

Forest Grazing in the Southwest

VERTICAL FILE

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IN THE Southwest many changes in land use capabilities have been wrought by human culture since the time of early exploration (De Niza 1539, Coronado 1540) and first settlement (San Juan, New Mexico, 1598). Most of these changes have taken place within the last half century. Great irrigation projects, extensive dry farming areas, hydroelectric power, copper, coal, oil, gas, and timber have been developed at great labor and expense. Paved highways and railroads cut across the terrain in all directions of the compass. People have come by the thousands either to make a living from the land or simply to be able to live in the health-giving climate. Blanketing the bulk of the land has been the grazing of domestic livestock.

Probably the least apparent change over the years and probably the most important because of its marked influence on the future economy of the region has been the alteration in range condition. Too heavy and continuous grazing use in many areas has caused marked deterioration and unraveled the protective plant cover, exposing the soil to accelerated erosion and lowering its value for grazing, watersheds, and wildlife. Once extensive grasslands are now covered with noxious weeds and half-shrubs such as burroweed (*Aplopappus tenuisectus*) and snakeweed (*Gutierrezia sarothrae*). Other millions of acres of formerly productive open grassland have been invaded by low-value, moisture-robbing shrubs, and trees such as mesquite (*Prosopis* spp.). About the only thing that hasn't changed has been the climate—it is still dry and droughts are frequent.

In the Southwest water is precious. The amount of available and usable water supplies will markedly influence the future development and economy of the Southwest. It is the principal factor that will limit population growth and development of resources. In the Southwest the problem of conserving water and making the most effective use of it is closely related to the problem of improving and maintaining range land productivity. This is particularly true of the timbered and woodland areas whence most of the water supplies of the region originate. It is the purpose of this paper to describe briefly the general aspects of these forested lands, discuss how grazing conflicts or fits in with other forest land uses, and finally point out the major range problems and improvement practices.

GENERAL ASPECTS OF FOREST RANGE

The "Southwest" is considered as the region made up of the States of Arizona and New Mexico, which comprise an area exceeding 150 million acres. In order to clearly visualize and gain perspective of the nature and magnitude of forest grazing problems within this region it would seem necessary to sketch briefly the scope of the forest range involved, the over-all climate and vegetation, the history of range use, and the economic importance of the range livestock industry.

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Extent and character.—In the mind of the general public the Southwest is generally thought of as largely treeless; yet the total forest area approaches 40 million acres. This is an area nearly the size of the State of Washington. In more exact terms the total forest area is 39,539,000 acres comprised of 10,739,000 acres of sawtimber forests (about 60 per cent commercial) largely ponderosa pine and 28,800,000 acres of woodland mostly pinyon pine and juniper. In view of the recent rapid growth in southwestern urban communities, requiring large quantities of lumber for homes and wood-using industries, timber is an important forest product. The annual cut is about 275 million board feet valued at more than 17 million dollars. Most of this is carried out on a sustained yield basis. Nearly all of the forest area is grazed at some time during the year by domestic livestock.

Sawtimber forests, including ponderosa pine, spruce, and Douglas-fir, are distributed chiefly through the north and central portions of Arizona and north and west central New Mexico. They form the principal formation on high plateaus and mountain slopes varying in elevation from 6,500 or 7,000 feet up to 11,500 feet. Annual precipitation varies from 20 to 30 inches. The important forage plants in open ponderosa pine forests are: Arizona fescue (*Festuca arizonica*), mountain muhly (*Muhlenbergia montana*), pine dropseed (*Blepharoneuron tricholepis*), Thurber's fescue (*Festuca thurberi*), muttongrass (*Poa fendleriana*), blue grama (*Bouteloua gracilis*), blue grasses (*Poa* spp.), brome-grasses (*Bromus* spp.) and a variety of weed and browse species. Depending on elevation the grazing season usually covers a period of about 5 months from May to October. Grazing capacity varies with the density of the timber stand and with range condition. Dense stands of timber are considered unusable. In the more open areas of pine bunchgrass range, in good condition with gentle topography, grazing capacity is about 2 to 4 acres per cow per month whereas on comparable range in poor condition 10 to 20 or more acres per animal unit month are required.

Overshadowing the importance of all other forest land uses is the watershed value of the saw timber areas. Each year winter snows and rains furnish the bulk of the water flowing into the great irrigation projects of the Elephant Butte, Salt River, and Gila.

The woodland ranges lie immediately below the ponderosa pine forests and range downward to about 4,500 feet in altitude. Annual rainfall varies from 12 to 18 inches and the main growing season for perennial grasses is during July, August, and September. The forest is composed chiefly of pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.) with evergreen oaks (*Quercus* spp.) predominating in the southern portion of the region. Interspersed throughout the type are open grama grasslands and savannah. The principal forage plants are: blue grama, sideoats grama (*Bouteloua curtipendula*), black grama (*B. eriopoda*), hairy grama (*B. hirsuta*), bluestem wheatgrass (*Agropyron smithi*), galleta (*Hilaria jamesi*), curlmescal (*Hilaria belangeri*), muttongrass (*Poa fendleriana*) and Indian ricegrass (*Oryzopsis hymenoides*). Browse species include: mountain mahogany (*Cercocarpus* spp.), cliffrose (*Cowania stansburiana*), ceanothus (*Ceanothus* spp.), eriogonum (*Eriogonum* spp.) and rough menodora (*Menodora scabra*). The range is used on a yearlong

basis by cattle or sheep but is occasionally reserved for winter grazing. Dual use is not common. Even on ranges in satisfactory condition grazing capacity is relatively low, varying from 3 to 10 or more acres per cow per month. The forage of grama ranges has long been reputed to cure well for winter grazing. Recent research indicates that this is not generally true but that in the winter period the protein level and phosphorus content of the forage grasses fall below the nutritional requirements of livestock. Unless palatable browse that will supply these deficiencies is plentiful the feeding of supplements such as cottonseed cake on the range is especially advisable during the winter for maintenance of top livestock production.

In comparison with the higher forest range watersheds, woodlands yield relatively little water but are important potential sources of sediment. Prior to the introduction of domestic livestock most of the dense stands of pinyon-juniper were confined to rocky ridges and poor shallow soils or occurred as savannah on the better sites. During the past half century these trees, especially the junipers, have encroached on the better soils of the adjacent grasslands. Then too, reproduction has filled in the openings between the mature juniper trees of the savannah forming a nearly continuous woodland canopy. These invasions are still in progress and have been attributed to two causes: grazing and protection from fire. They unquestionably have been accelerated by continuous heavy yearlong grazing use. Other plants of low forage value such as rabbitbrush (*Chrysothamnus* spp.), pingue (*Actinea richardsoni*), and snakeweed have also increased in abundance largely because of excessive grazing use. The impact on the economy of the region, at least where these invasions have been accompanied by overuse, is twofold—first, through lowered forage crops animal production is decreased and, second, with the replacement of the original perennial grass cover with woody or taprooted herbaceous species the erosion rate has been accelerated above the normal.

History of grazing use.—Most of the range lands in the Southwest including forest range became fully stocked by domestic animals in the eighties, at which time the major build-up in livestock numbers throughout the West took place. It was fathered and nurtured by the “beef bonanza,” the development of the railroads, the invention of barbed wire, and the subsidence of Indian wars. Grass was free and taken much for granted and most of the stockman’s efforts were bent toward increasing his herds. Cattle were allowed to roam much at will and aside from branding and gathering for market were not given too much care. All livestock were sold by the head. Management of range and livestock as we know of it today were unknown. Sheep followed the cattle and were driven into the seemingly endless range country until conflict between sheepmen and cattlemen was inevitable wherever the grazing areas overlapped. A stabilizing influence on the part of the industry using a large portion of the forest range in the Southwest resulted with the establishment of national forest areas in the early 1900’s.

In the late eighties and early nineties livestock numbers reached a peak. For example, the peak number of sheep in New Mexico was 5.2 million in 1882 whereas today there are less than 1.6 million. Then occurred the

widespread drought of 1886 in the Southwest, a series of severe winters throughout the West, and with glutted markets the industry was almost prostrated by the panic of 1893. Similar events have reoccurred.

The raising of livestock has been and still is a large scale enterprise except on the Indian reservations and in the vicinity of the Spanish-American communities in northern New Mexico. There are many reasons for this: large Spanish and Mexican land grants; establishment of rights and privileges to use of the range by ownership and control of strategic range watering places; a relatively large acreage is required to support a cow yearlong; and predatory animals have necessitated herding of sheep which is uneconomical in bands of much less than 1,000 head.

Economic importance of the range livestock industry.—The range livestock industry is an important segment of the agricultural economy of the Southwest. In 1945 cattle numbers were about 2.2 million, sheep 2.4 million, and mohair goats 250 thousand. The bulk of these animals were produced from range forage and the gross income from them was about 126 million dollars, representing about one half of the total income from farms and ranches within the region. Exact figures on the number of animals grazing forested lands are not available. A conservative estimate would place the numbers of livestock grazing forested lands at 350 thousand for cattle, 900 thousand for sheep, and 200 thousand for goats.

In the woodland areas most cattle outfits are operated on a cow-calf basis. In the higher summer ranges steer operations are common. Sheep are grazed on both types of range with the bulk of the lambs going as grass-fat to market in the fall, from the better managed outfits. Animals are usually marketed in the fall going to irrigated pastures, feed lots, or direct to slaughter. California, the Middle West, and Texas are the most popular markets.

GRAZING AND OTHER LAND USES

The degree and manner of livestock grazing use bears an immediate and important relationship to surface water runoff, soil erosion rates, sedimentation, flood hazards, timber reproduction, wildlife conservation, recreation, and other land uses.

Watersheds.—The agricultural economy of the Southwest is based largely on irrigated agriculture and range livestock, although there are areas of successful dry farming in northern Arizona and eastern New Mexico. This economy in general depends on a pattern of land relationships wherein comparatively small areas of water-consuming lands are directly dependent on extensive tracts of water-yielding forest lands. The irrigated lands are located in the lower, drier portions of the main valleys and drainage basins and are far removed from the watersheds. Consequently, public recognition of the importance of keeping the water-producing lands in good condition is not only largely lacking but difficult to attain. In general there is a distinct occupational difference between farmers and ranchers although this is not so marked in central Arizona where there are many individuals who farm as well as operate mountain or mesa ranches. In the sheep industry of Arizona there is a seasonal migrational pattern of moving bands from irrigated pastures to the higher

summer forest ranges. The future agricultural prosperity of the region will depend directly on how well the range watershed lands are managed and how rapidly conservation practices are adopted.

Water is so important to the economy of the Southwest that it is difficult and in some ways meaningless to attach an economic value to it. Nevertheless, the value of the watershed lands has been estimated in several ways. For example, the drainage areas of the Salt and Verde are worth \$15.22 an acre if based on the water yield alone and \$108 an acre if computed on the basis of crop values. (Capitalized at 3 percent.) The same lands have an average market value of about \$2 an acre for range. This does not mean that these lands should not serve both as range and watersheds—although there are some lands which because of steepness of topography or erodibility of soils should not be grazed (such lands should not be considered “range”). However, if the vegetational cover is impaired both range and watershed values suffer. Grazing use should be so designed as to secure and maintain the highest production of range forage that is commensurate with other land values. In other words, proper range and livestock management will encourage the establishment and maintenance of desirable forage plants, promote plant vigor, and provide the highest type of erosion controlling plant cover.

Timber.—In the Southwest the conflict between timber production and grazing depends largely on the kind of range management practiced, including season of use and proper distribution of livestock through better watering and salting facilities. Damage where it occurs consists mainly in browsing the terminal leaders of young coniferous tree reproduction, especially during dry periods in spring, and again late in the fall when needle leafage may be eaten. Such grazing either retards growth or causes actual death loss of small seedling trees. In dense stands of timber this is not serious because the density of the trees alone prevents much grazing use and forage values are generally low. In the more open forest areas, where grazing use by livestock or big game has been excessive, timber values have suffered. Paradoxically, however the renowned 1919 seedling year in the ponderous pine type coincided with heavy grazing use occasioned by the heavy stocking that took place during World War I and then was followed by several years of livestock reductions.

In the woodland areas where juniper has encroached on adjacent grasslands control of invasion through elimination of tree seedlings would appear to be warranted on the basis of increased forage and maintaining the most effective erosion control plant cover. In the saw timber forests the case is not so clear. Increase in tree reproduction has resulted in crowding out the forage plants through shade and competition for moisture. This is unfortunate to the interests of grazing but is as it should be on the lands where timber is the primary value. In many cases, however, it has meant the closing in of natural openings within the forest—valuable not only for grazing but as natural firebreaks. It would seem sound land management to keep these openings in grass and maintain them as firebreaks for protection of adjacent forest lands. After all, grazing if properly conducted may be a distinct aid to timber production. On most forest ranges in the Southwest it is believed that grazing can be

fitted into timber harvesting and that both can be carried out successfully together on the same area, i.e. cutover areas, at least until restocked.

Game and recreation.—The animal life of the forest, the fish and birds, and even domestic livestock, is a prime essential to enjoyable public recreation. In the Southwest ever increasing thousands of people—hunters, fishermen, campers, vacationists, and health seekers—find enjoyable recreation on forest land. Consequently, wildlife should be efficiently produced and wisely used.

Grazing use as it bears on wildlife and recreation may become in serious conflict. Destructive grazing destroys the habitat of desirable wildlife, results in muddied streams, and water temperatures become ill suited for fish. This in turn means poor hunting, poor fishing, and unenjoyable recreation. Excessive numbers of big game or livestock or even game fish mean inefficient production. On most of the open timber types in the Southwest there is little or no conflict between game and domestic livestock. In some areas, particularly on the lower woodland ranges, there is competition for forage during winter by cattle and deer. There are also a few areas where livestock and elk have come into conflict within recent years.

MAJOR GRAZING PROBLEMS AND IMPROVEMENT PRACTICES

Grazing and watershed problems in the forested range stem largely from excessive stocking combined with the effects of recurrent drought. The parts of the summer range which are largely in the open timber type are in fair to good condition. On the other hand, most of the meadows and natural openings within the timber type are in varying degrees of deterioration. The woodland areas, the bulk of which are grazed on a year-long basis, are on the whole in unsatisfactory condition. Forage production is low, even in years of good rainfall and in spite of a fair sod of blue grama. This is largely because of poor plant vigor and an inadequate carry-over of grass litter which is necessary for maximum moisture infiltration and soil fertility. In the areas of juniper invasion range condition and livestock production are in a downward swing. Deterioration of the forest range lands not only results in lowered grazing values but through accelerated erosion and movement of sediment shortens the life of reservoirs and causes stream beds to aggrade. This in turn creates drainage and flood control problems such as are found along the Rio Grande.

The problem of improper balance between livestock numbers and forage supply is greatly complicated by the extreme fluctuations in yearly forage crops caused principally by variation in rainfall. It is important to the ranch operator that numbers be correctly balanced both from the standpoint of his pocketbook and the ultimate permanence of his business. In the regional and national economy proper balancing of livestock numbers with feed and forage supplies is necessary for conservation of the range resource. It is also necessary in times like these when meat is at a premium—a prime essential for national welfare and even world peace.

And yet each year large amounts of range forage are wasted through the maintenance of nonproductive animals. Whenever animals eat their fill every day in all seasons, about 70 percent of the digestible nutrients

is required for body maintenance and the remaining 30 percent is available for growth and production of offspring. Under such conditions the mature beef cow, for example, will year in and year out weigh about 1,000 pounds or more, produce 80 to 90 percent calf crops, with calves weighing 400 to 450 pounds at 8 months of age. On the other hand, if the mother cows had been allowed only 70 percent of a full ration they would produce only about 50 percent calf crops averaging 320 pounds per calf. The latter figure represents about the long-time average for the Southwest and is significant in that it indicates that nearly half the cow production is being grazed on a maintenance basis with no production. Other factors such as the use of purebred bulls and culling shy breeders are important in animal production, but overshadowing these is the matter of keeping animals in balance with the forage supply. This has been shown by the results of a long-time study at the Santa Rita Experimental Range in southern Arizona and is being demonstrated on the better operated ranches in the Southwest.

Proper balancing of numbers with forage supply in the open pine forest range is difficult because the animals start grazing this type in the late spring prior to the onset of the main summer growth season. If drought occurs they must either overuse the timber type or return earlier than usual to their winter range, which means an added burden on the latter unless numbers are drastically reduced during fall marketing. The woodland type is the key to proper balancing of livestock numbers because if these lands were properly stocked, managed, and improved by reseeding and noxious plant control they would materially ease the grazing pressure on much of the higher summer forest lands. The bulk of the forage crop is produced during the summer months and late fall is the main marketing period. Hence in the fall, the range operator can estimate the proper number to graze for the winter season, or on yearlong range determine the number to be grazed until the next summer's growth period.

On all range areas, including the forested areas, in the Southwest the problem of excessive grazing use is largely the result of: (1) over-optimism as to the grazing capacity; (2) the mild open winters have permitted yearlong grazing use (except in the pine type) and consequently there has been failure to adopt management plans and a rate of stocking suited to the soils, climate, and vegetation; (3) failure to recognize changes in range condition; (4) tendency to hold over animals and gamble with the weather in the hope of a wet spring and new green forage; (5) tendency to think in terms of numbers (a carry-over from past marketing methods) rather than in terms of pounds of meat production; (6) failure to recognize the nutritional requirements of range livestock which results in such practices as holding over on summer ranges as long as weather permits, and in spite of declining weight gains; (7) laxity or hesitancy on the part of public agencies to make needed adjustments because of the problem in human relations involved. It is unfortunate that these beliefs and practices have prevailed in the past and are even common today in the philosophy of some stockmen and some public range administrators.

On the portions of the forest range in unsatisfactory condition the big

job of revegetation can be accomplished through proper stocking and management. This is especially true where the range is not too seriously deteriorated and the key forage species remain in sufficient abundance to respond to management. In most instances this will simply mean bringing down livestock numbers to grazing capacity and securing good distribution of the grazing animals. Proper management, especially on the year-long ranges, will require additional cross fencing in order to rest periodically the more critical portions of the range during the growth season. Such fencing is also necessary for improved animal husbandry practices such as seasonal breeding and segregation of yearling heifers from bulls. Cross fencing large range units into pastures also tends to focus the attention of the operator on areas in poor condition which previously would have been unnoticed. In recent years in New Mexico "wolf-proof" fencing of ranges used by sheep, abandoning the herder system, and turning the animals loose has been meeting with increased favor. Reduced costs and better management appear to result.

There are many openings in the pine type and the woodland where natural revegetation through management or even total protection from livestock grazing is too slow or uncertain. These are the areas where the original plant cover is largely gone. These areas often form not only important parts of the range but exert great influence on the character and kind of runoff. In such cases range reseeding will no doubt have to be resorted to. Research and experience are just beginning to point the way to effective accomplishment. Reseeding offers possibilities for improving range conditions and increasing livestock production on both the open forest type and woodland range. If properly accomplished and accompanied by better stocking and management practices, it will provide more adequate forage, permit the adoption of proper grazing periods, alleviate grazing pressure within areas in critical condition and, by extending the "green feed" period, raise the plane of nutrition for game as well as domestic grazing animals.

One of the most serious and perplexing problems on forest range in the Southwest is the invasion of low value shrubs and trees; juniper, for example, is one of the most persistent throughout the region and sagebrush is a common problem in the northern portions. Among the most troublesome poisonous plants are locoweed, pingue, whorled milkweed, and wild tobacco which each year cause reduced animal production through actual death loss or lowered marketing weights or restricted grazing use. Each of these plants presents separate and distinct problems in control in which proper management is the key to reduced animal losses and retarding further invasions. If control and eradication are resorted to, it should be accompanied by reseeding to the most suitable species wherever the original forage cover has been markedly reduced.

Forest grazing in the Southwest in most instances can be fitted into other land uses, provided livestock numbers are properly adjusted to the forage supply, range and livestock carefully managed, and range improvement practices such as reseeding and noxious plant control adopted wherever necessary. General adoption of such range improvement practices is necessary to the realization of a sound land use program wherein

all land values including range, timber, wildlife, recreation, and, most important of all, watersheds play an important part. However, such multiple land use must be coordinated and integrated to the extent that in many instances one or more uses play a minor role or, if necessary, are even excluded insofar as local or regional demands may require.

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