

Range Management History and Philosophy¹

W. R. Chapline

Chief, Division of Range Research,
U. S. Forest Service, Washington, D. C.

RANGE LAND MANAGEMENT has come a long way from the widespread unrestricted grazing in the days of western settlement. Early public land policy tended to encourage such grazing. Insufficient area allowed in individual homesteads, the hope of many settlers to make a stake and return to their former homes, economic pressures, and the necessity of grazing ranges closely to discourage others from settling or remaining, all played a part. Such philosophy and the failure to appreciate that overgrazing was damaging, seriously deteriorated most western ranges, and left in their wake bankruptcy, blasted hopes, deserted homes, and distressed communities.

Fortunately, in the 50 years while the Society of American Foresters has been growing to its present stature, range management philosophy has evolved to where conservation is more generally emphasized. Most federal range lands have been brought under administration. Private owners now have a greater appreciation of the benefits which can accrue to them and the public generally from efficient management of their ranges. Improved practices, developed by research, have already brought millions of dollars in savings and increased revenue to stockmen annually. Such progress might indicate that range conservation had already attained a high degree of success. However, the condition of western ranges was so bad 50 years ago, and there was such a lack of understanding of efficient range management, that major progress has been attained only within recent years.

Native forage-producing lands, commonly called range, approximate 950 million acres, about half the total land area of the nation. About two-thirds are in private

ownership and one-third public. Three-fourths of these ranges are in the West. Nearly two hundred million acres are grazed forest lands and coastal prairies of the South. With abundant rainfall and a heavy cover of turf-forming grasses, southern ranges have not generally been seriously damaged, although the productivity of some has been lowered by promiscuous burning.

It is appropriate that we review some of the milestones in the development of range management philosophy in its relation to land use management.

Early Public Land Policy

The federal land policy resulted in the passing to private ownership of some 375 million acres of range lands, but it was not well adapted to encourage range management.

The original 160-acre homestead law and the forest homestead law were designed primarily for farming. In areas submarginal for farming they ordinarily provided so small an acreage of low-value range land that it was impossible for the settler to make a satisfactory living on the area homesteaded. Most settlers had little appreciation of the true productive capacity of the range. Where irrigation water was not available or not later developed, cropping ordinarily proved a failure. Uncropped portions were commonly abusively grazed. Many such homesteads were abandoned in periods of depression, drought, and hard winters. Ultimately, most of these have been acquired by stockmen and are now used in connection with their other private holdings. They offered the opportunity for establishing home ranches which served as bases for grazing public lands and for control of water holes and other strategic areas. Some have been reacquired by the federal government, or occasionally the states, and incorporated in public reservations. Where they

have remained as isolated public domain tracts or as tax-delinquent lands, they have often continued to be abused.

A large part of the dry farm area of the West was developed through the application of the enlarged homestead acts. Thousands of established ranches, using public land in their operation, were broken up and forced out of business or seriously hampered in management, sometimes for years. Some 15 to 25 million acres, submarginal for cultivation, were plowed and later abandoned. The most depleted areas in the Plains States and in some foothill areas of the West are these plowed and abandoned "dry farm" fields. Some were a part of the famous Dust Bowl. Many are still producing only from 1 to 10 percent of the forage they once produced. It has taken years for other areas to reach a semblance of their original forage production.

The 640-acre grazing homestead act did facilitate passing of large acreages of range into ultimate stable private ownership. This did not take place, however, until the operation of thousands of additional established ranches were seriously disrupted and tens of thousands of hopeful settlers practically destroyed the forage resource on their homesteads and lost most, if not all, of their savings. Many stockmen were forced to overextend their investments in lands in order to remain in business. This in turn, led to heavy stocking in the hope of meeting burdensome financial obligations.

The railroad and wagon road grants gave about 100 million acres of alternate sections from 10 to 40 miles on each side of the rights of way to encourage their construction. Some stockmen, leasing or buying such lands or utilizing scrip given in lieu of some of them, gained control of large tracts. Where such lands were reasonably productive, range

¹Paper presented at a meeting of the Division of Range Management, Society of American Foresters, Washington, D. C. December 15, 1950.

management was facilitated. In a few areas, individuals or associations leased these private lands and gained control over intermingled public lands. This made possible improved management. As one prominent sheepman commented, however, many went broke after World War I trying to buy such lands. Where such a condition prevailed, too heavy grazing often resulted, to be followed by extreme deterioration when drought occurred.

Some stockmen endeavored to control large areas of unappropriated and unreserved federal lands by fencing, without legal authority. Most applied a better type of management on these controlled ranges than was possible under the generally prevailing severe grazing competition for federal lands. Often the controlling stockmen tried to discourage settlers on "their domain" through excessive grazing in the vicinity of new homesteaders. The Department of the Interior tried in some degree to overcome such illegal fencing, but this ordinarily only intensified extension of excessive grazing.

Foundations of Conservation

The establishment of several forest reserves before the turn of the century brought a recognition of damage to timber reproduction and watersheds from excessive grazing. A regulation was issued to exclude grazing from such forests, but the regulation was never applied. Dr. F. V. Coville, chief of the Division of Botany of the Department of Agriculture, was called upon by the Department of the Interior, which controlled the forest reserves, to study the problem of sheep grazing in the Cascade Forest Reserve of Oregon. He concluded that the evil effects of abusive sheep grazing could be overcome through regulation and management. Shortly after that, at the request of the Public Lands Commission, Dr. Coville and A. F. Potter, a stockman of Arizona, made an exploratory survey of the condition of the public lands generally and recommended their regulation by the federal govern-

ment, both to conserve the resource and to give greater stability to users.

When the forest reserves were transferred to the Department of Agriculture in 1905 and the Forest Service was established, the forest and range resources were recognized as crops, and an effort was made to manage the range rather than to exclude grazing. The increasing flood damage, injury to timber reproduction, and other adverse effects of unsound grazing played their part in the great expansion of the national forests in the western mountains during the next two years.

Some major adjustments in grazing use of the national forests were made between that time and 1915, only to be undone by overgrazing resulting from increased numbers of livestock during World War I in a fruitless effort to produce more meat. Since World War I, the national-forest range program has aimed to restore deteriorated ranges and provide a sustained forage supply and improved watershed cover on the 80 million acres of range land within the national forests. Preference is given to resident home builders in allocating grazing privileges to aid them in building up economical agricultural enterprises capable of satisfactorily supporting families. By correlating and managing the national-forest range with adjacent range and crop lands, stockmen are better able to round out efficient yearlong operations and maintain them on a more permanent and profitable basis.

Range Research

The key to maintenance of the range, with all its direct and indirect social and economic benefits, is the restoration and correct use of the range forage and the soil on which it grows. The premise upon which public and private range programs are built is the development of basic principles and practices of better management.

Many early research workers were discouraged with their results because of the low productivity of the land and their inability to con-

vert such lands to high-producing improved pastures. A few recognized that range problems were quite distinct from those relating to humid improved pastures.

With the desire to bring about more efficient use of the national-forest ranges, Pinchot, Potter, and Coville planned for range studies which would facilitate efficient grazing administration of the forests. Dr. James T. Jardine, later director of research in the Department of Agriculture, and Dr. A. W. Sampson, later professor of range management at the University of California, were hired to initiate such studies. Others were employed shortly thereafter, and in 1910 the Office of Grazing Studies was formed in the Forest Service, with Dr. Jardine in charge. His dynamic personality, keen vision, and directive capacity stimulated the studies, and remarkable progress was made in developing many empirical results applicable to mountain ranges. The Great Basin Experiment Station in the mountains of central Utah was established in 1912 to facilitate more intensive studies and to lay a fundamental foundation for range management. Dr. Sampson, the first chief of that experiment station, pressed forward vigorously with a group of ecological studies to meet this purpose.

In 1915 the Santa Rita and Jornada Range Reserves in southern Arizona and New Mexico, established in 1903 and 1912, respectively, were transferred from the Bureau of Plant Industry to the Forest Service, along with authority for range research on other public and private lands as well as the national forests. The McSweeney-McNary Forest Research Act of 1928 set up an authorization which gave impetus to expansion of range research, both on forested and untimbered ranges, public and private. Considerable expansion has taken place in the range research program since the mid-thirties. At the present time studies are under way in the Great Plains area, the desert and foothill areas of the intermountain and southwestern regions, the foothills of

California, and many mountain areas. In 1940 studies of grazing of forest range were initiated in eastern North Carolina and southern Georgia. This was followed in 1944 with somewhat comparable studies in central Louisiana. Provision has since been made for range research in several other southern states, including Missouri. The program of establishing experimental forests and ranges followed by Congress since World War II has been a big factor in recent expansion.

Range research is now under way in all six regional forest and range experiment stations in the West and at the Central States, Southern, and Southeastern stations. Much of our work is cooperative with other federal agencies and with state agricultural experiment stations. Such cooperation has not only broadened the studies but has facilitated an integrated attack dealing both with the animal and range forage problems.

These studies have developed many practices as aids in management and more efficient conservation of the range resources. Numerous practices are now so widely applied that few persons realize that they came from research. These include: (1) opening and closing dates which harmonize better with readiness of the range for grazing and nutritional requirements of livestock; (2) a fairly good basis for determining grazing capacities of western range types; (3) a basis for judging productive condition and whether the forage cover and soil are improving or deteriorating; (4) deferred and rotation grazing which permit satisfactory use of the forage by delaying grazing until after seed dissemination or forage maturity on a different portion of the range each year; (5) improved methods of grazing sheep and goats, such as open and quiet herding and bedding them down in a new place every night to avoid damage through trampling and localized overgrazing; (6) obtaining a better distribution of cattle through well-placed watering facilities and better salting methods to bring

about more and efficient use of all the range forage; (7) management which harmonizes grazing with forest requirements and overcomes the damage to timber reproduction which once prevailed; and (8) management which better harmonizes grazing with other range resource values.

More fundamental studies have been conducted to determine the interrelationship between soils and forage production, the resistance of important species to grazing and the development of utilization standards, the ability of plants to obtain and produce the necessary growth substances, and the relationship of changing nutritive values of plants to the nutrition of the livestock. Numerous examples could be cited of increased forage and livestock production obtained from improved management developed by such research. In general, research has brought about better condition of range and animals, greater calf and lamb crops, more rapid gains, lower death losses, and increased profits to producers.

In range reseeding the objective has been somewhat different on western ranges and those in the South. In the West the principal aim has been to develop methods and find suitable plants for seeding on the portion of range lands now so badly depleted that reasonably rapid natural revegetation appears improbable. Although some progress was made in the early studies, especially for reseeding mountain meadows which had especially favorable soil and moisture conditions, costs were relatively high. The present wide-scale application of range reseeding is primarily a development of the last 15 to 20 years. Intensive studies were first undertaken in the intermountain and northern plains regions. Such studies were extended to other parts of the West and to the South in 1945. In the South the objective has primarily been to replace a heavy cover of low-value native range plants with more palatable and nutritious plants that would extend the grazing season and afford better development of

grazing animals.

More than 8 million acres have now been successfully reseeded by stockmen and governmental agencies throughout many parts of the West. Many of these reseeded areas have increased forage production from 5 to 10 times, some 15 to 20. The gross value of livestock produced annually in recent years on these reseeded ranges has often been from \$10 to as much as \$25 an acre.

Although the problems of noxious range plants was early recognized, successful procedures for controlling them were generally limited to grubbing or other control of several highly poisonous plants. In studying methods for reducing competition to facilitate range reseeding, economic procedures have now been developed for converting many low-value big sagebrush areas to productive grassland range. Methods for reducing other undesirable shrubs are now evolving, both in the South and in the West. There are millions of acres covered by low-value juniper, mesquite, and unwanted hardwoods. Chemical control has been a recent development for reduction of shrub stands at relatively low cost. Fire, which was used extensively in an unrestricted manner with terrific losses at times to both forage and other land resources, has now been found to offer some potentialities for converting low-value shrub stands to productive range. This is true on the more level areas of big sagebrush range, where other land values than forage are not important. Recent studies of shrub conversion in California indicate potentialities for using fire in this process when soils are reasonably favorable and species to reseed and successful establishment methods are known.

Such research evolved over the years has now laid a much better foundation for range management generally than prevailed 50 years ago, or even 30 years ago.

Broadening Federal Policy

When John T. Caine III, a western trained man, became exten-

sion animal husbandman about the time of World War I, it appeared that real progress might be made in disseminating information concerning better range management and other ranch practices. However, he soon left the Extension Service, and range extension on a national scale has seriously lagged.

Throughout much of the 1920's consideration of grazing regulation of the unreserved and unappropriated public domain continued. The Taylor Grazing Act was finally enacted in 1934, and the possibility of overcoming excessive overgrazing and applying better management became a reality not only on the federal lands incorporated in the grazing districts but on many interrelated private lands. The objectives of administration of these federal grazing lands are somewhat similar to those of the national forests. Grazing privileges are allotted to established owners of ranch land who have much more voice in administration of the grazing districts.

In the mid-1930's the Soil Erosion Service was established in the Department of the Interior to aid erosion control on both public lands under the administration of the Interior Department and on private range lands. When this service was transferred to the Department of Agriculture a few years later, its responsibilities were expanded. The land utilization projects now administered by it were taken over from the successor to the Resettlement Administration. These lands, often submarginal for cultivated agriculture, had been purchased by the federal government and organized into units in cooperation with stockmen for more efficient grazing use and support of the maximum number of families. The widespread development of soil conservation districts and the development of supplemental soil demonstration areas has served as one of the more important means for bringing home to private owners the potentialities of improved range management. Technicians cooperate with the private owners in developing ranch

plans which include management of the range land.

The range conservation program of the Production and Marketing Administration inaugurated in 1936 has proved an important step in the interest of better managed, more productive private range lands. Encouragement in carrying out the range management objectives is offered in the form of benefit payments. Such payments are conditioned upon the adoption of the betterment practices.

Several other federal programs have stimulated better range management. Among these the improvement in livestock, in which the Bureau of Animal Industry has played a major part, has encouraged shorter grazing seasons, more conservative grazing, and other desirable range and livestock management. The plant introduction and improvement work of the Bureau of Plant Industry, Soils and Agricultural Engineering has aided reseeding studies, as has the seed production and other nursery phases of the Soil Conservation Service. Close cooperation is maintained among these agencies. The Farm Credit Administration has relieved much of the financial stress that seemed to discourage better management. Still others could be cited.

State Programs

State agricultural colleges and experiment stations have become more and more interested in the range problem. Limited studies were initiated about the turn of the century. In recent years most state stations have undertaken phases of range research, often in cooperation with the Forest Service and other federal bureaus.

Much could be said about training range men in state colleges and universities for federal and state work, and for handling of ranches.

The state extension services have disseminated information concerning better range management. Research results and principles are presented in a practical form to owners, users, and managers of range land, and test demonstrations of desirable practices adapted to local conditions are conducted.

This program is largely carried out by county agents and state extension specialists working in cooperation with stockmen. Only two state range extension specialists have been designated, but extension agronomists, extension animal husbandmen, and extension foresters have given more or less attention to the range problem. Many range management principles are not yet widely known. An increase in the extension personnel trained in range management would immeasurably broaden the possibilities of better management of the range.

Changing Stockman Philosophy

A growing understanding of range management principles and practices by ranchers has resulted in many taking an active part in the development of various state and federal programs and in more efficient use of their range lands. In the early days most stockmen were concerned primarily with establishing a home. Returns were ordinarily low, and life was hard. Many, too, looked upon the effort of the government to help as an infringement on their freedom. Over the years, more and more stockmen have become interested in the extension demonstrations and a great many are visiting experimental ranges to observe results, and are reading research reports and endeavoring to apply the results. Many college graduates are going into the livestock business. This is tending to give an entirely different attitude toward better management, both on the part of such graduates and other stockmen. Many of these graduates are trained in animal husbandry which causes them to recognize that better animals require better nutrition.

Generally, it is the larger, more progressive stockmen who have taken the lead in range management. Many have become real students of range problems. There are still a great number of small outfits, however, inadequate to provide a satisfactory living. The owners of these must earn much of their living from other activities. They often give little, if any, care to their animals while on the range.

Few of these people realize the responsibility which they have for sound use of the land they own or use. The several federal and state programs which have come in direct contact with stockmen and the gradual spread of knowledge of better management and the practical demonstrations which individuals have developed lead to the hope that more and more of these stockmen will follow the lead of their more progressive neighbors. Higher profits in recent years, especially when better management has been applied, have greatly helped to change stockmen's philosophy. The recent development of management organizations and increasing numbers of range consultants indicate that stockmen, who can afford such help, are looking toward still better management of their holdings.

What of the Future

The remarkable production of meat and other animal products

during World War II on western range lands in coordination with other agricultural production, considerably above that of World War I, attests the value of development and application of sound range management philosophy. Beef and veal production in the nation as a whole has been greater in every year since 1941 than in any previous year. Similarly, lamb and mutton production in each year from 1941 to 1946 inclusive exceeded that of any previous year.

There is still, however, a vast area of deteriorated range, often adversely affecting watershed management. Overgrazing continues on too many range areas. Corn belt woodlots are continuing to be damaged by excessive grazing with little return either from timber or livestock. Low livestock production from many extensive areas, particularly in the South, brings home the need for still more efficient management there. All of these emphasize the need for addi-

tional research, both of a fundamental character that will answer many problems confronting stockmen and land administrators and of a practical character that will show the economic and other values which flow from actual application of better management.

Although there has been a greater recognition of the need for better range land administration by federal and state agencies, much remains to be done if public range lands are to produce the forage, meat, wool, and other animal products of which they are capable. More and more stockmen must recognize their responsibility for sustained production and better management of the lands they own and use. Greater mutual understanding of problems and possibilities for betterment offers still further opportunity for improving range lands and increasing efficiency in their utilization in a greater and more profitable livestock production.



Relationship Between Shear and Diagonal Web Stresses in Laterally Loaded Wood Panels¹

Twenty-four diagonally-sheathed, quarter-scale panels constructed of Douglas-fir members approximately one-sixteenth the cross-sectional size of standard finished material were tested under lateral loading. The experiment was designed to determine the accuracy of a proposed method of analysis of stresses in wood panels and diaphragms. This proposed method, which was evolved from consideration of the mechanics of webs of shear resistant beams, is explained, and its application to panel and diaphragm design is indicated. Test panels of four different height to length ratios, three different nailing patterns, and two different spacings of stud members were prepared.

Results, including statistical analyses, of preliminary direct withdrawal and lateral resistance tests on nails of the two sizes

¹Abstract of thesis for M.S. degree in forestry.

used in panel construction are tabulated in the appendix. Deflections of the panels at various load increments were taken at intervals along the loaded and unloaded end posts and across the top plate. Lateral loads divided by panel lengths provide a measure of shear stresses. Shear stresses and the deflections of the panels at the centers of the end posts substituted in the conventional uniformly-loaded simple beam formula are used to calculate diagonal web stresses. The relationships between shear stress and diagonal stress for the various panel designs are shown by "rigidity index" curves. The influences of panel design variables as indicated by the rigidity index curves are discussed.

It is concluded that: (1) quarter-scale panels with a height-length ratio of 1:1 are less rigid than quarter-scale panels with height-length ratios of 1:1.5, 1:2, and 1:3; (2) quarter-scale panels

with height-length ratios of 1:1.5, 1:2, and 1:3 have approximately the same rigidity; (3) panels with two and with three nails per joint are considerably more rigid than panels with only one nail per joint; (4) quarter-scale panels with three nails per joint are slightly more rigid than panels with two nails per joint (greater rigidity occurs only at lower unit shear loads and is not enough to justify the use of three nails per joint in construction); (5) the spacing of studs four inches apart in a quarter-scale panel gives the panel much more rigidity than does a stud spacing of six inches; (6) the relationships between shear and diagonal web stresses found through this investigation are in accord with the relationships expected; and (7) additional tests on panels of other designs are recommended.

JAMES WENDELL JOINSON,
*School of Forestry,
Oregon State College.*