



The ecology of curl-leaf mountain mahogany (*Cercocarpus ledifolius* Nutt.) in southwestern Montana with special reference to use by mule deer
by Elizabeth Ann Duncan

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Fish and Wildlife Management
Montana State University
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Abstract:

This study was conducted to obtain basic ecological information for curl-leaf mountain mahogany (*Cercocarpus ledifolius* Nutt.) within its range in southwestern Montana. Intensive investigations were conducted on 21 stands. Mountain mahogany was distributed in isolated, typically small stands on steep southerly and westerly slopes with rather dry, rocky soils and sparse herbaceous cover. Total density of mountain mahogany in the stands ranged from 472 plants per hectare to 21,627 plants per hectare. Mountain mahogany was the dominant shrub on all but two stands, and had the highest importance value among shrubs on all stands. Importance values were significantly higher in stands of west exposure and on slopes greater than 40 percent. Two growth forms occurred; available plants were low and rounded while those escaping early browsing pressures tended to be "umbrella"-shaped. Plants in stands west of the Continental Divide averaged 16.7 decimeters in height and 16.5 decimeters in diameter with a mean live crown area of 1.54 square meters; while plants east of the Divide averaged 9.2 decimeters in height, 9.6 decimeters in diameter, and 0.52 square meters of live crown. Growth of current annual twigs from terminal and lateral portions of last year's wood occurred between late May and early July and averaged 29.2 millimeters in 1973 and 28.7 millimeters in 1974.

Total production of current annual growth varied considerably between stands and between years and appeared to be enhanced by past utilization. Fall precipitation from the previous year was also positively correlated with better production. Total numbers of twigs produced per hectare varied among individual stands from zero to about 1.5 million in 1973 and from 43,000 to almost 2.0 million in 1974. Total utilization of current annual growth twigs by deer varied from zero to 54 percent among stands. Ocular estimates of the numbers of twigs used per plant showed from zero to 90 percent of the twigs were browsed. Stands were predominantly young to middle-aged (10 to 30 years) although older plants were often found, especially in stands west of the Continental Divide. Seed production was apparently sporadic. An average of 76 percent of the seeds collected in 1974 germinated in the laboratory. Conditions for seedling growth were harsh but survival, as indicated by the presence of young plants and mixed age structure in all stands, seemed to be sufficient to maintain existing populations. Crude protein values averaged 10.5, 10.4, 9.5, and 9.8 percent for the spring, summer, fall, and winter, respectively.

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THE ECOLOGY OF CURL-LEAF MOUNTAIN MAHOGANY
(*CERCOCARPUS LEDIFOLIUS* NUTT.)
IN SOUTHWESTERN MONTANA WITH SPECIAL REFERENCE TO USE BY MULE DEER

BY

ELIZABETH ANN DUNCAN

A thesis submitted in partial fulfillment
of the requirements for the degree

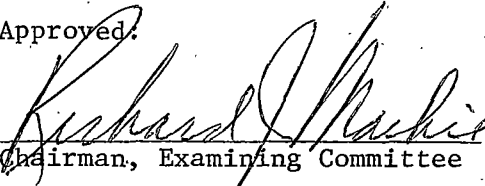
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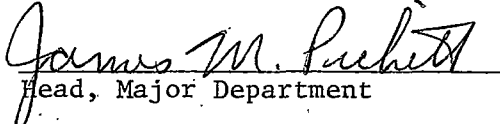
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ABSTRACT

This study was conducted to obtain basic ecological information for curl-leaf mountain mahogany (*Cercocarpus ledifolius* Nutt.) within its range in southwestern Montana. Intensive investigations were conducted on 21 stands. Mountain mahogany was distributed in isolated, typically small stands on steep southerly and westerly slopes with rather dry, rocky soils and sparse herbaceous cover. Total density of mountain mahogany in the stands ranged from 472 plants per hectare to 21,627 plants per hectare. Mountain mahogany was the dominant shrub on all but two stands, and had the highest importance value among shrubs on all stands. Importance values were significantly higher in stands of west exposure and on slopes greater than 40 percent. Two growth forms occurred; available plants were low and rounded while those escaping early browsing pressures tended to be "umbrella"-shaped. Plants in stands west of the Continental Divide averaged 16.7 decimeters in height and 16.5 decimeters in diameter with a mean live crown area of 1.54 square meters; while plants east of the Divide averaged 9.2 decimeters in height, 9.6 decimeters in diameter, and 0.52 square meters of live crown. Growth of current annual twigs from terminal and lateral portions of last year's wood occurred between late May and early July and averaged 29.2 millimeters in 1973 and 28.7 millimeters in 1974. Total production of current annual growth varied considerably between stands and between years and appeared to be enhanced by past utilization. Fall precipitation from the previous year was also positively correlated with better production. Total numbers of twigs produced per hectare varied among individual stands from zero to about 1.5 million in 1973 and from 43,000 to almost 2.0 million in 1974. Total utilization of current annual growth twigs by deer varied from zero to 54 percent among stands. Ocular estimates of the numbers of twigs used per plant showed from zero to 90 percent of the twigs were browsed. Stands were predominantly young to middle-aged (10 to 30 years) although older plants were often found, especially in stands west of the Continental Divide. Seed production was apparently sporadic. An average of 76 percent of the seeds collected in 1974 germinated in the laboratory. Conditions for seedling growth were harsh but survival, as indicated by the presence of young plants and mixed age structure in all stands, seemed to be sufficient to maintain existing populations. Crude protein values averaged 10.5, 10.4, 9.5, and 9.8 percent for the spring, summer, fall, and winter, respectively.

INTRODUCTION

Curl-leaf mountain mahogany (*Cercocarpus ledifolius* Nutt.) occurs over most of the western United States where it is recognized as an important browse species for mule deer. Its range, centered in the Great Basin region of Utah and Nevada, extends east into Colorado, north into Montana, Idaho, and Washington, west into Oregon and California, and south into Arizona (Kirkwood 1930). In Montana it is found mainly in the southwestern portion of the state and in a small area of southcentral Montana (Fig. 1).

A paucity of ecological information for mountain mahogany has hindered efforts of game and range managers to measure and interpret range conditions and relationships and to develop effective management plans on mahogany ranges. Two studies in Idaho by Schedlt (1969) and Claar (1973) and a study of the Scudder Creek mule deer winter range by Allen (1967) provide the only information currently available on the ecology and game use relationships of mountain mahogany in the northern portion of its range.

The current study was established in the summer of 1973 to obtain basic ecological information for curl-leaf mountain mahogany in southwestern Montana. Specific objectives were: 1) to determine general distribution, edaphic, climatic, and synecological characteristics; 2) to determine and describe certain autecological characteristics such as reproduction, growth and development, forage production, and



Figure 1. General distribution of curl-leaf mountain mahogany in Montana.

and nutritional values; and 3) to evaluate the inter-relationship between mountain mahogany and mule deer in Montana. Field studies were conducted full time during the summer of 1973 and the spring and summer of 1974. Additional data were collected during the fall of 1974 and winter of 1975. Intensive investigations were conducted in 21 mountain mahogany stands in southwestern Montana. Three of these were located in Ravalli County, west of the Continental Divide; the remainder were located east of the Divide in Beaverhead, Silver Bow, Madison, Jefferson, and Broadwater Counties (Fig. 2).

The genus *Cercocarpus* is a member of the Rosaceae (Rose) Family and consists of 19 species, five of which are confined to Mexico. Curl-leaf mountain mahogany was first described by Nuttall in 1840 in *Flora of North America* (Torrey and Gray, 1840). The generic name comes from the Greek *kerkos* (a tail) and *karpos* (a fruit), referring to the peculiar long styles of the seeds, which are characteristic of the genus. The specific name *ledifolius* refers to the resemblance of the leaf to that of Laborador-tea (*Ledum*). The common name, mountain mahogany, refers to the mountainous habitat in which the genus is found and the very hard and often reddish brown wood, suggesting that of true mahogany, a tropical American tree (*Swietenia mahagoni*). "Curl-leaf" comes from the characteristic revolute leaf margins of the species. The species is an erect evergreen shrub usually three to fifteen feet tall, though in some parts of its range it reaches tree-like heights of

