

THE EFFECT OF LIVESTOCK PRODUCTION
ON REFORESTATION OF WESTERN OREGON
MARGINAL LAND

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THE EFFECT OF LIVESTOCK PRODUCTION ON REFORESTATION OF WESTERN OREGON MARGINAL LAND

INTRODUCTION

The hill land bordering the Willamette Valley is adapted to the production of fir timber. Much of this same land furnishes an acceptable type of pasture for livestock production. Land that is not kept in either timber or grass soon becomes covered with such types of brush as hazel, vine maple, rose bushes (sweet briar), poison oak, alders, evergreen blackberry, salal, and mountain laurel. This land is typical of much of the hill land in western Oregon.

The question of whether this land should be used for pasture or timber production had long been debated. The factors of this land-use problem may deserve reconsideration and alteration in view of the relatively recent increase in value of timber and timber products, notwithstanding the fact that the price of livestock and livestock products has also increased to a high level.

Regardless of the variance of opinion over land use, we can make three assumptions upon which to base this study: first, that there is some of this land unquestionably more adaptable to timber than to pasture; second, that some of the land when properly managed furnishes quite excellent pasture; and third, that much of these types of

land are in small adjacent areas which cannot be practically and economically separated by fences. Consequently, it appears that a combination of pasturing and tree farming is desirable if there are no bad results from carrying on the two operations on the same farm at the same time.

In order to keep this survey on a practical basis and still get as accurate information as possible, it seemed advisable to contact representative farmers with years of experience in grazing livestock on this type of land.

The purpose of this study is an attempt to determine the effects of livestock production on natural reforestation of these areas.

REVIEW OF LITERATURE

Very little printed information is available regarding management practices for dual production of livestock and timber. Pertinent material that is attainable from various and distant areas may aid in solving some of the local problems.

In a Texas study, Cory (8, pp, 5-12, 31, 32, 45-47) reports that cattle, sheep, and goats show different preferences in their feeding on the native plants, and any one of these types of livestock alone may utilize only slightly certain portions of the range vegetation while utilizing excessively other portions of the same to the detriment of the whole. The system of grazing used by the Ranch Experiment Station provides for a certain proportion of cattle, sheep, and goats to be grazed in each pasture. Their grazing standard calls for twenty-three units of cattle, nineteen units of sheep and ten units of goats as the suggested proper ratio for that type of range.

Cory further reports that cattle are grazing animals. They browse less than sheep and show a decided preference for grasses, weeds being taken usually only incidentally; but they do eat certain weeds that sheep and goats do not eat. Cattle prefer variety in their feed and browse some even when the growth of grass and weeds is good. Grazing

conditions are good for them when there is much cured grass available.

Sheep are primarily grazing animals with a preference for weeds rather than grass. Sheep graze very little on cured grass or on a luxuriant growth of grass, their preference being new growth of weeds or grass. When there is an abundance of succulent weeds and green grass, sheep do very little browsing.

Goats are primarily browsing animals. They frequently browse more than they graze; however, like sheep, they show a preference for succulent weeds and green grass. In browsing, goats eat a much wider variety of plants than sheep or cattle. Goats commonly rear up on their hind legs to browse and frequently bend down a shrub and stand on it to reach its foliage, flowers, or fruit.

Among other browse plants, shin oak, (*Quercus breviloba*) at certain times appears to be a favorite browse plant for cattle and goats.

Although shin oak was named by Cory as one of the favorite browse plants used by livestock, Boughton and Hardy (4, pp. 158-160) report that common shin oak (*Quercus breviloba*) contains a material in the early buds, green shoots, and leaves which is a fatal poison to both sheep and cattle. It appears that during certain seasons of the year, especially in the early spring, livestock may be

ravenous for green feed and consume exceptionally large quantities of shin oak, often to the exclusion of other available feeds.

In a similar report from Kentucky, Brown and Hull (5, p. 398) state that *Taxus cuspidata* (Japanese yew) and *Taxus baccata* (English yew) contain an alkaloid called "taxine" in the wood, bark, leaves, and seeds which is very poisonous to livestock. This toxic material acts as a heart depressant. Death to livestock will result within a short time if a large quantity of leaves is eaten.

Wells (30) discusses bracken fern poisoning in cattle pasturing in the park at Staffordshire, England. Apparently cattle on rank, lush grass may develop a craving for fibrous material which they satisfy with bracken if nothing else is available. Upon eating substantial amounts, intestinal trouble and often death follow.

In Oregon the problem of bracken fern poisoning has been recognized, and some material on this subject has been presented by Haag (13). In Haag's experiments, rats were fed rations containing fifteen to forty percent bracken fern. In every case the rats developed vitamin B₁ deficiency symptoms which usually resulted in death. Spectacular recovery occurred from thiamine therapy.

In an experiment at British Columbia, Canada, MacDonald (19) found that beef cattle prefer pine needles

as part of their diet, even when fed an adequate winter ration containing hay, oilcake meal, vitamin A supplement, and minerals. The cattle ate approximately five pounds of needles and reproduction buds per head daily when the material was offered free choice. Under forced feeding the amounts eaten daily averaged eight pounds per head. The experimental results showed that pine needle consumption by beef cows results in abortions or weak calves at birth.

Local browse plants similar in character will be reported in this survey for which no background of literature was uncovered in this search.

There is a substantial amount of written material regarding some effects of livestock pasturing in timber areas. Following is a review of an article written in 1927 by Pearson (22) of the Southwestern Forest Experiment station who attacks aggressively and vehemently practically all grazing on any forest land. All evidence in European countries, according to Pearson, substantiates the assumption that livestock production and forest silviculture are incompatible on the same area. He states that "with a stocking of about one sheep to thirty or forty acres, perhaps the damage would not be intolerable." Other similar information in this report is of the same caliber, with all livestock grazing on forest land being attacked with a vengeance. In his opinion, any advantages of

livestock pasturing to timber production or reforestation is highly overrated.

A different approach to the same question is shown in these few excerpts from an article written in 1925 by Arthur W. Sampson (24, p. 476), division of forestry, University of California: "In those parts of the older countries where economic and natural conditions are appreciably different from those of ours, and where intensive forestry is practiced, grazing is either not permitted or is much restricted. Under such conditions advancement in scientific range management has naturally been given little thought."

".....Because our first lessons in forestry were necessarily based upon European teachings, grazing was considered by most professional foresters as a temporary evil. Few at that time believed that cattle and sheep would long have a place on timbered areas, or that grazing plans could be so developed as to make pasturing compatible with good forestry practices. Conditions have changed, for now comparatively few foresters feel that grazing does not have a place in the program of the forester's working plan....."

Jardine (17, pp. 484-485) in referring to the previous article written by Dr. A. W. Sampson, says: "The investigations prior to 1920 indicated, too, that much can be done to minimize grazing injury to tree growth and to

range by timely use of the forage, by proper handling of the stock, and by discretion in deciding upon the class of livestock for a given range."

In a survey to determine the effects of cattle grazing on loblolly pine forests in Louisiana, Campbell and Rhodes (6, pp. 33-37) found that damage to trees by cattle was highly attributable to overpasturing. Cattle have been observed pulling needles and nipping the buds of young pines under closely grazed conditions. Most of the damage to young seedlings occurred in the early spring from physical injury to the tender shoots.

In Campbell's opinion damage to trees in small farm woodlots does not deserve to be attributed to grazing because such areas are used as "stomplots" or bedding grounds or for protection from heat and cold, and are consequently subject to much greater use than a normally grazed area.

The same study revealed that fire hazard is substantially reduced where livestock are being pastured by their removal of the highly inflammable grass material. Actual measurements showed less than forty percent as much fuel on the grazed area as on a comparable ungrazed area.

The farmers who were questioned were in agreement that a substantial reduction in grazing capacity each year is due to shading and the competition of loblolly pine trees. It was estimated that this decrease in the amount of forage

occurs at the rate of approximately three percent per year.

Maki and Mann (20, pp. 279-281) reported that the piney woods sheep of Mississippi did eat the terminal buds of the long leaf pine. It appeared that the sheep ate the pine buds because they were hungry rather than because of something lacking in their diet. Most of the nipping occurred during late winter and early spring months. There was no apparent damage to trees which were over four feet high, however, on the seedlings and smaller trees eighty-six percent of the buds had been nipped. Four years after the sheep were removed, a resurvey showed that fifteen percent of the seedlings were too badly deformed or stunted to grow into trees which would produce high quality timber. The pasture was stocked at the rate of one sheep to twelve acres on the thirteen hundred acre pasture.

Moderate grazing by sheep is beneficial to white pine reproduction in northern Idaho, according to Young (31, pp. 28-43); however, overgrazing and excessive trampling contribute to a large loss of Douglas fir seedlings. In considering all of the types of conifers growing in that area, the loss of seedlings due to sheep trampling was greatest in the one year class and decreased to practically no loss at five years of age.

Results indicate that white pine seed germination is enhanced by contact with mineral soil induced by trampling

probably because the moisture content of mineral soil is more desirable for seedling production than on a duff medium. Some benefit may accrue from seed stratification caused by trampling.

Young agrees with the other authorities that continuous overgrazing is harmful to coniferous reproduction. Grazing forest lands immediately after logging operations helps control forest vegetation which would otherwise be competing with conifer reproduction.

One of the greatest benefits of livestock pasturing to the establishment of a stand of forest trees is the reduction of competing plants. In an experiment in Central Washington, Rummell (22, p. 607) reported that the high density of herbaceous understory vegetation on an ungrazed area contributed to a deficiency of advance tree reproduction. Heavy grazing of the herbaceous understory vegetation appeared to be a prime factor in explaining the dense advance tree reproduction on a similar area which had been grazed.

Ingram (15, p. 1001) in controlled experiments in the Douglas fir region west of the Cascade Range in Oregon and Washington found that the use of vegetation by livestock reduced fire hazard. Thirty-six percent of all of the vegetation was removed by livestock. Trampling over the range and establishment of trails were other important

factors in reducing fire hazard.

Ingram (15, p. 1001) also found that better seedling survival (all ages) occurred on grazed plots than on protected plots. In 1925 and 1926 on ninety-four grazed enclosures the seedling survival was greater under both heavy grazing and moderate grazing than in protected areas. He concluded that where moderate grazing occurs, damage and loss of seedlings from livestock grazing is of distinctly minor consequence.

Under most usual circumstances, damage to seedlings is greater from trampling than from nipping, according to Ingram (16, p. 416) except where livestock bed down or where palatable vegetation is scarce.

More nearly approaching the management phase of the problem for which this study was intended is this information which is local in character. Daniel and Ensminger (9, pp. 9-10) state that the natural forage which grows on cut-over land that is not seeded to grass is generally more palatable to sheep than to cattle because cattle prefer a diet with a higher percentage of grass than broad-leaved plants. Advantages of combination grazing of two kinds of livestock have appeared in isolated cases. For example, goats and cattle, or goats and sheep indicate promise of eliminating brush even after it becomes well established.

In an article in the Southern Lumberman, Campbell (7) touched the point that appears to this writer to be the crux of the whole problem. Mr. Campbell could have been referring to any number of the farmers of western Oregon marginal land areas in the following quote: "He realizes that his trees now are the most valuable single product on the farm. As on many farms, however, livestock have been practically indispensable in achieving that result, furnishing him a living while the pines were growing up."

METHODS AND MATERIALS

Twenty-five farmers in five Willamette Valley counties and one farmer in one of the coast counties were selected for this survey. An attempt was made to choose farmers with many years of experience in raising sheep, goats, or cattle on marginal land of the type that is adapted to the production of fir timber as well as pasture.

The survey was conducted by the writer in personal interviews. The visits were planned with adequate time to inspect certain areas and take some photographs where specific information was available from the farmer.

During the actual interview, it seemed better to ask a few general leading questions and then to let the farmer present his experiences and his opinions in his own words. This method has the disadvantage of not being able to chart all of the answers to specific questions as "yes" or "no".

Most of the answers were relative to certain conditions and not adaptable to a form type questionnaire.

Following are the main questions used in the survey:

1. Can livestock and timber be raised successfully on the same farm at the same time?
2. Are there differences in raising sheep, cattle, or goats in this respect?
3. What is the value of this land for livestock

production?

4. Does reforestation occur best under light, moderate, or heavy pasturing, or under no pasturing at all?
5. What are the biggest problems of pasturing livestock on this type of land?
6. Can cattle, sheep, and goats be pastured satisfactorily together?
7. What are the advantages or disadvantages of pasturing livestock on areas that are reforesting?
8. In your opinion, is there a trend among farmers to keep and protect the young fir trees rather than to clear the land for use as pasture?

RESULTS

LIVESTOCK RAISING AND REFORESTATION

A very high percent of the farmers who were interviewed agreed that with proper management livestock raising and reforestation can be carried on together with successful results. Opinions varied from one man who said, "I would stress the point that it would be a natural to run stock and timber together," to another farmer who stated definitely that "if you want to raise trees, you shouldn't have livestock."

Over-pasturing was agreed to be the most damaging factor to natural reforestation. Some of the benefits which were mentioned are as follows:

1. Pasturing helps keep down brush competition to young firs.
2. Pasturing reduces fire hazard by decreasing the amount of dry summer forage left on the ground during the fire season.
3. Young trees start better on land maintained in grass pasture than where brush conditions exist.
4. There is the possibility of some benefit to the establishment of trees from livestock tramping seeds into the ground or exposing some mineral

earth which may furnish a better seed bed.

The problem as cited by two farmers is not one of protecting the young fir trees but of keeping the young firs from encroaching on well established pasture areas. A large percent of opinions were in agreement that Douglas fir is an aggressive competitor to grass and even to well established brush in this region. While fir becomes established faster in pastured or open areas, it will grow under reasonably heavy brush cover and eventually dominate and kill out the brush. Such evidence is apparent on the hills covered with oak, poison oak, sweet briar (rose bushes), mountain laurel, and other types of bushes where the firs are beginning to dominate. Such, also, has been evidenced over a period of years in the observation and experience of these farmers.

VALUE OF THIS TYPE OF LAND FOR RAISING LIVESTOCK

"Native brush pasture in many cases won't pay taxes and management, but when it is improved it can furnish a substantial amount of relatively good pasture," according to one farmer. His statement in general represented the opinion of most of those who were questioned. The opposite viewpoint was presented by another farmer who stated his opinion as follows: "This hill ground is poor for

pasture-- it's brush country. These hills were put here to raise trees on, and to try to raise grass here is the same as trying to raise trees in Iowa."

Approaching the question from another angle, one cattle rancher made the statement that, "it is valuable enough to spend some money to reclaim it. You can't winter cattle on flat ground, so this hill ground has an extra value."

Following are a few statements of estimated value:

1. "On hill land of this type seeded down to good grass, the cattle can stay out until January 1. They can pasture six to eight months per year. One beef head for every four acres is a good estimate . . . better than that for the first four years, but that is on the basis of a grass stand lasting ten years."
2. "Land is definitely more valuable as pasture . . . if it is seeded to sub and fescue. By the time trees would be ready to market, the land would yield several times as much in pasture."
3. "Would average three to five acres for one animal unit per year."
4. "Had thirty-one head of cattle on twenty-five acres of improved pasture through the pasture season."

5. "That kind of land (referring to improved hill pasture) will raise three or four ewes per acre the year around."
6. "One hundred fifty to two hundred sheep on three hundred sixty acres is the approximate carrying capacity."
7. "These high hills get dry too soon, but canyons seeded down are good pasture all summer."

The foregoing statements all refer to hill land containing some pasture area and some timbered or brush area. The fact that there is no pasture at all under dense timber stands is without question.

The problems of raising livestock on this type of land are:

1. Shortage of desirable forage during long, dry summers.
2. Predatory animals: coyotes, foxes, dogs, and bears.
3. Poisonous weeds: tansy ragwort, larkspur, water hemlock, and wild parsnip.
4. Sheep and goats getting tangled in sweet briar and evergreen blackberry brush.
5. Fence problems.
6. Difficulty in gathering livestock at the end of the pasture season.
7. Sheep, cattle, and goats will die or abort their

- young from eating mistletoe blown down by the wind.
8. Sheep, cattle, and goats will die or abort their young from eating fir needles.
 9. Cattle, sheep, and goats during certain fall seasons can eat enough mushrooms or toadstools to kill them.
 10. Encroachment of fern or brush on pasture land.

PASTURING DIFFERENT KINDS OF LIVESTOCK TOGETHER

The majority of farmers believe that cattle and sheep can be satisfactorily pastured together, but that they will thrive better if pastured separately. Of the group surveyed, twelve percent contended that sheep and cattle pasturing together is perfectly satisfactory while sixteen percent agreed that the same practice is totally unsatisfactory.

The reason given by most in favor of separate pasturing was the fact that sheep eat the grass too closely for cattle to follow. The rate of stocking of cattle and sheep was suggested as the deciding factor by two men who approved of the practice. One farmer's reason for not pasturing cattle and sheep together was stated as follows: "Not at any time do you want lambs and any other stock together; you lose quite a few sheep if you run them with

cattle."

Cattle, goats, and sheep are a good combination since they select different types of area and different forage according to one large operator. Some suggested that cattle and goats or sheep and goats are a better combination than sheep and cattle. The preference of browse by goats and grass by cattle was the reason given.

LIVESTOCK BROWSING OF FIR

Goats should be kept out of young fir stands in a program of reforestation according to forty-eight percent of the opinions gathered. There was rather general agreement that goats will browse on firs. Opinions varied considerably from those who stated that goats eat fir seedlings naturally as part of their diet to those who believed they would have to be forced to it. Several agreed that goats nip off fir seedlings and new buds on young firs, however, not to a great degree unless the area is overstocked. Two farmers stated definitely that goats can be kept alive through long winter snows by falling fir trees for browse, however the nannies will abort their young from such a practice. Goats will eat lots of fir browse and even peel small trees if starved to it, especially during the winter and early spring. Three farmers attributed death of goats to eating too much fir. Others felt that

the cause of death was worms or weakness from malnutrition. One farmer stated that goats eating too much fir will get black scours which causes abortion and often death.

Sheep will eat fir to a much lesser extent than goats, according to thirty-two percent of the opinions. Sheep will not eat fir under any ordinary circumstances was the belief of twenty-four percent of the farmers. It was the consensus of opinion of those who had observed sheep eating fir seedlings and other tender fir buds and shoots that that type of browse was mostly incidental; however, during the early spring there may be a considerable amount of nibbling if other green feed is scarce. One farmer stated that little firs do not get along with sheep. The seedlings and small fir trees were being nipped off on a pasture near his buildings. Sheep were the only type of livestock on the farm. Under close observation it was apparent that the sheep were nipping the seedlings and tender buds and shoots. In this case there were fifty sheep on four hundred acres of fairly rough timber area. This farmer sold his sheep to let the trees grow. There is some reason to believe that this particular, small area may have been overgrazed as a result of its location near the barn and winter feeding ground.

There was agreement among twenty percent of the farmers that cattle eat some fir. One man claims that he knows

that two head of his cattle have died from eating too much fir browse. The circumstances were the result of cattle caught in snow in the mountains and near starvation.

Five men stated that in falling firs for wood or timber during the winter, or when fir limbs blow down during a storm, especially when snow is on the ground, that the cattle will come running and browse on the fir branches.

LIVESTOCK PASTURING DECREASES FIRE HAZARD

There was general agreement among all of the farmers interviewed in the matter of pastured areas being less susceptible to fire damage. Pasturing disposes of much of the vegetative material that could otherwise become fuel for a fire. Livestock trails are of some benefit in controlling small fires. Pastured grass has a tendency to stay greener. One man stated that on more than one occasion he had seen a fire stop after it had burned up to an area that had been heavily pastured.

TREND TOWARD MAINTAINING TIMBER RESOURCES

Almost half of the farmers interviewed had, during their farming experience, cleared stands of fir to use as pasture land. Only one stated that he will continue to clear that type of land for pasture if circumstances allow him to do so. He stated that he had cleared twenty-five

acres of firs up to five inches in diameter five years ago. Everyone interviewed agreed that the trend is toward maintaining and often encouraging young stands of firs for timber or timber products.

One farmer stated that thirty-seven years ago he had slashed forty acres of firs eight to twenty feet high which was a very foolish thing to have done. It didn't do any good because trees came back immediately and are now twenty feet high on the same area.

A very small percent of the farmers felt that they could not afford to maintain the timber stands because the trees could not be harvested during their lifetime. The majority believed in saving the areas thickly populated with fir trees or fir seedlings. One man summed up his opinion with the following statement: "You would have to be a good grandad to some offspring that probably wouldn't appreciate it, but I believe we should do the right thing and leave things better than we find them. "

TOXICITY OF CERTAIN TYPES OF BROWSE

Six of the men had experienced death or abortion in cattle, sheep, or goats from eating fir needles. Others said losses could have occurred from stock eating fir. However, in their opinions, death probably was caused by worms, lack of adequate feed, or some other unknown cause.

Two men have had sheep, goats, or cattle abort or die from eating mistletoe blown down during storms. Others admit possible losses from that source but attribute losses to other unknown causes.

Three of the farmers state definitely that they have had sheep, cattle, or goats die or abort from eating large quantities of the mushrooms (or toadstools) which come up in abundance after the early fall rains.

TIMBER VERSUS GRAZING

Land use is not within the scope of this survey, however, certain factors which might aid in determining land use arose during the interviews and will be presented in a narrative but factual fashion. It is hoped that this added information, incidentally collected, will be of interest without being considered a part of the problem with which this thesis deals.

On one farm the timber was slashed and the land cleared for pasture during the years from 1892 to 1896. The same land is now heavily stocked with trees up to twenty inches in diameter.

A similar situation occurred where land was slashed of all timber and cleared for pasture in 1885. A small sawmill has been operating in the area during the last two years cutting logs up to thirty inches in diameter.

Two brothers hauled bundles of grain from a field thirty years ago that now has on it a stand of fir timber up to forty feet in height.

One of the men worked as a boy thirty-eight years ago helping to slash forty acres of fir trees six to eight inches in diameter to clear for pasture land. About five acres were not slashed when spring work interrupted the job and the five acres were never subsequently slashed. The firs that were left average thirty inches in diameter now. He was recently offered ten thousand dollars for the stumpage on the five acres.

One man went back after forty years to a place his father had farmed. The old dead furrows were still there among fir trees up to two feet in diameter.

In another case, land that was clear forty-six years ago and has been pastured continuously since has marketable piling on it now. These reports are characteristic of others not mentioned.

There was general agreement that a timber thinning process could begin for posts after a very few years; that piling could be selected at about forty years; but that trees should not be cut for timber until at least seventy-five to one hundred years.

No questions were asked as to returns from grazing in comparison to returns from timber, however there was

a wide variation in opinions voluntarily offered. Such information was scant, and the material was not recorded.

DISCUSSION

Fifteen of the twenty-six farmers who were interviewed during this survey were men who had spent their lives in one immediate vicinity, and many of them were born and raised on the same farm that they now operate. Only two of these men had had less than forty years of experience. The one lady in the group has been on the farm only seven years, but was included because of some recent experience in pasturing hogs on forest land.

Some variation of opinion would naturally be expected from any large group of persons. On the other hand, men who have had as much experience in a common enterprise as the group of farmers interviewed during this survey would be expected to show some pattern of similarity of opinion.

Some factors appear to be of sufficient significance in this regard to be worthy of mention. In practically every instance, it was the farmer who had a large acreage of grazing land who stated that livestock and trees can be successfully raised together on the same area. Only minor criticism of livestock pasturing on timber areas came from farmers who had five hundred acres or more of this type of land. Those farmers who made definite contrary statements had a total of four hundred acres or less, few or none of which were productive crop land.

These figures are suggestive that the major deciding factor may be overgrazing. If this assumption is correct, then the solution must be economic in nature. Apparently on the larger acreages there is sufficient range to carry enough livestock to furnish an adequate living without heavy overstocking. Under such circumstances grazing may be beneficial to timber raising. These conditions may be reversed if an attempt is made to carry enough animals for an economic unit without enough land to support that amount of livestock. This, of course, is an economic problem.

The economic problem involved will not be solved in this paper. The answers to some management problems, however, might assist in evaluating the economic picture of these subsistence farms.

There is no doubt that all types of grazing livestock will eat fir buds and tender shoots and nip off the small seedlings at certain times of the year, or under certain other conditions. This was stated as a definite fact by a number of the farmers and is also supported by many published experiments. Rubbing and trampling by livestock are responsible for some amount of damage to small trees and seedlings, however, it was generally stated that deer do much more of that type of damage than do farm livestock.

Most of the damage from nipping, according to all sources, occurs during the winter when the ground is

covered with snow or in the early spring when the new growth is tender and the livestock are hungry for green forage. It was also stated that trees above four feet in height were seldom damaged.

The first management practice to suggest is that livestock should be kept out of areas where small firs are growing during the late winter and early spring or when the ground is covered with snow. On farm units of adequate size, this should not be a serious problem. On smaller units, of course, the problem is again economic.

This subject should not be left without mentioning that there are benefits of livestock pasturing toward getting a stand of seedling trees. Trampling seeds into the ground, incidental scarification of seed, exposure of mineral earth for a seed bed, and keeping down forage that might harbor seed-eating rodents are probably important factors in this regard. The farmers, in general, recognized the fact that young trees become established quicker and thicker where livestock are pastured than on ungrazed areas. Too often, perhaps, open pasture areas become infested with fir seedlings from some neighboring seed tree.

Douglas fir trees are very aggressive competitors to brush. Numerous examples were cited where trees have become established in dense brush. When the trees have

reached sufficient height to furnish deep shade, the underbrush usually dies. That fir trees establish themselves very slowly under these conditions is common knowledge.

Following a logging operation or a fire, it is especially essential to establish a grass cover so that restocking of fir trees can occur before weeds and brush take over. At this point the mention of the second management practice will be appropriate. Whether tree farming or livestock farming, keep all unforested areas seeded to grass and keep them pastured until the fir seedlings appear.

Whenever and wherever livestock are being pastured, there is the possibility of overgrazing. In some cases overgrazing may be desirable or even necessary. Goats, for instance, are often used to clear out an area that is too brushy for either trees or grass to become established. One farmer, in discussing some hill land covered with poison oak, oak grubs, mountain laurel, rosebriars, evergreen blackberry, and other native brush, made the statement that unless goats were put on the area in ten years he would not be able to crawl through on his hands and knees. In general, however, overgrazing is an undesirable condition to be guarded against. Small firs are in a perilous position when surrounded by hungry livestock.

When livestock have insufficient winter feed they will

browse on most plants as high as they can reach. Often much damage is done to good young forest reproduction under such circumstances. According to some of the farmers, goats will peel six and eight inch firs during a winter snow when no other feed is available. Probably the worst malady affecting livestock is "hollowbelly", a term used to describe under-nutrition in livestock.

Keeping livestock from being hungry by using good pasture or supplemental feed to maintain healthy livestock and to protect desirable tree and forage growth is the third management practice.

Several of the stockmen have had experience with livestock being poisoned by certain types of forage. Some of the poisonous plants, such as larkspur, water hemlock, and tansy ragwort were mentioned by farmers. Since there is general recognition of the poisonous qualities of these plants, they were not given prominent mention in this report. On the other hand, farmers reported toxic effects to livestock as a result of eating quantities of mistletoe, mushrooms (or toadstools), and fir browse. Abortion and death resulted in many cases.

These problems were not prominent among a large percent of the group. Two men had experienced losses from deaths among livestock which had eaten mistletoe blown to the ground during storms. Several farmers had had

experience with abortions or death caused by livestock eating too many fir needles. Three farmers had lost stock from eating mushrooms which came up in abundance after the first fall rains. According to these farmers, and supporting evidence in the review of literature, large quantities of these fibrous materials may be relished and eaten by livestock even when they are being fed adequately.

The fourth principle is: Keep in mind the types of forage that may be toxic and the times or circumstances under which they may be available to livestock, and take steps to protect livestock when the conditions occur.

Be cognizant of the fact that it may be profitable to carry two or more types of livestock on the farm. Fifteen of the farmers who were interviewed had sheep, goats, and cattle, if not all at once, at least at alternate times. None had less than two types.

Most of the farmers believed that sheep and cattle could be raised on the same farm, but that they should be fed and pastured separately. Some thought that sheep and goats or cattle and goats were better combinations than cattle and sheep. The farmer who had the largest farm (eighteen hundred acres) stated that cattle, sheep, and goats pasture satisfactorily and probably advantageously on the same area at the same time. The sheep graze on the low ground, the goats stay high on the ridges, and the

cattle feed down in the canyons. Apparently, criticism of pasturing the different types of livestock together diminishes or disappears when there is adequate grazing land; in fact the advantages of such a practice seem to be worth consideration in setting up a livestock management program. There should be better utilization of all plant forage when a system of this type is followed.

The value of marginal land as pasture depends primarily upon the quality of its forage. Most native grasses are annuals which yield small quantities of relatively low quality forage. They produce some pasture during a few spring months and dry up early in the summer. The statement that "this type of pasture land will not pay for taxes and management" may be close to the truth in many cases.

High yielding grasses and legumes such as alta fescue and subterranean clover have been widely and extensively used to increase the value of this land for pasture. These pasture plants are adapted to this type of land and furnish substantial quantities of high quality forage. The establishment of this type of improved pasture can not be left out as a management practice.

Fire is the greatest hazard to production of timber. It was stated that "small trees or grass can be established easily after an original burn, but after the second burn

it takes a long time." Livestock pasturing is usually the only practical method of utilizing the grass and forage that, when dry, becomes potential fuel for a damaging fire.

Where timber growth is dense there is no pasture beneath it; where timber growth is not dense, the trees usually have limbs clear to the ground and make low quality timber. This points to the fact that occasional trees or small clumps of trees located in a pasture area may well be destroyed or salvaged, and, by the same token, those trees in dense stands should be protected.

The problem of goats and sheep getting caught in rose briars or evergreen blackberry bushes was quite common. Angora goats and long-wool sheep are often not able to get out without assistance. Shearing twice a year reduces the frequency of this hazard, however there is no substitute in this regard for daily observation of sheep and goats. Frequent observation and care is a management practice applicable and essential to all kinds of livestock production.

On one farm hogs were kept on forty acres of unimproved hill pasture. The open area was covered with rose briars, poison oak, and native grasses. Other portions were covered with oak and fir trees. The open pastured area was stocked with small firs in certain limited areas. After the fall rainy season had begun,

fifty half-grown hogs began to root up the ground. From the road, a few feet away, it looked like the firs were cultivated. Upon close inspection early in the spring there was no obvious damage to the small trees. The roots at the base of the trees were slightly exposed, especially on the steeper ground. Evidence is not yet available as to the results of this practice.

Predatory animals are serious problems in some areas. The methods of control vary according to the seriousness of the losses and the kinds of animals involved. Poisoning is one of the most effective methods of killing coyotes. There is considerable objection to this method, especially by farmers who own good stock dogs. Most of the objection is to the method of putting out the poison rather than the practice itself. When properly done, the poison is put out in the evening and taken up the following morning. There is little danger of farmers losing good stock dogs when that procedure is followed.

Foxes prey on lambs and kids. It is a natural habit of goats to hide their young and leave them unguarded for hours at a time. Kids left alone are easy prey for foxes.

Bear invade these areas much less frequently but do considerably more damage in a short period of time. Stray dogs are responsible for a great deal of loss, especially of sheep.

Many livestock farmers have not realized until recently the value of the timber on their farms. Much of this timber had grown up incidental to a livestock farming operation, uncared for and almost unnoticed. During recent years timber values have increased to the point that more care and attention have been given to management of timbered areas.

SUMMARY AND CONCLUSIONS

The original purpose of this survey was twofold; first, to determine the management practices best suited to maintaining the timber resources on livestock farms, and second, to determine if livestock can be of value in establishment of stands of trees on timber areas. The survey method was used to get this information.

Twenty-six farmers from six western Oregon counties were interviewed in person. Only three of these farmers had less than forty years of actual experience in raising livestock on dual-purpose pasture and timber areas.

The results of this survey contain sufficient evidence to convince this writer that livestock and timber can be successfully produced together if carefully planned management practices are followed. Following are the results and management practices determined by this survey to be of value toward that end.

1. Under certain circumstances, all kinds of livestock will browse on firs to the extent of causing permanent injury or death to small trees and seedlings. Proper management of livestock will reduce this damage to a minimum.

2. Tree stands become established on grazed areas more readily than on ungrazed areas.
3. Most damage to trees occurs as a result of overgrazing.
4. Livestock may browse on poisonous plants even when fed properly.
5. Unproductive native grasses in present pastures should be replaced with high-yielding grasses and legumes.
6. Fire is the greatest hazard to production of timber. Livestock are beneficial in reducing fire hazard.
7. Combination stocking of sheep, cattle, or goats may increase efficiency in the utilization of forage.
8. Angora goats and long wool sheep frequently become tangled in rose briars and evergreen blackberry bushes. Shearing twice a year reduces this hazard.
9. Frequent observation of livestock is essential to proper management.
10. The income from a livestock farm can be supplemented by proper management of its timber resources.

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APPENDIX

APPENDIX

Pages 43 and 44 contain statistical information about the farmers who were interviewed during this survey.

The answers to the questions asked during the interviews are recorded on pages 45 and 46.

Pages 47 to 53 inclusive contain pictures complementary to the material presented in this thesis.

<u>Name</u>	<u>Total acres</u>	<u>Hill land</u>	<u>Cattle</u>	<u>Livestock owned Sheep</u>	<u>Goats</u>	<u>Years Experience</u>
Ray Adams				100	200	40
R. C. Allen		275	10	90	70	*63
Fred Auer	900		50	120		35
Mrs. Brannon					14	7
W. Bump	1500	1250				
Jack Cochran	1000	600	250	50		*40
Frank Cochran	1000	600	250	50		40
Glen Decker	400	400	12	40	200	*49
Guy Hansen			30	150	100	*54
Dolph Heater	600	150	50	150		*47
Claude Hoisington						
Fred Hottinger	700	100	25	300		*51
H. H. Peters	400	200	10	60		*48
Sydney Howard			30	10	5	18

Name	Total acres	Hill land	Cattle	Livestock owned		Years Experience
				Sheep	Goats	
Calvert Jones	1800	250	90	350	150	*41
W. J. Kerr		360	35	120	100	20
Art Kyle	1000	700	100	160	60	*61
Orr Kyle	500	150	50	200	100	*64
C. A. Overton		400	100	250	100	40
E. J. Pearl	720	650	30	150	150	52
Henry Plunket	750	700	6	150	250	*69
James Price	230	115	15	50	50	*65
George Sander	1100	700	60	200	150	*70
John Sielbernagel	272	180	30	65	100	*59
P. R. Starr	320	260	20	30	150	*72
S. C. Wilson			20	150	150	42

* Total age of men who have been born and raised on their present farms or on farms in the immediate vicinity.

	<u>Yes</u>	<u>Under some conditions</u>	<u>No</u>
Livestock pasturing and reforestation can be successfully carried on together.	12	12	3
Moderate pasturing is beneficial to natural reforestation.	12	12	2
Cattle and sheep can be successfully pastured together.	3	8	4
Native grass is valuable for pasture.	5	8	8
This type of land will support quite valuable improved pasture.	10	10	
This land is more valuable as timber than pasture.	2	12	9
Goats will eat fir seedlings and browse.	16	5	2
Sheep will eat fir seedlings and browse.	8		7
Cattle will eat fir seedlings and browse.	5		6
Young firs will start in brush and oaks.	10		
Young firs will start better in grass than under brush conditions.	10		
Poisoning predators is satisfactory.	6	2	3

	<u>Yes</u>	<u>Under some conditions</u>	<u>No</u>
There is a trend toward maintaining stand of fir instead of clearing for pasture.	15	6	
Goats hinder reforestation.	11	1	1
Sheep hinder reforestation.	3		7
Cattle hinder reforestation.	2		8



In these pictures sheep are grazing on pasture land of the type referred to in this thesis.

Open pasture land with adjacent timber areas is characteristic of Western Oregon marginal land.





No pasture or other forage grows in the dense shade of a heavy stand of fir trees.





This picture shows the size of 65 year old logs being cut in the mill shown below.



The timber being harvested for this mill is coming from a naturally reforested area which was slashed clean and seeded to pasture in 1885.



The sawmill on the previous page is located at the arrow point in the center of this picture. The timber on the hills above has grown since 1885.



The timber shown in this picture has grown during the last 35 years on a heavily grazed hill pasture.



The seed trees in the pictures shown above are the sources of the small fir trees in the surrounding pasture areas.



These small Douglas fir trees have been browsed by hungry sheep at a time when the small trees were vulnerable to that type of injury. Many of them are deformed as a result.



The divided and separate tops in the small firs in these pictures are typical results of live-stock injury.



The lower picture on the right was taken in an area pastured by hogs.