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Economic Impact of Range Improvements on Livestock Operators

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The topic I have been asked to address today represents a major portion of the work I have done during my professional career. It is an area where I have considerable personal interest but it also represents an area where much work has been done by others. Before I discuss the issue assigned however, I believe that a few bases must be touched to enable all of us to meet on common ground.

First, I will emphasize the economic problems associated with the use and improvement of range lands. This does not mean that other points of view, e.g. ecological, are not important but emphasis will be placed on the economic aspects. While this may bring to your mind dollars and cents, economics to an economist is much broader than this narrow accounting viewpoint. Economics is primarily concerned with people and how resources can be allocated to achieve their desires. Thus, market as well as nonmarket considerations must be evaluated in a complete economic analysis. Furthermore, interest in other organisms is only of interest if they affect the satisfaction obtained by humans.

Second, the range improvements I'll talk about today will be interpreted very broadly to include popular practices such as seedings,

fencing and water developments as well as practices such as salting and herding. Some will probably object to this broad view but, in my opinion, any action that can help achieve or obtain something desired by man is an improvement. This does not infer that all improvements can be justified because the first principle of economics is "there is no such thing as a free lunch". Every action has by its very nature a cost that must be borne by someone. Economic justification requires that the benefits be greater than the costs. This evaluation often involves benefits obtained by one group or person at the expense of another group or person.[1] Thus, any improvement infers that some sacrifice has been made which may be of greater or less value than the improvement.

Third, most range land is owned and managed by some agency of the federal government. Thus, most range improvements are inherently part of the policies affecting the use of these lands. While considerable controversy historically and presently exists concerning the use of these lands, they do not represent "Lands nobody wanted".[2] One of the primary reasons why much of this land did not transfer to private ownership was due to legal restrictions which did not allow the formation of profitable sized units. Given this ownership pattern and the theme of this workshop, I will limit my remarks to western livestock operators.

Fourth, livestock operations in the west are, with very few exceptions low profit enterprises. I have yet to see a study where the returns on invested capitol in ranching were as great as most other types of types of

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1. These distributional problems are particularly accute in public land management where one group is often subsidized by another group.

2. This is perhaps the most fallacious argument used for their retention as public lands.

agriculture or other business enterprises. As Smith and Martin (1972) have shown, most ranchers continue in this occupation because it is their "way of life" and because they have strong land fundamentalist beliefs.

Fifth, the costs that must be incurred to graze public lands are not small. For example, an update of the costs reported in the 1966 grazing fee study indicates (Table 1) that the nonfee costs of grazing cattle on public lands are approximately $7 per AUM and that the average total costs of grazing public lands is probably[3] more than $9.00 per AUM. One should note however, that no cost is allowed for the value of permits held and that wide differences from these averages probably exist. For example, it would cost nearly $15 per AUM for the U.S. Sheep Experiment Station (Table 2) to graze ewes and lambs on summer ranges if a $2 grazing fee were charged. This would require that lambs sell for more than 50 cents per pound and gain more than one-third of a pound per day just to pay these costs with no return being made to help pay for the costs of producing the lamb. If these high costs were experienced by all operators, they would be forced to either seek other sources of feed or go out of business.

Sixth, while federally administered range lands continue to provide a decreasing portion of the feed used by domestic animals, this does not mean that their importance to individual operators or to the livestock industry can be discounted (Nielsen and Workman, 1971).

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3. The costs reported for repair and maintenance of fences, water developments and herding have probably increased more than the amounts indicated. The reason for this difference stems from the fact that agency policy has changed since 1966. This change has made ranchers responsible for all maintenance versus earlier policies where the costs were borne by the federal agencies. Recent changes in federal policy which have essentially eliminated private developments on federal lands have probably reduced the development depreciation costs.

TABLE 1. Average nonfee cost of Grazing Forest Service and BLM Lands, 1966 and 1978

Itemized Cost	Cattle		Sheep	
	1966	1978	1966	1978
Lost Animals	$ .60	$ .99	$ .70	$ 1.16
Association Fees	.08	.16	.04	.08
Veterinary	.11	.27	.11	.27
Movement of Livestock	.24	.58	.42	1.02
Herding	.46	1.12	1.33	3.23
Salt and Feed	.45	1.01	.55	1.24
Travel	.32	.78	.49	1.19
Water	.08	.16	.15	.30
Fence Maintenance	.24	.57	.09	.21
Horse	.16	.29	.16	.29
Water Maintenance	.19	.45	.11	.26
Development Depreciation	.11	.40	.09	.33
Other	.13	.26	.29	.58
TOTAL	$3.28	$7.04	$4.53	$10.16

Sources: 1966 data from Nielson and Workman, 1971
1978 data are the 1966 data updated using price indexes for farm production expenses, Ag Statistics 1979

TABLE 2. Operating Expenses on Mountain Summer Range for Ewes and late weaned lambs

Period of Evaluation: July 6th - September 27th

Management System:

3600 lambs and 3623 ewes grazing summer range for 64 days
3600 lambs grazing low summer range and 3623 ewes grazing sagebrush-grass range for 20 days.

Operating Expenses:

Labor:	4 herders on high summer range for 64 days @ $18.50/day	$ 4,736.00
	1 camp tender on high summer range for 64 days @ $175/week	1,575.00
	1 herder on low summer range for 20 days @ $18.50/day	370.00
	2 herders on sagebrush-grass range for 20 days @ 18.50/day	740.00
	1 camp tender on low summer range and sagebrush-grass range for 20 days @ $175/week	500.00
	1 water hauler on sagebrush-grass range, 10 hrs/day for 20 days @ #3.50/hr	700.00
Horse and Tack:		1,250.00
Transportation:		1,628.00
Animal Losses:	146 lambs @ $55	8,030.00
	118 ewes @ $104	12,272.00
Grazing fees:	(3623 ewes ÷ 5) x $\frac{84}{30}$ @ $2.00 per AUM	4,057.00
	(3600 lambs ÷ 5) x $\frac{20}{30}$ @ $2.00 per AUM	960.00
TOTAL		36,818.00

The decreased use of federal lands have and will likely continue to have some dramatic effects on livestock operations. These effects[4] need to be understood before we consider the impact of impovements on ranch operations because history has shown that the absence of positive factors has generally resulted in decreased use of publically administered range lands.

Impact of reductions in use on ranchers

It has been extremely popular to argue that reductions in the use of public lands will force ranchers out of business but reductions in the number of ranchers has not occurred to the degree some have suggested. This does not mean however, that ranchers have not been forced to make adjustments or that some have not been forced out of business.

While the use of federal lands has declined (figures 1 and 2), the number of livestock over time in the west has increased (figure 3). This suggests two possible alternatives, either ranchers have overgrazed private lands[5] or reductions in the use of public lands have been overcome by increases in the productivity of private lands. Numerous reasons have probably contributed to this change but two interrelated factors were probably most important. First, some private range improvement were economically feasible but were not seriously considered until the reductions in federal lands occurred. Secondly, reductions in the use

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4. We know a great deal more about these impacts than the alternative because reductions have been more common than have increases or even maintenance of historic use.

5. This is unlikely given the market price of lands in the west

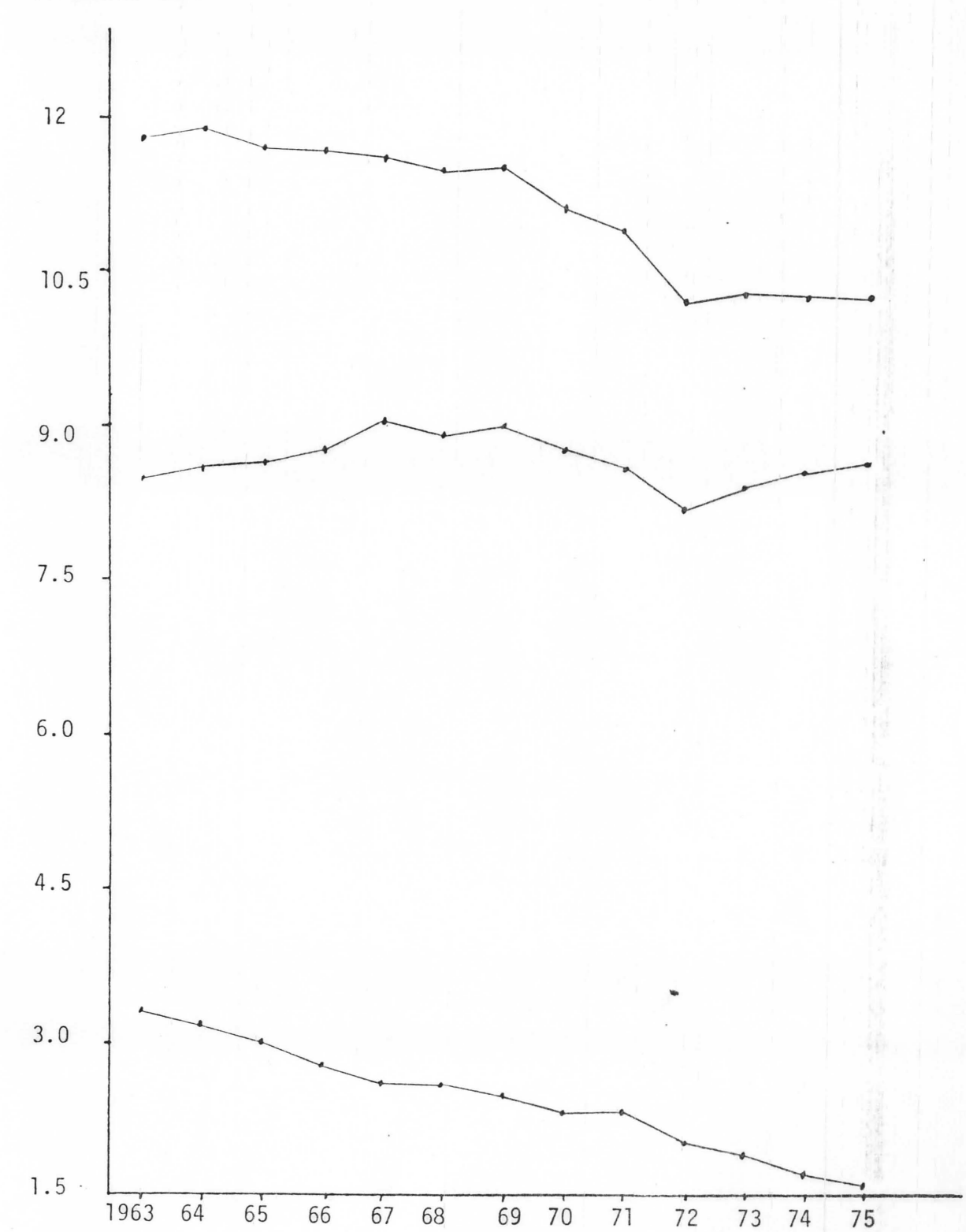

Figure 1. Animal unit months(AUMs) of use on BLM lands by domestic livestock, 1963-1975
Source: Public Land Statistics

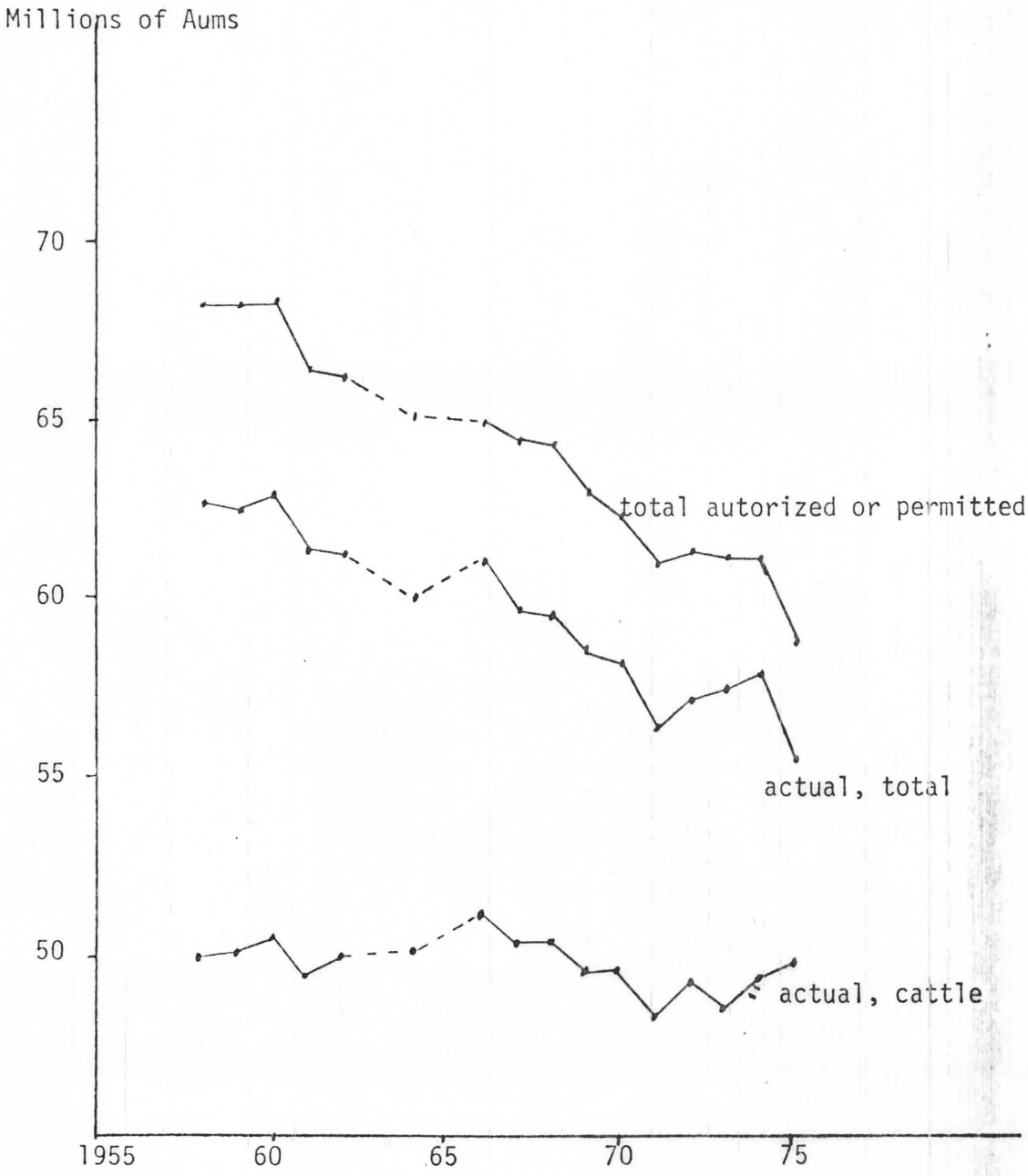

Figure 2. Authorized and Actual AUMs of use by domestic livestock on Forest Service lands, 1958-1975.
Source: Annual Grazing Reports, Forest Service

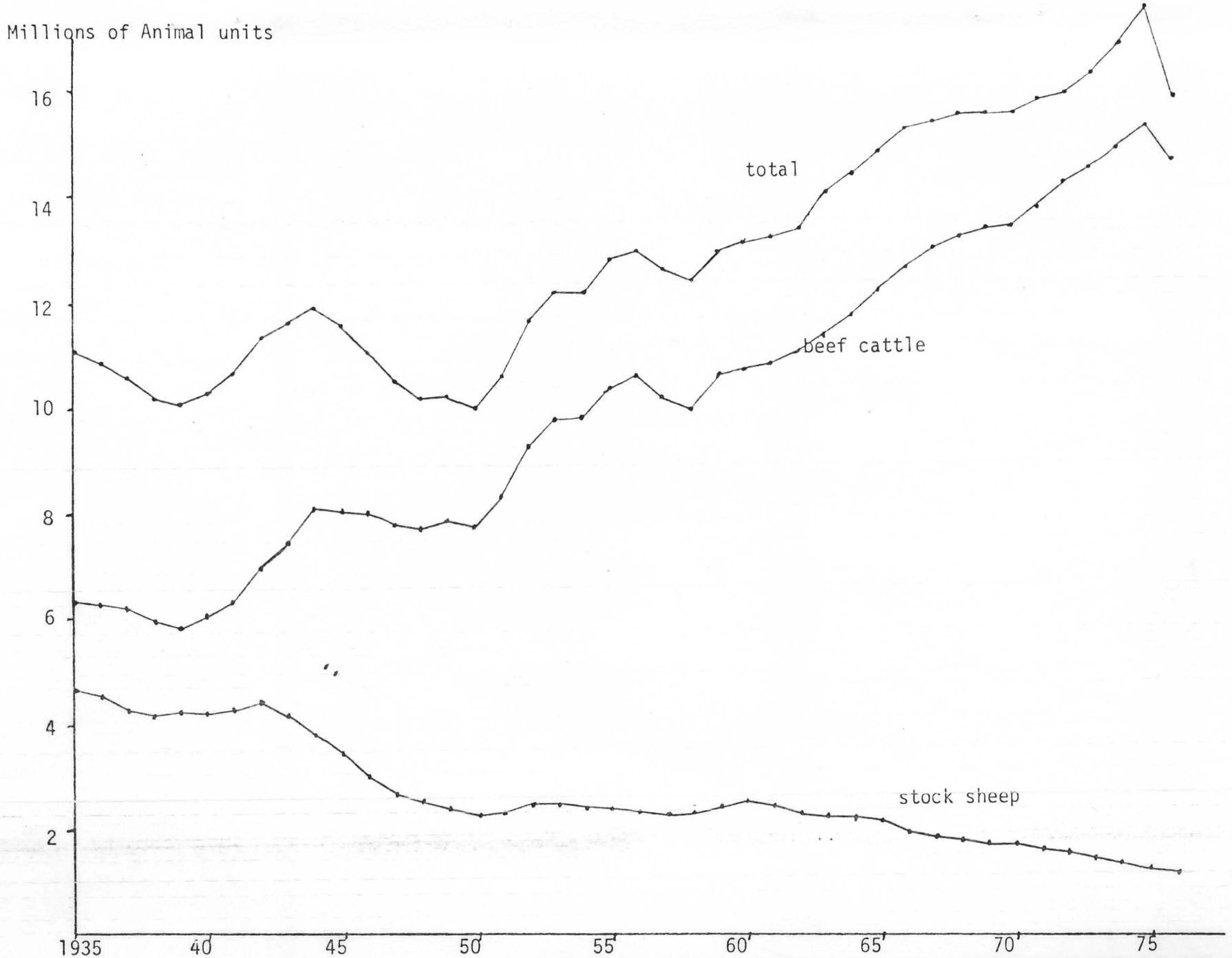

Figure 3. Animal units of domestic livestock, eleven western states, 1935-1976
Source; Agricultural Statistics

of federal lands has tended to make private forage more valuable which has helped make more private improvements economically feasible. As a result, private lands were developed and use shifted from public to private lands in the west.

This shift in use has probably been one of the major contributing factors in helping drive the price of range land upward. These increased prices have been forced upward as ranchers try to purchase or lease private lands to overcome decreases in the use of public lands.

The shift in use to private lands has also forced operators to use private land more intensively. As a result, crops are often planted and harvested from "fence to fence". This has also caused some ranchers to convert some areas to crop or pasture land that were formerly viewed as waste.

All ranchers have not been affected equally by adjustments in the use of public lands. One of the characteristics of ranching is that they are subject to economics of size--i.e. larger ranches generally have smaller average costs than do small ranchers. One of the major reasons for this stems from the fact that a large portion of the costs paid by ranchers are fixed. As a result, the small full-time operator is under heavy financial pressure when reductions in use are imposed. These operators must either expand by "buying out" ones neighbors or seek off farm/ranch employment. Data from the Bureau of Land Management (BLM) and Forest Service (FS) also suggest that the primary holders of grazing permits are either relatively large full-time operators or small part-time "hobby type" ranchers[6]--the latter group represents the major livestock user group from a "number of permits held" point of view. Thus the small full-time single owner ranch has probably been put under considerable financial pressure to remain as a user of public lands.

These and other pressures have tended to shift beef cattle U.S. production to other parts of the United States while sheep production has shifted to the west (figure 4).

These adjustments have also had some rather major effects on other users and user groups. First, many ranchers have found it necessary to limit or exclude free use of private lands by hunters or fishermen. Secondly, some ranchers (e.g. East Fork of the Salmon River) have found subdivisions to be a profitable means of salvaging the value of their ranch. Third, absentee ownership has probably been fostered with its general absence of personal concern for the land and its use. Fourth, riparian habitat which is commonly associated with privately owned lands has experienced increased grazing pressure, channelization and clearing.[7] Thus, one is brought to the immediate conclusion that the use of public lands is only one part of a giant puzzle and that changes in the use of land managed by one group of owners generally has positive as well as negative impacts on lands managed by other owners. These intermingled ownership patterns can therefore easily yield impacts that, when viewed in total, differ significantly from the impacts when viewed from the point of view of one ownership.

While the preceeding has taken a somewhat negative point of view, the impacts outlined can be used to infer that actions to increase the productivity and use of public lands can have the opposite effect.

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6. These two major groups are particularly evident amoung holders of sheep permits while cattle operators tend to be more evenly distributed by size class. This polarization represents a major problem for organizations such as the various cattlemen's association.

7. Most wildlife and fisheries biologist agree that this is the most critical habitat area for fish and wildlife populations. The intensive use of privately owned riparian habitat could have hurt wildlife and fish populations more than the possible gains made on public lands.

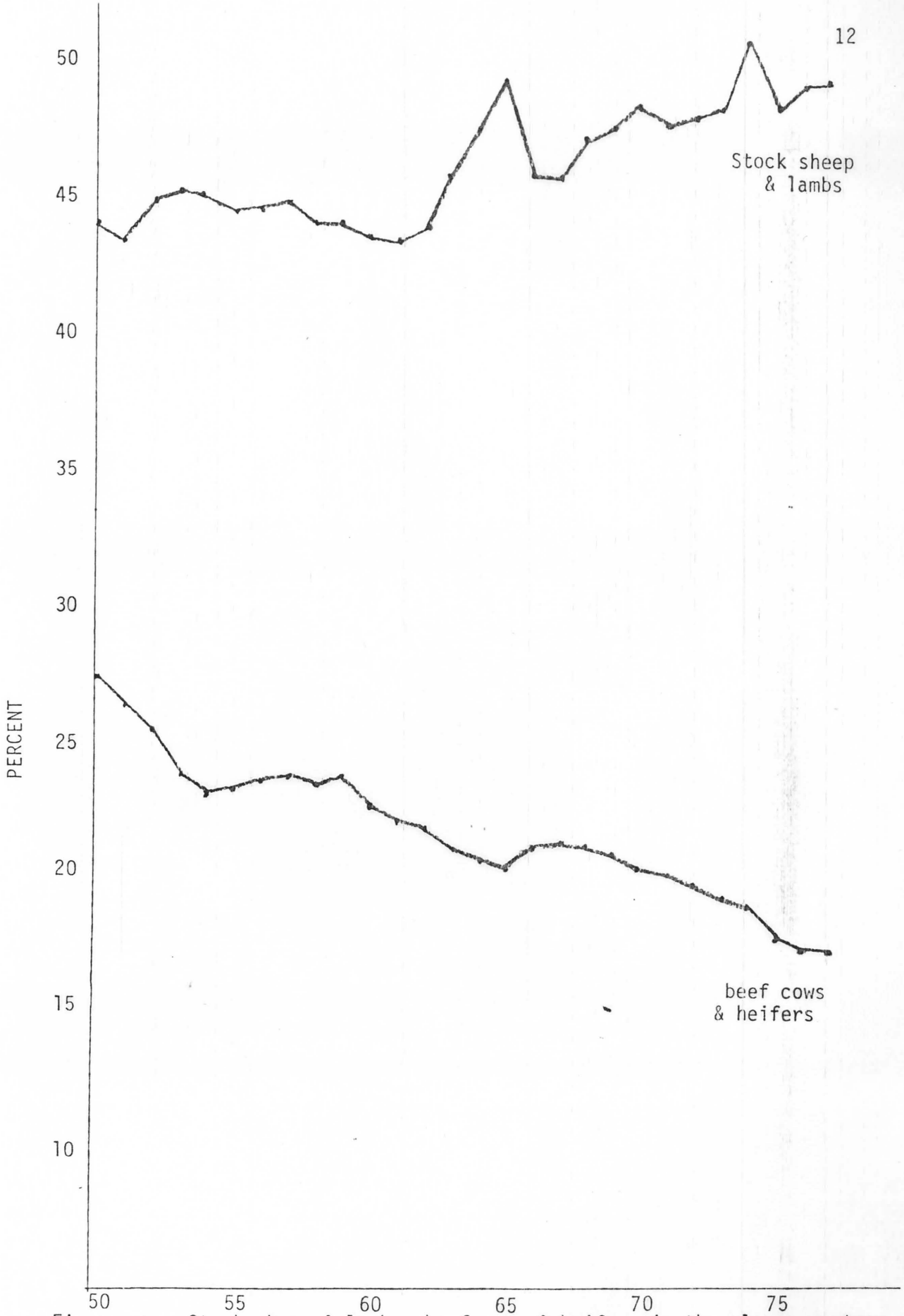

Figure 4. Stock sheep & lambs, beef cows & heifers in the eleven western states as percent of U.S. total, 1950-77.

Source: Ag Statistics

Furthermore, the above can be viewed as the "macro or large picture" point of view, they do not outline what impact range improvements can have on individual ranching operations.

Range Improvement Costs and Benefits

Most of the research that has been reported on the impact of range improvements was conducted during the period from the early 1950's to the late 60's. The results of this research indicate that no improvement practice is either always or usually profitable because individual characteristics have a larger impact on project feasibility. These mixed results suggest that care must be exercised or monies will be inappropriately spent. The numerous studies (see Nielsen and Hinckley, 1975; Gray and Saadi, 1969; and Gray, Stubblefield and Roberts, 1965; for a review of some of these studies) do suggest however, some general guidelines that need to be considered.

The first and perhaps most important thing that must be considered if an improvement practice is to be feasible involves whether or not the practice can solve a problem (relax a constraint). This can perhaps best be viewed from the point of view of a livestock operator[8]. Table 3 shows the monthly feed requirements of a fairly typical cow/calf operator in the Intermoutain region. Let us assume that this operator has a BLM permit for his herd from 1 May to 30 June and a Forest Service (FS) permit from 1 July to 15 October. Thus, nearly one half of this operators feed requirements are obtained from federal lands. Suppose further that the average capacity of BLM lands he is permitted to graze is 700 AUM's and the FS lands have an average capacity of 1500 AUM's. It is clearly

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8. An analogous example could have been developed for wildlife or any other user group.

seen that in dry years BLM lands will tend to be used heavily while FS lands would generally receive relatively light use. Thus, improvements which would increase the capacity of summer ranges would not alleviate a problem while improvements that would increase the capacity of areas used during the spring would help solve a problem. Thus, the elimination of seasonal forage "bottlenecks" must be the first problem that must be considered before a range improvement can be expected to have a payoff.

Most evaluations of range improvements on public lands have tended to be unjustified while private improvements have tended to be more positive. One of the reasons why this may have occurred may be due to differences in the natural productivity of a site but I suspect that it has been more commonly due to differences in management philosophy. Some range managers become intensely interested in the "theology"[9] rather than the science of ecology. As a result they endeavor to get all range lands in excellent (climax) condition when some seral stage would be more productive but of a lower condition class. This has also resulted in the implementation of range improvements on lands that were in poor condition and had relatively low production potential instead of "improving" a fair or good condition site where increases in production from the same investment would have yielded greater returns.

This theological rather than scientific ecological approach has also lead some biologists to advocate only "natural" regeneration or improvement. This is based on the belief that "natures way is best" or that "man can not improve on nature" (If this were strictly true, man

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9. This difference is emphasized by groups that are more concerned with the status of timber, grass or "dicky birds",per se, than they are in the role these resources have in fulfilling human wants.

TABLE 3. Monthly Feed Requirements (AUM's) for a 300 cow/calf operation

	Type of Animals				
Month	Cows	Bulls	Replacement Heifers	Calves	Total
January	260	22	40	20	342
February	300	22	20	--	342
March	300	22	20	--	342
April	290	22	20	--	332
May	290	22	25	--	337
June	290	22	25	--	337
July	290	22	25	--	337
August	290	22	30	--	342
September	290	22	30	--	342
October	260	22	30	54	366
November	260	22	40	108	430
December	260	22	40	20	342

would probably still be killing game with sticks or stones and living in a cave). Man must work within the laws of nature but "natural" means are not necessary as good or better than man introduced alternatives. For example, the limited number of evaluations of grazing systems (basically natural improvements) that have been conducted to date (Workman and Nazir, 1973; Rosell, Ching and Hancock, 1974) have shown that they are not usually justified. The basic reason for this conclusion stems from the fact that any increases in production that occur using natural means do so after relatively long periods of time. They may be relatively inexpensive for the agencies to implement--this may be the primary reason for their popularity--but they commonly impose high costs on livestock operators in the form of maintenance, repairs, decreased calf crops and lower weight gains than historic patterns of grazing. Thus, ranchers often object to these types of improvements while other user groups, primarily wildlife interests, have objected to alternative improvement practices. For example, numerous studies have shown that range improvements often have a negative impact on particular species.[10] But these studies generally overlook the fact that most range improvements harm some species while benefiting others. The Vale project in eastern Oregon, represents one example of these tradeoffs. The autecological and historic view of this project suggests that mule deer have probably neither been harmed or benefitted by range improvements, collard lizard populations were probably hurt while sagegrouse and antelope populations have been enhanced (Heady and Bartlome, 1977). Numerous examples where livestock are being used to benefit wildlife (e.g. Boise Front, Mud Lake

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10. Most ecological studies of range improvements have been autecological (specie oriented) rather than synecologically oriented. There is some evidence that water developments are generally of benefit to all species.

Wildlife Refuge) could be cited but these are rarely reported in the literature.

During the early 60's, a large number of acres of rangeland was seeded to various species (primarily crested wheatgrass). These were commonly objected to by various ecologists because they were viewed as monocultures. However, it was rarely admitted that the area was often a sagebrush monoculture before the area was seeded. These sagebrush monocultures were (are) probably of no greater value to wildlife than the resultant grass monocultures and they are of significantly less value as a site for livestock grazing.

Perhaps the largest impact on the benefits from a range improvement stems not from the biological response but from how an area is used after it has received some treatment. For example, grazing is commonly deferred when improvements such as seedings or brush control are implemented. These deferrment costs are borne by the rancher and represent one of the primary costs of some types of range improvements (Table 4). There is some evidence which suggest that these costs are sometimes unnecessarily incurred (Smith, 1979) but they represent one of the primary reasons why ranchers have found some improvement practices to be too costly. These costs also represent one of the reasons why some federally sponsored range range improvements are objected to by affected ranchers.

Not only must a rancher bear the costs of deferrment by purchasing additional feed or reducing the size of his herd, but private range improvements also commonly impose significant financial costs. For example, when a seeding is established most financial institutions require that loans be paid during the deferrment period. This represents a period when net returns are lower than usual which makes the payment of loans particularly difficult.

TABLE 4. AVERAGE COSTS PER ACRE, 1979

	SPRAYING	SPRAYING & SEEDING	PLOWING & SEEDING
REHABILITATION	$2.23	$4.69	$ 8.56
FENCING	0.88	1.07	1.67
CATTLEGUARDS	0.07	0.13	0.36
WATER DEVELOPMENT	0.57	1.16	1.76
OTHER	0.02	--	0.01
DEFERRED COSTS	0.80	0.53	0.60
TOTAL COST PER ACRE	$4.57	$7.59	$12.96

SOURCE: STEVENS AND GODFREY, 1976.

While the costs of range improvements may be high, they often represent a cheaper means of obtaining additional forage than leasing private forage or buying land. Some of the reasons why these costs are often smaller stem from the ranchers basic operation. First, ranchers commonly have the equipment necessary to "put in" many types of range improvements. This allows the rancher to "spread" some of the fixed costs of owning this equipment. Furthermore, these improvements can often be scheduled as part of another job or activity. Secondly, ranchers often have labor that is under employed during some periods of the year. As a result, they can work on range improvements during these periods when opportunity costs are low. Third, and perhaps most importantly, ranchers commonly have an intimate knowledge of the area.[11] Thus, they are generally able to predict how livestock will use an area and how an improvement might affect the areas use by other animals. Furthermore, they are often able to determine how livestock using the area will respond to a change in forage use. These differences are particularly important when range improvements must be justified from a livestock production point of view. For example, the same volume of forage does not have equal value from an animal response point of view if grazing is available at different locations or during different periods of time. Thus, an improvement that is located some distance from water will have a lower animal response than one located close to a source of water because energy must be expended in traveling to and from the site which will reduce gains. Furthermore, animals do not respond equally to forage taken during different periods of time. Some of these

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11. This knowledge is too commonly discounted by federal land administrators.

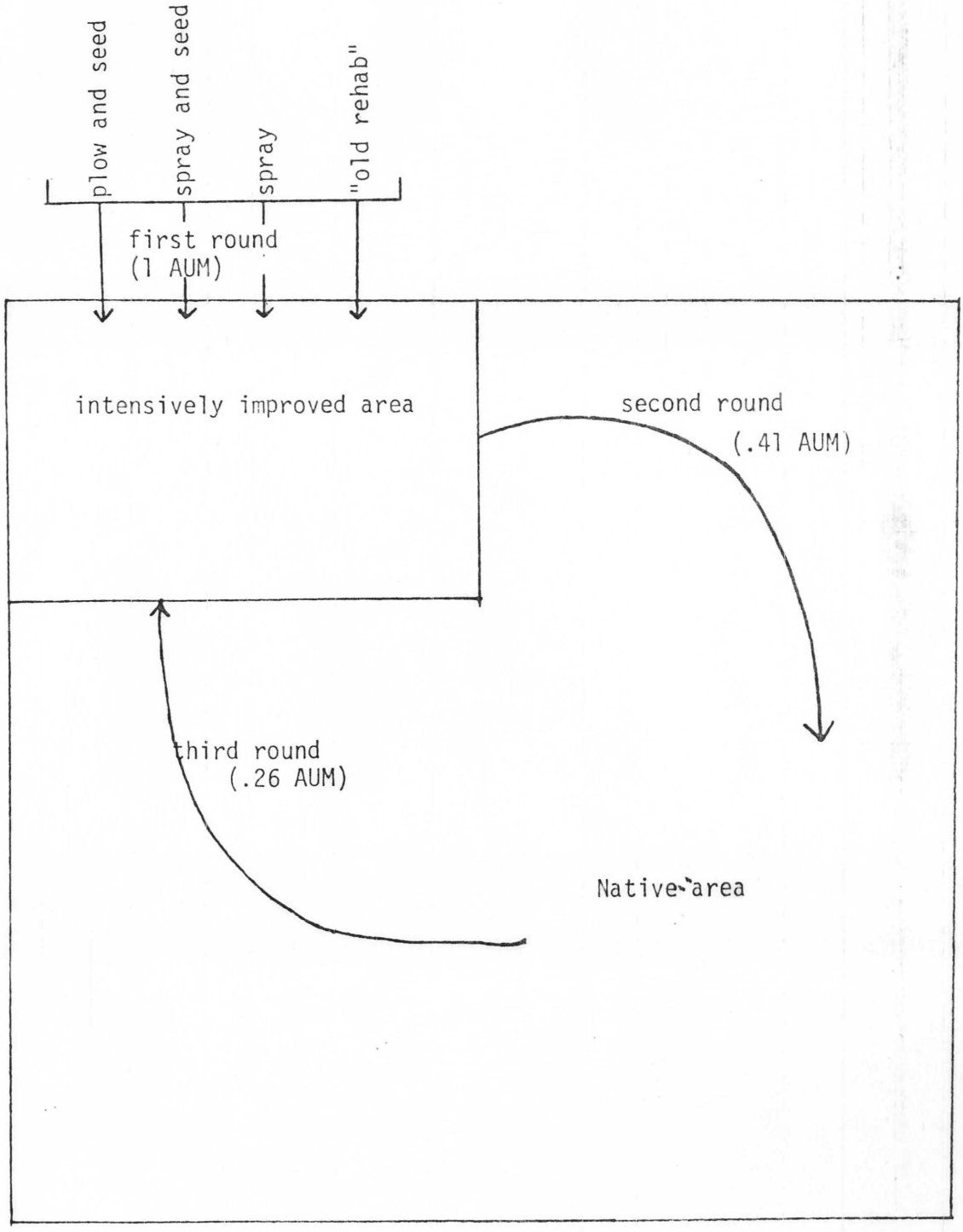
differences are illustrated in Table 5. These data clearly show that relatively heavy use during the spring is a necessary requisite to high returns from seeding an area to crested wheatgrass. Furthermore, there is evidence that improvements such as seedings can have a positive affect on the productivity of other areas as shown in figure 5. This data, for the Vale project in Oregon, (Stevens and Godfrey, 1976) indicates that for every AUM increase in the productivity of intensively improved areas, the productivity of neighboring native areas increased four-tenths of an AUM. These increases were made possible by using intensively improved areas in the early spring and allowing the use of natural areas to decrease during this period. These and similar results for other areas and practices suggest that a broad view of range improvements must be considered before they are accepted or rejected by public or private decision makers.

One other factor that must be considered whenever any type of range improvement is being considered--most are risky alternatives. Numerous problems can arise which often cause the results to be less than was predicted or expected. As a result of this risk, the relatively low cash flow that ranchers have available and their generally risk adverse nature (when capital must be expended) some ranchers view range improvements adversely. However, they often represent a viable use of scarce capital. While range improvements should not be viewed as a panacca, they often represent a viable method of improving the productivity of rangelands within a reasonable period of time.

TABLE 5. Discounted net returns per acre, Point Springs experiment pastures, 1955-1970

Pattern of Use	Pasture number	Discount rate 3%	6%	9%	12%
Light fall	01	$ 55.07	$ 38.08	$ 27.58	$19.99
Light spring	02	142.97	100.18	83.73	64.59
Heavy spring	03	170.97	130.35	101.58	80.75
Heavy fall	04	43.89	33.35	25.84	20.36
Moderate spring	05	116.98	115.85	89.83	71.00
Moderate fall	06	55.33	39.29	28.59	21.26
Moderate spring/heavy fall	10	112.79	79.93	57.69	42.35
Light spring/light fall	20	137.63	104.19	80.50	63.38
Moderate spring/moderate fall	30	159.95	122.82	96.35	77.04
Light spring/heavy fall	40	101.38	73.45	54.25	40.79
Moderate spring/light fall	50	157.50	119.45	92.49	73.00
Light spring/moderate fall	60	97.87	70.33	51.43	38.23

Figure 5. Secondary impact of intensive range improvements on native forage production



Source: Stevens and Godfrey,1976

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