

PROBLEMS OF MANAGING RANGE LANDS

ON THE NATIONAL FORESTS

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A Thesis

Presented to the Faculty

of the

School of Forestry

Oregon State College


In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

May 1939

Approved:


Professor of Forestry

SCHOOL OF FORESTRY
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CORVALLIS, OREGON

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INTRODUCTION

Purpose The object of the study is to bring to light the place that range management and livestock grazing occupies on the National Forests of the western states where the range industry is considered a major enterprise. The problems include a study of the relation of grazing to the other uses and methods of utilizing the forage in order to secure a perpetuation of the forest ranges and not interfere with the productivity demanded of each and all of the National Forest uses.

Methods Of Procedure And Sources Of Data This is not an original study but a compilation of factual information derived from reliable and authentic experimental reports and technical papers made by various governmental agencies, experiment stations, and research workers striving for scientific methods of coping with problems in this phase of the national industry.

Background To be able to get the problems of managing range lands on the national forests in mind it is necessary to have a comprehensive background of grazing on the forests and see the broad picture of the situation, that is, the national forest policies and the place that grazing occupies. In the original statutes providing for administration and regulation of national forests, provisions were made for setting aside areas suitable for timber production with the purpose of improving and protecting the

forest within the boundaries, or securing favorable conditions for water flows, and to furnish a continuous supply of timber for use and necessities of citizens of the United States; but it is not the purpose of these provisions to authorize the inclusion therein of lands more valuable for mineral, or for agricultural purposes than for forest uses. (1) No legal provisions were originally made for regulating grazing. However, due to the fact that it was a crop and was to be utilized as one of the resources, it was interpreted that the Secretary of Agriculture

"has the authority to regulate, permit, or prohibit grazing. Under his direction will be allowed the use of the forage crop as fully as the proper care and protection of the forests and water supply will permit.

There is no law which gives an individual or corporation the right to graze stock on national forest lands. The grazing of such lands may be allowed by the Secretary only as a personal privilege that is temporary and allowable under the law when it does not interfere with timber production and watershed protection." (20)

Grazing as a use on much of the land could not be disregarded. A big percentage of the area had been used heavily by nomadic stockmen to the extent that it had deteriorated seriously before coming under regulation. Often times the land was depleted until it was useless for any use whatever. There was much opposition from stockmen to regulation at first but benefits derived were above reproach.

The administrators who faced the problem of regulating this use at first tended to do away with grazing but it

was seen that this would disrupt the economic functioning of the using stock outfits as well as the local governments and economic units. Administrators could see where grazing should be one of the major functions included in the policy of greatest use for the most tangible and intangible returns.

GRAZING ON THE NATIONAL FORESTS

Economic Importance

Although each forest desires to get the biggest returns possible from its resources compatible with a permanent use policy, the significance of grazing on national forests and even to the states within which they are situated is not a vital factor to the national livestock industry as may be generally supposed. It is of great local and economic significance to local communities and dependent ranches within or adjacent to the forests whose holdings and working units are not capable of functioning without running their livestock on the national forests for at least part of the season. However, in land use planning the government can not forget the policy of managing for the greatest good to the greatest number of people in the long run.

In an inquiry compiled for the Senate Investigation Committee on the western range lands and presented in Senate Document number 199 it was shown that eighty two and one half ($82\frac{1}{2}$) million acres or sixty two percent (62%)

of the total area of the national forests are at present usable and available for grazing of some form and intensity. Approximately half of this or forty three (43) million acres of the national forest range is capable of producing commercial timber and on such lands timber production will have to be the dominant use because of the general purposes for which the forests were created. Grazing will generally be possible but will have to be made contingent with the protection of forest growth and continuous tree production. An additional twenty two (22) million acres is non-commercial forest in which there will have to be a correlation between livestock grazing and watershed protection. (3)

Census reports show that approximately twenty nine percent (29%) of all livestock in the eleven western states in which national forests are located graze on the forest range during the summer season and a very small percentage of this number graze the entire year. This is less than five percent (5%) of the total number of cattle in the United States and seventeen percent (17%) of the sheep. (2)

Effect Of Forest Service Policies

Prior to establishing national forests the stockmen kept areas which they wished to graze open by burning at intervals to keep back invading reproduction and brush cover on sites where this was the natural tendency. With the advent of the Forest Service and its fire protection

policy, however, much of the formerly grazed areas have grown up with such a cover of timber growth as to make grazing practices impossible or at least not practicable without injury to the new crop. Virtually the same situation holds on the areas of non-commercial watershed or timber areas. No definite reliable estimates have been made as to the rate of establishment and occupation by timber on sites capable of producing timber under intensive fire and other protection and regulated moderate grazing, although Butterick (2) made an estimation that such areas under the given conditions will be occupied within two decades. Even if this statement appears liberal the evidence still remains that land used under the Forest Service policy will gradually be taken out of grazing use or at least reduced in grazing capacity compatible with timber production and watershed protection. Grazing is restricted from additional areas each year to provide for wildlife and also specific areas for recreation, both uses of which are increasing yearly. (21)

Effect Of Recent Land Legislation

Beside the national forest policy which makes for diminishing the forest range area, recent economic conditions and the parallel legislation have done a great deal in effecting the profitable possibility of the grazing industry in the far western states. The population of the United States is approaching a stationery stage of meat consumers and also per capita requirement is falling off.

The per capita consumption averaged sixty five (65) pounds in nineteen hundred fourteen (1914) compared to less than fifty (50) pounds at present. (5) However meat is required in the diet and can not be altogether substituted. If the livestock industry is expanded more than domestic consumers can utilize, the prices have to fall to meet stiff South American and Australian and other competition. Also the demand is changing to a small highly finished animal which is finished in the feed lot or on lush pastures. The cost of marketing the product from the range area is expensive. Examples are a thousand one hundred (1100) pound steer which costs twelve dollars thirty-five cents (\$12.35) to put on the Chicago market from Idaho in comparison to three dollars eighty-five cents (\$3.85) from Illinois. (3). Consequently grazing can exist only on very inexpensive land and cheap forage conditions, frequently below the cost of administering and regulating forest lands as ranges.

Under the present presidential administration much of the sub-marginal farm lands and excess crop lands have been taken out of production of such commodities as wheat, corn, and cotton throwing an immense aggregate acreage out of production. Under the present Agricultural Adjustment Administration policy this land has to lie idle but pressure of public opinion and the middle-west stockman will undoubtedly put it back into some kind of use, mainly forage

production. This is highly productive as grass land and can support immense numbers of stock in the areas adjacent to the feed lots and also principal markets. As stated before the possibility of increasing animal numbers is impossible without drastic price reduction prohibitive even to this new source of raising meat. The other probable alternative is a reduction of the significance of grazing on national forests and other national ranges.

Even though range grazing is on the defensive in the United States and particularly on the national forests where it competes with much of the land for other uses, grazing of wild lands will always remain a dominant use in the part of the United States in which the inherent characteristics of the land exclude, restrict, compete, or correlate with other uses. (5) The economic significance will be materially reduced to fit the state of the country. Any sudden changes in the industry can not be made without altering the economic set up. Changes will have to be gradual and the Forest Service will have to handle their lands for the best use. The study of proper range management methods and the effects will continue to be an integral part of the Administration's duties.

GENERAL GRAZING PROBLEMS ON THE NATIONAL FORESTS

Even though the amount of grazing on national forests will be reduced in the future to be compatible with other uses for the benefit of the land and for the nation, the significance of the problem will by no means diminish.

In fact the importance of so handling the grazing end should be as technical and more complicated than any other phase in the administrative units. A complete knowledge and use of the methods of handling the stock, the periods, and the areas which can be utilized either physically or without cost to the government is basic.

The methods and problems are general so as to apply to the characteristics of the national forests in particular; the same general practices may also be applied on most western range lands of generally mountainous characteristics.

Land Adapted To Livestock Grazing

In setting off areas for national forests the higher, inaccessible ranges and watersheds were naturally selected because of the purpose of the Act and also the most productive timber and wild lands had already been alienated through various land disposal measures. That much of the allocated areas were valuable for grazing can be seen from past use and the type of vegetation much of it supported. Natural grazing land supports a climax species, at least in intermittent situations, adaptable to grazing by domestic and wild hoofed animals. The palatable types of vegetation are grass, weeds, and brush browse.

On the forest ranges which have a diversity of elevations, soil, climate, and a resultant variation of vegetative cover types, they are often interspersed with sites more valuable otherwise. Some regions are impregnable by live-

stock due either to rough physiography or too dense cover. These come into the problem of allocating grazing units compatible with the Forest Service policy and also from an economic standpoint of the stockman.

Classes Of Stock To Use

After the general portions of a region are zoned off for the purpose of utilizing the forage crop available thereon, units have to be set up for various classes of livestock based upon the profitability from the rancher's side, and also economically and ecologically desirable from the administrative and regulative viewpoint. The classes of domestic livestock best utilize different types of vegetation and different physiography as well as utilize an identical site to different degrees of intensity. In the past cattle, sheep, horses, goats, and swine have grazed on the forest ranges but the trend has been to limit the classes to primarily cattle and sheep. They are the two principal classes referred to in this paper.

The natural characteristics of a cattle or sheep range are somewhat different although the ideal use may be tempered by the nature and class of stock produced on the adjoining winter ranches as well as the market demand. However classification should be based upon the requirements and grazing habits of livestock, the character of the range, relation of grazing to other resources, and tempered with the economic desirability of the stockman to be able to

profitably utilize the units. The primary factors which together determine the class of stock to use on a given range are considered in sequence. On each individual site any one of the factors may be the controlling element while in other cases it may be an equal integration or even a summation of minor local factors.

Vegetative Types- Cattle utilize a large percentage of the grass forage while sheep prefer only the tenderest leaves and grains; weeds are much more palatable to sheep. Although they will show a preference they will utilize nearly all of most weed species on a closely grazed range; only a small relative percentage are palatable to cattle. In other words, coarse bunch grass range is essentially for cattle while the ideal for sheep is the grass-weed and weed range. (4)

Browse is taken by both classes but sheep tend to browse more while cattle can reach higher and eat the taller browse species. For sheep to get around over a brush range it should be open enough to allow the sheep and herder to get through it. If handled quietly they will gradually work their way into dense thickets and small bands can closely utilize these sites. Cattle will use dense brush range if forced but they prefer open grass with intermittent brush or timbered areas that will provide shade and forage.(11)

Physiography- Although sheep prefer a level, rolling range they are nimble and can readily use rough areas due

to the fact that they are controlled by herders and can maintain a relatively even distribution of grazing. On the same region or watershed sheep naturally prefer the higher, more rugged, and cooler range where the lush feed is available while cattle congregate on the lower, more open slopes. Sheep are bad to roll rocks and start slides.

Cattle, if forced, can use rough range but they are more difficult to handle than sheep even with the proper distribution of salt grounds, watering places, and drift fences; there is a strong tendency to overgraze the meadows, level creek bottoms in rough areas, and the open parks in timbered belts.

Poisonous Plants- Poisonous plants are a serious problem especially in the West where the annual losses are heavy. Areas containing the poisonous plants may be small in respect to the total range but the drastic results are sufficient to discourage the use of an otherwise desirable piece of land. Usually different species affect different classes of livestock. On national forests the principal plants to contend with are the larkspurs, death camas, lupines, locos, and water hemlock. While other species are poisonous to cattle ninety percent (90%) of damage is caused by the larkspur genera belonging to the buttercup (Ranunculaceae) family. (6) Sheep are not susceptible to this genera but the plants that raise havoc with them on forest ranges are death camas and lupine. The seasons and sites are somewhat different.

The range managers must have information or knowledge upon the growth habits and nature, the ability to recognize the poisonous plants on the range, and determine their distribution and abundance in the field. Little progress can be made in applying measures to prevent poisoning. Local forest officers and stockmen have to learn to cope with the problem in the area. Individual precautions or measures have to be applicable to combat the growth of each individual species but general rules that may apply to any range, plant species, or class or stock are building up the amount of palatable forage so poisonous plants will be less conspicuous or crowded out, putting the type of livestock on the unit that is not susceptible to the species, proper salting to prevent perverted tastes, and even by grubbing if the patches are localized. C. D. Marsh suggests: (8)

- "1. Don't overgraze the range. To do so may result in any class of stock's being poisoned fatally from eating plants which do not cause loss in the amount eaten when the range is not overgrazed.
2. When trailing stock, don't let the hungry animals in on areas where there are poisonous plants.
3. Cattle should not be salted near larkspur patches they tend to congregate and loaf.
4. Do not worry or excite stock but let them rest and graze as they choose.
5. Graze during seasons when poisonous plants are not effective."

Where common use could be put into practice larkspur areas may be controlled by cleaning them off with sheep before cattle are permitted on the area; where a sheep allotment adjoins a cattle range this is practicable.

It has been tried on two forests in Nevada with great success but proved unfavorable on the Fish Lake National Forest in Utah. (9)

Combating larkspur by grubbing is often prohibitive due to labor costs varying from about a dollar and a half (\$1.50) to thirteen and a half dollars (\$13.50) or an average of three and a half dollars (\$3.50) to five dollars (\$5.00) an acre on average infected areas. (9)

Poison areas may be fenced on cattle range and avoided by herding on sheep range.

Distribution and Availability of Water Supply- The ideal range has enough water available in the form of streams, developed springs, or succulent and dew covered forage to satisfy the demand of the livestock.

Animal Pests- This factor is sometimes of significance to make the practicability of grazing some areas impossible. On some ranges, especially at the higher elevations where seasons are very short, various insects (11) will actually drive stock off a range otherwise well adapted to use. Cattle are apparently the most susceptible to gnats and flies but often bands of sheep are made impossible to handle due to the annoyance of gnats or flies working on them. There is apparently no practicable reliable remedy.

Coyotes and other predators may be included here. Coyotes are the principal sheep nuisance; in rough country where it is impossible for the herder to keep in sight of the whole band at all times they may cause considerable

trouble. Bear occasionally get started molesting a band and cause considerable damage before they are apprehended.

Although a few calves are lost to predators, they are not considered as a problem in cattle management.

Management Of Cattle

The fundamental of range management is a control over the number and distribution of livestock. Often the national forests as a whole may be understocked and yet large portions will be overstocked. The problem, then, involves controls at the boundaries of individual grazing units. On a cattle range the only effective remedy is that of fencing where natural barriers will not serve as boundaries and for the promotion of a deferred and rotation grazing policy; division fences are necessary within the boundaries of each unit. Of course on ranges of low carrying capacity the expense of fencing is prohibitive.

In dividing ranges into individual units the governing factors are a mixture such as "lay of the range" or nature of the watersheds, topography, vegetative types, climate, and local or community interests. The usual characteristic of dependent ranches adjacent to the forest ranges are relatively small numbers of livestock. On the cattle units usually several outfits form associations or cooperatives and the units should be laid out to the best interests of the associations as far as possible.

Distribution within each grazing unit to get the best out of the forage involves grazing at the proper period

over all parts of the unit. This is brought about by proper salting, development of watering places, drift and division fences, development of stock trails, and riding.

Salting- Proper salting can go a long way toward distributing the cattle and is an implement which may be put into practice without material initial cost. (10)

Cattle require from one to two pounds a month depending upon the succulence of the feed; more salt is needed with succulent feed. Common stock or crystal salt is the best adapted and most economical. It is usually put up in fifty pound sacks which are adapted to carrying on a pack-horse; it also can be spread out in troughs so several head can use it at once. Salt should always be put in a container such as long log troughs or boxes when logs are not available. The practice of putting salt on the ground is very wasteful; much of it is dissolved by the soil moisture and it gets mixed with the dirt so stock have to eat large quantities of soil to obtain the required amount. In some cases cattle have been known to die from the large lumps of mud formed in their stomachs from this cause. (10)

The salting places should be located to draw cattle away from places where they naturally congregate. Cattle will go to salt nearly as much as they will to water and this phenomena can be capatilized by placing salt grounds out on areas otherwise of good grazing capacity but not naturally utilized by livestock. No set rule can be stated but distance from salt to water will depend upon the physio-

graphy and distribution of water. In general they should not be over a mile apart and midway between watering places or located on other less desirable but valuable sites. The amount should be based upon the grazing capacity of the range in a using radius. Also the timing and distributing of salt may be a tool in promoting regulated grazing. When a salt ground begins to deteriorate from excessive trampling it should be removed from the specific location but remain in the same general location if the old site was satisfactory. (10)

Water Supply- The control over watering places on the range is limited although it has more influence on stock distribution than any other single factor. Water should be available to cattle daily ordinarily. The ideal is to have a supply within the daily ranging radius; in rough country water should be available every one half mile and every one and one half ($1\frac{1}{2}$) miles on level or rolling territory. (11)

Any small seeps or springs can be utilized on cattle range by developing a trough or two or a reservoir that is sufficient to water a few head at a time or else used as an early season supply.

Fences- Fences are usually the most effective and economical means of controlling cattle. The boundary protection of a unit is primary to control total numbers of livestock; partition fences within a unit provide for

supervised and regulated grazing, protection from poisoning, protection of watersheds, timber growth, and recreation areas.

Riding- On any range management unit, even with complete developments a rider is necessary to distribute salt, keep water places and division and boundary fence in working order, keep stock well distributed over the portion of unit in use, and many other jobs too numerous to mention to provide for maximum welfare of the condition of cattle and of the range. On an improved unit one rider may care for many more times the number of cattle on an unimproved range.

Other Improvements- Other minor developments are trail improvements or development by opening up inaccessible areas and providing trails to inaccessible water.

Management of Sheep

As in cattle management control over the number and distribution of stock is fundamental to sheep range management. Control of the number is comparatively simple due to the fact that they are under a herder and can be counted upon entering the forest.

Size of Unit- Usually the forest service policy is to divide the range into units sufficient to support one band of sheep. Occasionally, however, one individual, corporation, or company may have an allotment which included several bands. Appropriating individual units to each band places the responsibility of how that particular unit is

used upon the sheepmen.

Size of bands vary from one thousand two hundred (1200) to eight hundred (800). The past practice was to run large bands but studies have shown that small bands are more profitable especially on mountainous range. The policy is to run a band small enough that the sheep all have equal chance to get on fresh feed and cause minimum wear and tear on the land and vegetation, and yet be large enough to pay to have a herder. On mountainous forest ranges bands of about eight hundred (800) ewes are proving more profitable than larger bands. They are easier to handle and are able to penetrate into small openings and cause less trampling out of vegetation and hence get a higher utilization of the unit.

Lambs do better in small bunches by being able to be on a maximum of fresh feed. After they are marketed the small bunches of ewes may be united to cut down herding expense if the permittee has more than a one-band allotment. In some situations two adjoining single band owners could combine ewes for the remaining summer season.

Trespass- Trespass between grazing allotments must be avoided if proper practices are to be followed and natural boundaries should be established as far as practicable so the herding plan can be laid out to defer use on parts of the range some seasons without fear of losing it to a neighboring band. Often mutual trespass along boundaries is advisable where a small choice area may be inaccessible

to the permittee but which is of high value to the adjoining allotment.

Herding- Sheep grazed under fences support from twenty five percent (25%) to fifty percent (50%) more sheep per acre and they are in better condition than herded sheep under old practices. (12) On national forests the feasibility of fencing the allotments is out of the question because of the expenditure involved in building a boundary fence that would be predator proof. The other alternative is to devise improved herding methods. The Forest Service when first trying to use improved methods made a blanket rule of one night camping with a three night maximum limit with the idea that this more nearly represented the pasturing under fences and would be better for both the sheep and the land. Experience has shown that, as in most problems, a blanket rule is not adaptable. On the lower, more smooth ranges it is ideal but the land allocated to sheep on national forest ranges is characteristically of the brush browse and rough topography type. Here the sheep are relatively difficult to keep together. The best solution for herding in mountainous ranges is to cut down size of bands and establish camps from three days to a week, and alternate their period of use from one year to the next.

Arguments in favor on one night stands are freedom from coyotes, minimum harm to vegetation on bedgrounds, and sheep are always on fresh feed. Some outfits on the forests use two men per band with one man tending camp

and helping herd in order to comply with the bedding out practice. This is expensive and of questionable.

Watering- The length of time sheep may be away from water varies with the type of feed available and weather conditions. T. J. Jardine (11) states that sheep have been grazed successfully an entire summer without water on high mountain ranges where the vegetation is characteristically lush and dew is heavy. Sheep may not need water oftener than every three or four days if the feed is succulent and the weather cool. Prior to the period when lambs are taken off, the sheep should have access to all the water and succulent feed they desire in order for the lambs to have the best of feed and the ewes to give a maximum quantities of milk. In late summer and fall watering oftener than every three or four days is not good practice if the band has to trail considerable distances into deep canyons, and so on. Sheep should be grazed to water, never driven.

If water developments are planned they necessarily have to be larger than for cattle to accommodate a whole band as compared with a few head of cattle stringing in at a time. Water, however, may be more sparsely distributed as the preceding chapter indicates. Seeps or springs to be worthy of development should have the capacity to fill a thousand (1000) gallons of troughs or tanks every two or three days during cool weather and oftener during hot, dry weather unless several watering places can be used alternately.

Salting- Sheep require salt the same as cattle and supplied with sufficient amounts at all times they are contented and easier to handle. The ideal is to have salt for them every evening as they come on the bed-ground but if the one-night system is used they may be salted every three or four evenings with good results. On bed grounds a few small troughs can be hewed out without much trouble or expense or convertible canvass troughs may be used. On one night stands if use of troughs is prohibitive, the salt should be poured on rocks, hard ground, or grass to prevent minimum waste and the sheep from eating excessive quantities of dirt. The amount varies with the type of feed but very little, fifty to seventy-five pounds every three days, is required if given often. (10)

Unit Planning- A plan of grazing is relatively easily put into practice with sheep due to the fact that they are under control of a herder at all times. Dates of occupying camps each year can be adjusted so a perfect plan of deferred and rotation grazing is put into practice. This, however, is altered by the physical characteristics which has a variety of vegetative types on the allotment or some of the watering places drying up in mid-season. Plans have to be adjusted to utilize the early watering places and also the portions of range that support an early maturing forage before it dries up and becomes unpalatable. On the other hand there are areas that have noxious weeds and grazing has to be withheld until they dry up or are not palatable.

Also sub-alpine meadows do not dry up and remain green until late in the season.

The object of running sheep is to put the most weight on the lambs in the least time before feed dries up and the weather gets hot, and keep the ewes in fair condition. Sheep do best on succulent, tender, or lush weed forage. With the sheep under control and a knowledge of the character of the allotment it is easy to put a plan into effect that is optimum to gains of lambs and to the residual condition of the allotment.

Alternating or Multiple Cattle and Sheep Grazing

On the Same Range

The Forest Service has not followed the policy of common use of a given range by the two classes of livestock probably due to pressure of public opinion and friction between the types of operators. Specific instructions are given in the Forest Service Range Management Handbook (13) which state:

"Forest Service officers should not be over zealous about urging transfers in class of stock as an economic phase enters in over which the Forest Service has no control, i.e. market demand. A tight rein should be held in class of stock and exchanges allowed only when they will not militate against the range. Exchanges are discretionary with the Service."

If the range is uniform enough to be fully utilized by one class of stock there is nothing to be gained by common use. However, due to the mountainous character of national forest range there is often a wide variation in range types within areas too small to set off as a range

unit; common use should be considered as a means of utilizing all of the unit. This practice is used and is comparatively simple to the stockmen on privately owned range. The argument that cattle won't graze on a sheep range is a fallacy originating on the "free range" in the early days when the sheep had eaten everything into the ground and there was nothing left. (14) In fact cattle like to snoop around sheep bed-grounds and salting places and get into sheep camps; special precautions as guard fences around the tents have to be constructed to prevent damage. Often within the boundaries of a cattle range there may be some high rugged areas that are inaccessible to cattle yet fully utilized by sheep without interfering with the cattle carrying capacity. On the other hand, on a sheep allotment there are often meadows and bottomlands that support such a dense, rank growth of grass that sheep do little but knock it down. Even on the identical areas alternate use may be beneficial. On the aforementioned meadows cattle can clean out the coarse growth to provide for fresh, green, succulent forage for sheep. And again sheep can clean the weeds off of the cattle range and thereby maintain its value for cattle. (15)

Common range use on many of the forest units would greatly increase the value of range land by close utilization of otherwise waste range and at the same time improve quality of the units already in use to a given class of stock. On national forests the problem of regulation is

more difficult than on a private range but a system of regulation is possible without inflicting sacrifice upon either party and in most cases actually improve conditions for both types of operators.

STOCK DRIVEWAYS

Due to the tremendous numbers of livestock, especially sheep, that trail long distances to summer ranges the Forest Service has had to establish driveways to accommodate this travel from the winter ranches and ranges. These driveways have always been more or less of a sore thumb to range management plans. From the large numbers that enter and cross the forests in regions where grazing is a major enterprise, it is evident that a relatively large acreage must be devoted to driveways. To illustrate the amount of livestock movement on some national forests, approximately two hundred thousand (200,000) sheep pass through the Ukiah district on the Umatilla National Forest every summer. A great many of these stock are trailing long distances and have to have feed along the way; thus sufficient areas have to be set off to supply forage.

Stock driveways are a necessary evil but suggestions have been presented by Robert R. Hill (15) who reported as follows:

"Even at best an excessive number of stock must use these strips of range, and injury can not be avoided. However, all practicable means should be used to conserve the stand of forage by furnishing sufficient feed for the stock using the driveways to reduce the injury to reproduction to a minimum. In order to accomplish this, it is recommended that driveways be used as little as possible;

that, whenever practicable, they be closed to grazing except by passing stock; that a sufficient number be established to prevent over-grazing; and that water be furnished at proper intervals along them."

In some cases it may be advisable to develop extra driveways and rotate their use. (11) Where they have to be used regularly the driveway should be as narrow as practicable to drive a band of sheep with definite well marked boundaries with grazing areas set off at intervals along the way. On this type of driveway the regulations must be enforced by patrol to prevent infringements and trespass upon adjoining allotments.

Proper driveway development is essential to good range management practice. Stock that travel relatively long distances to their allotment must arrive in the best condition possible. If famished from days of travel without sufficient feed or water they will eat everything in sight for several days including all of the palatable forage, brush, reproduction, and poisonous plants. Serious damage to the range results as well as possible heavy livestock losses from poison.

Cattle travel only relatively short distances to summer ranges as compared to sheep. Cattle ranches are therefore situated fairly adjacent to the forests while sheep outfits are scattered out many miles from their summer range. This phenomenon is explained by the fact that the cattle do not bring enough margin to stand much traveling expenditure. Much of the long distance traveling is a result of short

sighted management policies and land disposal policies.

An operator may go broke or sell his livestock to another operator in a different part of the region; national forest permits are principally tied to the livestock and the operator from the new location has to travel across the state to use the range. Examples are sheep outfits wintering around the Dalles adjacent to summer ranges on the Cascade range and summering on the Wallowa National Forest. Other outfits wintering in the John Day country adjacent to the Umatilla, Whitman, and Malheur Forests travel across two national forests to summer on the Freemont National Forest in southern Oregon. (22)

Forest Service officials have recognized this problem and have worked for many years toward straightening out the entangled network of long treks but have been hampered seriously by politics. Changes will have to be gradual, however, to prevent economical upheaval to livestock interests.

REVEGETATION OF DEPLETED RANGE

Natural Reseeding- Revegetation has to be carried on to maintain the species; if the life cycle is interrupted this is hampered. Therefore a working knowledge is required of the forage plants to understand how they may be utilized and yet maintain or improve the range capacity. Unless the area is too far gone there is no necessity to vacate it. As a matter of fact certain types of grazing accommodate as well as promote natural revegetation. Grass is apparently well adapted to periodic grazing with periods of allowing it

a chance to mature and produce seed crops. That grass is adapted to this was suggested by the buffalo which according to early authorities (4) and (14) roved from northern to southern parts of the range with the seasons and despite much trampling maintained the forage crop. The type of grazing most nearly approaching the buffalo system and also has proved to be the most satisfactory in maintaining and improving the forage is the system referred to as Deferred and Rotation Grazing. It is used on areas where the grass has to be utilized from the beginning of grazing until autumn. To illustrate, an example is taken from Sampson (4) in which a unit is divided into three subdivisions. One portion of the unit is used at the beginning of the season, the second division is used during mid-season, and the third portion is used after seed maturity to let the area seed in. The following season the newly seeded area is again withheld until last to provide for establishment of the new seedlings while the other two may be alternated. One of the other areas is then withheld for seed production the next year and so on.

Plan of Pasturing for Revegetation

Year	Area A	Area B	Area C
1926	first	second	last
1927	second	first	last
1928	first	last	second
1929	second	last	first
1930	last	second	first
1931	last	first	second

After Sampson (4)

Artificial Revegetation- On areas where depletion has reached such a stage that practically no palatable plants remain to produce seed or there is a great need for change

in vegetative type, artificial reseeding is the only alternative. Introduced plants require an optimum of site conditions to be successful. Only where forage plants are of inferior quality and too sparse to prevent establishment is it practicable to introduce the higher type. The average mountain ranges susceptible to artificial reseeding will seldom bring a return which will justify an expenditure of three and one-half dollars (\$3.50) an acre for increasing the grazing capacity. (17) It is, however, justified as a supplement to erosion control. Grazing should be refrained until the new plants have become permanently established as in natural revegetation.

RELATION OF GRAZING TO OTHER USES

The more specific problems of grazing will be discussed here as they relate to each of the other principal forest uses. The wide diversity of land and cover types present a complication of many individual problems.

Soil is the basis of all the forest resources and any use must be aimed to get maximum utility which means permanent conservation of the basic resource, soil. Retention of fertile humus layer of top soil is essential to continual productivity. The original cover prevented run off and erosion, and by conserving precipitation the productive soil yielded abundantly. Overgrazing and fires, both primarily the product of man, are the principal means by which the protective and absorptive vegetative cover is removed or deteriorated to the extent that accelerated erosion takes place and removes the valuable soil layer to the lower regions sometimes enriching the valley

floors but usually doing more damage than good by covering up the already desirable cultivated land with material inferior to that already there. Accelerated runoff causes physical destruction to property with its floods and silting in and ruining the value of storage reservoirs and irrigation projects. (18)

Water Sheds- On important watersheds which are badly depleted, management plans have to be adjusted to facilitate as rapid a recovery as possible. Where vegetation has been removed or at best is an insecure natural balance, grazing should be excluded entirely. Efforts to graze the negligible forage results in sliding soil on slopes and prevents establishment of new vegetation.

Municipal Water Supply- Over seven hundred (700) cities in the western states get their water from drainages originating within national forests. There has developed pronounced public sentiment against the use of livestock on areas designated for this purpose but sanitary Engineers (18) hold and have shown that contamination usually does not come from livestock but from the presence of human beings upon the area and precautions against contamination have to be taken just the same. Nevertheless the Forest Service has eliminated seven hundred twenty thousand (720,000) acres of usable grazing land for this purpose alone.

"Securing favorable conditions for water flows" was one of the two major purposes of the national forests as stated in the Act (20); consequently timber cutting and graz-

ing are regulated by the watershed factor.

Runoff is a natural process as is erosion but it is made unstable and destructive by removal of the protective cover which absorbs and checks percolation. Packing the soil by trampling also reduces the water holding capacity.

Grazing and Timber Production

On all except the portion of the national forest range which is strictly other than timber land, the use of forage resource has to correlate with the production and establishment of timber stands. In order to get maximum use out of grazing without damage to reproduction and timber growth it is necessary to know the effect of forage utilization upon the welfare or silviculture of timber stands.

The extent to which reproduction is damaged varies directly with the intensity of grazing. (15) Sheep tend to do more damage with a given degree of utilization than cattle. In general, under moderate or conservative use, cattle do little or no damage to coniferous reproduction; sheep can be expected to do some damage to reproduction up to four feet in height.

G. A. Pearson, Director of the Southwest Forest and Range Experiment Station, has found that managed grazing may be an implement in establishing reproduction. Although grazing to the point of denudation is, under most conditions undesirable because it tends to pack and otherwise deteriorate the soil, he says: (19)

"It is good practice to graze conservatively as a regular practice until a good seed year or cone crop comes into evi-

dence, then increase the intensity only for such time as is required to save seedlings from suppression. With deficient reproduction and a good seed crop in prospect, the areas should be grazed heavily, preferably by cattle because they do less damage per degree of utilization than sheep. Seedlings already present will suffer but those over two years old can withstand quite a bit. Heavy grazing through summer and early fall on the year of a heavy seed crop will discourage the mice and rodent propagation as well as expose the soil for seed reception. If conditions (weather) are favorable and a good crop is obtained, grazing should then be directed toward survival of reproduction."

Such a program is difficult to apply due to the impracticability of the livestock owners being able to fluctuate the size of their stock units rapidly. However it could be effective if the Forests were able to make plans flexible enough to provide moving of stock from one portion of the range to another as conditions and developments warrant. Because relatively small areas are involved any one season, the administrative difficulties are not impossible, although there will be some increase in expenses and inconveniences to the livestock interests but this must be expected on lands chiefly valuable for timber production. Incidentally Pearson has shown from studies in the southwest, and the relative figures will apply to any multiple use forest region, that on areas accessible to market the annual stumpage increment is fifteen (15) to twenty five (25) cents per acre whereas the forage crop nets an average return of about one and one-half ($1\frac{1}{2}$) cents.

When so many precautions and conditions are an integral part of the grazing plan on timberlands the costs are much higher than the receipts due to administration and improvements provided by the government. The time is not far distant

when the government will have to maintain such lands for grazing at a big cost.

On national forest land whose primary purpose is timber production, grazing, when allowed, should be regarded as a part of silviculture; if cost of carrying it on exceeds the revenue the excess should be subject to a silvicultural justification.

Grazing and Wildlife

When referring to wildlife as tying into grazing the first thought comes to big game which use more or less similar forage as domestic livestock. Species on national forests having forage habits similar to sheep and cattle are primarily elk, deer, and mountain sheep. Although much of the land available for wildlife is too rough, too densely covered, too far from water, and so forth, there may be conflicts when the range is used by both. The greatest difficulty comes when a given area is overstocked by one or by both. There is generally plenty of summer range but a lack of winter range even for the present numbers of game. The big game's former winter range, the lower foothills and valleys, have been taken up by settlement thereby forcing them to winter in the higher ranges where there is less vegetation and deeper snows to contend with.

Public interest in a well maintained wild life supply will require curtailment or elimination of livestock from specific areas. The national forests have already set aside approximately three million (3,000,000) acres for the benefit

SCHOOL OF FORESTRY
OREGON STATE COLLEGE
CORVALLIS, OREGON

of game; indications point out that this acreage will gradually increase directly with increased interest in wildlife. (18)

Winter ranges for big game are usually on the exterior of national forest boundaries; nevertheless the problem in providing for them requires a study and knowledge of the capacity, distribution, and forage habits, how they correlate with livestock production, how winter range facilities correlate with summer range, and the desirable numbers of game.

In the mountainous regions grazing sheep have been a factor in reducing the blue and native grouse population. In areas which are adaptable to these birds, a band of sheep will trample the clutch before they have feathered out due to the fowl's nature by which the hen hides her clutch on the ground under leaves and twigs and feigns crippled to try to lead away the intruder.

Fish are a highly valuable feature in the mountain streams and proper precautions must be taken to maintain their habitat. Prevent contamination to the cool, fresh streams by avoiding overgrazing and permitting erosion and silting. Avoid bedding sheep down regularly on stream banks or unnecessary loitering when watering. (13)

Grazing and Recreation

Recreationists have an intensive interest in grazing on national forests. In general they tend to look upon grazing as deleterious to the welfare of the forest; however, there are a few individuals who obtain an aesthetic value by observing grazing on the range. The number of people

using or visiting the forests are increasing annually; to accommodate their needs and interests results in diminishing the grazing use somewhat.

Except on specific areas which are to intensively utilized for recreation, there will be no drastic change in numbers of livestock or plans of management. On these limited areas there is a heavy concentration of demand for campgrounds, picnic grounds, and resort sites. They demand locations near good supplies of water and ideal park-like sites which conflict with the livestock operator who needs them to water his stock and locate camps if running sheep.

Satisfying the recreation demands give intangible returns hence outweighing the livestock interests on public ranges. When recreation needs of a region monopolize most of the ideal locations on a forest range it may be sufficient to eliminate grazing from the forest entirely.

Grazing and Fire Protection

Fire protection is not a forest use in itself but is brought in here as it is one of the biggest problems on national forests and either directly or indirectly effects all of the forest resources.

Fire is one of the primary enemies of the national forests in attempting to carry out their use policies. They ordinarily cause much more serious damage to the timber than to forage. Fires are destructive to forest and forage lands alike but differ in degree more or less directly with the volume of vegetation. Although the annual monetary loss due to timber

destruction from fires is tremendous, estimates state that probably the loss is no greater than that of loss of soil fertility. (4) On the range land itself burning is fully as destructive to the range as overgrazing.

Regulated grazing, however, may be utilized in reducing fire hazards by removing the palatable forage which when dry is more inflammable than most timber growth. Trampling of livestock decreases hazard in timbered areas by breaking down the litter and hastening its decomposition, especially on sheep allotments.

Trails to and from water, salt, feeding grounds, and stock driveways are an aid to fire protection as they aid in getting over the ground with equipment in case of fire and also to act as effective fire breaks. The object should be to graze the forage in high hazard spots before it dries up. High hazard pockets or small inaccessible areas are often a serious source of danger and special attempts should be made to utilize these spots by opening up with trails and developing watering places.

The forage is transformed into mutton or beef instead of going into potential tinder. In such cases where grazing is a factor in fire protection part of the overhead charges should be made to fire protection and hence broaden the margin in order that grazing may be profitable on areas otherwise possible to utilize only at a loss.

GRAZING INSPECTION

In order to ascertain the problems to be coped with and to be able to develop and promote plans for the proper use of a given unit a survey or inspection must be made of the area in question with complete records taken. The methods are variable but the object is to collect information for drawing up or improving range management plans.

A range survey generally uses mechanical methods of gathering data, the "Point Observation Method" which has been adapted by the Forest Service and other government bureaus being an example. Resultant data is the basis for grazing plans. Systematic range inspection is less intensive than the surveys and should be conducted annually. The aims are to size up the individual unit in the field, collect information to point out flaws in the present management, and how to make satisfactory adjustments.

Even under proper management policies conditions fluctuate enough to require altering plans occasionally on a given unit. There is a change in vegetative types due to building up the range through regulated use, encroachment of timber on lands capable of supporting it due to intensive timber protection, and increases in other use demands such as recreation and game refuges.

SUMMARY

Livestock grazed on national forests do not represent a major portion of the industry considering the nation as a whole. However to the western stockmen the national forests furnish a large portion of the summer range and as far as the western livestock industry is concerned the summer ranges are a vital element. The western operator has stiff competition from the middle-west principally in the form of high freight rates. To offset this the western industry has to have cheap feed and operate in a scientific manner in order to produce the most meat and associated products at a minimum expense outlay.

Efficient livestock operation on the national forest depends upon meeting and solving successfully the complicated and integrated problems. Forest range use is essential to the welfare of the west yet the Forest Service does not legally allocate grazing as one of its purposes. It is considered a privilege to the livestock operator and he has no legal rights whatsoever. Due to this fact grazing is on a defensive on national forests especially when it competes with other uses or interests.

Fundamental to forest range management is determining if the area has value for grazing use either economically or silviculturally. After a given region is classified as adaptable to grazing, the class of stock have to be used which are best adapted to the habitat and conditions. Proper methods of handling the various classes of livestock are

essential to obtaining optimum returns in keeping with maintenance and improvement of the natural resources.

Even though acreage allocated to grazing is now dwindling due to encroaching reproduction and developments of other uses, with mostly intangible returns, it will strike a stable position eventually on the land primarily suited to that use. The extent of the grazing management problems will not diminish but will increase as the need for more scientific methods develop. Grazing may actually be a valuable implement for timber production and fire protection in many cases.

Grazing management is dynamic hence constant inspection and research is essential.

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