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# Oregon Agricultural College Extension Service

PAUL V. MARIS  
Director

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## Management of Range Grazing Land

By

J. T. JARDINE  
H. A. LINDGREN  
E. L. POTTER

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# Management of Range Grazing Land

By

J. T. JARDINE, H. A. LINDGREN, and E. L. POTTER

This bulletin aims to give in simple form the available information on the care and handling of ranges with the idea that it may be of benefit both to individuals using deeded grazing land and to range and grazing associations using the public ranges and National Forests. This bulletin is based upon experimental investigations and observations, by the United States Forest Service, upon wintering investigations and cost of cattle surveys conducted by the Oregon Experiment Station, especially through its branch at Union, and upon the needs of the state as appear to us through our Agricultural Extension Service. The three authors represent these three points of view.

The word "range" is used in this bulletin to include all Western grazing lands unsuitable for farming and sufficiently large in area to justify the raising of livestock on a commercial scale, regardless of whether deeded or not deeded, or whether fenced or unfenced.

There has been a tendency among the more progressive stockmen in recent years to give more and more attention to winter feed, and less to grazing, but experimental work at the Eastern Oregon Branch Experiment Station, and similar work at the Western Kansas Experiment Station, together with surveys and investigations into the cost of beef and mutton production, lead us to the following conclusions:

1. The beef or mutton produced in the winter time on hay, grain, silage, or any combination of these feeds, will cost more than the normal selling price of beef or mutton. This means that taking the year as a whole the winter is an unprofitable period.

2. The time when sheep or cattle are really making a profit above the cost of feed is when they are on grass. During this period they must make a profit high enough to cover the net expenses of wintering and thus make a profit on the entire year's operation.

3. Over a large portion of the Northwest, the winter feeding period during which climatic conditions make grazing impossible averages four to five months. This, of course, means an average grazing season of seven to eight months.

4. The expense of four to five months winter feed is so heavy that the only chance of a net profit for the year lies in keeping the animals gaining as rapidly as possible during every day of the time that they are on grass. This in turn means a better management of grazing than has been the general practice.

5. The big opportunity for improvement in our methods of livestock feeding, therefore, lies in better methods of grazing management, rather than in more extensive winter feeding. As a means of bringing about decreased cost of production, better methods of grazing must therefore take rank with those other important steps of progress; namely, increased percentage of calves and lambs, diminished losses, and improved breeding.

## CLASS OF STOCK TO WHICH THE RANGE IS BEST SUITED

In general, cattle and horses use a grass range to better advantage than do sheep. By "grass range" we mean a range in which the dominant forage plants are true grasses, as distinguished from weeds and similar forage, such as we find in the higher mountain districts. Sheep relish the tender green leaves and also the seeds of many grasses, but they eat sparingly of the coarse or dry stems and leaves. Cattle, on the other hand, consume a much larger portion of the coarse grass. Sheep will eat part, or all, of most weed species on closely grazed range and often prefer the succulent weed to true grass. On the other hand, only a small percentage of weeds are palatable to cattle. Both sheep and cattle eat considerable browse; but sheep eat more than cattle, although cattle reach higher than sheep and get more forage from high growing browse species, such as scrub oak, service berry, and mahogany. Grass range may be quite suitable to sheep when the grasses are young and tender, and most of the early spring ranges used for sheep are grass ranges. The fall and winter sheep ranges in Oregon are, to quite a considerable extent, grass ranges. There is, in fact, not as much difference in the requirements of sheep and cattle for spring or fall range as there is for midsummer range.

Altitude alone makes little difference in the suitability of a range to cattle or sheep. The higher ranges, however, commonly run more to weeds and succulent forage of that nature and less to the pure grasses, which fact tends to make them more suitable for sheep than for cattle. Also, the higher altitudes may be less suitable for cattle because of ruggedness.

The presence of such insects as flies, gnats, and mosquitoes, sometimes makes it impracticable to graze cattle or horses on ranges which otherwise are well suited to them. Sheep are annoyed by these insects, but much less than are cattle or horses. Usually no consideration need be given to this factor in allotting sheep to a range within the National Forests, but in a few localities adjustment in the time of grazing may be necessary.

In the foot-hills of Western Oregon where sheep are run in small bands under fence and without herder, the presence of any considerable number of coyotes, or bob-cats, or other "varmints," will make it necessary to run cattle even though the country might otherwise be better suited to sheep.

Larkspur is very poisonous to cattle, but is harmless to sheep. Lupine and death camas, on the other hand, are very poisonous to sheep and cause serious losses, but they give little trouble with cattle. These are probably poisonous to cattle if taken in large enough quantities, but in actual practice they seldom get enough to do any harm. For further information on poisonous plants see Oregon Station Bulletin 187, "The Principal Stock Poisoning Plants of Oregon," by William E. Lawrence.

If a range can be fully and properly utilized by either sheep or cattle alone, there is nothing to be gained by grazing two classes in common; but where the range supports a variety of plant species, including a good

deal of grass, or where there is an appreciable area of meadow range, cattle grazing, if not overdone, is a benefit rather than a detriment to the sheep interests. On the other hand, sheep grazing on a cattle range where there is a good deal of weed feed, or on small areas difficult for cattle to reach, not only is economy, but aids in maintaining the cattle feed by keeping down the weeds. In some cases a few horses may be used to advantage on grass range not well suited to sheep and too far from water or too rough for full use by cattle.

The old-time belief that cattle will not graze on a range used by sheep is erroneous. It originated mainly when the ranges were badly overgrazed and there was little or no feed of any kind left for cattle after sheep grazing. Naturally, cattle would not stay on such a range.

### GRAZING PERIOD

**Beginning of the grazing period.** Premature grazing is undoubtedly a primary cause of the deterioration of range lands. The growing leaves of the plant are its breathing apparatus and are therefore essential to its most vigorous growth. If the young leaves and stalks are cut off as fast as they come through the ground and the process continued long enough, the plant will die. On the farms this process is used as a means to kill the most persistent weeds.

The damage to the forage plants from grazing is greatest immediately after growth begins and decreases as the growing season advances. Little or no damage is done after the plants have matured seed. In a broad sense grazing at any time before seed maturity may be considered premature, but in actual practice we find there is little damage if we do not turn the cattle or sheep on until 25 percent or more of the heads of the earlier forage grasses begin to show, or are conspicuous in the sheath, which stage of development comes normally from ten days to two weeks after growth begins.

Grazing when the soil is very wet is another source of damage, resulting in packing the soil so that it hardens when it dries; but here again the greatest danger from trampling and packing is usually over by the time the main forage plants have been growing about two weeks.

The beginning of the growth of grass for any given exposure is usually seven to ten days later for each one thousand feet increase in altitude. There is, of course, a considerable variation in the time at which growth begins on different exposures at the same altitude, but on the whole, altitude in any district is the large factor in determining the date at which the first grass will appear and from this the time at which grazing may begin.

**The close of the grazing period.** The time at which the grazing period closes is not of great significance to the growth of grass, providing there has not been overgrazing.

**Length of the grazing period.** The shortage of rainfall throughout the West makes the growing season on any one range very short, but fortunately variation in altitude and topography makes it possible to have grazing suitable for all seasons of the year when the ground is not covered with snow. Most of our cattle, therefore, will spend the mid-summer months on range perhaps two or three thousand feet greater in

elevation than their winter quarters, while with sheep a difference in altitude of four to six thousand feet between summer range and winter quarters is not uncommon. In planning a cattle or sheep ranch, we must arrange for ranges of different altitudes and exposures, and of course, the greater the differences in altitudes or exposures of the various ranges, and the shorter the drive between them, the better.

While we should not attempt to use any one range for as long as seven months, the grazing period may in some cases be made too short properly to utilize all of the forage. Different grasses and forage plants reach their period of greatest value at different times, and an attempt to graze off a range in a week, for example, would be a mistake, resulting in loss of considerable quantities of forage that matured either before or after this particular week. Many ranches and even whole districts are at present badly out of balance in regard to the amounts and kinds of grazing, but fortunately the Northwest as a whole has a very satisfactory proportion of the various types of grazing land. If the stock were properly distributed, there would rarely be a lack of satisfactory grazing at any season of the year when the ground is not covered with snow.

### OVERGRAZING

Overgrazing may be defined as grazing which reduces the forage crop during subsequent years, or which results in a change of the forage to undesirable varieties. Such overgrazing may exist over an entire area, as is the case with many of our free or public ranges and also, unfortunately, on many privately owned, fenced areas. On the National Forests and on privately owned ranges that have received some little care and attention, overgrazing of the entire area is less frequent, but overgrazing very often does exist in spots, while often on the same range there may be other spots undergrazed.

**Indicators of overgrazing.** The merest amateur can tell when a range is so badly overgrazed that it no longer produces a normal crop of forage, and no longer supports a normal number of stock in good condition; but by that time the damage will have gone so far that the restoration of the range to its old-time condition will be slow and expensive if not impossible. The object of this study is to learn to recognize and prevent overgrazing before permanent damage has been done. The condition of the stock is not a reliable indication, because if grazed prematurely the stock, though coming off fat, may yet have done serious damage. If not grazed until the grass is quite dry and mature the stock may come off thin and yet have caused no damage. We must, therefore, look for some other method of recognizing overgrazing.

The following more obvious "earmarks" are the most reliable indicators of overgrazing that has taken place prior to the year of examination:

1. The predominance of annual weeds and grasses, such as knotweed, tarweed, mustard, annual brome grasses and fescues, a dense stand of such species and a lack of variety in the species. This condition is a severe stage of overgrazing such as occurs around sheep bed-grounds which have been used for long periods each year and for several years in succession.

2. The predominance of plants which have little or no value for any class of stock, such as sneezeweed, niggerhead, yellowweed, snakeweed, and gumweed. These and similar plants frequently occur in abundance over large areas of range and indicate that the range needs careful management to give better forage plants a chance to grow.

3. The presence of dead and partly dead stumps of shrubs; such as snowberry, currant, willow, service berry, birch-leaf mahogany, and Gambel oak. This condition usually indicates that the most palatable grasses and weeds have been overgrazed. There may be some exceptions to this, as in the case of dwarfed willows on ranges where grasses predominate above the timber line. Sheep sometimes kill the willows before the grasses are damaged.

4. Noticeable damage to tree reproduction, especially to western yellow-pine reproduction on sheep range, and aspen reproduction on cattle range. Provided the natural conditions are favorable to aspen reproduction, lack of aspen reproduction on a weed sheep range indicates overgrazing. On a sheep range where grass predominates, severe injury to western yellow-pine or aspen reproduction may indicate that the range is not well suited to sheep.

5. Erosion and barrenness, accompanied by a network of stock trails where formerly there was a cover of vegetation. These are typical of areas where overgrazing has reached the extreme stage.

The earmarks described are perhaps more typical of overgrazed sheep range than of overgrazed cattle range, but the general appearance of the two does not differ greatly when overgrazing reaches a stage to be recognized by one or more of these earmarks. The main difference is that the weeds eaten by sheep are often found in abundance on overgrazed cattle range, while coarse grasses palatable to cattle are often abundant on overgrazed sheep range. This fact has given rise to the use of the term "class overgrazing," by which we mean that there is overgrazing of the forage plants suitable to sheep, together with undergrazing and consequent increase in the forage plants suitable to cattle; or, vice versa.

**Prevention of overgrazing.** It will be noted that all of the above are indicators of damage already accomplished. Unfortunately, there is no way in which we can ride over a range and in one inspection be sure that no damage is taking place. On the other hand, the man in charge of the range can be sure on this point if he has followed a few simple precautions to prevent there being any cause for overgrazing. These precautions are as follows: (1) No range should be used before the grass is two weeks old or until the soil is reasonably dry. (2) No range should be grazed so heavily that there is mechanical injury to the grass through trampling, or close cropping. (3) In all normal years the stock should come off in good condition with some little feed left on the range. (4) The grass must have a chance to form seed at least every three or four years, and the following spring the seedlings should have a chance to grow, as will be more fully explained under the subject of rotation and deferred grazing.

If these simple precautions are followed over all parts of the range the stockman may be reasonably certain that his range will retain its productive capacity, or even improve, and that the indications of over-

grazing as described in the preceding paragraph will not appear. If these precautions are not followed we may feel sure that overgrazing is taking place although the direct evidences may not appear until later. While these rules are comparatively simple, putting them into operation may often require new methods of handling the stock, as will be discussed later.

**Undergrazing.** Undergrazing has no detrimental effect upon the stand of forage, and in the case of areas previously overgrazed may have a beneficial effect. In actual practice, however, most of the areas now undergrazed have always been undergrazed and further undergrazing is a waste of feed.

### IMPROVING THE STAND OF GRASS

There are four plans commonly suggested for increasing the carrying capacity of our ranges: (1) Reseeding to domesticated grasses. (2) Reseeding with seed gathered from the range grasses. (3) Entire protection of the native grasses from grazing. (4) Deferred and rotation grazing.

The very low carrying capacity of our ranges as compared with the pasture of the farming districts has led to many attempts to introduce the high yielding farm grasses on the ranges, but such attempts have resulted in failure or unwarranted expense, except for occasional meadows on our ranges suitable to such common forage crops as timothy, redtop, or clover. The failure of domesticated grasses led to the idea of gathering seed from the best range grasses and seeding it over the areas where improvement was desired. In this way it was possible to effect a marked improvement in the stand of grass, but the expense involved was out of proportion to the results obtained.

The next plan is to keep all stock off the range for such number of years as may be required to bring it back to its original state of productivity. This, of course, gives the native grasses a chance to form seed and results in a considerable improvement in the range, but it is expensive and often impossible. The heavy stand of dry and unused grass in the late summer and early fall is also a very considerable fire hazard.

**Deferred and rotation grazing.** It has been found by repeated tests that if the grass is protected until the seed is formed it may then be grazed and the grazing will not only do no harm, but will trample the seed into the ground and very much increase the stand of new grass the following spring. At the same time, the grass will all be used and the fire hazard eliminated. The next spring, however, the little seedlings will not stand normal grazing; that is, grazing after the old grass has made a two weeks' growth. The seedlings will, on the contrary, need a month or six weeks of growth before they can be grazed without much injury. If the range can receive this treatment every third or fourth year a marked improvement will result. The practical application of this principle is "rotation" grazing, which we may illustrate as follows: Let us assume that we have a range on which the normal length of the grazing season is three months. Then let us divide the range into three parts which we will call A, B, and C. The first year we will graze A the first month, B the second, and C the third. The second year we will



graze B the first month, C the second, and A the third. The third year we will graze C the first month, A the second, and B the third. This process will be continued indefinitely, making as it were a three-year rotation. We will note that C in the first year was not grazed until the third month, in which case it had an opportunity to reseed. The second year it was not grazed until the second month, which allowed the new seedlings a chance to start. The third year it would be grazed the first month, which would be the hardest, but by that time it would be in condition to stand it. In this manner, as a result of grazing being deferred, each section would have a chance to reseed every third year, and in the meantime no grazing would have been lost and no reduction in the total number of stock would have been necessary, providing of course, that the range was not overstocked in the first place.

Rotation grazing is not only the salvation of our worn-out areas, but is the only way we have so far discovered whereby overgrazing may be entirely prevented and full use of the range still be possible. In a recent test in North Dakota (U. S. Department of Agriculture Bulletin 1170) it required 5 acres to support a two-year-old steer without overgrazing where rotation and deferred grazing was practiced, while 7 acres were required without rotation. Not only was the stand of grass better on the rotated areas, but it was possible to utilize the grass more fully without damage. This test was upon first-class grazing land that was in good condition at the beginning of the test. Deferred grazing, while developed mainly through the activities of the National Forest Service in the handling of the mountain ranges, has proved equally suitable to the handling of desert and foot-hill ranges and to the pastures of Western Oregon.

Methods of putting deferred grazing into actual practice with the minimum of expense and difficulty will be discussed in the paragraphs concerning the management of sheep and cattle.

## MANAGEMENT OF CATTLE ON THE RANGE

It would require a volume to discuss all the problems of handling cattle on the range. In this bulletin we shall discuss only those plans of management which affect the proper utilization and protection of the grass.

**Suitability of the range.** The first step is to see that the range in question is suitable for cattle and that it may be reasonably expected to afford satisfactory grazing for the number on hand for the entire season from the time the cattle come off of hay in the spring until the snow falls in the winter and forces them to go on hay again. This may require quite a little adjustment, but the business cannot be on a permanently profitable basis until it is done. There has been entirely too much buying and selling of land on a speculative basis, but there needs to be much buying and selling with a view to building up ranches on which stock can be handled efficiently and profitably for the entire twelve months of the year.

**Number of cattle on the range.** The number of cattle must be adjusted to the capacity of the range. A range will produce the maximum amount of beef per acre when there are barely enough cattle on it to

consume the grass. If there are any more than this the total amount of beef produced will be less, while if the number of cattle is doubled they will live but make no gains. In view of the fact that the crop of grass is always uncertain, more beef will be produced in the long run if we carry a few less stock than the range will support on average years. In this way we can produce not only the greatest total tonnage of beef, but beef of the highest quality. A steer should gain on an average range at least a pound a day for every day he is out. One hundred steers would make 100 pounds of beef a day. Put 150 steers on the same range and they will gain one-half pound a day, or 75 pounds for the 150 head. Put 200 steers on the same range and they gain nothing. Similarly, 30 pounds of alfalfa a day fed to one 800-pound steer will make one pound of beef. The same hay fed to two steers will keep them alive, but will make no gain. Many of our Oregon ranges would produce more beef and cheaper beef if they were stocked less heavily.

After these adjustments have been made the next thing to consider is the control of the cattle while they are on the range without the use of any more fence than is absolutely necessary.

**Divisions of the herd.** The number of cattle that can be successfully run together in one herd seems to be very elastic and is in nearly all cases larger than any one cattleman is likely to possess. The Forest Service has found that cattle may be run in herds of from one thousand to three thousand with entire satisfaction from the standpoint of grazing management. There are probably not more than a dozen herds in Oregon larger than one thousand head and by far the greater majority are less than two hundred. Subdivision of our range solely for the purpose of reducing the number of cattle running together in one herd would therefore very rarely be desirable. Regardless of the size of the herd, however, the first move toward better management of cattle, as every stockman will agree, is the separation of the steers from the breeding herd. This apparently can be done only by running them on entirely separate ranges, or by fencing.

**Distributing cattle on the range.** It is already apparent, however, that a herd of cattle even though all steers, or all cows and calves, cannot advantageously be turned loose on a range early in the spring and left to hustle for themselves until snow comes. Cattle often form bad grazing habits. Sometimes, as previously indicated, they follow the snow line and eat the young grass as fast as it comes through the ground, but many of our cattle ranges are too far from the snow line to permit this, except for a few days early in the season. The more common thing is that when the cattle are turned out in the spring they select the lower meadows, where grass and water are best at that time and there they stay; staying at first because the best feed is there, but after that staying from habit and encouraged by the common practice of salting the cattle where they are, rather than where they ought to be.

**Salting plans.** Cattle have a natural craving for salt, which may be used as a convenient means to put the cattle where they are wanted, instead of encouraging them to stay on old stamping ground. Most cattle ranges contain areas of widely different altitudes and exposures, and in fact must do so if satisfactory grazing is to be provided for the entire

season. It therefore becomes advisable to arrange the salt troughs in several series: one series on the lower or earliest range, another on a somewhat later range, a third on a still later range, and so on as far as may be necessary.

Within each series some care should be taken as to the placing of the troughs. The salt troughs should practically always be placed on the ridges and at a considerable distance from water, so as to counteract the habit of standing around the water holes. The range should be carefully inspected and the troughs placed on the areas that are undergrazed. This will require more work in distributing the salt than where the salt is dumped at the nearest water hole and it will also require some attention to see that the cattle find it. Usually, however, it takes but little driving or calling to bring the cattle to a new salting place, and when once there they usually remain.

As the season advances and it becomes desirable to work the cattle back to later ranges the first series of salt troughs should be abandoned and the salt placed in the second or higher series. Here again some driving and calling will be necessary that the cattle may learn the new salt trough and at the same time the new range. This work will be made easier, however, if care is taken that all of the salt in the first series of troughs has been consumed and the cattle allowed to become a little salt hungry before being moved to the second series. All this requires work and attention, but it is well repaid by the better distribution of the stock and the consequent better utilization of the range. It is also much cheaper than fencing into small tracts.

Many of the old-time range-riders take pride in pointing out areas where "the grass looks good to a tenderfoot, but the cattle will not eat it." With the exception of pine grass and one or two other species of very minor importance, this is a mistaken idea and these undergrazed areas are usually undergrazed because too far from salt or water, and because the cattle have formed the habit of grazing elsewhere. Likewise the overgrazed areas are not necessarily areas of more palatable grass, but are areas on which the cattle have become accustomed to grazing. Much can be learned from a study of the natural habits of cattle, but too much dependence should not be placed upon it.

It now seems fairly well demonstrated that cattle can be handled to maximum advantage in many cases through the distribution of salt and water, and without fencing, except for the outside boundaries of the range and for the separation of steers and heifers. Not only does proper handling of salt and water enable the cattleman to prevent local overgrazing and undergrazing, without fencing, but it offers him an economical and satisfactory way of putting into practice "rotation grazing."

Salt and water have their greatest effect on the distribution of cattle where the ranges are large and of low carrying capacity and where fencing would be very expensive. On the other hand, this method is least effective where the carrying capacity is large and a large number of cattle are run on a small area, but under these conditions fencing is usually possible without prohibitive expense. Fencing, however, does not eliminate the necessity for care in salting. There are many hundred-acre pastures where moving the salt trough would be a very great improvement.

Proper salting alone cannot be expected to bring about a perfect distribution of cattle on the range; but, everything considered, it offers the greatest possibility for immediate improvement with a minimum of expense and delay.

**Amounts and kind of salt.** Cattle should have two pounds of salt a month while the grass is very green, and one pound a month during the remainder of the season.

All kinds of salt have been successfully used for range purposes, but the general preference is for a coarse granulated salt of the kind commonly called crystal sack salt, or half-ground salt.

**Salt containers.** Salt is usually placed in long log troughs or in board troughs. It is often placed on the ground, but this requires more frequent salting and wastes some salt. On level or prairie ranges, the troughs can be made of two-inch lumber and hauled to the place where needed, while in mountain and timber ranges troughs made of logs are more economical. It does not take a great deal of work with a sharp adz and ax to make a good trough, and it is generally possible to find logs in suitable places so that they need not be moved. On large ranges where the salting is done by hired labor, it is a great advantage to number or name the salt boxes. The owner may then give definite instructions as to where to put the salt and will know when those instructions have been carried out. A map of the range showing the location of the troughs is a great convenience.

**Storage of salt.** Many ranges are almost inaccessible to a wagon in the early spring. In such cases salt should be hauled and stored the previous season, as it is especially important to have a good supply of salt on hand during the early spring months when the cattle need it most. It is not difficult to build small cabins or storage boxes in which a considerable quantity of salt may be stored for future use.

**Water.** The water supply may influence the distribution of cattle and the consequent utilization of forage more than any other single factor. Unfortunately, our control over the distribution of watering places on the range is limited, but great improvement is usually possible without undue expense. Springs or seeps which naturally furnish water only in small puddles or cow tracks will furnish clean water for a number of cattle if fenced and the water piped to a trough. With the proper development of springs and seeps there should be no serious shortage of water anywhere in Oregon except on the high desert region of Central or Southeastern Oregon. There, however, the proper development of springs and seeps and the drilling of wells will open up areas now of little value except as sheep range when there is snow on the ground. Little development in this area can be expected, however, as long as it is wide-open free range.

An excellent discussion of methods of developing stock water under range conditions is found in Farmers' Bulletin 592, "Stock Watering Places on Western Grazing Lands," by Will C. Barnes. This bulletin can be obtained from any senator or representative, the United States Department of Agriculture, the United States Forest Service, or the Oregon Agricultural College.

## MANAGEMENT OF SHEEP ON THE RANGE

In the handling of sheep with a herder, the problem of preventing overgrazing and of practicing rotation grazing is comparatively simple, since the sheep are always under the control of the herder and may be grazed wherever he wishes. The general principles are of course the same as with cattle, and further discussion of these factors is not necessary except to say that a well thought out plan of grazing is essential and that it is especially helpful to have maps showing the various camps and watering places. The very fact that sheep are in charge of a herder, however, brings about certain problems not encountered with cattle. As early as 1909, investigations conducted by the National Forest Service showed that mountain summer range grazed by sheep, under fence, supported from 25 to 50 percent more sheep than were being grazed on the same acreage of similar range on which the sheep were herded by the methods practiced at that time. It was also found that the pastured sheep gained 5 to 8 pounds more in weight than the herded sheep. From four years' study of the actions of the sheep both in pasture and under different methods of herding on unfenced range, it was concluded that the great difference in grazing capacity and in the growth of the sheep, as between pasturing and herding, was largely due to the following conditions:

1. In the pasture the sheep were bedded down where night overtook them instead of being trailed for a considerable distance to an old bed-ground with consequent damage to both the sheep and the grass.
2. In the pasture the sheep did most of their grazing early in the morning and late at night, while the herded sheep commonly had to spend much of this time in camp.
3. In the pasture the sheep tended to bed on the open ridges instead of down in the canyons where the herders usually prefer to camp.
4. The sheep in the pasture grazed quietly in open formation instead of being crowded together and disturbed, which interferes with their grazing and needlessly tramples the grass.

These important benefits can fortunately be obtained through the adoption of better methods of herding and without resorting to fencing, which is always expensive and often impossible. In addition, the herder may give more attention to keeping lambs and ewes from being separated, keeping off predatory animals, and giving assistance in many ways. These better methods of herding have been tried out in many experiments, and perhaps 50 percent, or more, of the sheep grazed within the National Forest are now herded under improved methods. The problem now is to secure the adoption of better methods for the other 50 percent.

**Herding.** The essential things to be accomplished in better herding have already been indicated in the comparison of herding with pasturing; namely,

- (1) Do not bed more than one, or at the most two or three, nights in a place.
- (2) Permit the sheep to graze early in the morning and late at night.
- (3) Bed the sheep on the ridges rather than in the deep canyons.
- (4) Do not crowd them together in a close, compact band.

In many localities, especially in the Southwest, these things are accomplished through what is known as the "burro" system, in which the herder remains with his sheep all the time, carrying his entire camp outfit on a burro that has been trained to stay with the sheep. American herders, however, often do not take kindly to this system, and where feed is good and the range not too heavily timbered, or brushy, good results are obtained by what is known as the "blanket" or "bedding-out" system. In this system the herder has a central camp where he does most of his cooking, and which is moved by the camp tender every few days, but every afternoon he puts his bed and teepee on his saddle horse and moves out to the place where the sheep are to be bedded. He thus stays with the sheep all the time except for a few hours in the middle of the day.

The sheep are allowed to begin grazing soon after daybreak so that they will fill up before the heat of the day. Their course of travel is directed by the herder, and, if necessary, the leaders are checked so that the herd will spread out quietly over an area sufficient to provide forage for the morning. The herder moves quietly around the outside of the herd, keeping track especially of the leaders, but not disturbing them except where necessary to check them or change their direction. Especial care is taken to prevent crowding the sheep together, and the use of dogs is really not necessary, except in emergency. Open herding is not more difficult than close herding, and the saddle horse largely replaces the dogs.

Between seven and nine o'clock in the morning during summer the sheep usually settle down to rest. They will not move far during the warm part of the day and need not be disturbed, but the herder goes around the outside of the band occasionally to see that none of the sheep are straying off.

While the sheep are resting, the herder has several hours, during which time he returns to the supply camp and does his cooking and camp work for the day. Herders who follow this plan usually eat two meals a day at the supply camp, one upon arrival in the morning and one before leaving to round up the sheep for the night. The supply camp should be close enough so that the herder will be able to go around the band occasionally while they are resting, which means that the camp will have to be moved frequently. During these scouting trips a bedding place for the night is selected and the bed and the teepee, and salt for the sheep, are moved to the new location.

The site for the bed-ground should be comparatively open, free from down timber and brush, and larger than the actual bedding space required. On an open site the lambs can find their mothers with the least difficulty, there is less danger from attack by predatory animals, and there is less danger of a "pile up" or of crippling of sheep in case the band is frightened during the night.

High, dry mounds or ridges make the best bedding grounds. Sheep bedded in canyons with adjacent open or fairly open country have a tendency to leave the bed-ground and drift to the ridges, but on the other hand they rarely drift far from a ridge into a canyon. Where there is much heavy timber and brush, small openings are of vital importance, and their location should be known and grazing so planned as to use them to best advantage.

In gathering the sheep in the evening it is especially important that the herder circle the outermost tracks made by the sheep during the day. From this outer circle the sheep are turned toward the site selected for beddings. Stragglers and isolated sheep are collected into a loose band near the bed-ground. They may then graze in this formation until they bed for the night. Meantime, the herder moves about them counting the bells and markers and watching the ewes and lambs. Lambs that cannot find their mothers, or ewes that cannot find their lambs, in a reasonable time, are indications that the sheep are not all in. Care in rounding up the sheep at night cannot be over emphasized. The greatest losses occur from leaving small bunches away from the band, subject to attack by predatory animals. There is, however, less loss from predatory animals where the sheep are bedded but one night in a place than where a central bed-ground is used. Predatory animals seem to gain courage with familiarity and are more apt to attack after the sheep have been bedded a few nights in the same place. Also sheep are more apt to stray away when bedded on an old ground where the grass is all gone.

We recognize the fact that on some ranges the topography is such as to make it difficult or impossible to handle the sheep in the most ideal manner. Also, many sheep men have been unable, as yet, to persuade their herders to adopt new methods. The fact remains, however, that the best use of the range and the largest gains on the lambs are obtained only when the conditions above outlined are met to at least a reasonable degree. The extent to which the best interests of the range and of the lambs are to be sacrificed to convenience of operation is a matter for decision in the individual case.

**Watering.** The length of time sheep may be away from water depends upon the character of the forage and the weather. On high mountain, summer range, within the National Forests, sheep have been grazed successfully during the entire summer without water, but they must be handled very carefully, and they do not make the best gains. Ordinarily when the vegetation is succulent, the weather cool, and heavy dew frequent, sheep do not require water oftener than every three or four days. During hot, dry days, however, they will do best where shade, forage, and water are convenient, and such places should be reserved for this period. Cool weather and storms ordinarily make watering oftener than every three or four days unnecessary, and barren stretches at some distance from water can be then grazed to advantage.

If the sheep are herded as suggested in the preceding paragraphs, watering oftener than every few days is not only unnecessary but may not be for the best interest of the sheep, especially if they can reach water only by traveling several miles into deep canyons. In going to water they should be grazed, rather than driven, and should reach water in the late morning or midafternoon. An hour on water during these periods of the day will be sufficient. After this they are moved away so as to avoid unnecessary contamination of the water supply.

**Salting.** About 100 pounds every five days for 1,200 ewes and their lambs should be the minimum. Salting every night on a new bedding ground helps to make the sheep contented during the night and is to be advised wherever possible. In any case, however, salt should be given at least every five days. The salt should be distributed, one or two handfuls

in a place, on rocks, clean ground, or grass. Sand or gravel in the salt may result in marked injury to the teeth. If salt is distributed in small piles, before the sheep reach the salting ground, there will be comparatively little waste, and all of the sheep will get salt in a short time. It is doubtful if troughs are desirable since the sheep are seldom salted more than once in the same place.

### ESSENTIAL POINTS IN THE MANAGEMENT OF RANGE GRAZING LAND

1. Use range for the class of stock and for the length of grazing season to which it is best adapted.
2. Do not use the range until the grass has had two weeks' growth.
3. Do not overstock.
4. Practice deferred and rotation grazing, thereby giving the grass a chance to reseed every third or fourth year.
5. Adopt a salting plan for cattle that will better distribute the cattle over the range and so prevent local overgrazing and undergrazing.
6. Do not bed sheep more than one night in a place, except in an emergency.
7. Permit sheep to graze early in the morning and late in the evening.
8. Permit sheep to graze quietly in open formation.