where they felt justified in asking for formal recognition as a Local Section. The same officers that it had as a subsection will continue to serve the new Section.

The program adopted by the Section was as follows: Two botany field trips, the preparation of a herbarium that will be available for reference to all interested agencies, a tour for the study of range management problems, and an annual meeting for conducting the business of the section.

We were fortunate on May 19 of this year, in having in the area, Fred Renner, former President of the Society; Herb Schwan of the Forest Service at Denver; and Dr. E. J. Dyksterhuis, Chief of the Range Management Division of the Soil Conservation Service at Lincoln, Nebraska. A dinner meeting was arranged for at Custer, South Dakota. Thirty-two men were present and spent a very enjoyable evening in discussing range problems and experience.—*Henry P. Holzman*, Vice-Chairman.

Texas

This section hopes to have a meeting later on in the summer at which technical papers and discussions will be held.—*Harold F. Heady*, Chairman

SOCIETY BUSINESS

Candidates for Officers 1951

Chairman B. W. Allred and his nominating committee report the following fine roster of candidates for officers for the Society of Range Management for 1951. A biographical sketch of each candidate is included.

President

Daniel A. Fulton, Ismay, Montana
Arthur W. Sampson, Berkeley, California
M. W. Talbot, Berkeley, California

Vice-President

Waldo R. Frandsen, Portland, Oregon
L. A. Stoddart, Logan, Utah

Treasurer

Floyd D. Larson, Billings, Montana
C. Kenneth Pearse, Tucson, Arizona

Council Members (2)

A. P. Atkins, Guymon, Oklahoma
A. L. Hafenrichter, Portland, Oregon
Radford Hall, Denver, Colorado
E. R. Jackman, Corvallis, Oregon
Bruce Orcutt, Miles City, Montana

Candidates for President

Daniel A. Fulton, Ismay, Montana

Charter member, life member, past councilman, American Society of Range Management. Born 1904 and life to date spent on a ranch in southeastern Montana. Active in Montana Stockgrowers Association and Montana Woolgrowers Association. Chairman, Montana Grass Conservation Commission. Occupation and hobby, range management. Collects books on art and lore of western livestock trade.

Arthur W. Sampson, Berkeley, California

Better known as "Sammy", one of the "elder statesmen" of range management, earned his B.S., M.S., and Ph.D. at Nebraska, Johns Hopkins, and George Washington Universities. In 1907, the newly organized Range Research Branch of the U. S. Forest Service assigned him to the Wallowa Forest, Oregon. In 1912 he became director of the first range research station of the Forest Service, the Great Basin, in Utah. In 1922 he accepted a professorship of range management and ecology at the University of California, Berkeley, where he still is. He authored three texts on range management (a fourth now in press), and many bulletins and scientific papers. In 1948 he was a representative at the Pan American Scientific Conference, Denver, and in 1949 at the United Nations, Lake Success. He belongs to several scientific societies and is a life member of the American Society of Range Management.

M. W. Talbot, Berkeley, California

Associate Director, California Forest and Range Experiment Station, and in charge of its division of range research since 1931. Conducting and directing research on improvement and management of range and other wild lands. Born 1889 and reared on livestock and grain farm in western Missouri. Worked on cow ranch in western Colorado. Forestry degree, University of Missouri, 1913. Grazing reconnaissance, range studies and inspection, Southwestern District, Forest Service, 1913–1917. Lieut., field artillery, 1918. In charge, 1919–1923, range surveys in the southwest, and cooperative studies with stockmen on range forage plants, water supplies, salting, and grazing capacity. In charge, weed investigations of U. S., 1924–1930, Bureau of Plant Industry, Washington; field work in 29 States. Author of numerous publications on range ecology, range forage plants, principles of judging range and water shed conditions, efficient range utilization, and coordination of grazing with other land uses. Vice President of Society, 1950.

CANDIDATES FOR VICE-PRESIDENT

Waldo R. Frandsen, Portland, Oregon

Reared on a sheep and cattle ranch in Eastern Utah. Graduated from the Utah State Agriculture College in 1932, majoring in Animal Husbandry and range management. After death of father was manager of his ranch from March 1932 until May 1935. Joined the Soil Conservation Service May 12, 1935. Served as range conservationist in both field and regional offices. Author of numerous articles on range conservation. At present, Zone Conservationist at large, working on range conservation problems in Region 7, Soil Conservation Service (Oregon, Washington, Idaho, Nevada, California and Hawaii) since April 1946.

L. A. Stoddart, Logan, Utah

Born and reared on the plains of Southeastern Colorado, received the Bachelor's and Master's Degrees in Range Management at the Colorado A. and M. and the Doctor's degree in Plant Ecology and Soils at the University of Nebraska. Was range specialist in the regional office of the Soil Conservation Service in the state of Washington and came from there to Utah as head of the Range Management Department and Range Ecologist for the experiment station. Author of a number of articles and bulletins on range; also senior author of the book "Range Management". Has been on the editorial board for the Ecological Society and the Society of American Foresters and the first Journal Committee for the Range Society; was a councilman when the Society was founded. Is currently a member of the Agricultural Board of the National Research Council and a member of the American Society of Animal Production.

CANDIDATES FOR TREASURER

Floyd D. Larson, Billings, Montana

Raised on a ranch in central Utah. B.A. degree from Brigham Young University, with a major in music and a minor in English, followed by a B.S. degree from Utah State Agricultural College, with a major in Range Management and a minor in forestry. Experience: Forest Service: 3 seasons construction crew and fire guard at Pinedale, Wyoming and one season as CCC foreman. One season timber reconnaissance, Springerville, New Mexico. Soil Conservation Service: Three years range surveys in southwest and Northern Great Plains. One-half year as assistant in regional office at Rapid City, S. D One-half year as project manager at Pine Ridge, S. D.; One and one-half years as area range conservationist at Billings, Montana. Bureau of Land Management: Seven and one-half years, Chief, Branch Soil and Moisture Conservation, Billings, Montana.

C. Kenneth Pearse, Tucson, Arizona

Spent all of his working life in range and wild land research. Received bachelors degree in Plant Ecology from the University of Chicago in 1930 and his masters degree in Plant Physiology from the same institution in 1932. Received a permanent appointment with the Intermountain Forest and Range Experiment Station of the U. S. Forest Service in 1930. His first assignment dealt with determining the influences of plant cover, grazing, and climate on erosion and streamflow of the Boise river watershed in southeastern Idaho. From 1938 to 1943 he was in charge of range reseeding studies in Utah, Nevada, and Southern Idaho, and helped develop information on which extensive reseeding operations have since been based. He was made Assistant Chief of the Division of Range Research of the Forest Service in Washington in 1943. Since July 1948 he has been Chief of the Division of Range Research of the Southwestern Forest and Range Experiment Station, Tucson, Arizona.

CANDIDATES FOR COUNCIL MEMBERS
(Two to be elected)

A. P. Atkins, Guymon, Oklahoma

Early life was spent in Flint Hill section of Kansas. Was graduated from Kansas State College at Manhattan in 1924, with major in animal husbandry. Spent 26 years ranching in the Kansas Flint Hills and Oklahoma and Texas Panhandle. Has been active in furthering conservation on farms and ranges in Oklahoma for many years. Is president of the State Association of Soil Conservation Districts in Oklahoma. Is the author of a number of articles on conservation and development of farm and ranch resources.

A. L. Hafenrichter, Portland, Oregon

Chief, Regional Nursery Division, Soil Conservation Service, Swan Island, Portland,

Oregon. Ph.D.—Illinois, 1926. Investigator, Carnegie Institution of Washington, Division of Ecology 1926–1929; Assistant, Agricultural Experiment Station, State College of Washington, 1929–1933 (forage crops, crop ecology); Soil Conservation Service, U.S.D.A., 1933 to date. For details see: American Men of Science R.U.S. Publications include reports on study of native and exotic grasses and legumes for use in soil and water conservation; adaptation, culture, use and management of grasslands.

Radford Hall, Denver, Colorado

Born in Trenton, Nebraska; spent boyhood in Nebraska, Utah, and Colorado. Graduate of University of Colorado. Worked for Swift and Company for some time, then was employed by the Record Stockman, Denver Livestock paper. After that was secretary of Colorado Hereford Breeders Association. For the past five years has served as Assisttant Executive Secretary of the American National Livestock Association, Denver, Colorado. Is author of many articles dealing with livestock interests.

E. R. Jackman, Corvallis, Oregon

Born in 1894 in Stillwater, Minnesota. Lived in Montana, Oregon and southern California. Farmed in Montana and eastern Oregon. Graduated from Montana State College and Oregon State College, B.S. in Agronomy. For 26 years, Extension Specialist in farm crops in Oregon. Is author of numerous articles and bulletins that deal with grassland improvement. Has worked with local and state leaders in developing certified seed business in Oregon.

Bruce Orcutt, Miles City, Montana

Rancher, public speaker, poet, and official needler at annual meetings of American Society of Range Management.

Committee Asks Suggestions

The American Society of Range Management is canvassing its membership for suggestions that will make it possible for the Society to be of maximum effective service. This is the job of the Planning and Activities Committee. We would be most grateful to have your ideas. The goal of the Committee is given on page 163 of the April 1950 issue of the Journal. —*A. L. Hafenrichter*, Chairman, Planning and Activities Committee.

Reminder—Essay Contest

Don't forget to inform and interest college students in the student essay contest. Papers must be in by November 15. See the announcement of the contest on page 272 of the July 1950 Journal.

1951 Annual Meeting

You'd better start planning now to attend the annual meeting of the Society which will be held in Billings, Montana, January 23–26, 1951. Be sure to leave some of your vacation time until then, arrange with a neighbor to do your chores, and take your wife along to enjoy the activities planned for the ladies.

M. W. Talbot is chairman of the Program Committee and Albin D. Molohon chairman of the Local Arrangements Committee. The program was approaching semi-final form as this issue of the Journal went to press. The meeting will feature specific subjects, as follows:

First Day: Forenoon—Greeting by the Governor of Montana; President Savage's address, and business session. Afternoon. —Special range problems of the Northern Rocky Mountain and Great Plains Regions.

Second Day: Forenoon—Big game problems of range lands. Afternoon—Range management in western Canada. Evening —Banquet.

Third Day: Forenoon—Recent significant developments in management and research. Afternoon—How to obtain faster progress in range management on the ground.

Fourth Day: Weather permitting—a trip to the Miles City range and livestock experimental areas.

Board of Directors Meets in Denver

A highly successful business meeting was held August 4 and 5. The meeting was characterized by rolled up sleeves, independent and democratic expression of opinion, and much enthusiasm.

The Society will publish six issues of the Journal in 1951.

The Board recommended that the revised By-Laws, soon to be submitted to a membership vote, include (1) provisions for a permanent Executive-Secretary, and (2) abolishment of the offices of Treasurer and Secretary on January 1, 1952.

Student dues were increased from $2.50 to $3.00 annually in order to have them self supporting. For similar reasons, it was decided no reduction could be made in annual dues of international members of the Society.

The library of the Utah State Agricultural College was chosen as a central depository of Society literature. Members who wish to store, or avail themselves of Society literature may use these facilities.

Excerpts of all actions taken by the Board will be printed in the January 1951 Journal.—*E. H. McIlvain*, Secretary.

SURPLUS ACRES

The long-expected adjustments from the wartime pattern of agricultural production are on in earnest in 1950.

The announced allotment programs for the 1950 season call for about 12 million fewer acres in wheat than were planted in 1949; about 11 million fewer acres in corn in the commercial areas; and considerably fewer acres of cotton. Other war-expanded crops such as rice, peanuts, flaxseed, and potatoes have been or are faced with reductions.

Altogether these reductions total some 30 million acres and may involve millions more during the next few years. These "surplus" acres represent a major unbalance in our agricultural plant. What to do with them is one of the major problems facing farmers.

For the bulk of the 30 to 35 million "surplus" acres in prospect, the answer seems to be largely more hay and pasture to produce milk and beef.—Carl P. Heisig *in* The Agricultural Situation (USDA) May 1950.

Membership List as of July 1, 1950

Membership Classes

(C) Charter
(L) Life
(CL) Charter and Life
(S) Student

Abbreviations

(R)—Rancher
States
ES—Extension Service
AES—Agricultural Exp. Sta.
FGD—State Fish and Game Dept. or Commission
FD—State Forestry Dept. or Commission
Federal
U. S. Department of Agriculture
BAI—Bur. of Animal Industry
BPISAE—Bur. of Plant Industry, Soils & Agricultural Engineering
FHA—Farmers Home Administration
FS—Forest Service
Forest and Range Exp. Station
CAL—California
CS—Central States
INT—Intermountain
NRM—Northern Rocky Mt.
PNW—Pacific Northwest
RM—Rocky Mt.
SE—Southeastern
SS—Southern
SW—Southwestern
PMA—Production and Marketing Administration
SCS—Soil Conservation Service
U. S. Dept. of the Interior
BLM—Bur. of Land Management
BR—Bur. of Reclamation
FWS—Fish and Wildlife Service
GS—Geological Survey
IND—Bur. of Indian Affairs
NPS—National Park Service

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Index to Volume 3, 1950

A

Abstracts, 220
A cost-benefit analysis of seeding abandoned farm land to crested wheatgrass by the preparatory crop method, 190
Ahlgren, Gilbert H., reviewed, 232
Airplane, reseeding the range by, 33
Albertson, F. W., Editorial, 275
Anderson, W. James, note, 245
Annual meeting, 1950, 148
Arizona, shrub invasion of desert, 172
A sand county almanac and sketches here and there, review, 325
Atkins, A. P., article, 167

B

Barnes, O. K., article, 198
Barre, H. J., and L. L. Sammet, reviewed, 323
Beath, O. A., co-author, reviewed, 233
Beetle, Alan A., review, 233
Bloch, Don, review, 230
Briggs, Hilton M., reviewed, 229
Brown, Albert L., article, 172
Brush control for more grass, 46

C

California, range land use, 204
Campbell, Imogene F., review, 233
Campbell, R. S., review, 325
Campbell, R. S., and Fred A. Peevy, article, 118
Campbell, R. S., et al., Symposium, reviewed, 42
Campbell, R. S., letter, 261
Challenge of the Range Researcher, 277
Chemical control of undesirable southern hardwoods, 118
Chohlis, John, and Fred Schlots, article, 114
Clawson, Marion, reviewed, 228
Climax, grassland, fire, and man, 16
Collecting forage plants in Turkey, 213
Condition and grazing capacity of wet meadows on the east slope of the Sierra Nevada Mountains, 303
Conservation and Nevada—a tetxbook for use in the public schools of Nevada, review, 325
Conservation ranching in the Oklahoma panhandle, 167
Cox, Maurice B., co-author, article, 46
Crane, Basil K., article, 303
Current and future progress of the range society (Presidential Address), 91
Current Literature, 83, 133, 235, 327

D

Darrow, Robert A., current literature, 83
Davis, Jr., Waters S., article, 178
Deer, feeding on browse species, 130
Desert grassland, southern Arizona, shrub invasion of, 172
Dyksterhuis, E. J., review, 322

E

Effects of different intensities of grazing on depth and quantity of roots of grasses, 100
Effects of spring and fall grazing by sheep on vegetation of the upper Snake River Plains, 308
Elwell, Harry M., and Maurice B. Cox, article, 46
Estimating perennial grass utilization on semi-desert cattle ranges by precentage of ungrazed plants, 182
Extension program, range management, 29
Extension range work in Texas, 186

F

Farm structures, review, 323
Feeding deer on browse species during winter, 130
Fenley, John M., article, 316
Field methods used to demonstrate range conservation, 95
Fire, grassland climax, and man, 16
Fisher, C. E., article, 60
Forage crops, review, 232
Forage plants in Turkey, collecting, 213
Forest range in southern agriculture, Symposium, review, 42
Frandsen, Waldo R., article, 125
Fulton, Dan, review, 319

G

Grass and the Association of Texas soil conservation district supervisors, 178
Grass judging contests in Canada, letter, 253
Grass, methods of brush control for, 46
Grazing capacity of wet meadows in the Sierra Nevada mountains, 303
Grazing, intensities, effects of on grass roots, 100

H

Hall, Radford S., article, 277
Hardwoods, undesirable southern, chemical control of, 118

Harlan, Jack R., article, 213
Heady, Harold F., review, 228
Harris, Grant A., current literature 133, 235, 327
Harris, Harvey L., article, 287
Helicopter, classification of range condition by, 114
Hopkins, Walt., review, 321
Howard, Walter E., article, 291

I

Italy, pastures in the highlands, 22

J

Jackman, E. R., review, 324
Journal Suggestions, letter, 271

K

Killough, John R., article, 33
Kirby, F. Lee, note, 339

L

La Faver, L. H., review, 323
Land use, range, in California, 204
Leithead, Horace L., article, 95
Leonard, Warren H., co-author, reviewed, 324
Leopold, Aldo, reviewed, 325

M

MacDonald, M. A., letter, 253
Management of reseeded ranges, 125
Management, range, extension program, 29
Martin, John H., and Warren H. Leonard, reviewed, 324
Mechanical treatments on Wyoming range land, 198
Meik, E. E., article, 190
Membership list as of July 1, 1950, 352
Mesquite problem in the southwest, 60
Mesquite, velvet seedlings, mortality, 281
Missouri River Basin agricultural program, review 319
Modern breeds of livestock, review, 229
Mortality of velvet mesquite seedlings, 281
Mueggler, Walter F., article, 308

N

Natural Resources Council of America, 245
New methods of brush control for more grass, 46
News and notes 76, 139, 245, 337
Nixon, W. M., review, 232

O

Oklahoma, conservation ranching in, 167
Oosting, H. J., reviewed, 71
Opportunities for students in The American Society of Range Management, Editorial, 275

P

Pastures in the Italian highlands, 22
Paulsen, Jr., Harold A., article, 281
Pays Basque forests, pollarding permits grazing, 316
Peck, R. B., article, 299
Peevy, Fred A., co-author, article, 118
Pigs—from cave to corn belt, review, 321
Plea for more and larger range demonstration plots, 339
Plots, range demonstration, plea for more and larger, 339
Pollarding—age-old practice permits grazing in Pays Basque forests, 316
Principles of field crop production, review, 324
Problems in the development of a range management extension program, 29
Proceedings of the inter-American conference on conservation of renewable natural resources, review, 74
Program, Third Annual Meeting, 79

R

Ranching, conservation, in the Oklahoma panhandle, 167
Ranching services: a challenge to rangemen, 299
Range condition and soil site classification by helicopter, 114
Range conservation, field methods used to demonstrate, 95
Range land use in California, 204
Range society, current and future progress (Presidential Address), 91
Ranges, reseeded, management of, 125
Regrassing, by farmers and ranchers, 287
Renner, F. G., Presidential Address, 91
Researcher, range, challenge of, 277
Reseeding research in the intermountain region, 52
Reseeding the range by airplane, 33
Reynolds, Hudson G., review, 73
Roach, Mack E., article, 182
Robertson, Jos. H., review, 325
Roots, grass, effects of different intensities of grazing, 100

S

Sammet, L. L., co-auther, reviewed, 323
Sampson, Arthur W., review, 71, 74
Sauer, Carl O., article, 16

Saunderson, Mont H., and Elmer A. Starch, article, 29
Saunderson, Mont H., reviewed, 230
Schlots, Fred, co-author, article, 114
Seeding abandoned farm land to crested wheat grass, a cost-benefit analysis, 190
Seedings, broadcast, wildlife depredations of, 291
Selenium, review, 233
Sheep, spring and fall grazing of Snake River Plains, 308
Shepherd, W. O., review, 42
Shrub invasion of southern Arizona desert grassland, 172
Smith, Arthur D., article, 130
Society business 263, 384
Soil site classification by helicopter, 114
Stanley, E. B., review, 229
Starch, Elmer A., co-author, article, 29
Stewart, George, article, 52
Students, opportunities for in The American Society of Range Management, (Editorial), 275
Study of plant communities: An introduction to plant ecology, review, 71
Suggestions for Section News, letter, 261

T

Texas, extension range work, 186
Texas soil conservation district supervisors and grass, 178
The Soil Science Society of America, Proceedings 1948, review, 322
The western range livestock industry, review, 228
Towne, Charles W., and E. N. Wentworth, reviewed, 321
Trelease, Sam F., and O. A. Beath, reviewed, 233
Trippensee, Reuben E., reviewed, 73
Turkey, collecting forage plants, 213

U

U. S. D.A. House Doc. No. 373, 1949, reviewed, 319
U. S. D. A. Misc. Pub. No. 654, review, 233
Utilization, estimating perennial grass, 182

W

Walker, A. H., article, 186
Weaver, J. E., article, 100
Wentworth, E. N., co-author, reviewed, 321
Western land and water use, review, 230
Wheeler, S. S., et al., reviewed, 325
White, W. T., article, 22
White, W. T., letter, 271
Why haven't farmers and ranchers taken to re-grassing?, 287
Wildlife depredations on broadcast seedings of burned brushlands, 291
Wildlife management, upland game and general principles, review, 73
With the Sections, 143, 256, 345
Wood, Waldo E., article, 204
Woody-plant seed manual, review, 233
Wyoming, mechanical treatments of range land, 198

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Table of Contents
Volume 3, 1950

NUMBER 1, JANUARY

Some Effects of the 1946–48 Drought on Ranges in Southwest Texas. *Ben Osborn* 1
Grassland Climax, Fire, and Man. *Carl O. Sauer* 16
Pastures in the Italian Highlands. *W. T. White* 22
Some Problems in the Development of a Range Management Extension Program. *Mont H. Saunderson and Elmer A. Starch* 29
Reseeding the Range by Airplane. *John R. Killough* 33
The Forest Range in Southern Agriculture. *W. O. Shepherd* 42
New Methods of Brush Control for More Grass. *Harry M. Elwell and Maurice B. Cox* 46
Reseeding Research in the Intermountain Region. *George Stewart* 52
The Mesquite Problem in the Southwest. *C. E. Fisher* 60
Book Reviews. 71
News and Notes. 76
Current Literature. *Robert A. Darrow* 83

NUMBER 2, APRIL

Current and Future Progress of the Range Society. *F. G. Renner* 91
Field Methods Used to Demonstrate Range Conservation. *Horace L. Leithead* 95
Effects of Different Intensities of Grazing on Depth and Quantity of Roots of Grasses. *J. E. Weaver* 100
Range Condition and Soil Site Classification by Helicopter. *John Chohlis and Fred Schlots* 114
Chemical Control of Undesirable Southern Hardwoods. *R. S. Campbell and Fred A. Peevy* 118
Management of Reseeded Ranges. *Waldo R. Frandsen* 125
Feeding Deer on Browse Species during Winter. *Arthur D. Smith* 130
Current Literature. *Grant A. Harris* 133
News and Notes. 139
With the Sections. 143
Third Annual Meeting. 148

NUMBER 3, JULY

Conservation Ranching in the Oklahoma Panhandle. *A. P. Atkins* 167
Shrub Invasion of Southern Arizona Desert Grassland. *Albert L. Brown* 172
Grass and the Association of Texas Soil Conservation District Supervisors. *Waters S. Davis, Jr.* 178
Estimating Perennial Grass Utilization on Semidesert Cattle Ranges by Percentage of Ungrazed Plants. *Mack E. Roach* 182
Extension Range Work in Texas. *A. H. Walker* 186
A Cost-benefit Analysis of Seeding Abandoned Farm Land to Crested Wheatgrass by the Preparatory Crop Method. *E. E. Meik* 190

Mechanical Treatments on Wyoming Range Land ..... *O. K. Barnes* 198
Range Land Use in California ..... *Waldo E. Wood* 204
Collecting Forage Plants in Turkey ..... *Jack R. Harlan* 213
Abstracts 220
Book Reviews 228
Current Literature ..... *Grant A. Harris* 235
News and Notes 245
With the Sections 256
Society Business 263

NUMBER 4, OCTOBER

Editorial—Opportunities for Students in The American Society of Range Management ..... *F. W. Albertson* 275
The Challenge of the Range Researcher ..... *Radford S. Hall* 277
Mortality of Velvet Mesquite Seedlings ..... *Harold A. Paulsen, Jr.* 281
Why Haven't Farmers and Ranchers Taken to Regrassing? ..... *Harvey L. Harris* 287
Wildlife Depredations on Broadcast Seedings of Burned Brushlands *Walter E. Howard* 291
Ranching Services: a Challenge to Rangemen ..... *R. B. Peck* 299
Condition and Grazing Capacity of Wet Meadows on the East Slope of the Sierra Nevada Mountains ..... *Basil K. Crane* 303
Effects of Spring and Fall Grazing by Sheep on Vegetation of the Upper Snake River Plains ..... *Walter F. Mueggler* 308
Pollarding—Age-old Practice Permits Grazing in Pays Basque Forests *John M. Fenley* 316
Book Reviews 319
Current Literature ..... *Grant A. Harris* 327
News and Notes 337
With the Sections 345
Society Business 348
Membership List as of July 1, 1950 352
Index to Volume 3 381