



An economic survey of Beaverhead and Madison counties, Montana  
by Dudley E Young

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the  
Degree of Master of Science in Agricultural Economics  
Montana State University  
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Abstract:  
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MONTANA

by

Dudley E. Young

A THESIS

Submitted to the Graduate Committee in  
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TABLE OF CONTENTS

Section	Page
I. Introduction .....	4
Purpose.....	4
Objectives.....	4
Sources.....	4
Districts.....	5
Climate.....	7
Population.....	9
Resources.....	9
Range.....	9
Water.....	12
Minerals.....	13
Types of ranches.....	14
Community organization.....	14
II. Discussion of resources and uses made of them.....	16
Grazing and farm lands.....	16
Grazing and feed capacities.....	21
Calculations by counties.....	21
Calculations by Minor Civil Divisions.....	22
Livestock numbers.....	26
Management practices.....	27
Lease cost of range land.....	27
Age of stock sold.....	30
Wintering period.....	31
Value of ranches.....	31

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Section	Page
Land ownership.....	32
Markets.....	36
Public service.....	37
Type of roads.....	37
Retail stores.....	37
Schools.....	39
Railways.....	39
Taxation.....	39
Mortgage debt.....	42
Concentration of ownership.....	43
III. Adjustments and Conclusions.....	49
Major problems.....	49
Overstocking.....	49
Grazing districts.....	51
Seasonal range.....	52
Cause of overstocking.....	52
Basis of permits to graze.....	53
Balance between range and feed resources.....	54
Tendency to develop economic unit.....	54
Gross income.....	57
Maintenance of public services.....	58
Tenancy and part ownership.....	58
IV. Summary.....	59
V. Appendix.....	60

## I. INTRODUCTION

The purpose of this study is to present an economic and social analysis of Beaverhead and Madison counties, Montana, with special reference to agriculture. The objectives are to point out: (1) Desirable adjustments in ranch organization and management which will increase and stabilize incomes in the long run; and (2) Changes which might be advisable in policies of administration of public lands and their beneficial uses from the standpoint of the community and society as a whole.

The principal sources of material used in this report are: (1) Report of Economic Survey, Beaverhead and Madison counties, submitted by H. E. Schwan of the United States Forest Service, February, 1936, co-authors were M. H. Saunderson, of the Montana Agricultural Experiment Station, Neil W. Johnson, of the United States Department of Agriculture, and others; (2) a revision of Schwan's study, dated December, 1936, which presents some additional material; (3) data from a range management survey conducted by the Montana Experiment Station during the summer and fall of 1936; (4) various data from the census; (5) reports of weather stations in the area; (6) data on livestock numbers from revised estimates made in a study of livestock numbers by the Montana Experiment Station; (7) and data on shipments of cattle from an analysis of livestock shipments which is being made by the Experiment Station and whose source is brand inspectors' reports.

This study was made as an analysis of the Minor Civil Divisions by which the census data are taken. It will be seen from figure 1 that the boundaries of these divisions are, in almost every case, mountain ranges which form the natural

boundaries of the areas. When one first visits these counties one's impression is of a very mountainous terrain. The valleys are isolated from each other by high ranges. The altitude of these valleys varies from about 4,500 feet in the lowest part of the Jefferson Valley, the northern part of Madison County, to 6,200 feet at Wisdom in the northern part of Beaverhead County. The larger streams do not have continuous valleys but flow through a succession of nearly flat valleys and precipitous canyons. The Minor Civil Divisions, four in Beaverhead County and five in Madison County, are listed by name as follows:

(1) Wisdom: This district is the Big Hole Basin and the surrounding National Forest. It is a high valley with a short growing season. High winds are not a serious problem because the ranges by which the valley is surrounded break their force. Temperatures are moderate during the summer and extreme cold does not occur for long periods in the winter, although the winters are long and the snowfall heavy.

(2) Armstead: The district is similar to Wisdom in the length and severity of its winters. Several creeks flow from this region, of which Horse Prairie and Medicine Lodge are the most important.

(3) Lima: This valley in the southern part of Beaverhead County is largely made up of the drainage basin of the Red Rock River above Armstead. It is one of the higher valleys and in it severe winds are more frequent than in the other parts of the county.

(4) Dillon: This district is the drainage basin of the Beaverhead River from Armstead to the Madison County line in the east. This is one of the lower valleys and the winters here are milder than elsewhere in the county. Snowfall is lighter and severe winds are not so frequent as in the southern part of the county.

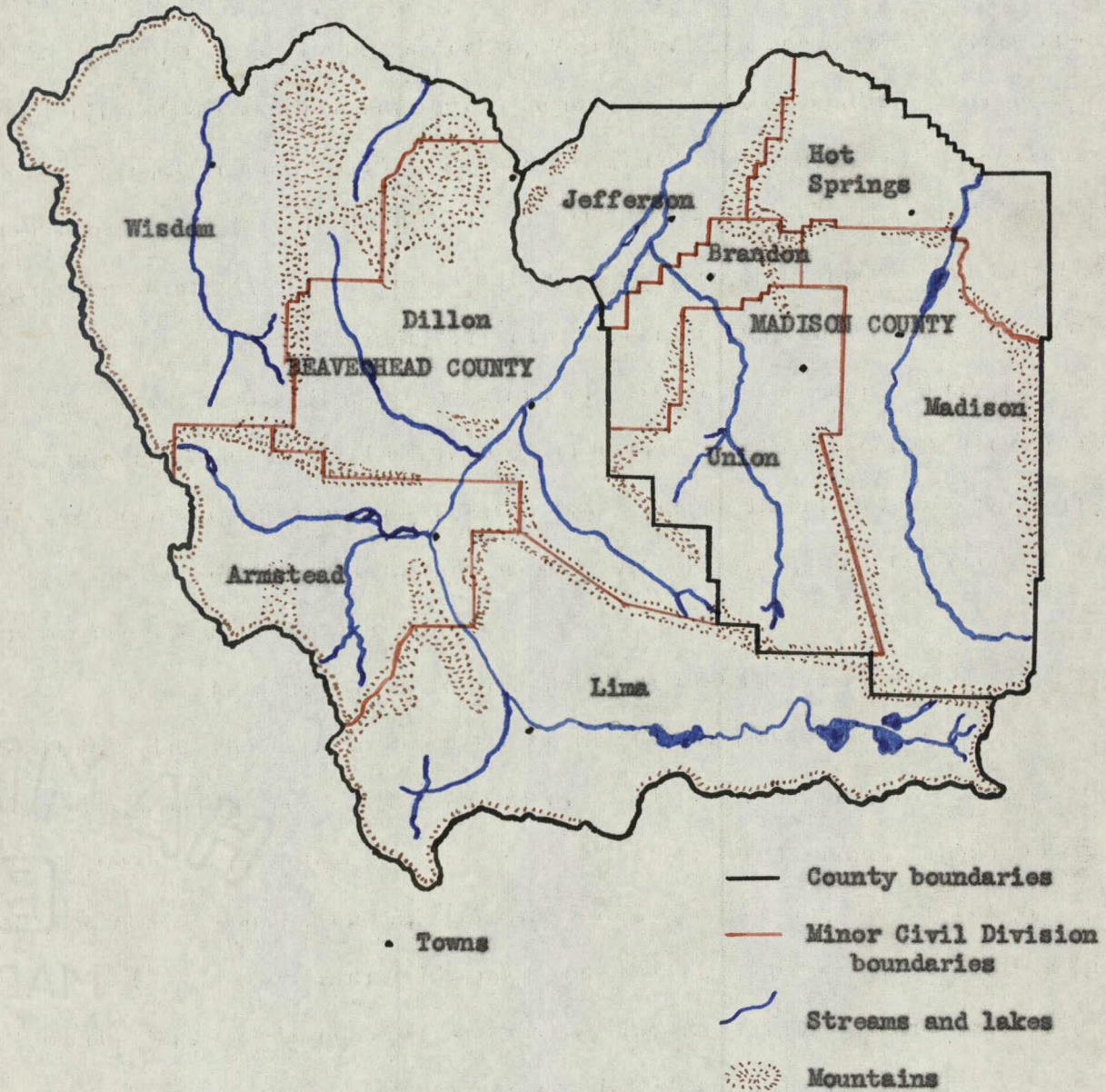


Figure 1. Map of Beaverhead and Madison counties showing Minor Civil Divisions.

The next five districts are all in Madison County. The first of these is (5) Jefferson. It is the lowest valley of the group and into it all the others, except that of the Madison River, drain. In this valley the winters are milder and the frost-free period is probably longer than in Dillon.

(6) Brandon: The district lies just south of Jefferson. No natural boundary separates the two and they are similar in climate and elevation.

(7) Union: This is the upper valley of the Ruby River. It is one of the higher valleys and has long and bitter winters with heavy snowfall.

(8) Madison: The upper valley of the Madison River is one of the two windiest regions discussed. It is not, however, so high as Union, which bounds it on the west, and it has a longer growing season.

(9) Hot Springs: The district lies north of Madison and is the lower valley of the Madison River. It has the longest growing season of any valley in the two counties.

Table I gives a summary of weather conditions in these areas. Some of the data cover only a few years, that taken at Dillon being the only continuous record which lasts for as long as thirty-six years.

Table I. Weather Data for Minor Civil Divisions in Beaverhead and Madison Counties

Area	Annual Rainfall		Rainfall - April 1 to Sept. 30		Number of days between killing frosts (av.)	Altitude of weather station
	Max.	Min.	Max.	Min.		
Beaverhead Co.						
Armstead	16.33	5.50	11.75	2.40	69	6,125 ft.
Dillon	24.80	11.50	18.80	4.00	111	5,143
Lima	11.80	4.80	10.25	2.66	66	6,265
Wisdom	18.50	6.50	10.33	1.90	No no. recorded without frost	6,080
Madison Co.						
Brandon	--	--	--	--	--	--
Jefferson	10.33 (only year taken)			7.50	--	4,650
Hot Springs	24.00	11.66	18.10	5.00	132	4,845
Madison	16.00	7.90	10.10	6.00	--	--
Union	13.75	10.33	10.66	3.33	108	--

Elevation at the southern end of Madison is 5,600 feet, at the northern end 4,800 feet.

Source: Weather Bureau.

The change in population numbers from 1890 to 1930 is shown by figure 2. The figures are given as totals for the two counties because there was a change in the boundary line between them in 1914 so that earlier figures are not comparable on a county basis.

The ranches in the areas of Dillon, Brandon, Jefferson, and the northern part of Union are concentrated on the irrigated lands along the rivers. In other districts they are more widely scattered.

From table I in the Appendix it is also apparent that the most thinly populated districts are Wisdom and Armstead. They had, in 1930, about one person for every two sections. In Madison County the least settled area was Union with a density of about one person per section.

The area with the most people per square mile was Brandon, in which lies the town of Sheridan. This area is also quite a bit the smallest. The concentration of population is probably caused by the district having a greater proportion of irrigated land than the others. The irrigated land is not necessarily more thickly settled than in other districts.

#### Resources

A principal resource of Beaverhead and Madison counties is the range. Almost half of the population of the area lives on farms or ranches. The ranches are dependent on the range which furnishes the forage for their livestock during the spring, summer, fall, and sometimes even in the winter, for some of the ranchers use both range and hay for winter. By definition "ranching" is a type of livestock production where chief emphasis is placed upon grazing and, in the case of the type of farming study made by the Bureau of

the Census, a farm was not classified as a ranch unless it had ten times as much acreage in pasture as in crops.

"In 1930 the reported value of agricultural products sold or used was nearly \$9,000,000. Sixty-three per cent of those engaged in gainful pursuits were directly engaged in agriculture. Less than six per cent were engaged in mining, the industry next in importance to agriculture."

"About \$7,000,000 or 80 per cent of the products sold, traded, or used, was reported from stock ranches ....." <sup>1/</sup>

Hence agriculture, and particularly livestock ranching, is of great importance to the region.

In addition to the range lands there are the irrigated fields on which hay is raised for winter feed. Livestock ranching in this region is based upon a combination of winter feeding and summer pasture. There are few farms of the cash grain type. In 1930 there were about 14,000 acres of wheat in the two counties, chiefly around Dillon and in the Hot Springs district. The other grains produced were on much smaller acreages and were probably used almost entirely as stock feed.

The range was originally composed of various bunch grasses. It is now covered by sagebrush and in some regions sagebrush has become the predominating type of vegetation. Needlegrass has also invaded the range. It furnishes reasonably good pasture in the early summer and spring but later the stem of the grass becomes sharp and tough and injures the mouths of stock attempting to feed on it. This needlegrass also covers a large area, being predominant around Dillon and along the Beaverhead River in each direction.

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<sup>1/</sup> Shwan, H. E., Economic Survey of Beaverhead and Madison Counties, Montana. February 1, 1936. p. 7.

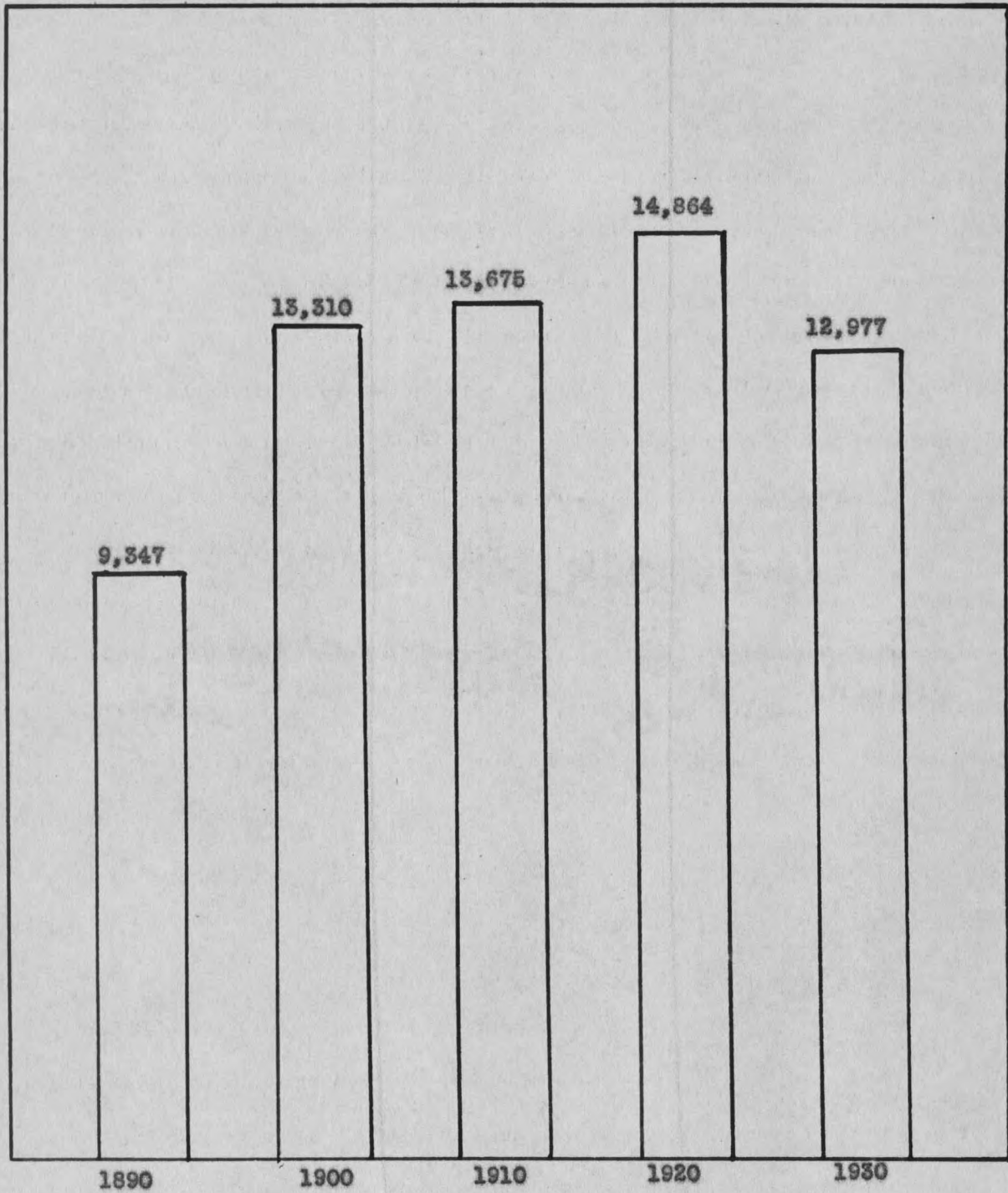


Figure 2. Comparison of total population in Beaverhead and Madison counties for different census dates. 1890-1930.

The sagebrush serves as a partial protection to the grass under it which is now struggling to survive in the face of overgrazing. 2/

Where the range has been protected, as in pastures fenced by the Forest Service, the sagebrush has not gained a foothold. In one case where a pasture was fenced off in 1919 the sagebrush then present has been largely crowded out. 3/

Water is quite important and so the watershed may be mentioned as a real resource. There are approximately 130,000 acres of irrigated and 175,000 acres of tillable lands. These tillable lands are either partially irrigated or subirrigated. More than half the people in the counties live on these lands. Roads, schools, railways, and most other improvements owe their existence to them. Without irrigation the ranching of the area would be completely out of balance.

The water supply must be maintained in order for the counties to continue in a prosperous condition and to permit any expansion of population. 4/

Recreation is important in these two counties but for most of the area fenced camp grounds are considered sufficient to take care of the campers. However, in some areas grazing is limited on their account. 5/

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2/ Schwan, op. cit., p. 10.

3/ U. S. Department of Agriculture, A Study of Economic and Other Problems Involving the Allocation of National Forest Range in Beaverhead and Madison Counties, Montana, December 1, 1936. Sect. IV, p. 9-10.

4/ Idem, Sect. II, p. 9-10.

5/ Schwan, op. cit., p. 4.

There is one wilderness area 6/ in this region. It is a portion of the Spanish Peaks Primitive area, most of which lies in Gallatin County. There are about ten thousand acres of it in the Gallatin National Forest on the northeast side of Madison County. There are, according to Schwan, a few other small areas which could be set up as wilderness areas without unduly displacing stock. These areas would meet all foreseeable needs.

These counties have an abundance of fish and game. There is an adequate supply of summer range for all game, but elk and cattle come into competition for the lower winter range. There are also small bands of mountain sheep which will need to have winter range set aside for them if they increase in number. A herd of about two hundred antelope graze in the Sweetwater Basin just south of the Ruby Range. This is one of the best antelope ranges in western Montana so far as its situation goes, but it is now badly overgrazed. It is on public domain land rather than National Forest. Moose compete with cattle for the range in the western division of the Beaverhead National Forest. However, according to Schwan, most alarmist arguments on shortage of feed for game are man-made to prove the point. Most lack of game is due to man rather than to lack of forage.

Minerals are of considerable importance, most of the mines being in Madison and the northern part of Beaverhead County. Three hundred and fifty people are regularly engaged in mining. Many more small mines would be opened if transportation became easier, market prices rose, or other cost factors were favorably affected. The average annual value of the minerals mined in 1928 and

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6/ A "wilderness" area may be defined as one in which roads are not built and the vegetation is left unchanged. Hunting is permitted which distinguishes it from a "primeval" area. Grazing is, of course, forbidden.

1934 was \$275,000. Mining would seem to be on the upward path in importance. 7/

#### Types of Ranches

Most of the ranches run their stock upon the National Forest during the summer and lease or own private range for spring and fall grazing. There are also districts, notably Armstead, where the public domain is an important factor in spring and fall grazing. Hay is fed during the winter by all the ranches and some late fall grazing is obtained from the haylands after they have been out over. A few ranchers leave their cattle on the open range all winter and feed hay only during storms. More sheep ranches follow this practice than cattle ranches, however. Stock water is ample over most of the range except on the public domain. Large amounts of hay are put up in the Big Hole Valley and this is occasionally sold and shipped out of the valley.

There is plenty of hay raised to winter present numbers of livestock. There is a lack of range.

In discussing the gross income and profits of ranches in Madison and Beaverhead counties this report does not attempt to distinguish the areas within the counties. Nor does it attempt to set up as desirable or undesirable any certain "standard of living." Gross income and profits vary widely from year to year. The rancher must balance his operations over a number of years and comparative statistics are not available for a long enough time to say with certainty exactly what income should be for any particular year to guarantee the proper "standard of living."

#### Community Organization

The residents of these two counties live in a series of mountain valleys. These valleys are separated from each other either by narrow canyons or by high

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7/ U. S. D. A., op. cit., Sect. II, p. 13.

mountains. Thus each valley becomes a separate entity.

Roads are generally rough, except for the oiled highways which run north and south, one in each county.

Improvements in the form of telephones, electricity, or running water are infrequent. 8/

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8/ Schwan, op. cit., p. 23.

II. A DISCUSSION, BY MINOR CIVIL DIVISIONS, OF  
RESOURCES AND USES OF THEM

Grazing and Farm Lands

General: There are 133,000 acres of irrigated land with an average assessed value of \$26.28 an acre in 1934, 175,000 acres of subirrigated or partially irrigated land valued at \$10.14 an acre, and 1,712,000 acres of privately owned range land valued at \$2.13 an acre. There are 2,177,500 acres of forest land in the two counties and 1,134,800 acres of public domain. <sup>9/</sup> Not more than half of this public domain is at present in Taylor Grazing Districts. The one district in these counties is District V which takes in Armstead and a portion of the eastern end of Lima regions.

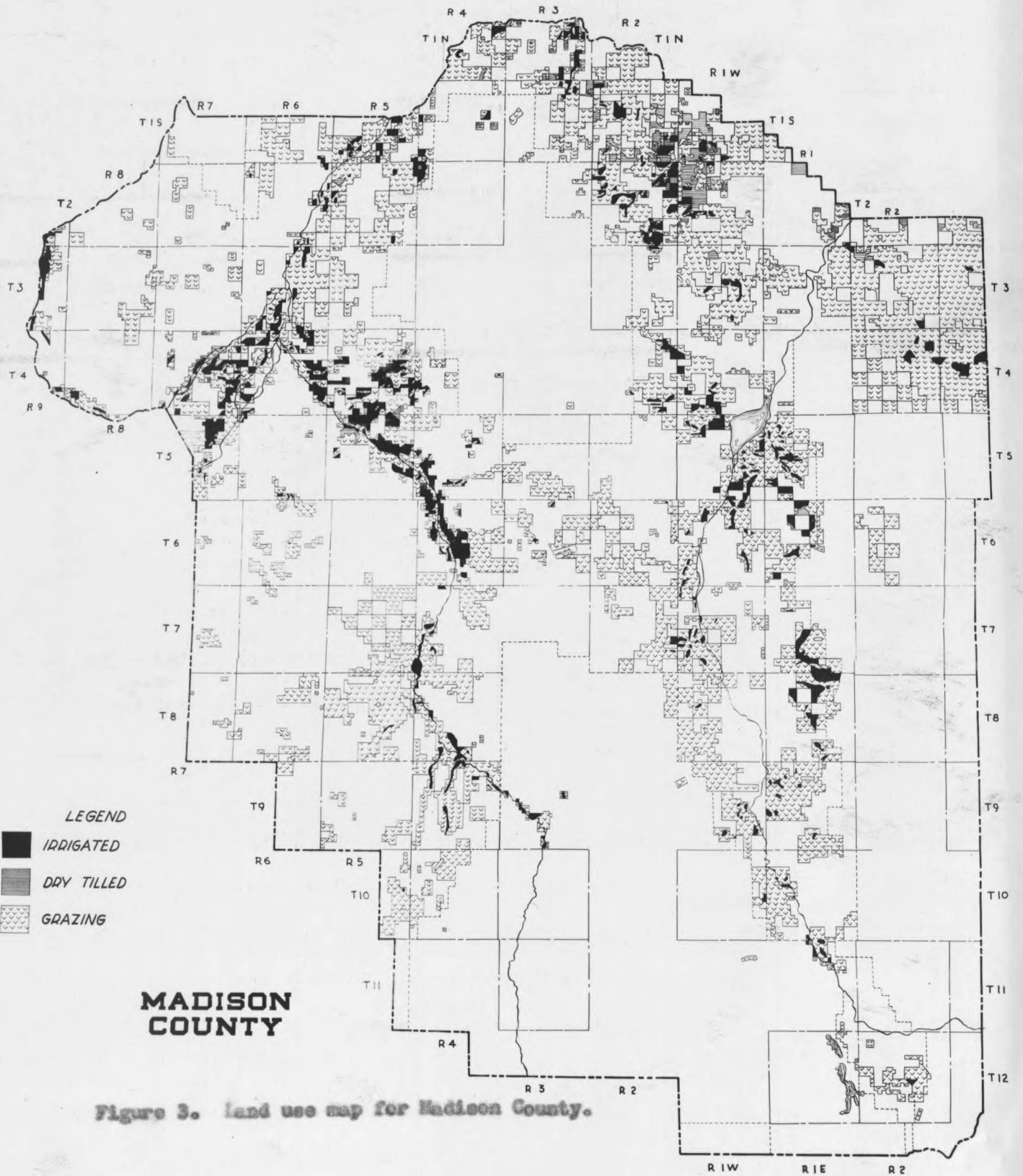
The accompanying maps, figures 3 and 4, show for each county the amount and location of irrigated, dry tilled, and grazing lands. These maps do not show all grazing land as certain areas have not been filled in on them.

The irrigated and subirrigated lands are, of course, grouped in the valleys. The biggest concentration is in the Big Hole Basin, then in the Centennial Valley around Dell and Lima, around Dillon, and on Horse Prairie. In Madison County most of the irrigation is in the Brandon and Union districts, and on the upper Madison. There is no dry land farming recorded for Beaverhead County, though in the past there has been some around Dillon. There is a small amount in the Ruby and lower Madison Valley. The balance of the land is forest and grass lands.

(1) Wisdom: This is the most important district in the state in the production of wild hay which is grown on irrigated, subirrigated, and partially

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<sup>9/</sup> Schwan, op. cit., p. 22.



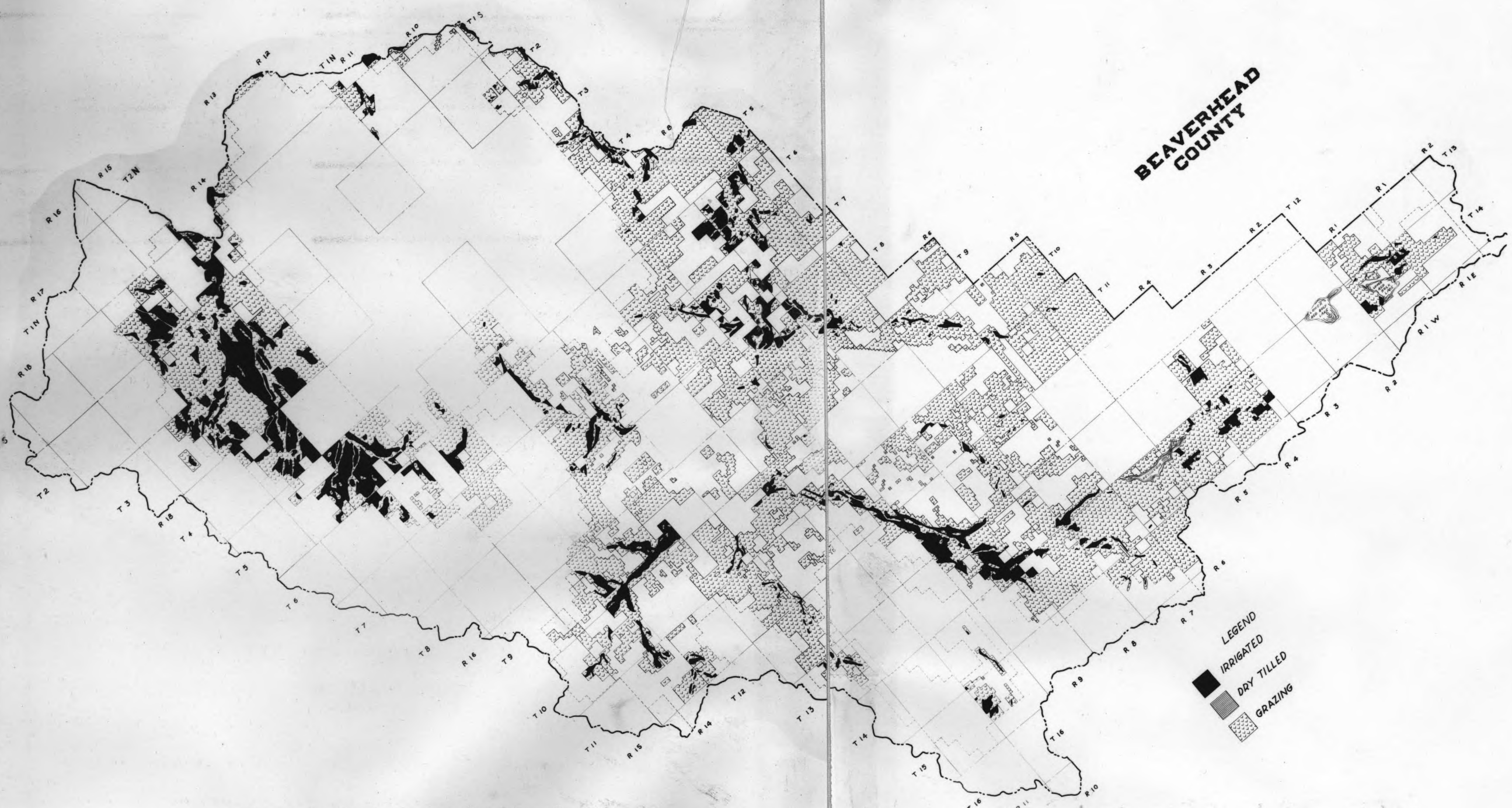


Figure 4. Land use map for Beaverhead County.

irrigated land. In 1935 the acreage of wild hay was approximately 81,000 with an approximate average yield of three-quarters of a ton per acre. Many cows and two and three-year old steers are fattened on this hay in the valley. The range is about equally divided, according to the Forest Service estimate, between high and medium grades. <sup>10/</sup> The high grade is on the southeast, the medium on the west and north.

(2) Armstead: This district is very similar to Wisdom. There is some irrigation along the creeks and there was about 25,000 acres of hay recorded for 1935. There is, however, no grain. The range in most of this area is rated as low grade, although there is a fringe of high and medium grade range around the area.

(3) Lima: Irrigated land lies largely in the valley of the Red Rock River and is concentrated around Lima and Dell. There is some irrigation on tributary streams. This area had 4,757 acres of crops other than hay in 1935. Hay was raised on about 21,500 acres with an approximate average yield of two-thirds of a ton to the acre. The range is quite varied in type but except along the valley and in Sheep Creek Basin, in the southwest corner of the county, it is low in grade. In the valley and basin it is medium.

(4) Dillon: Irrigation is concentrated around the town of Dillon on the Beaverhead River. There is also some on Dry Blacktail Creek in the southeastern part of the Dillon district. There were about 35,000 acres of hay in 1935 with an average yield of almost one ton to the acre. The hay in Dillon and in all the districts of Madison County is principally alfalfa. Other crops covered

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<sup>10/</sup> Forage is classed as high grade which takes 23 to 33 acres of forage per head for a seven-month season of grazing. Medium forage takes 33 to 60 acres per head for a seven-month season. Forage is classed as low grade which takes 60 acres and over per head for a seven-month grazing season.

20,000 acres. Dillon is low enough so that some grain can be raised there, principally barley and oats with some wheat. Most of the range in the Dillon area is rated as medium in grade.

(5) Jefferson: Irrigation is concentrated between the Big Hole and Beaverhead Rivers before their junction. The acreage of hay estimated for 1935 was 20,000. Other crops took 5,076 acres. The range is low grade except along the southeast border of the area where it is medium.

(6) Brandon: Irrigated land is around Sheridan. There were about 9,000 acres of hay with an average yield of slightly more than a ton to the acre and 4,000 acres of other crop land in 1935. The grass lands are medium in grade.

(7) Union: There is irrigated land along the Ruby River. On the northern edge of the area is some dry farming. The estimated acreage of hay land in 1935 was about 11,000 with a yield of over a ton to the acre. There were approximately 6,700 acres of other crops. Grazing is varied. The north and west portions of the area are principally low in grade, the east side of the river and the south is medium.

(8) Madison: There is not much irrigation recorded for the Madison Valley. What there is is concentrated at the north end of the area and along the creeks coming out of the mountains. In 1935 the hay acreage was estimated as 12,000 with a yield of one and a quarter tons to the acre. There were about 10,600 acres of other crops. The range is medium in carrying capacity.

(9) Hot Springs: This area has more dry farming than any other in the two counties. It is concentrated around Harrison and is interspersed with some irrigated lands. There were about 15,500 acres of hay in 1935 with a

yield of almost one and one-half tons to the acre. The range is of medium quality from Harrison west and low quality from Harrison east. There is a small area of cheat grass in the northeast corner of the county which is now spreading. Higher yields in the lower districts are probably due to longer growing seasons and a heavier second cutting.

#### Grazing and Feed Capacities

General: The calculation of wintering capacity of Beaverhead and Madison counties which is given here is taken from Schwan's report and was originally prepared by M. H. Saunderson, Department of Agricultural Economics, Montana State Experiment Station.

The crop data used were for the harvest of 1929. It is assumed that these data are for a representative year. The crop data were reduced to pounds of digestible nutrients, using experimental standards for the total digestible nutrient value (TDN) of the different feeds reported in the census.

The livestock data used to determine stock numbers for the two counties were taken from data for 1933 and 1934. The sources of the data were the records of Regional Agricultural Credit Corporation loans, United States drought purchase, United States National Forest permits, and assessor's records. Assessor's records are taken in March when the number of mature animals is at a low point because of sales in the preceding fall, there is also probably some error in reporting numbers due to a desire of ranchers to evade taxes and hence give a low estimate of numbers. Where only assessor's records were obtained livestock numbers given were increased thirty per cent. The result of using these figures was that numbers were arrived at considerably higher than those given by the census. In using these data for livestock the ratios between the different ages and classes of cattle and between ewes and yearling ewes which occur in the census were applied.

A daily wintering requirement in terms of the total TDN necessary to

maintain this livestock population was computed. Winter maintenance standards were applied to each of the different classes of cattle and sheep. To these figures was added an estimate of the feed consumed by horses at work throughout the year. The consumption of dairy cows was also computed. After subtracting from the total value of the feeds produced the number of pounds of TDN needed by work horses and dairy cows the balance of the TDNs were divided by the daily TDN requirements for range cattle. The result was the wintering capacity of the feed in days. It is estimated that about a third of the cattle in the Big Hole Basin are fattened on hay and that this would add forty per cent of the consumption of hay by this third. Some cattle are also imported for winter fattening. This might lower the wintering capacity of Beaverhead County by ten to fifteen days.

The wintering capacity, as estimated by this method, is 163 days for Beaverhead County and 103 days for Madison County. The calculations involved are shown by tables II through VI in the Appendix.

Quoting the Forest Service:

"From all available data, it appears that on a long time basis with the range properly stocked and a proper balance established between stored feeds, irrigated pastures and range, the two counties can support about 130,000 cattle and horses, and 340,000 sheep. To reach these recommended figures means a reduction of 43,350 cattle and horses and 97,000 sheep from the numbers of livestock estimated to be on hand in 1935. In percentage it means 25 per cent less cattle and 22 per cent less sheep." 11/

Districts: The same calculations may be carried out for each area.

In estimating the numbers of livestock they are regarded as distributed among the districts in the same proportions that existed in the 1935 census figures.

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11/ U. S. D. A., op. cit., Sect. IV, p. 11 and Sect. III, p. 16 ff.

Horses are allotted in proportion to the number of ranches; two teams to a ranch.

The wintering capacity of the different districts is computed through the tables shown in the Appendix. Figure 5 gives a comparison of the number of animal units, 12/ excluding work horses and dairy cattle, which there are to winter in each district with the number of pounds of digestible nutrients which are grown in the districts for that purpose. In this discussion the grazing value of cut over pasture is included with the hay which is taken off it. Table II shows the number of days wintering capacity for each region and the number of days for which sufficient range for the present numbers is available.

The carrying capacity of the range is taken from a Forest Service Survey of range carrying capacity. This report gives the surface acres of private pasture, public domain, state land, and irrigated pasture for each district and the estimated forage acres for a normal year as totals for each county. 13/ In breaking down the forage acres to represent each area they were given in the same proportion as that in which the surface acres occurred. This is admittedly not an exhaustive procedure because of the recognized difference in the quality of pasture in different districts. However, sufficient information was not available to make possible the proper weighting of the various areas to provide for quality of pasture. To the Survey estimate of

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12/ One cow or five sheep equals an animal unit.

13/ A forage acre of pasture may be defined as a surface acre of maximum density of stand and palatability of species of forage.

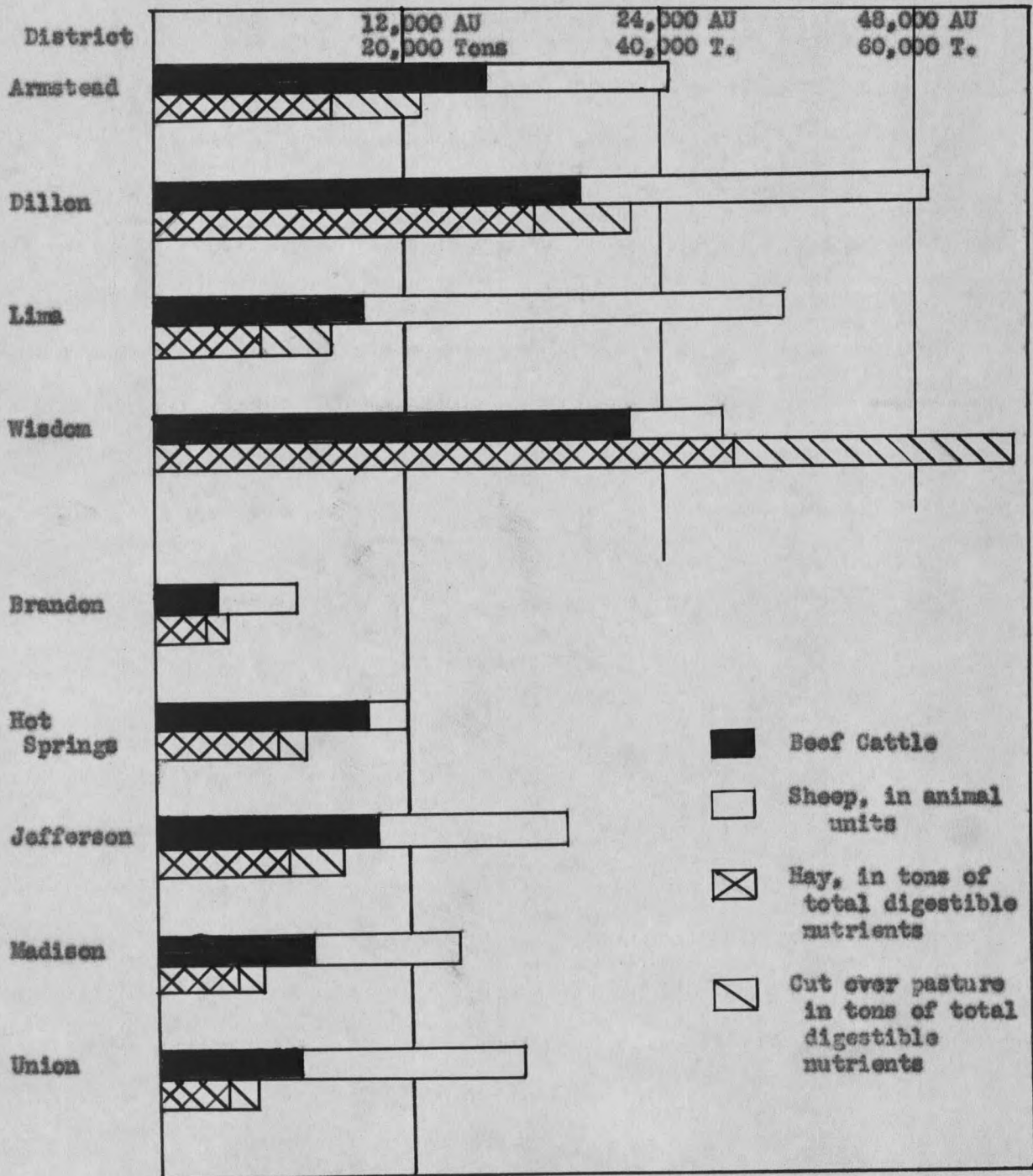


Figure 5. Comparison of the number of animal units, both cattle and sheep, and the number of pounds of digestible nutrients for wintering them. By Minor Civil Divisions. A relative comparison of districts, actual production of hay and cut-over pasture for 1935 used. Refer to tables XII, XV, and XVI in the Appendix.

Table II. Wintering and Range Capacity for Beaverhead and Madison Counties by Minor Civil Divisions, Expressed in Days. For number of Livestock Present in 1933-34.

Area	Days of Wintering		Days of Range		Total
	Cut-over pasture	Hay	Range other than National For.	Nat. For. Range	
Beaverhead Co.	67	163	120	22	372
Armstead	53	114	91	19	277
Dillon	37	161	103	20	321
Lima	34	59	166	18	277
Wisdom <sup>a/</sup>	158	325	118	31	632
Madison Co.	30	101	81	30	242
Brandon	29	92	60	26	207
Hot Springs	34	158	82	17	291
Jefferson	40	110	66	28	244
Madison	26	87	105	47	265
Union	20	69	86	31	206

<sup>a/</sup> The reason that the values for wintering stock in Wisdom are entirely out of line is that a large proportion of the cattle there are fattened on hay. They were not included on this basis, however, because figures as to the exact number fattened or the amount of hay fed are lacking. This also distorts the average given for the county as a whole. Types of cattle fattened are cows, two-year old steers, and three-year old steers.

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25  
1

range outside the National Forest was added the feeding value of Forest Grazing Permits issued to stockmen within the two counties in 1935. In enumerating the number of animals dependent upon the range, horses not already counted as being at work and dairy cattle not being fed were included.

Great differences exist within the counties in amounts of range and winter feed. In Madison County, for example, the Madison area has 152 days of range but Brandon has only 86 days. <sup>for 1933-1934 numbers of stock.</sup> The importance of the National Forest range is shown by the fact that it comprises almost a third of the total days of range for one area, Brandon. And in Lima, the district where it is a smaller proportion of the total than in any other, it makes up one-tenth of all range in number of days capacity. It is important also to remember that this range is the highest and is about all that is available during midsummer.

It should be pointed out that the forage acre estimate upon which this range carrying capacity calculation is based was made during a dry year and then revised upward by the officials of the Forest Service. <sup>14/</sup> It is the best information available but check surveys should be made to achieve the accuracy which is needed.

#### Livestock Numbers

The number of cattle in Beaverhead County has decreased twenty-four per cent from 1923 to 1935 according to estimates shown in table III. During the same period sheep have increased sharply in numbers. In Madison County, however, there are about the same number of cattle now as at the earlier time. Sheep have not increased nearly so much in Madison County as

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<sup>14/</sup> U. S. D. A., op. cit., Sect. IV, p. 11.







































































































































