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ECONOMIC IMPACT OF BLM GRAZING ALLOTMENT REDUCTIONS ON HUMBOLDT COUNTY, NEVADA

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SUMMARY

The purpose of this study is to estimate economic impacts of proposed reductions in BLM grazing allotments in the Paradise-Denio Resource Area. Economic impacts on the ranching sector and the Humboldt County economy were estimated. Because estimated economic impacts largely depend on the procedures followed, they have been documented in detail. Specifically, the estimated impacts depend on beef price levels, the level and season of proposed reductions in BLM grazing, and on the type of ranch adjustments permitted in the analysis.

Estimated reductions in gross product sales on ranches range from about $0.6 million to $7.5 million. Corresponding reductions in total sales in the Humboldt-Lander economy range from $1.0 million to $12.1 million. These reductions in sales were also reported for the various sectors in the Humboldt-Lander economy. Of special interest, estimated reductions in payments to households (income) range from about $0.12 million to $1.5 million. Finally, estimated reductions in employment range from about 18 jobs to almost 226 jobs.

Using 1979 beef prices, assuming ranchers do not shift to selling alfalfa hay, and assuming a 50 percent BLM reduction, the estimated reduction in gross product sales by area ranches is $2.88 million. Estimated reduction in payments to households is $579,000. And, the estimated reduction in employment is about 87 full-time jobs. Other estimates for alternative beef price levels, ranch adjustments, and BLM cuts are presented in the report.

INTRODUCTION

In 1974, the Natural Resources Defense Council along with five other environmental groups filed suit in the U.S. District Court in Washington, D.C. against the Secretary of the Interior. The suit contended the Bureau of Land Management (BLM) had failed to comply with the National Environmental Policy Act (NEPA). Specifically, the plaintiffs argued the BLM had issued and renewed grazing permits yearly since 1970 without preparing Environmental Impact Statements (EISs).

In December 1974, the court ruled in favor of the plaintiffs and found BLM had violated NEPA. The court ordered BLM to develop a schedule for preparing EISs on specific geographical areas. The Bureau of Land Management completed such a schedule in June, 1975. This schedule provided for 212 EISs covering about 150 million acres throughout the west to be completed over a 13-year period. In the subsequent two-year period, little progress was made. As a result, BLM filed a new schedule in September, 1977. Of importance, there was one major policy change critical to the study reported here. Specifically, the new schedule stated EISs completed

after 1980 would consider proposed actions based primarily on "vegetation allocations" rather than on allotment management plans. The vegetation allocation process will normally begin with a new intensive survey procedure which they call the "soil vegetation inventory method" (SVIM). The next step involves estimating the amount of available forage for livestock and other uses such that the plant population can maintain itself and reproduce. Following such procedures, BLM estimated carrying capacities of various land areas for various uses (cattle, sheep, wildlife, etc.).

In Humboldt County, Nevada, the vegetative allocation process (based on modified old survey procedures, (not SVIM) has led to proposed grazing allotment adjustments ranging from a 100 percent reduction to a 94 percent increase of existing grazing privileges. Eleven of the 75 allotments in the Paradise-Denio Resource Area are proposed to receive grazing allotment increases. Reductions are proposed for the remaining 64 allotments. The overall proposed change averages about a 50 percent cut over all ranches and allotments.

The Humboldt County Commissioners are concerned about the impact such reductions will have upon the county's economy. County Commissioners and area ranchers wanted an objective study to estimate the economic impact of these grazing allotment reductions on Humboldt County. They (commissioners and ranchers) are hopeful that such economic information will be a useful addition to BLM land use planning procedures.

Accordingly, the County Commissioners passed a resolution asking for the assistance of the Max C. Fleischmann College of Agriculture. Specifically, Resolution Number 12-20-79A reads as follows:

> WHEREAS, pending livestock grazing reductions proposed by the BLM averaging 60 percent and ranging to much higher percentages will doubtless cause a substantial economic impact upon the economy of Humboldt County and Nevada, and
>
> WHEREAS, the extent of such impacts is known to the people and officials of the County, and
>
> WHEREAS, the Division of Agricultural and Resource Economics of the University of Nevada is capable of studying the matter and developing meaningful information for the benefit of the citizens of the County, now therefore,
>
> IT IS RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS, HUMBOLDT COUNTY, NEVADA:
>
> 1. That the Chairman and Clerk be and they hereby are authorized and directed to engage said Division for the purpose of preparing such report.
>
> 2. That the Chairman appoint a committee to consist of at least one Commissioner, one City Councilman, two members of the range livestock industry and one member of the agricultural extension staff for the purpose of assisting said Division in conducting such report.

This resolution was passed and adopted on December 20, 1979.

The Division of Agricultural and Resource Economics agreed to conduct a study with two main objectives: (1) to estimate the change in livestock sales associated with the grazing allotment reductions, and (2) to estimate the impact of these changes in livestock sales on the Humboldt County economy.

PROCEDURE FOR RANCH ANALYSIS

The ranch analysis procedure consisted of four main parts. First, secondary information from BLM and other sources on ranches and allotments in the Paradise-Denio area was analyzed. Throughout the analysis the Paradise-Denio Resource Area was considered to practically coincide with Humboldt County. Both BLM and Nevada Crop and Livestock Reporting Service personnel concur with this assumption. Specifically, data were analyzed to determine how ranches should be classified based on their similarities, their dependence on BLM and U.S. Forest Service (FS) lands, time periods ranchers use these lands (subsequently referred to as "grazing periods"), and best estimates of proposed changes in use of BLM land by area ranches.

Second, based on a series of meetings with area producers, (producer panels), production costs and returns were generated for each ranch class. Producer panels provided basic production parameters and specific information on seasonal forage availability. Ranch budgets were subsequently reviewed with producer panels to verify their accuracy.

Third, linear programming (LP) models were constructed to describe the current situation of ranches in the area. These models were based on secondary data on ranches and area allotments as well as information provided by producer panels.

Fourth, proposed BLM allotment changes were introduced into the models and estimates of grazing policy changes were made. Specifically, changes in ranch organization by the representative ranches in each class and the resulting changes in ranch income and sales were investigated.

In part, the procedure used in the ranch sector impact phase is based on the analysis of secondary data on the ranches and allotments in the Paradise-Denio area. This procedure is valid for at least two reasons. First, it is based on analysis of the most current characteristics of the ranches with allotments in the area. Second, given the objectives of this study, the analysis of secondary data on the ranch allotments in the area focuses upon a most important characteristic--dependency on BLM lands.

Ranch Classification

The basic data for ranches and allotments in the Paradise-Denio area were provided by the Winnemucca BLM and FS offices (Table 1). Some herd size changes were subsequently made based on updated information from BLM records on other grazing districts and from ranchers participating in producer panels.

Table 1. List of Data Provided by Federal Offices on the Ranches and Allotments in the Paradise-Denio Resource Area

1. Operator BLM Allotment use for 69 ranches in the Paradise-Denio area. (Active preference, three-year licensed use, period of use, total herd size.)

2. Operator FS Allotment use for 69 ranches in the Paradise-Denio area. (Three-year licensed use, period of use.)

3. BLM proposed allocation of animal unit months (AUMs) by allotment.

4. BLM proposed periods of use by allotment.

Initial information supplied from BLM and FS covered 69 ranches in the Paradise-Denio area. After contacting the manager of one of the large ranches in the area, it was found that three of the ranches reported were actually owned and operated by the same company, resulting in double counting. Accordingly, the 69 ranches were reduced to 67. Also, one sheep ranch which depends on the area for only a small part of its grazing was excluded. Consequently, the total number of ranches considered in the analysis is 66.

The average ranch size, as measured in number of head over six months of age, was calculated at 994 with a standard deviation of 1,733. Thus, there is considerable variation in ranch size as measured by number of head. This estimate of mean and standard deviation is based upon the 66 ranches (Table 2). The number of head is the total number of cows, replacement heifers, and bulls.

Table 2. Number of Cattle on Ranches With Federal Grazing Permits in the Paradise-Denio Resource Area, 1978-79 Grazing Season

	All Ranches
Total number of head	65,591
Number of ranches	66
Average number of head per ranch	994
Standard deviation	1,733

The dates ranchers turned out cattle to BLM ranges during the summer as well as their turnoff dates were estimated for 1979. The procedure used was to number the dates for each of the 66 ranches analyzed: a "1" for January 1, a "2" for January 2, etc., and a "365" for December 31. The mean turnout date on BLM summer ranges was 95, which corresponds to April 3. The mean turnoff date from summer BLM grazing lands was 258 (September 14). The turnout date varied considerably with a standard deviation of 28, the

turnoff date was considerably more variable with a standard deviation of 72. Because of the wide variation in turnoff dates, moving the turnoff date used in the model back to day 244 or September 1 would not significantly alter the results and would keep the number of BLM animal unit months (AUMs) used by the model ranches consistent with the number of AUMs reported by the 66 ranches. Without this adjustment, the analysis would drastically overstate the number of AUMs currently being grazed on BLM range in the Paradise-Denio area. Only three ranches were affected by this adjustment. Thus, the period of BLM summer grazing used in the analysis of current operations is April 1 through September 1 (Table 3).

Table 3. On And Off Grazing Dates For BLM And FS, Paradise-Denio Resource Area, 1978-79 Season

	Average		Date Used	Length of Season	
	Day of Year	Day of Mo.	in LP Model	Statistical (Days)	Model (Days)
BLM--Summer				163	153
Date on	95	Apr. 3	Apr. 1		
Date off	258	Sept. 14	Sept. 1		
BLM--Winter					273
Date on			Oct. 1		
Date off			June 30		
FS				99	106
Date on	156	June 4	June 1		
Date off	255	Sept. 11	Sept. 15		

Some ranchers also utilized FS grazing as an integral part of their operation. Estimated period for FS grazing was 156 (June 4) through 255 (September 11). The FS grazing period used in the analysis is June 1 through September 15 (Table 3).

An obvious way of classifying ranches, or any kind of economic unit, is by size. Previous work by the U.S. Department of Agriculture, Economics, Statistics and Cooperatives Service (ESCS) under contract with BLM for other grazing areas in the west has focused on size (as measured by number of cattle) as a way of classifying ranches. In an initial effort to conduct an economic study in the Paradise-Denio area, BLM utilized a three-category classification based on number of cattle. This size classification was determined by BLM and provided to the ESCS economist. Thus, the first task was to consider the validity of using size as a way of classifying ranches. While economic theory suggests that size economies exist in ranching, the appropriate question is whether size economies occur within the range of ranch sizes of this study. An economies of size study would be necessary to answer this question, but time limitation prevents such a research effort.

Accordingly, numerous regression analyses were conducted on various measures of dependency on federal lands. Specifically, the following dependent variables were used: (1) percent of total AUMs from BLM sources, (2) percent of total AUMs during the summer from BLM sources, (3) percent of winter AUMs from BLM sources, (4) percent of all AUMs from FS sources, and (5) percent of total AUMs from all federal sources. The dependent variables were regressed against size as measured by total number of head, and size class as used by BLM, measured by two dummy variables. The size class variables took on the value zero or one depending on the classification of a particular ranch. The definitions of all variables used in the regression analyses are presented in Appendix Table 1. Results of the regression analyses for the Paradise-Denio area by size are presented in Appendix Table 2[1].

Regression analyses indicated that size, measured by total number of head or either of the discrete size classification variables, was not statistically significant at the 5 percent or 10 percent level of confidence. The analysis indicates that percent dependencies on BLM or FS rangeland as measured by the dependent variables is random. This means that dependency does not vary with size (measured by total number of head or discrete size classes), availability of winter grazing on BLM land, or availability of FS grazing. Thus, given the purpose of this study, the analysis strongly suggests that there is no justification for classifying ranches on the basis of size. While there may be certain size economies in some costs, there is no readily available information on such economies that could be integrated into the analysis. Thus, a classification based on size was rejected and an alternative way of classifying ranches was sought.

Ranchers on the producer panels were asked if there were any logical reasons to classify ranches in terms of differences in management practices among ranches in the Paradise-Denio grazing district. Ranchers indicated that there were differences in management practices between ranches that fed cattle on home-base property during the winter as opposed to ranchers that winter graze cattle on government land. After reviewing the information provided by BLM, a decision was made to develop two ranch models as suggested by members of the producer panel.

One model represents a ranch in which the cow herd is grazed on federal rangeland only during the summer months. This ranch model represents 62 ranches in the district. Averaging data across the 62 ranches indicated that the summer ranch model would consist of 800 mature cows, 120 yearling replacements and 45 bulls for a total of 965 head.

The summer ranch model was further classified as to those that had FS land to graze in addition to BLM land. Since the proposed allotment changes apply only to BLM land, a ranch with FS land would be impacted differently than a ranch with only BLM dependency. The summer ranch model with FS land was characteristic of 24 ranches while the model with no FS land represented 38 ranches.

[1]The authors are aware of the collinear problems posed by the model specification. For this reason regressions were run with and without size and the size dummies.

Ranchers on the producer panel also indicated that 25 percent of the ranchers in the summer grazing model sold calves during the fall while the other 75 percent fed the calves during the winter months prior to sale. This distinction is important in terms of the resource base, since it was assumed that all ranch models would be self-sufficient in terms of forage resources.

The other basic ranch model characterizes ranches that graze cattle on government land during the winter months. In this case, the cow herd is on home base property for only three months of the year. This model represents four ranches in the grazing district. Averaging data across the four ranches indicated that the year-round ranch model would consist of 1,000 cows, 150 heifer replacements, and 67 bulls.

Thus, there are five cattle ranch classifications. Additionally, a model was built to represent the one sheep ranch in the grazing district. For a description of the ranch groups and number of ranches in each group, see Table 4.

Table 4. Aggregation Classifications, Number of Ranches in Each Classification and Aggregation Factors

Classification Name	Description	Number of Ranches	Aggregation Factors
NFS-Spring	No FS range--sells calves in April	28	21.2
WFS-Spring	With FS range--sells calves in April	18	9.6
NFS-Fall	No FS range--sells calves in Nov.	10	7.0
WFS-Fall	With FS range--sells calves in Nov.	6	14.1
Winter	Nearly 100% on BLM during winter--sells yearlings	4	4.0
Sheep	Raises and sells sheep	1	0.8

The six ranch groups were expanded to represent the total number of ranches in the area by determining the number of BLM AUMs grazed by a particular ranch group within the Paradise-Denio grazing district and dividing that total by the number of BLM AUMs in the corresponding model. For example, the 38 ranches that do not have FS permits grazed a total of 119,742 AUMs of BLM land within the Paradise-Denio district. The number of BLM AUMs used in the corresponding model was 4,239 AUMs per ranch. Using the procedure outlined above, a multiplier (subsequently referred to as an "aggregation factor") of 28.2 was calculated. A comparably calculated factor for each ranch group is used to expand the results of the typical ranch to those for the entire group.

The values of the aggregation factors are less than the number of ranches in each group because 11 of the ranches depended upon BLM grazing outside of the Paradise-Denio district for a significant part of their summer forage requirement. The amount of BLM allotment used in the various models included not only AUMs from within the district, but also BLM AUMs that ranchers in the Paradise-Denio district graze from other districts. Since the procedure used in calculating the aggregation factor adjusts only to the number of AUMs within the district, all AUMs grazed by cattle outside the district are, in effect, held constant in the analysis by using a smaller aggregation factor.

Cost of Production and Prices

Information on cost of production for both livestock and forage crop enterprises was secured from enterprise budgets previously prepared by faculty in the Division of Agricultural and Resource Economics and modified by subsequent meetings with producer panels. The price of beef used in the analysis is viewed as a critical variable since the results of the study will vary directly with the price level used. A plausible estimate of price is the 1979 average for three classes of beef cattle--400-500 pounds, 500-600 pounds, and 600-700 pounds. Further, these prices differed depending on whether steers or heifers were sold. The 1979 prices would also be consistent with 1979 costs used in the model.

Because price is critical to the analysis, three additional price levels were considered: (1) the 1979 average plus 7 percent (U.S. Department of Agriculture Outlook price for 1980)[2]; (2) the 1977-79 average price; and (3) a reduction in price to a level where there is a change in the organization of ranch resources (frequently called the basis). The prices used in the analysis are presented in Table 5.

Ranch Budgets

Using enterprise budgets and producer panel information on equipment, labor requirements, production parameters (e.g., calving percentage and selling weights), and marketing information, ranch budgets were prepared for the six classes of typical ranches. A budget for ranches with BLM summer grazing is presented in Appendix Tables 3 through 7. A ranch budget for ranches with BLM summer and winter grazing (year-round) is presented in Appendix Tables 8 through 12. A ranch budget was also prepared for a typical sheep ranch. Since there was only one sheep ranch, however, these data are not presented to avoid violating disclosure of confidential information rules.

[2]See "Literature Cited" section of this report.

Table 5. Livestock Selling Prices Assumed in the Model

Livestock Class	1979 Average Price	1979 Price Plus 7%	1977-79 Average Price	Basis Change Price
	(price per hundredweight)			
400-500 lb. steer calves	$90.98	$97.34	$65.87	$64.51
400-500 lb. heifer calves	76.94	82.32	54.79	54.41
500-600 lb. steer calves	84.75	90.68	64.70	60.53
500-600 lb. heifer calves	72.70	77.79	52.49	51.94
600-700 lb. steer yearlings	78.21	83.69	57.94	56.50
600-700 lb. heifer yearlings	68.90	73.72	50.51	49.84
Cull cows and bulls[a]	50.64	53.93	37.65	36.95
Feeder lambs	61.58	65.89	54.51	37.07
Grease wool	109.00	117.00	101.00	68.68
Cull ewes and rams	17.00	18.20	15.00	10.20

Source: Market News, 1979.

[a]Because of insufficient data, cull bulls were assumed to sell for the same price as cull cows.

Proposed Change In BLM Grazing Allotments

Utilizing data supplied by the Winnemucca District Office of BLM on proposed changes in grazing allotments, proposed grazing periods were estimated (Table 6). For summer grazing, the mean proposed turnout date is 129 (May 8) and the mean proposed turnoff date is 311 (November 6). For analytical purposes, a proposed grazing period of May 1 through October 14 was used. This would shift the grazing period one month later in the season compared to the present situation.

Table 6. Proposed On and Off Dates for BLM Grazing, Winter and Summer Periods, Paradise-Denio Resource Area

Type of Allotment	Average Day of Year	Average Day of Mo.	Date Used in LP Model	Length of Season Statistical (Days)	Length of Season Model (Days)
BLM--Summer Model				182	166
Date on	129	May 8	May 1		
Date off	311	Nov. 6	Oct. 14		
BLM--Winter Model				243	243
Summer grazing					
Date on	122	May 1	May 1		
Date off	244	Aug. 31	Aug. 31		
Winter grazing					
Date on	306	Nov. 1	Nov. 1		
Date off	59	Feb. 28	Feb. 28		

The proposed turnout period for the four year-round operators is different from the present turnout period. Presently, the winter operator's turnout period is from about October 1 through June 30. The proposed season of use calls for at least four months off BLM land, of which March and April must be included. The other two months when cattle must be off BLM land are at the ranchers' discretion. The turnout period used in the winter model to reflect the proposed season of use of BLM land is from November 1 to February 28, and from May 1 to August 31. Thus, the winter model under the proposed changes requires cattle to be off BLM land during March, April, September and October. This requires the cattle to be moved twice.

In addition to changes in grazing period, proposed changes in BLM grazing policy indicates a general reduction in total number of AUMs licensed to ranchers in the area. Data provided by the BLM Winnemucca District Office distinguishes between active number of AUMs versus actual number of AUMS. The active number is the licensed use of the permittee and is the maximum allowed. On the other hand, actual use is a three-year average for the period 1977 through 1979. On the average, actual use is less than active use. Actual use is applied in this analysis which is an

important decision because percentage reductions would be higher if active rather than actual use had been used. For the 75 allotments, the average number of AUMs of actual use was 2,673 (Table 7). There was a large variation about this mean with the standard deviation being 3,891.

Table 7. Magnitude of Proposed Allotment Changes for BLM Grazing Paradise-Denio Resource Area

	Total for Area	Average per Allotment (number of AUMs)	Standard Deviation
Average 1977-79 allotment[a]	200,491	2,673	3,891
Proposed allotment	100,861	1,345	2,112
Percent change	-49.7	-49.7	

[a] Based on actual use and not active licensed use.

The average proposed allotment of AUMs from BLM lands is 1,345. Again, variation about this mean is large with a standard deviation of 2,112 (Table 7). Thus, of the 75 allotments, there is an approximate 50 percent reduction in AUMs. Alternatively, of the total 75 allotments in the Paradise-Denio area, there are 200,491 AUMs of actual use of BLM lands. Total proposed allotments in AUMs amount to 100,861 AUMs or a reduction of 99,630 AUMs from present actual use. Change in grazing by allotment is reported in Table 8.

Given these figures, a 50 percent reduction was utilized as the "most likely" estimate of the proposed reduction in BLM AUMs. Since these represent proposed changes, it would be useful to consider alternative levels of change. Accordingly, 25 percent and 75 percent reductions in BLM AUMs over the proposed turnout periods were chosen as alternatives to be analyzed.

Ranch Adjustments Permitted

Potential adjustments by ranchers to proposed grazing allotment reductions are assumed to be relatively limited. Specifically, the only adjustments to allotment reductions are assumed to be reductions in herd size, buying hay, and selling hay. Further, to the extent that some ranchers may resist the option of selling hay, the analysis permitted the alternatives of either reducing the herd size or hay buying. Subsequently, hay selling was included for comparative analysis.

Table 8. Percentage Change In Proposed Grazing Allotments From the 1977-79 Use in the Paradise-Denio Resource Area By Allotments and By Ranch

Percentage Change From the 1977-79 Average Use	Allotments		Ranches	
	Number	Percent	Number	Percent
-91 to -100	8	10.7	3	4.5
-81 to -90	6	8.0	4	6.1
-71 to -80	7	9.3	8	12.1
-61 to -70	7	9.3	5	7.6
-51 to -60	13	17.3	10	15.2
-41 to -50	8	10.7	14	21.2
-31 to -40	4	5.3	7	10.6
-21 to -30	5	6.7	3	4.5
-11 to -20	1	1.3	0	0.0
0 to -10	5	6.7	6	9.1
+1 to +100	11	14.7	6	9.1
Total	75	100.0	66	100.0

The "Just-Enough" Assumption

Given the production parameters (sale weights, calving percentages, etc.), numbers of cattle, and amounts of forage available from federal lands, it was assumed that the typical rancher had "just enough" other feed to satisfy the livestock feed requirements. Therefore, each typical ranch was assumed to have enough alfalfa hayland, grass hayland, and other rangeland (leased or deeded) to just meet livestock feed requirements throughout the year. While some ranchers in the area do in fact have "excess" amounts of hay and other land, they seem to be exceptions rather than the rule. Producer panel members supported this assumption as being realistic.

Linear Programming Models

Linear programming models were constructed to describe the typical ranch in each ranch classification. The simplex tables for the four ranch groups which graze BLM range only in the summer appear in Appendix Table 13. Those coefficients which varied between ranch groups are presented in Appendix Table 14. Comparable simplex tables for the sheep ranch and the four ranches grazing nearly 100 percent of their cattle on BLM during the winter, are not presented so as not to violate disclosure rules. Descriptions of the season referred to in the simplex table are presented in Appendix Table 15.

Linear programming models used in this study are merely a systematic form of ranch budgeting[3]. While this is generally true for any linear programming model, it is especially true here since the adjustments permitted are limited to herd reduction, hay feeding, and in some instances hay selling. The linear programming framework, however, does provide an easy way to analyze changes in BLM grazing allotment changes. Total changes in AUMs as well as changes in season of use can be handled explicitly.

PROCEDURE FOR COUNTY ANALYSIS

The method utilized to estimate community impacts of proposed BLM grazing allotment reductions is an input-output model of the Humboldt-Lander economy. This model is based on 1976 data obtained in a survey of firms in Humboldt and Lander Counties conducted by personnel of the Division of Agricultural and Resource Economics. There are no other input-output models of Humboldt or Lander Counties based on primary data. From the data obtained in the survey, output multipliers and employment multipliers have been estimated.

A multiplier is a number which gives total direct, indirect, and induced spending or employment in the economy. An output multiplier for a specific sector is defined as the total change in dollar sales of the economy due to a one dollar change in final demand of a sector.

[3]For a description of linear programming in general, see Beneke and Winterboer (1973).

An employment multiplier has a similar interpretation. It indicates the total change in employment (direct, indirect, and induced) associated with a one unit employment change in a given sector. An employment multiplier is derived from an estimated relationship between the change in final demand of a given sector associated with a one unit change in employment in that sector. The unit of labor used in this study, full-time equivalents (FTE), is equal to 50, forty-hour weeks of labor.

To estimate community impacts, changes in gross product sales from all ranch operations in the Paradise-Denio area are treated as gross dollar changes in final demand in the livestock sector. Output and employment multipliers are then used to estimate changes in total sales (output), sales in various sectors, and total employment in the Humboldt-Lander County economy. To be consistent with the ranch analysis section, community impact estimates are made for four alternative cattle price levels (1979, 1979 plus 7 percent, 1977-79 average, and the value at which the basis changes), three BLM allotment changes (25 percent cut, 50 percent cut, and 75 percent cut), and with and without hay-selling alternatives.

More technically, the measurement of community impacts consists of three distinct steps:

(1) The change in gross product sales from all ranches in the Paradise-Denio area are treated as a gross dollar change in final demand for the livestock sector. This figure is multiplied by the output multiplier for the livestock sector (1.6) to yield a total change in sales (output) in the Humboldt-Lander County economy.

(2) Using direct, indirect, and induced coefficients for the livestock sector (the sum of which yields the output multiplier for that sector), change in gross sales is estimated for each sector in the model. Of particular interest is the figure for the household sector which can be interpreted as the change in payments to households (i.e., income) associated with the change in gross product sales from ranches in the Paradise-Denio area.

(3) Employment effects are estimated by first converting the change in gross product sales on ranches in the Paradise-Denio area to 1976 dollars. This is necessary since the employment multiplier is dependent upon the ratio of FTE to dollar sales in 1976. While dollar sales on ranches have increased because of higher cattle prices (since 1976), it is unreasonable to assume that employment has increased accordingly. Therefore, changes in gross product sales were converted to 1976 dollars using a livestock price index (U.S. Department of Agriculture, 1977-1979). The change in gross product sales in 1976 dollars were then multiplied by the direct employment coefficient for the livestock sector, which converts gross product sales to employment in FTEs. This figure is then multiplied by the employment multiplier for the livestock sector which converts the employment change in the livestock sector to employment change in the Humboldt-Lander economy.

ESTIMATED RANCH IMPACTS

There is a significant amount of variation in the operation of the various ranches even within the ranch classes considered. In addition, there is variation in livestock prices over time and among weight classes in various seasons of the year. There are also variations among the individual ranches as they consider adjustments to the changes in BLM allotments. Finally, there is variation in the total reduction in AUMs on BLM lands among the ranches and ranch classes analyzed, and in the season of use in the proposed policy change. Consequently, point or single-valued estimates of changes in ranch sales associated with the reduction in BLM allotments would not be particularly useful.

Accordingly, various "scenarios" were considered so that a range of estimates is possible. Such a range of estimates should permit the BLM and ranchers to better visualize economic impacts of the proposed changes in grazing policies.

Specifically, each of the six ranch classes were analyzed under four price levels and three allotment changes. This is the basic form of the analysis. In addition, two other scenarios are considered in the price and allotment changes. They are the impacts when hay sales are permitted and not permitted in the analysis.

Hay Sales Not Permitted

Impacts associated with allotment reductions of 25, 50 and 75 percent are presented in Table 9 for the case where hay sales are not permitted. This same table contains impacts under four price levels previously defined. The same information expressed in percentage terms relative to the initial situation are presented in Table 10.

At the 1979 livestock price level, a 25 percent BLM allotment reduction would reduce gross product sales by about $1.33 million. When there is a 50 percent allotment reduction, gross product sales would be reduced by $2.88 million. If there were a 75 percent allotment reduction, gross product sales would be reduced by $7.02 million (Table 11). Relative to the initial solution, these changes in gross product sales amount to approximately 10, 21 and 52 percent reductions.

As the beef price level decreases, change in gross product sales also decrease. For example, at the 50 percent BLM allotment reduction, and the 1979 average price plus seven percent (the highest price level considered), the reduction in gross product sales relative to the initial solution is $2.95 million. The same figure for the 1979 average beef price, the 1977-79 average beef price, and the change-in-basis price level (lowest analyzed) are $2.88 million, $2.62 million, and $2.52 million, respectively (Table 11).

Hay Sales Permitted

Similar adjustments to various BLM allotment cuts and different product price levels are also shown when the effects of hay sales are

Table 9. Aggregated Adjustments of Various BLM Allotment Cuts at Differing Price Levels Without Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change 25% Cut	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	41104	36179	22285
All cattle over 6 mos.	Head	55931	50616	44442	27283
Total livestock Sales	Dol.	13613871	12287767	10737519	6594500
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	3664	2118	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	13613871	12287767	10737519	6594500
Net of variable costs	Dol.	6462905	5331892	4731823	3030857
Net of all costs	Dol.	387009	-744003	-1344072	-3045038
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	43503	36553	22285
All cattle over 6 mos.	Head	55931	53490	44893	27283
Total livestock Sales	Dol.	14549731	13942428	11602784	7047749
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	10992	3270	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	14549731	13942428	11602784	7047749
Net of variable costs	Dol.	7398760	6188101	5472683	3484103
Net of all costs	Dol.	1322864	112205	-603212	-2591792
1977-79 Average Price					
Producing Cow	Head	45520	37733	34170	22285
All cattle over 6 mos.	Head	55931	46020	41730	27283
Total livestock Sales	Dol.	10095430	8295461	7473013	4866501
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	10095430	8295461	7473013	4866501
Net of variable costs	Dol.	2944454	2201855	1973063	1321925
Net of all costs	Dol.	-3131441	-3874040	-4102832	-4753970
Price at Which Basis Changes					
Producing Cow	Head	45520	37733	34170	22285
All cattle over 6 mos.	Head	55931	46020	41730	27283
Total livestock Sales	Dol.	9753833	8024265	7233303	4712998
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	9753833	8024265	7233303	4712998
Net of variable costs	Dol.	2602881	1930638	1733367	1168421
Net of all costs	Dol.	-3473014	-4145257	-4342528	-4907473

Table 10. Percentage Change in Aggregated Adjustments of Various BLM Allotment Cuts At Differing Price Levels Without Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change 25% Cut (% Change From Initial Solution)	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	-9.70	-20.52	-51.04
All cattle over 6 mos.	Head	55931	-9.50	-20.54	-51.22
Total livestock Sales	Dol.	13613871	-9.74	-21.13	-51.56
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	13613871	-9.74	-21.13	-51.56
Net of variable costs	Dol.	6462905	-17.50	-26.78	-53.10
Net of all costs	Dol.	387009	-292.24	-447.30	-886.81
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	-4.43	-19.70	-51.04
All cattle over 6 mos.	Head	55931	-4.36	-19.73	-51.22
Total livestock Sales	Dol.	14549731	-4.17	-20.25	-51.56
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	14549731	-4.17	-20.25	-51.56
Net of variable costs	Dol.	7398760	-16.36	-26.03	-52.91
Net of all costs	Dol.	1322864	-91.52	-145.60	-295.92
1977-79 Average Price					
Producing Cow	Head	45520	-17.11	-24.93	-51.04
All cattle over 6 mos.	Head	55931	-17.72	-25.39	-51.22
Total livestock Sales	Dol.	10095430	-17.83	-25.98	-51.80
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	10095430	-17.83	-25.98	-51.80
Net of variable costs	Dol.	2944454	-25.22	-32.99	-55.10
Net of all costs	Dol.	-3131441	-23.71	-31.02	-51.81
Price at Which Basis Changes					
Producing Cow	Head	45520	-17.11	-24.93	-51.04
All cattle over 6 mos.	Head	55931	-17.72	-25.39	-51.22
Total livestock Sales	Dol.	9753833	-17.73	-25.84	-51.68
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	9753833	-17.73	-25.84	-51.68
Net of variable costs	Dol.	2602881	-25.83	-33.41	-55.11
Net of all costs	Dol.	-3473014	-19.36	-25.04	-41.30

Table 11. Absolute Change in Aggregated Adjustments of Various BLM Allotment Cuts At Differing Price Levels Without Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change (Change From Initial Solution) 25% Cut	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	-4415	-9340	-23234
All cattle over 6 mos.	Head	55931	-5314	-11488	-28647
Total livestock Sales	Dol.	13613871	-1326103	-2876351	-7019370
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	3664	2118	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	13613871	-1326103	-2876351	-7019370
Net of variable costs	Dol.	6462905	-1131012	-1731082	-3432047
Net of all costs	Dol.	387009	-1131012	-1731082	-3432047
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	-2016	-8966	-23234
All cattle over 6 mos.	Head	55931	-2140	-11037	-28647
Total livestock Sales	Dol.	14549731	-607302	-2946947	-7501981
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	10992	3270	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	14549731	-607302	-2946947	-7501981
Net of variable costs	Dol.	7398760	-1210658	-1926076	-3914657
Net of all costs	Dol.	1322864	-1210658	-1926076	-3914657
1977-79 Average Price					
Producing Cow	Head	45520	-7786	-11349	-23234
All cattle over 6 mos.	Head	55931	-9910	-14200	-28647
Total livestock Sales	Dol.	10095430	-1799968	-2622416	-5228928
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	10095430	-1799968	-2622416	-5228928
Net of variable costs	Dol.	2944454	-742599	-971391	-1622529
Net of all costs	Dol.	-3131441	-742599	-971391	-1622529
Price at Which Basis Changes					
Producing Cow	Head	45520	-7786	-11349	-23234
All cattle over 6 mos.	Head	55931	-9910	-14200	-28647
Total livestock Sales	Dol.	9753833	-1729567	-2520529	-5040834
Hay sales	Tons	0	0	0	0
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	0	0	0
Gross product sales	Dol.	9753833	-1729567	-2520529	-5040834
Net of variable costs	Dol.	2602881	-672243	-869514	-1434459
Net of all costs	Dol.	-3473014	-672243	-869514	-1434459

analyzed (Tables 12, 13 and 14). Generally, the total change in gross product sales by ranches in the Paradise-Denio area are more moderate when hay sales are permitted. At the 1979 average price and a 50 percent allotment reduction, there is about a $2.59 million reduction in total gross product relative to the initial solution. When hay sales are not permitted the comparable reduction is $2.88 million.

Comparison of Results with Aggregate Statistics

As suggested in the procedural section, the ranch analysis was conducted to be consistent with aggregate secondary data on Humboldt County and/or the Paradise-Denio area (Table 15). The two most critical aggregate statistics are the number of head of cattle and the number of AUMs from BLM lands in the Paradise-Denio area. These statistics are compared with the total cattle and BLM AUMs accounted for by the linear programming models.

Similarly, the reported number of FS AUMs used by Paradise-Denio ranchers and the number accounted for in the model are also compared in Table 15. While somewhat less important, the number of acres of alfalfa accounted for by the model is compared with the number of acres raised in Humboldt County. Here, it seemed reasonable to expect the number of acres accounted for by the model to be less than that reported for the entire county because some alfalfa producers in Humboldt County raise no cattle.

ESTIMATED COUNTY IMPACTS

For each of the scenarios considered in the ranch analysis, the changes in gross product sales were assumed to be changes in final demand and these were used as input into the Humboldt-Lander input-output model. The county impact procedure previously described is followed in this phase of the analysis.

Changes in Total Sales

The change in total sales in the Humboldt-Lander County economy associated with the change in gross product sales on ranches in the Paradise-Denio area were estimated using four beef price levels, three levels of allotment reductions, and with and without hay sales (Tables 16 and 17).

As expected, as the reductions of BLM allotments become larger, the changes in total sales increase accordingly. For example, in the situation without hay selling and with 1979 average cattle prices, the change in total sales resulting from a 25 percent allotment reduction is about $2.1 million. For the same situation, except with a 75 percent allotment reduction, the change in total sales is approximately $11.3 million.

As the price level for cattle increases, there is an increase in the change in total sales. For example, with the highest price--the 1979 average price level plus 7 percent--and a 50 percent BLM allotment reduction, the change in total sales when hay selling is not permitted is approximately $4.8 million. With the lowest price--where there is a change in the basis--and a 50 percent allotment reduction, the change in total sales is approximately $4.1 million.

Table 12. Aggregated Adjustments of Various BLM Allotment Cuts at Differing Price Levels With Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change 25% Cut	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	41104	36179	22285
All cattle over 6 mos.	Head	55931	50616	44442	27283
Total livestock Sales	Dol.	13613871	12287767	10738049	6559693
Hay sales	Tons	0	0	4448	17204
Hay purchases	Tons	0	3664	2118	0
Hay sales	Dol.	0	0	284672	1101087
Gross product sales	Dol.	13613871	12287767	11022721	7660781
Net of variable costs	Dol.	6462905	5331892	4899499	3677534
Net of all costs	Dol.	387009	-744003	-1176396	-2398361
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	43503	36553	22285
All cattle over 6 mos.	Head	55931	53490	44893	27283
Total livestock Sales	Dol.	14549731	13942428	11603335	7012940
Hay sales	Tons	0	0	4448	17204
Hay purchases	Tons	0	10992	3270	0
Hay sales	Dol.	0	0	284672	1101087
Gross product sales	Dol.	14549731	13942428	11888007	8114028
Net of variable costs	Dol.	7398760	6188101	5640359	4130752
Net of all costs	Dol.	1322864	112205	-435536	-1945143
1977-79 Average Price					
Producing Cow	Head	45520	37548	34113	22285
All cattle over 6 mos.	Head	55931	45774	41654	27283
Total livestock Sales	Dol.	10095430	8250138	7459470	4831715
Hay sales	Tons	0	585	4630	17204
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	37452	296345	1101087
Gross product sales	Dol.	10095430	8287591	7755816	5932804
Net of variable costs	Dol.	2944454	2211551	2143715	1968602
Net of all costs	Dol.	-3131441	-3864344	-3932180	-4107293
Price at Which Basis Changes					
Producing Cow	Head	45520	36428	32993	21573
All cattle over 6 mos.	Head	55931	44122	40002	26231
Total livestock Sales	Dol.	9753833	7606072	6845596	4439483
Hay sales	Tons	0	2105	6150	18172
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	134732	393625	1163039
Gross product sales	Dol.	9753833	7740805	7239221	5602523
Net of variable costs	Dol.	2602881	1944162	1906511	1816319
Net of all costs	Dol.	-3473014	-4131733	-4169384	-4259576

Table 13. Percentage Change in Aggregated Adjustments of Various BLM Allotment Cuts At Differing Price Levels With Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change 25% Cut (% Change From Initial Solution)	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	-9.70	-20.52	-51.04
All cattle over 6 mos.	Head	55931	-9.50	-20.54	-51.22
Total livestock Sales	Dol.	13613871	-9.74	-21.12	-51.82
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	13613871	-9.74	-19.03	-43.73
Net of variable costs	Dol.	6462905	-17.50	-24.19	-43.10
Net of all costs	Dol.	387009	-292.24	-403.97	-719.72
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	-4.43	-19.70	-51.04
All cattle over 6 mos.	Head	55931	-4.36	-19.73	-51.22
Total livestock Sales	Dol.	14549731	-4.17	-20.25	-51.80
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	14549731	-4.17	-18.29	-44.23
Net of variable costs	Dol.	7398760	-16.36	-23.77	-44.17
Net of all costs	Dol.	1322864	-91.52	-132.92	-247.04
1977-79 Average Price					
Producing Cow	Head	45520	-17.51	-25.06	-51.04
All cattle over 6 mos.	Head	55931	-18.16	-25.53	-51.22
Total livestock Sales	Dol.	10095430	-18.28	-26.11	-52.14
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	10095430	-17.91	-23.17	-41.23
Net of variable costs	Dol.	2944454	-24.89	-27.19	-33.14
Net of all costs	Dol.	-3131441	-23.40	-25.57	-31.16
Price at Which Basis Changes					
Producing Cow	Head	45520	-19.97	-27.52	-52.61
All cattle over 6 mos.	Head	55931	-21.11	-28.48	-53.10
Total livestock Sales	Dol.	9753833	-22.02	-29.82	-54.48
Hay sales	Tons	0	N.A.	N.A.	N.A.
Hay purchases	Tons	0	N.A.	N.A.	N.A.
Hay sales	Dol.	0	N.A.	N.A.	N.A.
Gross product sales	Dol.	9753833	-20.64	-25.78	-42.56
Net of variable costs	Dol.	2602881	-25.31	-26.75	-30.22
Net of all costs	Dol.	-3473014	-18.97	-20.05	-22.65

Table 14. Absolute Change in Aggregated Adjustments of Various BLM Allotment Cuts At Differing Price Levels With Hay-Selling Alternatives

Item	Units	Initial Solution	Amount of BLM Allotment Change (Change From Initial Solution) 25% Cut	50% Cut	75% Cut
1979 Prices					
Producing Cow	Head	45520	-4415	-9340	-23234
All cattle over 6 mos.	Head	55931	-5314	-11488	-28647
Total livestock Sales	Dol.	13613871	-1326103	-2875821	-7054177
Hay sales	Tons	0	0	4448	17204
Hay purchases	Tons	0	3664	2118	0
Hay sales	Dol.	0	0	284672	1101087
Gross product sales	Dol.	13613871	-1326103	-2591149	-5953089
Net of variable costs	Dol.	6462905	-1131012	-1563406	-2785371
Net of all costs	Dol.	387009	-1131012	-1563406	-2785371
1979 Prices Plus 7 Percent					
Producing Cow	Head	45520	-2016	-8966	-23234
All cattle over 6 mos.	Head	55931	-2440	-11037	-28647
Total livestock Sales	Dol.	14549731	-607302	-2946395	-7536791
Hay sales	Tons	0	0	4448	17204
Hay purchases	Tons	0	10992	3270	0
Hay sales	Dol.	0	0	284672	1101087
Gross product sales	Dol.	14549731	-607302	-2661723	-6435703
Net of variable costs	Dol.	7398760	-1210658	-1758400	-3268007
Net of all costs	Dol.	1322864	-1210658	-1758400	-3268007
1977-79 Average Price					
Producing Cow	Head	45520	-7971	-11407	-23234
All cattle over 6 mos.	Head	55931	-10157	-14277	-28647
Total livestock Sales	Dol.	10095430	-1845291	-2635959	-5263714
Hay sales	Tons	0	585	4630	17204
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	37452	296345	1101087
Gross product sales	Dol.	10095430	-1807838	-2339613	-4162626
Net of variable costs	Dol.	2944454	-732903	-800739	-975852
Net of all costs	Dol.	-3131441	-732903	-800739	-975852
Price at Which Basis Changes					
Producing Cow	Head	45520	-9091	-12527	-23946
All cattle over 6 mos.	Head	55931	-11809	-15929	-29699
Total livestock Sales	Dol.	9753833	-2147760	-2908237	-5314349
Hay sales	Tons	0	2105	6150	18172
Hay purchases	Tons	0	0	0	0
Hay sales	Dol.	0	134732	393625	1163039
Gross product sales	Dol.	9753833	-2013028	-2514611	-4151309
Net of variable costs	Dol.	2602881	-658719	-696370	-786562
Net of all costs	Dol.	-3473014	-658719	-696370	-786562

Table 15. Comparison of Ranch Analysis Results with Aggregate Statistics

	Secondary Sources	Model Results
Number of cattle, 6 months & older	65,591[a] 63,000[b]	64,740[e]
Number of AUMs from BLM land in Parasise-Denio Resource Area	200,491[c]	202,146
Number of AUMs from FS Sources	41,762[a]	41,238
Acres of alfalfa hay land	29,000[d]	9,744

[a]Source: BLM, Winemucca District Office, 1980.

[b]Cattle and calves as of January 1, 1979. Source: Nevada Crop and Livestock Reporting Service, 1979.

[c]Average 1977-79 allotment. Source: BLM, Winnemucca District Office, 1980.

[d]Total acres for Humboldt County. Source: Nevada Crop and Livestock Reporting Service, 1978.

[e]This includes approximately 8,100 head which were not considered in the analysis since they grazed primarily in BLM districts outside of the Paradise-Denio Resource Area.

Table 16. Overall Decrease in Total Sales in Humboldt-Lander Economy Given Alternative BLM Allotment Cuts and Cattle Prices Without Hay Selling Alternatives

Alternative Cattle Prices	Change in Total Sales With BLM Cuts		
	25% Cut	50% Cut	75% Cut
1979 average price	$2,139,883	$4,641,461	$11,326,898
1979 price plus 7%	979,981	4,755,379	12,105,669
1977-79 average price	2,904,542	4,231,696	8,437,728
Basis change price	2,790,938	4,067,284	8,134,207

Table 17. Overall Decrease in Total Sales in Humboldt-Lander Economy Given Alternative BLM Allotment Cuts and Cattle Prices With Hay Selling Alternatives

Alternative Cattle Prices	Change in Total Sales With BLM Cuts		
	25% Cut	50% Cut	75% Cut
1979 average price	$2,139,883	$4,181,241	$9,606,279
1979 price plus 7%	979,981	4,295,124	10,385,056
1977-79 average price	2,917,241	3,775,347	6,717,076
Basis change price	3,248,349	4,057,735	6,698,814

Finally, when hay selling is permitted, the change in total sales is somewhat less. For example, at the 1979 price level and a 50 percent allotment reduction, the change in total sales is about $4.2 million.

Changes in Total Sales by Sectors

The changes in total sales presented in Tables 16 and 17 are disaggregated by sector. In other words, totals reported are allocated among various sectors in the Humboldt-Lander County economy. These changes in total sales by sector for the four beef price levels, three allotment reductions, and the two hay selling alternatives are presented in Tables 18-23. The relationships over different allotment level reductions and hay selling alternatives are the same as those discussed under the changes in total sales. The estimates in these tables simply show the effects on the various sectors in the economy. It should be noted that certain figures in these tables are included so that they add up to the total. For example, in Table 18, under the 1979 average price, the reduction in total sales in the alfalfa seed sector is listed as $3. While this technically means that there will be a $3 reduction in total sales in the alfalfa seed sector associated with the allotment reduction of 25 percent (no hay selling), in a practical sense it means that there is essentially no effect on the alfalfa seed sector. The $3 has been included so that the sector effects add up to the total change previously reported.

Of particular importance, note the last row of Tables 18 through 23. For example, consider Table 19 and the 1979 average price level. The figure for the household sector is $579,438. This means that when there is a 50 percent reduction in BLM allotments, ranchers do not sell hay, and the 1979 average price level prevails, then there is a reduction in "total sales" to the household sector of about $579,000. The change in total sales to the household sectors can be interpreted as a change in payments to households or income. Thus, in this case we can also say that there will be a $579,000 change in incomes to workers in the Humboldt-Lander County economy.

Changes in Employment

For alternatives prices, allotment reductions, and hay selling options, changes in employment in the Humboldt-Lander County economy are presented in Tables 24 and 25. Again, the changes over price levels and allotment reductions follow those described under "Changes in Total Sales." These estimates of changes in employment (FTE) are conversions of sales into employment terms. Thus, when hay selling is not permitted in the models, the relevant beef price is the 1979 average price, and there is a 50 percent reduction in BLM allotments, there will be a reduction in employment of 87 FTE. Practically, this means 87 full-time jobs will be lost as a result of the allotment reductions.

TABLE 18. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 25 Percent, Assuming Different Livestock Price Levels and No Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$679.	$311.	$922.	$886.
Alfalfa Seed	3.	1.	4.	3.
Alfalfa & other hay	120,670.	55,262.	163,790.	157,384.
Livestock	1,331,832.	609,926.	1,807,744.	1,737,039.
Metal	0.	0.	0.	0.
Nonmetal	12.	5.	16.	16.
Food processing	89.	41.	121.	116.
Manufacturing	1,269.	581.	1,723.	1,655.
Printing & publ.	2,152.	986.	2,921.	2,807.
Casino	5,401.	2,474.	7,331.	7,045.
Service station	30,290.	13,871.	41,113.	39,505.
Eat, drink & lodging	7,002.	3,207.	9,504.	9,132.
Construction	21,920.	10,039.	29,753.	28,590.
Transportation	39,559.	18,116.	53,695.	51,595.
Communication	19,124.	8,758.	25,957.	24,942.
Utilities	30,170.	13,817.	40,951.	39,349.
Trade	96,144.	44,030.	130,499.	125,395.
Finance, insurance & real estate	68,768.	31,493.	93,341.	89,690.
Personal, business & prof. services	12,402.	5,679.	16,833.	16,175.
Other services	20,982.	9,609.	28,479.	27,365.
Health services	7,607.	3,483.	10,325.	9,921.
Local government	56,668.	25,952.	76,918.	73,910.
Household	267,142.	122,340.	362,602.	348,420.

TABLE 19. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 50 Percent, Assuming Different Livestock Price Levels and No Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$1,473.	$1,509.	$1,343.	$1,291.
Alfalfa Seed	6.	6.	5.	5.
Alfalfa & other hay	261,736.	268,160.	238,629.	229,358.
Livestock	2,888,777.	2,959,678.	2,633,745.	2,531,418.
Metal	0.	0.	0.	0.
Nonmetal	26.	27.	24.	23.
Food processing	193.	197.	176.	169.
Manufacturing	2,753.	2,820.	2,510.	2,412.
Printing & publ.	4,668.	4,783.	4,256.	4,091.
Casino	11,715.	12,003.	10,681.	10,266.
Service station	65,699.	67,311.	59,899.	57,571.
Eat, drink & lodging	15,187.	15,560.	13,846.	13,308.
Construction	47,546.	48,713.	43,349.	41,664.
Transportation	85,804.	87,910.	78,229.	75,190.
Communication	41,480.	42,498.	37,818.	36,349.
Utilities	65,440.	67,046.	59,663.	57,345.
Trade	208,538.	213,657.	190,128.	182,741.
Finance, insurance & real estate	149,159.	152,820.	135,991.	130,707.
Personal, business & prof. services	26,900.	27,560.	24,525.	23,572.
Other services	45,510.	46,627.	41,492.	39,880.
Health services	16,499.	16,904.	15,042.	14,458.
Local government	122,915.	125,932.	112,064.	107,710.
Household	579,438.	593,660.	528,283.	507,758.

TABLE 20. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 75 Percent, Assuming Different Livestock Price Levels and No Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$3,594.	$3,841.	$2,677.	$2,581.
Alfalfa Seed	14.	15.	10.	10.
Alfalfa & other hay	638,735.	682,650.	475,812.	458,696.
Livestock	7,049,694.	7,534,390.	5,251,517.	5,062,610.
Metal	0.	0.	0.	0.
Nonmetal	63.	68.	47.	45.
Food processing	470.	503.	350.	338.
Manufacturing	6,718.	7,179.	5,004.	4,824.
Printing & publ.	11,392.	12,176.	8,487.	8,181.
Casino	28,590.	30,556.	21,297.	20,531.
Service station	160,329.	171,353.	119,434.	115,138.
Eat, drink & lodging	37,062.	39,610.	27,609.	26,616.
Construction	116,030.	124,008.	86,434.	83,325.
Transportation	209,395.	223,792.	155,984.	150,373.
Communication	101,226.	108,186.	75,406.	72,694.
Utilities	159,698.	170,678.	118,963.	114,684.
Trade	508,911.	543,901.	379,103.	365,466.
Finance, insurance & real estate	364,003.	389,030.	271,157.	261,403.
Personal, business & prof. services	65,645.	70,159.	48,901.	47,142.
Other services	111,060.	118,696.	82,732.	79,756.
Health services	40,263.	43,031.	29,993.	28,914.
Local government	299,959.	320,582.	223,448.	215,410.
Household	1,414,045.	1,511,267.	1,053,362.	1,015,471.

TABLE 21. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 25 Percent, Assuming Different Livestock Price Levels and Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$679.	$311.	$926.	$1,031.
Alfalfa Seed	3.	1.	4.	4.
Alfalfa & other hay	120,670.	55,262.	164,506.	183,177.
Livestock	1,331,832.	609,926.	1,815,648.	2,021,724.
Metal	0.	0.	0.	0.
Nonmetal	12.	5.	16.	18.
Food processing	89.	41.	121.	135.
Manufacturing	1,269.	581.	1,730.	1,926.
Printing & publ.	2,152.	986.	2,934.	3,267.
Casino	5,401.	2,474.	7,363.	8,199.
Service station	30,290.	13,871.	41,293.	45,980.
Eat, drink & lodging	7,002.	3,207.	9,545.	10,629.
Construction	21,920.	10,039.	29,884.	33,275.
Transportation	39,559.	18,116.	53,930.	60,051.
Communication	19,124.	8,758.	26,071.	29,030.
Utilities	30,170.	13,817.	41,130.	45,798.
Trade	96,144.	44,030.	131,070.	145,947.
Finance, insurance & real estate	68,768.	31,493.	93,749.	104,390.
Personal, business & prof. services	12,402.	5,679.	16,907.	18,826.
Other services	20,982.	9,609.	28,604.	31,850.
Health services	7,607.	3,483.	10,370.	11,547.
Local government	56,668.	25,952.	77,254.	86,023.
Household	267,142.	122,340.	364,187.	405,522.

TABLE 22. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 50 Percent, Assuming Different Livestock Price Levels and Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$1,327.	$1,363.	$1,198.	$1,287.
Alfalfa Seed	5.	5.	5.	5.
Alfalfa & other hay	235,784.	242,206.	212,895.	228,820.
Livestock	2,602,343.	2,673,222.	2,349,720.	2,525,474.
Metal	0.	0.	0.	0.
Nonmetal	23.	24.	21.	23.
Food processing	174.	178.	157.	168.
Manufacturing	2,480.	2,547.	2,239.	2,406.
Printing & publ.	4,205.	4,320.	3,797.	4,081.
Casino	10,554.	10,841.	9,529.	10,242.
Service station	59,184.	60,796.	53,439.	57,436.
Eat, drink & lodging	13,681.	14,054.	12,353.	13,277.
Construction	42,832.	43,998.	38,674.	41,567.
Transportation	77,297.	79,402.	69,793.	75,013.
Communication	37,367.	38,385.	33,740.	36,263.
Utilities	58,951.	60,557.	53,229.	57,210.
Trade	187,861.	192,978.	169,624.	182,312.
Finance, insurance & real estate	134,369.	138,029.	121,325.	130,400.
Personal, business & prof. services	24,232.	24,892.	21,880.	23,517.
Other services	40,997.	42,114.	37,017.	39,786.
Health services	14,863.	15,268.	13,420.	14,424.
Local government	110,728.	113,743.	99,979.	107,457.
Household	521,984.	536,201.	471,313.	506,566.

TABLE 23. Decreases in Total Sales in Economic Sectors in Humboldt-Lander Economy Given a BLM Allotment Cut of 75 Percent, Assuming Different Livestock Price Levels and Hay Selling

Sector	Price Level 1979 Average	1979 Plus 7%	1977-79 Average	Basis Change
Potato	$3,048.	$3,295.	$2,131.	$2,125.
Alfalfa Seed	12.	13.	8.	8.
Alfalfa & other hay	541,707.	585,623.	378,782.	377,753.
Livestock	5,978,806.	6,463,505.	4,180,609.	4,169,243.
Metal	0.	0.	0.	0.
Nonmetal	54.	58.	37.	37.
Food processing	399.	431.	279.	278.
Manufacturing	5,697.	6,159.	3,984.	3,973.
Printing & publ.	9,662.	10,445.	6,756.	6,738.
Casino	24,247.	26,213.	16,954.	16,908.
Service station	135,975.	146,998.	95,079.	94,820.
Eat, drink & lodging	31,432.	33,981.	21,979.	21,919.
Construction	98,405.	106,382.	68,808.	68,621.
Transportation	177,587.	191,983.	124,175.	123,838.
Communication	85,849.	92,809.	60,029.	59,866.
Utilities	135,439.	146,419.	94,704.	94,446.
Trade	431,605.	466,595.	301,795.	300,974.
Finance, insurance & real estate	308,709.	333,736.	215,861.	215,274.
Personal, business & prof. services	55,673.	60,187.	38,929.	38,823.
Other services	94,190.	101,826.	65,861.	65,682.
Health services	34,147.	36,915.	23,877.	23,812.
Local government	254,393.	275,017.	177,881.	177,398.
Household	1,199,244.	1,296,466.	838,557.	836,277.

TABLE 24. Changes in Humboldt-Lander Employment Given Alternative BLM Allotment Cuts and Cattle Price Levels Without Hay Selling Alternatives

Cattle Prices	Amount of BLM Cuts		
	25 Percent	50 Percent	75 Percent
	Change in FTE [a]		
1979 Average	-40.0	-86.7	-211.6
1979 Ave. plus 7 %	-18.3	-88.8	-226.2
1977-79 Average	-54.3	-79.1	-157.6
Basis Change	-52.1	-76.0	-152.0

[a] Full-time equivalent is fifty, 40-hour weeks per year.

TABLE 25. Changes in Humboldt-Lander Employment Given Alternative BLM Allotment Cuts and Cattle Price Levels With Hay Selling Alternatives

Cattle Prices	Amount of BLM Cuts		
	25 Percent	50 Percent	75 Percent
	Change in FTE [a]		
1979 Average	-40.0	-78.1	-179.5
1979 Ave. plus 7 %	-18.3	-80.2	-194.0
1977-79 Average	-54.5	-70.5	-125.5
Basis Change	-60.7	-75.8	-125.2

[a] Full-time equivalent is fifty, 40-hour weeks per year.

Reductions in Total Sales in Perspective

While the reductions in total sales associated with the grazing allotment reductions are interesting in themselves, it is useful to place these in perspective relative to total sales in the Humboldt County economy. The input-output model for Humboldt-Lander County indicates that total sales in 1976 amounted to $256.5 million. Utilizing 1979 information on personal income from the U.S. Department of Commerce to disaggregate total sales, Humboldt County's share of total sales is estimated to be about $170 million.

Total sales in the livestock sector according to the input-output model (Fillo, 1978) is $11.3 million. Based on information from the 1974 Census of Agriculture (U.S. Department of Commerce, Bureau of the Census), approximately 62 percent of the livestock sales could be attributed to Humboldt County. Thus, an estimate of total sales from the livestock sector in Humboldt County is approximately $7.0 million.

Comparing the extremes of the ranch sector models, a 4 percent reduction in livestock sales would reduce total sales by $0.28 million, and a 50 percent reduction in livestock sales would reduce total sales by $3.5 million. These represent, respectively, 0.2 percent and 2.0 percent reductions in total sales of the Humboldt County economy. If all indirect and induced effects are taken into account, a 50 percent reduction in livestock sales would likely result in a loss in total sales of $5.6 million, or 3.3 percent of total sales in the Humboldt County economy.

CONCLUDING COMMENTS

The estimated impacts associated with grazing allotment reductions in the Paradise-Denio area are only as good as the data used in the analysis and the procedures followed by the analysts. For this reason, the authors tried to be as explicit as possible in terms of the data used and the procedures followed. Being aware of the critical importance of the data used in the analysis, every attempt was made to check the data during all phases of the analysis. For example, the parameters on individual ranches were checked for reliability with the producer panels. Further, in aggregating the data, every attempt was made to be consistent with aggregate statistics secured from various sources.

The estimated impacts presented in this report were also conditioned by the assumptions made throughout the analysis. The authors have tried to be explicit about these assumptions. For example, a critical assumption in the analysis involves the way in which ranches are classified. It was assumed that it is best to classify ranches for this analysis on the basis of their dependency on BLM lands. While this is an assumption, an analysis of secondary data indicates that such a classification is relevant. Another assumption is that the changes in gross product sales are equal to changes in final demand for the livestock sector. While it is a simplifying assumption, it does not appear to be heroic in nature.

In closing, the analysts emphasize that the impacts presented in this report are not as precise as they may seem in the presentation. Throughout, estimates are presented to the nearest dollar or to the nearest

tenth of a full-time equivalent (FTE). This is not to imply that the results are accurate to these levels of precision. Rather, they are presented so that the individual elements add up to the totals that we have estimated. By the very nature of the procedures followed, a range of estimates is emphasized rather than a point estimate. The users of this information are encouraged to follow a similar procedure as they utilize the information for making decisions.

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APPENDIX

Appendix Table 1. Definition Of Variables Used In The Regression Analysis

I. Variables used in computing Independent Variables

1. ACTUAL - three-year average of the amount of BLM AUM's used within district
2. SUMNUM - numbers of cattle grazing BLM land during the summer
3. WINNUM - number of cattle grazing BLM land during the winter
4. FSAUM - three-year average of the amount of Forest Service AUM's used.
5. OTHBLM - three-year average of the amount of BLM AUM's used from other districts.

II. Independent Variables

1. TTLNUM - total number of cattle over six months of age on a ranch
2. SIZE 1 - dummy (0 if TTLNUM > 350, 1 if TTLNUM $\leq$ 350)
3. SIZE 2 - dummy (0 if TTLNUM $\leq$ 800, 1 if TTLNUM > 800)
4. WIN - dummy (1 = has winter range, 0 = no winter range)
5. FS - dummy (1 = has FS, 0 = no FS)

III. Dependent Variables

1. PCTTTL = ACTUAL/(TTLNUM x 12)

   PCTTTL - percent dependence on BLM land for yearly forage requirements
2. PCTSUM = SUMNUM/TTLNUM

   PCTSUM - percent of herd on BLM land during the summer
3. PCTWIN = WINNUM/TTLNUM

   PCTWIN - percent of herd on BLM land during the winter
4. PCTFED = (ACTUAL + FSAUM + OTHBLM)/(TTLNUM x 12)

   PCTFED - percent of yearly forage requirements met by either FS or BLM allotments in either Paradise-Denio or other BLM districts.
5. PCTFS = FSAUM/(TTLNUM x 12)

   PCTFS - percent yearly forage requirements met by Forest Service allotments

Appendix Table 2. Regression Results Based On Percent Federal Range Dependency As The Dependent Variable

Independent Variable	Dependent Variable PCTTTL				Dependent Variable PCTSUM			
INTERCEPT	.26889 .35632+38	.18695 .30599 E+38	.25047 .39008	.3329 .13722	.72612 .35632 E+38	.66606 .30599 E+38	.64348 .48080	.68244 .16537
TINLUM	-.23647 E-04 .12071 E+35	-.32916 E-04 .11893 E+35	-.21265 E-04 .16044 E-03	-.18444 E-04 .74589 E-04	-.17804 E-04 .12071 E+35	-.24597 E-04 .11893 E+35	-.28739 E-04 .19776 E-03	-.41943 E-04 .89890 E-04
SIZE 1	.12853 .37935 E+38	.15320 .37535 E+38	.12865 .51066		.48806 E-01 .37935 E+38	.66886 E-01 .37535 E+38	.75615 E-01 .62943	
SIZE 2	.55453 E-01 .51957 E+38	.12517 .49581 E+38	.11154 .67828		-.84482 E-01 .51957 E+38	-.33392 E-01 .49581 E+38	-.28546 E-01 .83603	
WIN	.17474 .35783 E+38	.20051 .35319 E+38			-.90165 E-01 .35783 E+38	-.71278 E-01 .35320 E+38		
FS	-.15643 .34854 E+38				-.11464 .34854 E+38			
R^2	.33914	.24070	.08318	.01997	.13532	.10069	.08765	.06766
F	0	0	.03024	.06114	0	0	.03202	.21772
N	66	66	66	66	65	65	65	65

Appendix Table 2 Continued

Independent Variable	Dependent Variable PCTWIN				Dependent Variable PCTFED			
INTERCEPT	.41984	.30385	.33203	.44855	.33116	.32552	.32387	.38117
	.35632 +38	.30599 +38	.36275	.13930	.35632 E+38	.30599 +38	.30143	.10907
TINLUM	.32319 E-04	-.45441 E-04	-.40271 E-04	-.71220 E-04	.54591 E-05	.48211 E-05	.45184 E-05	-.16418 E-04
	.12071 E+35	.11893 E+35	.14920 E-03	-.75720 E-04	.12071 E+35	.11893 E+35	.12398 E-03	.59284 E-04
SIZE 1	.19342	.22835	.21745		.11044	.11213	.11277	
	.37935 E+38	.37535 E+38	.47489		.37935 E+38	.37535 E+38	.39461	
SIZE 2	-.13027	-.31581 E-01	-.37629 E-01		-.55608 E-01	-.50810 E-01	-.50456 E-01	
	.51957 E+38	.49581 E+38	.63077		.51957 E+38	.49581 E+38	.52413	
WIN	.52487 E-01	.88970 E-01			-.69832 E-02	-.52094 E-02		
	.35783 E+38	.35320 E+38			.35783 E+38	.35320 E+38		
FS	-.22145				-.10767 E-01			
	.34854 E+38				.34854 E+38			
R^2	.56831	.41745	.39374	.22773	.13871	.13798	.13781	.02493
F	0	0	.21649	.88467	0	0	.05328	.07670
N	15	15	15	15	66	66	66	66

Appendix Table 2 Continued

Independent Variable	Dependent Variable			
	PCTFS			
INTERCEPT	.29343 .35632 E+38	.26916 .30599 E+38	.22808 .19255	.18557 .69555 E-01
TINLUM	.10451 E-04 .12071 E+35	.77056 E-05 .11893 E+35	.17019 E-06 .79198 E-04	-.11530 E-04 .37808 E-04
SIZE 1	-.79049 E-01 .37935 E+38	-.71742 E-01 .37535 E+38	-.55860 E-01 .25207	
SIZE 2	-.14422 .51957 E+38	-.12357 .49581 E+38	-.11476 .33481	
WIN	-.13731 .35783 E+38	-.12968 .35320 E+38		
FS	-.46329 E-01 .34854 E+38			
R^2	.42655	.39328	.13950	.03007
F	0	0	.05404	.09300
N	24	24	24	24

Appendix Table 3. Ranch Inventory-Typical Ranch With BLM Summer Grazing

	Purchase Cost
1. Fences (40 miles)	$88,000
2. Inside corral	12,000
3. Outside corral (2)	3,000
4. Scale	12,000
5. Shop	10,000
6. Machine shed	10,000
7. Bunkhouse	15,000
8. Hay wagon	2,000
9. Pickup	9,000
10. Stock truck	20,000
11. Stack retriever	7,000
12. Tack	4,000
13. 14' S.P. swather	23,000
14. 3 wire baler	16,000
15. 115 hp tractor	33,000
16. Harobed	29,000
17. 12' offset disc	8,800
18. 30' spike tooth harrow	1,500
19. 40 hp tractor	8,300
20. 12' seed drill	4,800
21. V-tandem rake	4,000

Livestock	Land
800 Cows & heifers	See Appendix Table 14.
120 Replacement (15%)	
45 Bulls (1 per 18 Cows)	
10 Horses (1 per 80 cows)	
576 Calves (72% of Cows)	

Appendix Table 4. Enterprise Budget For Meadow Hay For A Typical Ranch With BLM Summer Grazing[a]

Production Costs	$/Acre
1. Harrow	4.20
2. Swath	9.80
3. Rake	2.83
4. Bale	8.39
5. Haul & stack	3.78
6. Rodent control	1.00
7. Ditch maintenance	1.00
8. General overhead (5% variable costs)	1.02
9. Irrigation labor	1.00
10. Taxes	1.00
11. Total costs	34.02
12. Cost/ton hay	34.02
13. Variable costs	23.43

[a]Yield 1.0 ton/acre, aftermath yield 0.3 ton/acre, flood irrigation from run-off.

Appendix Table 5. Enterprise Budget For Alfalfa Hay For A Typical Ranch With BLM Summer Grazing[a]

Production Costs	$/Acre
1. Harrow	4.20
2. Swath 2x	14.88
3. Bale 2x	28.00
4. Haul and stack 2x	13.37
5. Rodent control	1.00
6. Ditch maintenance	1.00
7. Boarder	1.00
8. Amortized establishment life (12%)	2.29
9. General overhead (5% of variable cost)	4.88
10. Amortized cost of irrigation system	24.44
11. Irrigation power costs	38.20
12. Irrigation labor	17.00
13. Taxes	3.00
14. Total costs	153.26
15. Cost/ton	38.31
16. Variable costs	105.47

[a]Yield 4.0 ton/acre, flood irrigation from runoff and well, pump June 1 - October 1, includes all costs except land and management

Appendix Table 6. Enterprise Budget For 800 Cow-Calf Enterprise For A Typical Ranch With BLM Summer Grazing[a]

		$ /cow
I.	Sales	
1.	Steer calves (554 x $.85 x .50 x .72)	169.02
2.	Heifer calves (500 x $.73 x .50 x .72 x .85)	76.29
3.	Cull cows (850 lbs. x $.50 x .15x.98)	62.16
4.	Cull bulls (1400 lbs. x $.50 x .25 x .0555 x .94)	9.13
5.	Total sales	316.60
II.	Production Costs	
6.	Supplemental winter feeding	
	a. calves (473 tons alfalfa)	22.65
	b. cows & replacements	
	i. alfalfa (419 tons)	20.06
	u. meadow hay (1,155 tons)	49.11
	c. bulls & horses (96 tons meadow hay)	4.08
7.	Government pasture (4,239 AUM's x $1.89)	10.01
8.	Total livestock labor (4,643 hrs. x $5.00)	29.02
9.	Salt and minerals	1.00
10.	Veterinary and medicine	5.00
11.	Fly control	.37
12.	Fuel (not hay enterprise)	4.45
13.	Accounting	1.50
14.	Brand inspection	.28
15.	Repair and maintenance (not hay enterprise)	3.85
16.	Amortized equipment & buildings (not hay enterprise)	37.32
17.	Bull amortization ($1500 for 4 yrs. @ 12%)	27.41
18.	Horses (amortized $1,000 for 15 yrs. @ 12% x .01)	1.83
19.	Taxes	3.40
20.	Misc.	8.07
21.	Interest on cow	64.20
22.	Total Costs	293.61

[a]800 cow-calf enterprise, sell calves in April, 80% calf crop at weaning, 72% calf crop at sale data, 15% replacement

Appendix Table 7. Livestock Calendar Of Operations
For A Typical Ranch With BLM Summer Grazing

	Labor in Hours
December	
Feeding cattle	360
Doctoring cattle	60
Vaccinate Heifers	38
January	
Feeding cattle	360
Doctoring cattle	60
February	
Feeding cattle	360
Doctoring cattle	60
Start calving	30
March	
Feeding cattle	360
Doctoring cattle	60
Calving	90
Wean calves	27
April	
Sell calves	60
Work cattle: brand, castrate, dehorn, vaccinate	226
Move cattle to range	250
Care of cattle on range	192
May	
Care of cattle on range	240
June	
Care of cattle on range	240
Move cattle	120
July	
Care of cattle on range	240
August	
Care of cattle on range	240
September	
Cattle moved off range	340
October	
Care of cattle on aftermath	192
November	
Wean, class-up	160
Vaccinate, brand, castrate, dehorn	126
Work cow: pour-on for lice	152
Total	4,643

Appendix Table 8. Ranch Inventory For A Typical Ranch With BLM Summer And Winter Grazing

		Purchase Cost
1.	Fence (30 miles)	$66,000.00
2.	Corrals (6)	12,000.00
3.	Scale	12,000.00
4.	Shop	10,000.00
5.	Machine shed	10,000.00
6.	Bunkhouse	15,000.00
7.	Hay wagon	2,000.00
8.	3 pickups	18,000.00
9.	Gooseneck trailer	3,500.00
10.	Stock truck	14,000.00
11.	Tack	11,250.00
12.	14 ft. swather	23,000.00
13.	3 wire baler	16,000.00
14.	95 hp tractor	27,000.00
15.	40 hp tractor	8,300.00
16.	12 ft. offset disc	8,800.00
17.	30 ft. spike tooth harrow	1,500.00
18.	12 ft. seed drill	4,800.00
19.	V-tandem rake	4,000.00
20.	2 self-unloading seed wagons	5,000.00
21.	Hay grinder	9,500.00
22.	Barn	15,000.00
23.	Inside corrals	12,000.00
24.	10 windmills	50,000.00

Livestock		Land
1,000	Cows and heifers	See Appendix Table 14.
150	Replacements (15%)	
67	Bulls (1 per 15 cows)	
18	Horses (1 per 56 cows)	

Appendix Table 9. Enterprise Budgets For Meadow Hay For A Typical Ranch With Summer And Winter Grazing[a]

Production Costs	$/Ac.
1. Harrow	3.99
2. Swath	9.80
3. Rake	2.68
4. Bale	8.39
5. Haul and stack	4.00
6. Rodent control	1.00
7. Ditch maintenance	1.00
8. General overhead	1.08
9. Irrigation labor	1.00
10. Taxes	1.00
11. Total costs	33.94
12. Variable costs	24.72

[a]Yield 1.0 ton/acre, aftermath yield 0.3 ton/acre, flood irrigation from runoff

Appendix Table 10. Enterprise Budget For Alfalfa For A Typical Ranch With Summer And Winter Grazing[a]

	Production Costs	$/Ac.
1.	Harrow	3.99
2.	Swath 2x	14.88
3.	Bale 2x	27.10
4.	Haul and stack	16.00
5.	Rodent control	1.00
6.	Ditch maintenance	1.00
7.	Boarder	1.00
8.	Amortized est. cost	2.29
9.	General overhead	5.21
10.	Amortized cost of irrigation system	24.44
11.	Irrigation power costs	38.20
12.	Irrigation labor	17.00
13.	Taxes	3.00
14.	Total costs	155.11
15.	Cost/ton	38.78
16.	Variable cost	112.53

[a]Yield 4.0 ton/acre, flood irrigation from runoff and well, eight year life of stand, includes all costs except land and management

Appendix Table 11. Enterprise Budget For 1,000 Cows For A Typical Ranch With Summer And Winter Grazing

		$/cow
I.	Sales	
	A. December sale	
	1. Steers (454 lbs.x$.91x.75x.22x.50x.98)	33.39
	2. Heifers (433 lbs.x$.77x.75x.22x.50x.98)	26.93
	B. September sale	
	3. Steers (650 lbs x $.78x.96x.75x.78x.50)	142.75
	4. Heifers (600 lbs.x$.69x.96x.75x.78x.48x.50)	55.72
	5. Cull cows (1,000 lbs.x$ .50 x.15x.97)	73.68
	6. Cull bulls (1,400 lbs.x$.50x.94x.25x.0667)	11.10
	7. Total Sales	343.57
II.	Production Expenses	
	8. Supplemental feeding	
	A. Calves	
	a. alfalfa (454 tons)	17.61
	b. meadow (151 tons)	5.12
	c. pasture lease (577 head @$10/mo.for 5 mo.)	28.85
	d. supplement	6.64
	B. Horses	
	a. alfalfa (23.6 tons)	.92
	b. meadow (23.6 tons)	.80
	9. Government pastures (9,600 AUMs @1.89/AUM)	18.14
	10. Total livestock labor (8,054 hours @$5.00/hrs.	40.27
	11. Salt and minerals	6.00
	12. Veterinary and medicine	1.65
	13. Fly control	.37
	14. Fuel	9.15
	15. Accounting	.80
	16. Brand inspection	.30
	17. Repair and maintenance	7.18
	18. Amortized equipment and buildings	43.03
	19. Bull amortization ($1,500 for 4 yrs. @ 12%)	32.92
	20. Horses ($1,000 for 12 yrs. @12% x .018)	2.91
	21. Taxes	3.40
	22. Horse care	1.19
	23. Interest on cow	64.20
	24. Misc.	6.87
	25. Total Costs	298.32

Appendix Table 12. Livestock Calendar of Operation For A Typical Ranch With BLM Summer and Winter Grazing

	Hours of Labor
October	
Feed calves	240
Turn cows out on range	360
Distributing cows on range	700
Pumping water for range cattle	180
Doctoring calves	15
November	
Feed calves	240
Vaccinate heifers	48
Repair flood damage	80
Fence maintenance	144
Doctoring calves	15
Pump water for range cattle	180
December	
Feed livestock	240
Bookwork (total)	280
Doctoring calves	15
Chop ice for range cows	60
Sell part of calves	80
Pump water for range cows	180
January	
Doctoring calves	15
Chop ice for range cows	60
Pump water for range cows	180
Feed livestock	240
February	
Doctoring calves	15
Chop ice for range cows	60
Pump water for range cows	180
Feed livestock	240
March	
Doctoring calves	15
Feed livestock	240
Wean, brand, castrate, dehorn, vaccinate and move cows from winter to summer range	504
April	
Weaners on feed moved to pasture	144
Continue working cows	504
Feeding weaners before going to pasture	60
May	
Continue working and watching cattle	720
June	
Continue working and watching cattle	360
July	
Move cattle off range and class up	360
August	
Class up cattle coming off range	288
September	
Gather yearlings on pasture	144
Sell yearlings	80
Gather cull cows	72
Sell cull cows	80
Big branding and weaning	80
Small branding	48
Preparation for dipping cattle	108
Dip cattle	80
Feed calves	120
Total	8,054

Appendix Table 13. DESCRIPTION	Simplex ROW	Table UNITS	RHS SIGN	RHS	1 Sell Steer Calf	2 Sell Heifer Calf	3 Sell Cull Stock	4 Sell Alfalfa Hay	
					c_1 [a]	c_2	c_3	64.00	
Steer calf transfer	1	Head	≤	0					1
Heifer calf transfer	2	Head	≤	0					2
Sale steer calf transfer	3	cwt	≤	0	1.025				3
Sale heifer calf transfer	4	cwt	≤	0		1.025			4
Cull livestock transfer	5	cwt	≤	0			1.025		5
Alfalfa hayland	6	Acres	≤	b_6					6
Grass hayland	7	Acres	≤	b_7					7
Alfalfa hay transfer	8	Ton	≤	0				1.0	8
Grass hay transfer	9	Ton	≤	0					9
Alfalfa aftermath	10	AUM	≤	0					10
Grass land aftermath	11	AUM	≤	0					11
BLM AUM transfer	12	AUM	≤	0					12
Season 1 forage transfer	13	AUM	≤	0					13
Season 2 forage transfer	14	AUM	≤	0					14
Season 3 forage transfer	15	AUM	≤	0					15
Season 4 forage transfer	16	AUM	≤	0					16
Season 5 forage transfer	17	AUM	≤	0					17
Season 6 forage transfer	18	Ton	≤	0					18
Minimum alfalfa season (6)	19	Ton	≤	0					19
Minimum alfalfa season (1)	20	Ton	≤	0					20
Meadow pasture	21	Acres	≤	b_{21}					21
Weaner replacement req.	22	Head	=	0					22
Yearling replacement req.	23	Head	=	0					23
Bull requirement	24	Head	=	0					24
Horse requirement	25	Head	=	0					25
Total BLM allotment	26	AUM	=	b_{26}					26
FS range transfer	27	AUM	≤	0					27
Deeded rangeland transfer	28	AUM	≤	0					28
Max. deeded season (1)	29	AUM	≤	0					29
Max. deeded season (2)	30	AUM	≤	0					30
Max. deeded season (3)	31	AUM	≤	0					31
Max. deeded season (4)	32	AUM	≤	0					32
Max. FS season (4)	33	AUM	≤	0					33
Total Forest Service	34	AUM	=	b_{34}					34
Total Deeded Range	35	AUM	=	b_{35}					35

[a] See Table 5 for a description of the beef selling prices used.

[b] Refers to seasons of use. See Appendix Table 14 for a description of the seasons used.

Appendix Table 13. Continued

	5 Raise	6 Raise	7 Raise	8 Raise	9 Raise	10 Raise	11 Raise	12 Buy	13 Raise	14 Raise	
	Cow	Steer Calf	Heifer Calf	Bull	Yearling Replacement	Weaner Replacement	Horse	Alfalfa Hay	Alfalfa Hay	Grass Hay	
	-82.78	0.00	0.00	0.00	0.00	0.00	0.00	-78.00	-105.50	-23.50	
	-.37	1.0									1
	-.37		1.0			1.0					2
		$a_{3\ 6}$									3
			$a_{4\ 7}$								4
	-1.275			-3.36							5
									1.0		6
										1.0	7
								-1.0	-4.0		8
										-1.0	9
									-.750		10
										-.750	11
											12
	1.0			1.0	1.0		1.0				13
	1.500			1.500	1.500		1.500				14
	3.0			3.0	3.0		3.0				15
	2.0			2.0	2.0		2.0				16
	.500			.500	.500		.500				17
	1.711	$a_{18\ 6}$	$a_{18\ 7}$	1.800	1.711	.795	1.500				18
											19
											20
											21
	.154					-1.0					22
	.150				-1.000						23
	1.0			-18.000							24
	1.0						-80.000				25
											26
											27
											28
											29
											30
											31
											32
											33
											34
											35

Appendix Table 13. Continued

	15 Total BLM	16 BLM (1) **	17 BLM (2)	18 BLM (3)	19 BLM (4)	20 Feed Alfalfa (1)	21 Feed Alfalfa (6)	22 Feed Grass Hay (6)	23 Alfalfa Aftermath (4)	24 Alfalfa Aftermath (5)	
	0.00	-1.89	-1.89	-1.89	-100	0.00	0.00	0.00	0.00	0.00	
											1
											2
											3
											4
											5
											6
											7
						1.0	1.0				8
								1.0			9
									1.0	1.0	10
											11
	-1.0	1.0	1.0	1.0	1.0						12
		-1.0				-3.0					13
			-1.0								14
				-1.0							15
					-1.0				-1.0		16
										-1.0	17
							-1.000	-1.0			18
							-1.0	[a]19 22			19
						-1.0					20
											21
											22
											23
											24
											25
	1.0										26
											27
											28
											29
											30
											31
											32
											33
											34
											35

Appendix Table 13. Continued

	25 Grass	26 Grass	27 Feed	28 Meadow	29 Meadow	30. Forest Service	31. Forest Service	32. Deeded Range	33. Deeded Range	34. Deeded Range	
	Aftermath	Aftermath	Grass	Pasture	Pasture	(3)	(4)	(1)	(2)	(3)	
	(4)	(5)	Hay (1)	(4)	(5)						
	0.30	0.30	0.00	0.00	0.00	-1.38	-1.38	0.00	0.00	0.00	
											1
											2
											3
											4
											5
											6
											7
											8
			1.0								9
											10
	1.0	1.0									11
											12
			-3.0								13
											14
											15
	-1.00			-.750							16
		-1.00			-.750						17
											18
											19
			.589								20
				1.000	1.000						21
											22
											23
											24
											25
											26
						1.0	1.0				27
								1.0	1.0	1.0	28
								1.0			29
									1.0		30
										1.0	31
											32
							1.0				33
											34
											35

Appendix Table 13. Continued

	35. Deeded Range	36. Total Deeded Range	37. Total Forest Service							
	(4)									
	0.00	0.00	0.00							
										1
										2
										3
										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25
										26
			-1.0							27
	1.0	-1.0								28
		-.133								29
		-.2								30
		-.4								31
	1.0	-.4								32
			-.28							33
			1.0							34
		1.0								35

Appendix Table 14. Definition Of Variable Coefficients In The Simplex Table For Each Individual Ranch Group

Coefficient Number	Coefficient Description	Units	NFS - Spring[a]	WFS - Spring	NFS - Fall	WFS - Fall	Winter
Right Hand Side							
b_6	Alfalfa land	Acres	225	225	111	111	118
b_7	Gross hay land (Harvested)	Acres	1245	1245	1348	1348	174
b_{21}	Meadow pasture	Acres	1805	1805	1837	1837	3975
b_{26}	BLM allotment	AUM	4239[b]	2300	4239[b]	2300	9600[c]
b_{34}	FS allotment	AUM	0	1740	0	1740	0
b_{35}	Deeded range Land	AUM	1102	1300	1102	1300	0
A Matrix							
$a_{3\ 6}$	Steer calf Selling weight	Cwt	5.54	5.54	3.85	3.85	4.54(6.50)[d]
$a_{4\ 7}$	Heifer calf Selling weight	Cwt	5.00	5.00	3.50	3.50	4.33(6.00)[d]
$a_{18\ 6}$	Steer calf winter Hay requirement	Ton	.795	.795	0	0	.458(1.38)[d]
$a_{18\ 7}$	Heifer calf winter Hay requirement	Ton	.795	.795	0	0	.420(1.33)[d]
$a_{19\ 22}$	Minimum alfalfa During winter		.722	.722	.335	.335	N/A

[a] See Table 7 for a description of ranch group abbreviations.

[b] Includes 1088 Aum's of BLM land from other districts.

[c] Includes 3100 Aum's of railroad land managed by the BLM.

[d] Number in parenthesis refers to the same parameter except for yearlings.

Appendix Table 15. Management Seasons Used For Cattle LP Models

Management Period	Dates	Description
1	April 1 - April 30	Present turnout on BLM range
2	May 1 - June 14	Proposed turnout on BLM range
3	June 15 - September 14	Turnout on FS range
4	September 15 - November 14	Gather cattle off BLM and FS range onto hay aftermath
5	November 15 - November 30	Graze hay aftermath
6	December 1 - March 31	Winter feeding period