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Ecology And Utilization Of Curl-Leaf Mountain Mahogany In Idaho

A Preliminary Report ¹By R. S. Scheldt and E. W. Tisdale ²

Curl-leaf mountain mahogany (*Cercocarpus ledifolius* Nutt.) is recognized as an important shrub species in Idaho and much of the Intermountain and Rocky Mountain region. Ecologically, it is one of the dominants of the mountain shrub zone (Mountain Mahogany — Oak Scrub of K  chler 1964). This evergreen shrub is considered a choice species as winter forage for big game, including elk, mule deer, bighorn sheep and Rocky Mountain goats. It is used only slightly by domestic livestock, and most of the stands occur at elevations above those of winter ranges for livestock (U.S. Forest Service 1937, Smith 1957).

Despite its abundance, wide distribution and importance as browse, curl-leaf mountain mahogany has received relatively little study. Observations from land managers in recent years have indicated that many stands of this species are in poor condition. Two problems mentioned commonly are (1) lack of reproduction and (2) low browse production due to concentration of foliage in the upper parts of older plants (Mitchell 1951).

The present study was designed to obtain information on the distribution of mountain mahogany in the state, the nature of the stands, and certain life history features including seedling establishment and mortality. Field work was conducted during portions of 1967 and 1968.

Initial reconnaissance of areas where mountain mahogany occurs was followed by sampling of 17 representative stands in five regions where this species was abundant. Density, diameter (ankle height), crown area and height were recorded for all stems of mountain mahogany, as well as counts of other shrubs, frequency of herbaceous species, and counts of mountain mahogany seedlings. Three plots each 50 feet in diameter were sampled at each site for the data on mountain mahogany and other woody species, while frequency and seedling counts were made on 20 one-by-two foot microplots. Woven wire cages, 4 feet square and 2 feet in height were used to protect mountain mahogany seedlings at 2 sites from grazing by large animals. One-half of each cage was further enclosed by finer mesh wire to exclude mice and other small rodents.

Mountain mahogany proved to have a wide, but scattered distribution in the southern part of the state. The

principal area of importance is in the drainage of the Salmon River, but sizeable stands occur in the southwestern, south central and southeastern portions (Fig. 1). Most stands occur at moderate to high elevations (3600-8000 feet), except in the Riggins area where the species occurs as low as 1500 feet above sea level.

The zonal position of mountain mahogany lies between the grassland or sagebrush-grass vegetation of the plains and lower slopes and the forest zones of ponderosa pine or Douglas-fir. In many areas mountain mahogany was found alternating with stands of sagebrush-grass or forest. In these cases the mountain mahogany was usually confined to areas of rocky or immature soils, while the other communities occupied areas of finer and better developed soils.

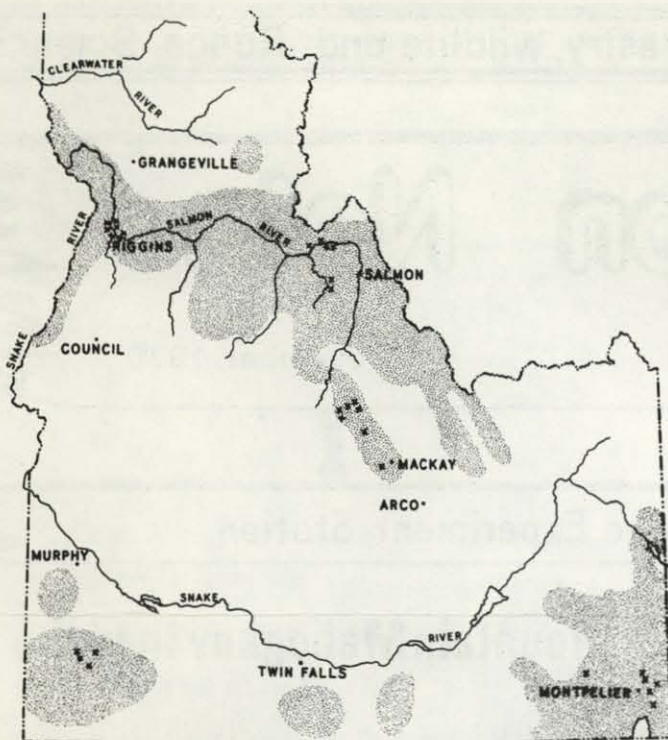
Most of the mountain mahogany was found in relatively pure stands so far as the overstory was concerned. Number of stems averaged 427 per acre, with an average of two stems per plant. The average height was 9.1 feet, and canopy cover averaged 55 per cent. Ages ranged up to at least 150 years; but stems older than this had rotten cores which made accurate aging impossible.

The understory vegetation varied considerably with site and past use. The principal shrub was snowberry (*Symphoricarpos albus* and *S. oreophilus*), with mountain big sagebrush (*Artemisia tridentata* subsp. *vaseyana*), and green rabbitbrush (*Chrysothamnus viscidiflorus*) occurring in lesser amounts. Snowberry occurred in 16 of the 17 stands sampled, sagebrush in 9, and rabbitbrush in 10.

The principal herbaceous species was bluebunch wheatgrass (*Agropyron spicatum*) which occurred in all 17 sites, with an average frequency of 61 per cent. Other common grasses include Sandberg bluegrass (*Poa sandbergii*), Idaho fescue (*Festuca idahoensis*) and Columbia needlegrass (*Stipa columbiana*). The major grass invader was cheatgrass (*Bromus tectorum*). This

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Outline map of southern Idaho showing approximate distribution of curl-leaf mountain mahogany (stippled areas). Sites indicated by crosses were selected for detailed study.

species occurred in 9 of the 17 sites, and was abundant only on sites where grazing and trampling disturbance had been severe on south and west slopes.

Many species of forbs were found, but few occurred abundantly, and the majority were of low forage value. Common species of good forage value included hawkbeard (*Crepis acuminata*), balsam root (*Balsamorhiza sagittata*) and groundsel (*Senecio integerrimus*). Most of the herbaceous species were those found also in adjacent sagebrush-grass or grassland communities.

Reproduction and seedling survival in mountain mahogany was evaluated by counts of seedlings of this species at all 17 sites, plus repeated observations of individually marked seedlings at two sites on both unprotected plots and plots protected from grazing.

Counts made in 1968 indicated that lack of mountain mahogany seedlings was not a problem. An average of 1.9 seedlings per square foot was recorded, and at only one site were no seedlings found in the frequency plots. Seedling survival, however, was low at both sites studied, averaging only 28 per cent for the first summer. Most of this mortality appeared to be due to summer drought. Winter mortality for the first year seedlings was also high, with average survival rates of only 25 per cent on seedlings open to all grazing, 45 per cent for those protected from big game and rabbits, and 50 per cent where protected from all grazing. Thus there was a significant amount of mortality due to grazing, with rabbits the most likely cause. Five cottontail rabbits (*Sylvilagus nuttallii*) collected in March, 1968 all had leaves and fine stems of mountain mahogany in their stomach contents.

Utilization of plants larger than seedlings was heavy at most of the sites studied. Overwintering populations of mule deer were the apparent major users in most cases, but other big game and rabbits were undoubtedly involved. In addition to high mortality among plants, many 4-5 year old plants were found to be only 1 to 2 inches in height due to heavy grazing use. In surviving plants, two distinct growth forms produced by heavy

utilization were common. The first was the "basket-ball" form, almost circular in shape, from close cropping since the juvenile stage. Such plants were only 3 to 4 feet tall at 60 to 70 years of age. The other growth form the "umbrella" was characterized by a stem almost devoid of branches or foliage, and topped by a relatively small crown. Such plants had grown to a height where their tops were above normal grazing height, and once this condition was attained, they continued to grow, but produced virtually no available forage. Studies by Thompson (1970) in Utah and results of administrative studies on the Sawtooth National Forest in Idaho indicate that top pruning may be a solution to this latter problem.

Another biotic influence on mountain mahogany is that of insects. Several infestations of tent caterpillars (*Malacosoma sp.*) and spiny silk worms (*Hemileuca sp.*) were observed in the two years of the study. In some cases, younger plants, two to four feet in height, were observed to be almost completely defoliated. Such attacks would weaken these plants, and if repeated in the following year would be sufficient to kill them. On Juniper Mountain, in Owyhee County, southwestern Idaho, an infestation of a measuring worm (*Anacamptodes clivinaris*) killed over half of the mountain mahogany plants in a large area (Furniss and Barr 1967). Similar attacks by this insect have not been observed elsewhere and may be restricted to sites with rich and well developed soils such as characterize the Juniper Mountain site.

Evidence of fire in the mountain mahogany stands examined was scant, but fire may be a more important factor for this species than the obvious signs would indicate. One known burn in the Mackay area revealed no charcoal in the soil and only the remains of a few dead mountain mahogany plants to indicate that a fire had occurred. This fire was dated as occurring 71 years ago and mountain mahogany plants in the regenerated stand ranged from 8 to 54 years in age, indicating a lag of about 17 years before restocking of the stand began. Another stand, burned in 1965, showed no sign of mountain mahogany regeneration by 1968, and the fire had left very few remains of the previous stand.

In conclusion, it appears that mountain mahogany is well adapted to the sites it currently occupies in Idaho. It produces seed abundantly in most years, and the rate of seedling emergence is high. In spite of heavy seedling mortality due to natural causes, it appears that reproduction would be ample in stands where grazing was not excessive. The major problem in most stands is excessive utilization, mainly by mule deer and other big game. Rabbits and possibly some rodents are an important contributing factor for damage in some areas. Use by domestic livestock does not appear to be a significant factor in the areas occupied by mountain mahogany in Idaho.

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