A Historical Perspective of Montana's Sagebrush

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Abstract

Sagebrush (*Artemisia*)/grasslands are declining in Montana and throughout the West. Sagebrush grasslands have existed for over 10,000 years in equilibrium with climatic conditions and just over 100 years under the influence of livestock grazing and other human interventions. Observations from early explorers and settlers indicate that big sagebrush was a dominant plant on much of the western rangeland region. Until 1934 sagebrush/grassland was used in whatever fashion the land users chose. The Forest Reserve Act gave the first authority to manage what became the National Forest Lands. The Taylor Grazing Act began Federal management of overgrazed rangelands on the remaining public lands known as the Public Domain. Since World War II the destruction of sagebrush has been accomplished through plowing, reseeding, chaining, chemical treatments, prescribed and wild fire, and increased agriculture conversion. Less than one half of the original sagebrush/grasslands remain. Conservation efforts of Montana Fish, Wildlife and Parks and other organizations protect some of these important rangelands.

Key Words: *Artemisia* spp., conservation, decline, human management, sagebrush/grasslands

Introduction

Sagebrush (*Artemisia* spp.) includes some of the most important plants occupying western rangelands (Beetle 1960). Evidence suggests that sagebrush was present in significant amounts prior to settlement of the West (Vale 1975). For over 100 years sagebrush/grasslands have experienced overgrazing, plowing and reseeding, chaining, chemical treatment, prescribed and wild fire, agriculture conversion, and urban obliteration resulting in less than half of the original sagebrush/grasslands remaining in the western United States. This paper provides a historical perspective of human influences on sagebrush taxa.

Pre - 1900

Sagebrush/grasslands developed during a time of general desiccation that followed mountain building at the end of the Tertiary and the start of the Quaternary and continued to evolve through the extreme climatic fluctuations of the Pleistocene (Axelrod 1950). Sagebrush/grasslands have existed for only 10,000 years in equilibrium with climatic conditions and just over 100 years under the influence of livestock grazing and human intervention.

Vegetation observations by early western explorers can be found in the journals of Townsend (1834), Wislizenus (1839), Fremont (1845), the U.S. War Department (1855), Hayden Expedition (1879), Merriam (1890), and Russell (1902). All of these explorers observed the abundance of sagebrush in essentially the same regions that now have sagebrush components. Wislizenus (1839) described vegetation near present day Casper, Wyoming, as "the constant presence of wild sage." Fremont (1845) described the area west of Fort Laramie continuing west across Wyoming and southern Idaho as having abundant sagebrush. Fremont (1842) provided an eloquent description of how the land changed while traveling from east to

west (in Smucker 1856). "With the change in the geological formation on leaving Fort Laramie, the whole face of the country has entirely altered its appearance...Westward of Laramie river the region is sandy, and apparently sterile; and the place of the grass is usurped by the artemisia [sic] and other odoriferous plants, to whose growth the sandy soil and dry air of this elevated region seem highly favorable."

Fremont (1845) continues: "One of the prominent characteristics in the face of the country is the extraordinary abundance of the 'artemisias' [sic]. They grow everywhere on the hills, and over the river bottoms, in tough, twisted, wiry clumps; and, wherever the beaten tract was left, they rendered the progress of the carts rough and slow. As the country increased in elevation on our advance to the west, they increased in size; and with the whole air strongly impregnated and saturated with the odor of camphor and spirits of turpentine which belongs to this plant. This climate has been found very favorable to restoration of health, particularly in cases of consumption; and possibly the respiration of air so highly impregnated by aromatic plants may have some influence."

Historical records of explorers traveling in Montana differ in vegetative detail. Thwaites (1904) cites the Journals of Lewis and Clark as a source of vegetative information. Lewis describes the area of Armstead (now under Clark Canyon Reservoir): "...The uplands are covered with prickly pears and twisted or bearded grass and are but poor; some parts of the bottom lands are covered with grass and tolerable fertile; but much greater portion is covered with prickly pears, sedge, twisted grass, the pulpy leafed thorn, southernwood, wild sage, etc., and the uplands is very inferior in point of soil." Additionally, Moulton (1993) reports the Lewis and Clark Expedition encountered sagebrush between Bannack and Horse Prairie: A...great quantities of the species hysoop (*Artemisia tridentata*) and shrubs common to the Missouri plains are scattered in those hills and valleys. Granville Stuart (1866) traveling from the Snake River Plains of Idaho into Montana reported sagebrush present at Bannack, Virginia City, and Ford and Flatwillow Creeks near Lewistown. Lesica and Cooper (1997) summarized Mullan's 1853 observations. Mullan (1855) described sagebrush in much of the Red Rock River Valley in 1853: "We found the soil of this valley principally of a yellowish or grayish yellow colored clay, upon which, throughout its whole length, the wild sage grows in the greatest abundance. On the lower and upper portions of this valley we found the grass to be exceedingly rich, but near the middle nothing growing save the wild sage bushes." Mullan (1855) provided additional sagebrush observations throughout southern Beaverhead County. Around present-day Dell and in the Sage Creek Valley he commented: "The portion of the valley bordering these buttes is formed of reddish clay, a soil resulting from the washings of these buttes up which nothing grows but artemisia or wild sage. The valleys between these low ridges were covered with artemisia or wild sage growing from eighteen inches to three feet high." Mullan (1855) continued to describe the area southeast of Big Hole Pass: "After crossing the divide above referred to, our trail led us through a large prairie plain covered with the artemisia or wild sage growing to a height of two or three feet."

The presence of sagebrush is well documented by early explorers of the West. Unfortunately their observations were only that—observations. No quantified sagebrush data are available from that era. However, observations do indicate that big sagebrush was a dominant vegetative type in Montana and throughout the western rangelands. Early vegetation maps of the west were generally produced by the U.S. Geological Survey and focused on timber and minerals. Examination of maps produced by Leiberg (1899) reveal detailed information describing forest reserves with huge areas lumped together as "prairie." No further delineation of the prairie type is present. Early focus in the west apparently was on fur trade, timber, passage to the

coast, and minerals, e.g., gold and silver, and not on native shrubs such as sagebrush. Chronology of Western settlement in the sagebrush\grassland type can be briefly described as follows: fur trappers (1809), Mormon settlements (1847), California Gold Rush (1849), Oregon Trail (1843), Comstock Lode (1859), California expansion, Homestead Act (1862), and post Civil War westward migration. All of these activities increased livestock grazing, cultivation for hay and crops, and other land practices that often occurred at the expense of sagebrush/grassland. However, in the spring of 1890, western rangelands had fewer livestock than in the previous 30 years as a result of a series of bad winters and dry growing seasons.

1900 - Present

At the turn of the century, pioneering range scientists studied the sagebrush/grasslands (Young et al. 1979). During the summers of 1900, 1901, and 1903, P.B. Kennedy, S.B Dutton and David Griffith conducted rangeland appraisals (Young et al. 1979). They described some Nevada rangelands as dust beds, accelerated soil erosion occurring, hay production on large ranches, most sagebrush/grasslands were overgrazed, high elevation ranges were damaged from concentrations of sheep, and wildfires were common in sagebrush/grassland types (Young et al. 1979). Though these reports do not divulge information about Montana rangelands specifically, some of the same conditions undoubtedly were present throughout the West.

Over-grazing of native bunchgrasses in the sagebrush/grasslands near the turn of the 20th century is well documented. Jardine and Anderson (1919) stated that the native plant communities associated with the sagebrush/grassland type are extraordinarily susceptible to alien plant invasion. Hironka and Tisdale (1963) claim that Russian thistle (*Salsola iberica*), tumble mustard (*Sisymbrium altissimum*) and downy brome (*Bromus tectorum*) drastically changed succession in the sagebrush/grasslands. These species are quite competitive and make seedling establishment by perennial grasses difficult. The implications of alien plant invasion to the ecology of the sagebrush/grasslands were detailed by the research of Piemeisel (1951) as he documented how alien plant invasion permanently changed the ecology of sagebrush/grasslands. Piemeisel (1951) stated that sagebrush/grasslands were so abused that if aliens had not invaded, accelerated erosion would have destroyed the potential of many sites. Daubenmire (1946) further demonstrated the permanence of exotic plant invasion when he reported that downy brome had established itself in a bunchgrass stand that had not been burned or grazed for as long as 50 years.

Young et al. (1979) summarized the early role of science in natural resource management. A.W. Sampson (1913) published an article for the National Wool Growers and suggested using science as a tool to manage western rangelands. This new concept grew slowly in popularity over the next couple of decades. Some early range scientists who recognized the role of plant succession in range management included J. T. Jardine (Jardine 1916, Jardine and Anderson 1919) and Sampson (1919). The Great Basin Experiment Station conducted much of the early sagebrush/grassland research (Keck 1972). Resulting from Sampson's work, Lincoln Ellison created condition and trend indicators (Ellison et al. 1951). Fleming (1922) studied plant community dynamics and possible influence of grazing management on them. Additionally, Hall and Clements (1923) published a thorough dissertation on the taxonomy of sagebrush (*Artemisia* spp.), rabbitbrush (*Chrysothamnus* spp.), and saltbush (*Atriplex* spp.). Evidence suggested that western sagebrush/grasslands were receiving attention from government agencies and the scientific community at the turn of the century.

Until 1934, much of the sagebrush/grassland type was used in whatever fashion land users chose. From 1914 to 1934 many bills were introduced in Congress in an

effort to address grazing on public land (Buckman 1935). Examples are the Kent, Colton, and Garfield bills. Eventually the Taylor Grazing Act passed Congress on 28 June 1934 that encompassed the remaining public lands (not under USFS management) known as the Public Domain. Holechek et al. (1989) described passage of this act as initiation of an era of land retention by the federal government in which it enabled management of extensive arid rangelands of the west previously damaged by severe overgrazing. The economic, climatic, and social conditions of the early 1930s set the stage for passage of the Taylor Grazing Act. Agriculture was struggling; the drought of the early 1930s also hurt western rangelands, and many western ranches were facing bankruptcy (Young et al. 1979).

The modern day assault on sagebrush started sometime in the mid-1930s but accelerated after World War II. Trying to restore degraded rangelands, the government experimented with reseeding native grasses with little or no success. Meanwhile several species of wheatgrass (*Agropyron* spp.) from Asia were being tested in the northern Great Plains (Hanson 1972) of which crested wheatgrass (*A. cristatum*) demonstrated to be most drought tolerant (Love and Hansen 1932). After World War II the effort of "reseeding" increased dramatically with millions of acres plowed and seeded (Plummer et al. 1955). At the same time, 2, 4-D [(2, 4-dichlorophenoxy) acetic acid] was being sprayed on millions of acres of sagebrush/grasslands (Pechanec et al. 1964). Since the mid 1940s, plowing and reseeding, chaining, chemical treatments, prescribed and wild fire, increased agriculture conversion, and urban development have left millions of acres of sagebrush/grassland permanently altered.

Discussion

The value of big sagebrush as wildlife cover and forage in Montana is well documented. Three species of sagebrush comprise 93 percent of the winter diet of Montana antelope (Cole 1955). Pyrah (1987) determined that antelope rely primarily on shrubs (chiefly sagebrush) from fall to spring and secondarily from spring to fall. Wilkins (1956) ascertained that during December, January, and February big sagebrush was the primary component of mule deer diets in the Bridger Mountains of Montana. Elk and deer on the northern Yellowstone winter range near Gardner, Montana, depend significantly on four species of sagebrush (Wambolt 1996). Sage grouse winter diets in Montana are 100 percent sagebrush (Rouse 1957). Green and Flinders (1980) found that the respective winter and summer diets of the pygmy rabbit (*Brachylagus idahoensis*) were 99 and 51 percent sagebrush.

Crude protein level and digestibility of sagebrush during winter are higher than other shrubs and grasses. Welch and McArthur (1979) found the winter crude protein level of sagebrush to be 12.4 percent, 10.6 percent for curlleaf mountain mahogany (*Cercocarpus ledifolius*) and 3.7 percent for dormant grasses. Big sagebrush and curlleaf mountain mahogany meet or exceed the protein needs of wintering mule deer (Thompson et al. 1973, Welch et al. 1979).

Sagebrush also provides wildlife with cover for nesting, resting, and escape. Swenson (1983) determined through aerial observations that winter habitat use by mule deer is strongly associated with sagebrush-grassland in rough topography. Best (1970) concluded that Brewer's sparrow (*Spizella breweri*) nest in the canopy of big sagebrush. Sage grouse use big sagebrush habitat with a canopy cover ranging from 20-50 percent (Eng and Schladweiler 1972, Wallestad 1972, Wallestad and Schladweiler 1974). Eng and Schladweiler (1972) reported wintering grouse were located in an average of 28 percent sagebrush canopy cover. Another big sagebrush dependent species is the pigmy rabbit, which requires tall dense sagebrush (Green 1980a, Green 1980b, Campbell 1982, Weiss 1984, Lyman 1991).

Sagebrush has been greatly reduced from its potential. Beetle (1960) estimated

sagebrush once occupied 60 million ha. Bruce Welch, Rocky Mountain Research Station Laboratory, U.S. Forest Service estimates that more than one half of the sagebrush throughout the West has been lost (personal communication). Montana Fish, Wildlife and Parks is focused on protecting sagebrush-grasslands. Land acquisition (Wildlife Management Areas) was the principle method protecting winter range for elk and nesting and resting areas for waterfowl. In 1987, House Bill 526 (HB526) provided an earmarked funding source for a wildlife habitat acquisition program with approximately $2.8 million available annually. The Upland Game Bird Program and Conservation Easements are two programs funded by HB526 and are effective sagebrush conservation tools. Stipulations of each program typically include a grazing management plan allowing adequate rest for sagebrush and associated rangeland species and a "no sagebrush manipulation" clause. There are 101 Wildlife Management Areas conserving 189,800 ha. at an annual cost of $500,000. To date the Upland Game Bird Program spends $700,000 annually and has protected over 161,900 ha. of wildlife habitat, a great portion being sagebrush/grassland. The Department has purchased 32 conservation easements affecting over 60,700 ha and has $2.8 million available each year for additional conservation easements. Comprehensive long-term vegetation monitoring sites are located on many of these projects.

Conclusions

Sagebrush was a dominant native shrub species providing critical forage and habitat for many wildlife species in Montana and throughout the West prior to settlement by European Americans. Despite its ecological importance, the historic distribution of sagebrush has been reduced by a number of human interventions. Land managers do not know how much sagebrush remains in Montana. Therefore, on-the-ground inventorying and mapping of sagebrush throughout the state should be a management priority because it would provide increased emphasis on this critical range taxon and allow us to monitor and improve the sagebrush/grassland type.

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