



An ecological study of a relict of grassland and an adjacent grazed pasture in Beaverhead Valley,  
Montana  
by Michael P Britton

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree  
of Master of Science in Plant Ecology at Montana State College  
Montana State University  
© Copyright by Michael P Britton (1955)

Abstract:

A detailed ecological study was made of a relict area which has been protected for 39 years and an adjacent grazed pasture in Beaverhead Valley in southwestern Montana during the summers of 1953 and 1954. The study area is located at an elevation of 5100 to 5200 feet. The soils were classified as sierozems, and four separate types occurred. The average annual precipitation at Dillon, Montana is 15.97 inches, 67 percent being received during the period April 1 to September 30. The average temperature for this period is - 55.6° F. Vegetation density was determined by the point-transect method. List quadrats were used to measure frequency and abundance of forbs and shrubs. Sampling areas were located on each of the four soil types in the relict area and the grazed pasture. Soil profile descriptions were made for each soil type. Differences in community composition on each soil type in the relict area and the grazed pasture are presented in tabular form and are discussed. The Agropyron-Poa type found on the most mature soils was assumed to be the climatic climax of the region. Two edaphic climaxes are discussed. Agropyron spicatum was the dominant plant on the relict area, whereas the grazing disclimax was dominated by Stipa comata.

63  
55  
MONTANA RESOURCES  
COLLECTION

AN ECOLOGICAL STUDY OF A RELICT OF GRASSLAND AND  
AN ADJACENT GRAZED PASTURE IN BEAVERHEAD VALLEY, MONTANA

BY

MICHAEL P. BRITTON

A THESIS

Submitted to the Graduate Faculty  
in  
partial fulfillment of the requirements  
for the degree of  
Master of Science in Plant Ecology  
at  
Montana State College

Approved:

\_\_\_\_\_  
Head, Major Department

\_\_\_\_\_  
Chairman, Examining Committee

\_\_\_\_\_  
Dean, Graduate Division

Bozeman, Montana  
April, 1955

MONTANA STATE COLLEGE LIBRARY  
BOZEMAN

N 378  
B 777e  
cop. 3



TABLE OF CONTENTS

|                                      | Page |
|--------------------------------------|------|
| ABSTRACT . . . . .                   | 3    |
| INTRODUCTION . . . . .               | 4    |
| ACKNOWLEDGEMENTS . . . . .           | 6    |
| DESCRIPTION OF STUDY AREA . . . . .  | 6    |
| CLIMATE . . . . .                    | 9    |
| METHODS OF STUDY . . . . .           | 9    |
| DISCUSSION AND CONCLUSIONS . . . . . | 10   |
| SUMMARY . . . . .                    | 22   |
| LITERATURE CITED . . . . .           | 22   |

ABSTRACT

A detailed ecological study was made of a relict area which has been protected for 39 years and an adjacent grazed pasture in Beaverhead Valley in southwestern Montana during the summers of 1953 and 1954. The study area is located at an elevation of 5100 to 5200 feet. The soils were classified as sierozéms, and four separate types occurred. The average annual precipitation at Dillon, Montana is 15.97 inches, 67 percent being received during the period April 1 to September 30. The average temperature for this period is 55.6° F. Vegetation density was determined by the point-transect method. List quadrats were used to measure frequency and abundance of forbs and shrubs. Sampling areas were located on each of the four soil types in the relict area and the grazed pasture. Soil profile descriptions were made for each soil type. Differences in community composition on each soil type in the relict area and the grazed pasture are presented in tabular form and are discussed. The Agropyron-Poa type found on the most mature soils was assumed to be the climatic climax of the region. Two edaphic climaxes are discussed. Agropyron spicatum was the dominant plant on the relict area, whereas the grazing disclimax was dominated by Stipa comata.

## INTRODUCTION

"Current range vegetation is more often than not a product of varying degrees of past disturbance by man's livestock. Grazing disclimaxes occur over such vast areas, and are of such long standing, that many stockmen do not realize their ranges once did and can again produce a quite different kind of vegetation."<sup>1</sup> This appears to be true of the grasslands occurring on the lower benches and terraces of Beaverhead Valley in southwestern Montana. Since the valley was settled in the late 1800s, most of this grassland has been used for spring-fall range. Stipa comata is the dominant grass on most of these spring-fall ranges and gives them the appearance of the Mixed Prairie Association (Weaver and Clements, 1938). Interspersed in the grassland are communities of plants dominated by Eurotia lanata and Chrysothamnus viscidiflorus (Fig. 1).

The vegetation of southwestern Montana has not been studied intensively. Reitz and Morris (1939) divided the rangelands of Montana into three regions based on the dominant type of vegetation. They included Beaverhead Valley in the Central Mountain Region which was described as being made up of four vegetation types: Short grass, mixed grass, open forest, and the pacific bunchgrass type. Morris (1946) classified the grasslands of Montana into two complexes: Mixed Prairie occupying the Great Plains, and Palouse Prairie in the western valleys and foothills. These in turn were divided into subhumid, semiarid, and arid associations corresponding to soil zones. Dominant species were indicated for each of the associations under moderate and heavy grazing

<sup>1</sup> Cooper, H. W., 1953. Amounts of big sagebrush in plant communities near Tensleep, Wyoming, as affected by grazing treatment. Ecology 34, p.186.



FIG. 1. GRAZING DISCLIMAX SHOWING STIPA AND CHRYSOTHAMNUS ASPECTS.

on two different soil textures. Wright and Wright (1948) made an ecological study of the grasslands of south-central Montana. They described in detail ten relict areas and grouped these into types based upon the dominant grasses. The diversity of the grasslands of south-central Montana was attributed to the extreme topographic variation, with its associated climatic differences, and was referred to as a tension zone lying between the Palouse Prairie and Mixed Prairie Associations.

Observations made on relict areas during 1953 and 1954 have indicated to the author that the present Mixed Prairie Association occupying the lower elevations of Beaverhead Valley is a disclimax that has resulted from overgrazing

an original Palouse or Bunchgrass Prairie type of vegetation. In support of these observations this thesis presents the results of a detailed study of a relict area which has been protected from grazing for the last 39 years.

#### ACKNOWLEDGEMENTS

The author wishes to acknowledge the assistance of Dr. J. C. Wright who directed the study and aided in the preparation of the manuscript. Sincere appreciation is extended to Mr. A. A. Anderson of the Soil Conservation Service for assistance in describing the soil profiles. Dr. E. J. Dyksterhuis, Soil Conservation Service, generously contributed literature from his personal files.

#### DESCRIPTION OF STUDY AREA

The study area lies at an altitude between 5100 and 5200 feet above sea level and is located about three miles south of Dillon, Montana on a low gently sloping terrace formed between Beaverhead River and Blacktail Deer Creek. The soils are classified as sierozems, being light gray-brown in color and calcareous throughout. The parent material is tertiary lake bed sediment.

The relict area is fenced on all sides and is about 16 feet wide and one mile long (Fig. 2). According to the present owners, the area was fenced in 1915, and previous to that time it was grazed and had the general appearance of the pastures presently adjacent to it. Although the area has been grazed on several occasions when the fences were in need of repair, it has not been grazed since 1940.

Four soil types are found in the study area (Table I). Three are loams;



FIG. 2. THE RELICT AREA AND ADJACENT PASTURES

two of the loams are deep soils, one of which is gravelly. The third loam is a shallow soil and receives additional moisture from runoff during heavy rains or periods of rapid snowmelt. The fourth soil type is a deep sandy loam lacking a lime layer.

An accurate history of grazing use was not available on the adjoining 640 acre pasture. However, during 1953 and 1954 approximately 150 cows with calves were turned into the pasture during the first week in May and were kept there until July 1. The pasture was utilized again in the fall of the year by approximately 150 cows for a four to six week period. About five horses grazed in the pasture periodically during the entire year. According to the owner



TABLE I. SOIL PROFILE DESCRIPTIONS

| SOIL TYPE                                     | HORIZON | DEPTH       | BOUNDARY          | COLOR   | TEXTURE            | STRUCTURE   | CONSISTENCE                           | REACTION                 |
|---|---------|-------------|-------------------|---|--------------------|---|---------------------------------------|--------------------------|
| DEEP<br>LOAM<br>AND DEEP<br>GRAVELLY<br>LOAM* | A1      | 0-6"        | clear,<br>smooth  | dry: light brownish gray<br>moist: dark grayish brown | loam               | moderate, thin platy  | dry: soft<br>moist: friable           | slight<br>effervescence  |
|   | B2      | 6-15"       | clear,<br>smooth  | dry: pale brown<br>moist: brown                       | silt loam          | moderate, coarse<br>prismatic to coarse<br>subangular blocky            | dry: slightly hard<br>moist: friable  | slight<br>effervescence  |
|   | Cca     | 15-25"      | clear,<br>smooth  | dry: very pale brown<br>moist: brown                  | loam               | weak, medium<br>subangular blocky                                       | dry: soft<br>moist: friable           | strong<br>effervescence  |
|   | C       | 25-38"      | clear,<br>smooth  | dry: light yellowish brown<br>moist: yellowish brown  | fine sandy<br>loam | massive   | dry: soft<br>moist: friable           | slight<br>effervescence  |
|   | D       | 38"plus     | unassorted        | sands and gravels                                     |                    |   |                                       |                          |
| SHALLOW<br>LOAM                               | A1      | 0-6"        | clear,<br>smooth  | dry: light brownish gray<br>moist: dark gray-brown    | loam               | moderate, thin platy  | dry: soft<br>moist: friable           | slight<br>effervescence  |
|   | B2      | 6-11"       | clear,<br>smooth  | dry: pale brown<br>moist: brown                       | silt loam          | moderate, coarse<br>prismatic to moderately coarse<br>subangular blocky | dry: slightly hard<br>moist: friable  | slight<br>effervescence  |
|   | Cca     | 11-22"      | clear,<br>smooth  | dry: very pale brown<br>moist: brown                  | silt loam          | moderate, medium<br>subangular blocky                                   | dry: slightly hard<br>moist: friable  | violent<br>effervescence |
|   | C       | 22-30"plus; | unassorted        | sands and gravels                                     |                    |   |                                       |                          |
| DEEP<br>SANDY<br>LOAM                         | A1      | 0-3"        | clear,<br>smooth  | dry: light brownish gray<br>moist: dark gray-brown    | sandy loam         | weak, fine crumb  | dry: soft<br>moist: friable           | strong<br>effervescence  |
|   | B2      | 3-11"       | clear,<br>smooth  | dry: light brownish gray<br>moist: dark gray-brown    | silt loam          | moderate, coarse<br>prismatic   | dry: slightly hard<br>moist: friable  | strong<br>effervescence  |
|   | C       | 11-22"      | abrupt,<br>smooth | dry: pale brown<br>moist: brown                       | sandy loam         | medium,<br>subangular blocky  | dry: soft<br>moist: friable           | strong<br>effervescence  |
|   | A1b     | 22-25"      | clear,<br>smooth  | dry: light brownish gray<br>moist: dark gray-brown    | silty clay<br>loam | moderate, thin platy  | dry: slightly hard<br>moist: sticky** | strong<br>effervescence  |
|   | B2b     | 25-36"      | clear,<br>smooth  | dry: light brownish gray<br>moist: dark gray-brown    | silt loam          | moderate, coarse<br>subangular blocky                                   | dry: slightly hard<br>moist: friable  | strong<br>effervescence  |
|   | Cb      | 36-43"      | clear,<br>smooth  | dry: pale brown<br>moist: brown                       | fine sandy<br>loam | massive   | dry: soft<br>moist: friable           | strong<br>effervescence  |
|   |         | 43"plus     | unassorted        | sands and gravels                                     |                    |   |                                       |                          |

\*contains 20% gravel

\*\*sticky when wet

1  
∞  
1



































