Cheatgrass and Wildfires in the Intermountain West

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Cheatgrass *(Bromus tectorum* L.) has revolutionized most aspects of the ecology of sagebrush *(Artemisia)* ecosystems in the Intermountain area between the SierraCascade and Rocky Mountains. A great deal has been written concerning cheatgrass in the American west. We will not attempt to review this extensive literature at this time, but refer interested readers to a categorized listing of some of the significant literature on the subject (Table 1). Our purpose is to summarize, from a historical perspective and from our research, aspects of fire ecology in the sagebrush-steppe impacted by cheatgrass.

Natural Wildfires

It is nearly impossible to truthfully reconstruct the extent and frequency of wildfires in the sagebrush-steppe under pristine conditions. The general absence of trees limits the use of fire scars so useful in chronicling fire frequency in forested habitats. We do know that the dominant woody sagebrush species do not sprout once the aerial portion of the shrub is consumed in wildfires. The woody sagebrush species flower in the autumn, after the wildfire season (Young and Evans 1989). The very small achenes, 1.0 by 0.5 mm, do not have a persistent pappus for wind dispersal nor are they actively collected orcached by granivores. The woody sagebrush species do not build seedbanks (Young and Evans 1975). It is thus apparent that stand renewal by wildfires would favor the perennial grass portion of pristine communities, and this herbaceous dominance would only be slowly replaced by sagebrush re-establishment on the site.

There are a number of woody or semi-woody species that are sub-dominants in sagebrush communities. These include rabbitbrush *(Chrysothainnus sp.),* horse-brush *(Tetradymia sp.),* ephedra *(Ephedra sp.)* and several members of the rose family. Most rabbitbrush species readily sprout from crown buds and horsebrush species sprout from root buds if the aerial portion of the plant burns.

Rabbitbrush species are the most abundant sub-dominant shrubs in most sagebrush communities. In communities strongly influenced by cheatgrass, these semi-woody species dominate sagebrush communities for several years (10 to 15) after wildfires (Young and Evans 1974). Although about 80% of the burned rabbitbrush plants will sprout after wildfires, dominance is not solely the result of crown sprouts. The sprouts produce abundant achenes, that have excellent wind dispersal characteristics through a persistent, robust pappus. These achenes germinate and establish in the burned area providing the plants for transitional dominance of the site. In high condition bunchgrass communities, however, extreme expression of rabbitbrush populations does not occur following wildfires. Under pristine conditions, rabbitbrush seedlings would have had to compete with fully stocked perennial grass stands. These stands are released from moisture competition with the burned sagebrush, and enriched with nitrogen through favorable conditions for mineralization following the fire.

Table 1.
Selected literature concerning. cheatgrass in the Intermountain area

Category	References
Classic	Pickford 1932 Robertson and Pearse 1945 Fleming et al. 1942 Stewart and Hull 1949
Overview of cheatgrass	Klemmedson and Smith 1964 Mack 1981 Young et al. 1987
Cheatgrass ecology	Hull and Stewart 1948 Piemeisel 1951 Young et al. 1969 Evans et al. 1970 West 1983
Fire ecology	Wright and Klemmedson 1965

Promiscuous Burning

With the settlement of the Intermountain area, there undoubtedly was an increase in wildfires associated with human activities. Griffiths (1902) reported that in 1899, mountainous rangelands of the northwestern Great Basin were covered by fires set in the early fall by sheep herders and cowboys. At lower elevations, there

were insufficient remnant perennial grasses to carry wildfires through the shrubs. Before cheatgrass was introduced, the more degraded the herbaceous portion of plant communities became from excessive, improperly timed grazing, the more fire proof the sites became (Young and Sparks 1985). The dominant shrubs that were not preferred by livestock increased in density without competition from perennial grasses and in freedom from wildfires.

Attempted Suppression of Wildfires

Early in the 20th century the Forest Service, USDA, obtained control of many of the mountain ranges within the Intermountain area. With establishment of National Forest lands came restrictions on grazing and promiscuous burning; and attempted complete suppression of wildfires. Management of the expansive lower elevation ranges did not occur until the establishment of the Grazing Service, USDI, under the Taylor Grazing Act in the mid 1930s. Fire suppression, on what became Bureau of Land Management (BLM) rangelands did not become a major issue until after World War II.

Introduction of Cheatgrass

Cheatgrass was recognized in the Intermountain area about 1900. It rapidly spread throughout the area, but did not become a wide spread landscape dominant except in specific situations where disturbance was severe and repeated. Abandoned crop land on the Snake River Plain and in eastern Oregon were examples of early dominance by cheatgrass. In the early 1960s it was estimated that only 1% of the 19 million acres of big sagebrush in Nevada had been converted to cheatgrass dominance.

The dominance of cheatgrass was limited by excessive grazing pressure on most rangelands. After World War 11, the number of grazing animals and the season of grazing on public rangeland became increasingly restricted. In the 1960s, grazing management became the rule on virtually all allotments. This management consisted of systems that rotated complete rest from grazing, deferred grazing until after seed ripening, and intense grazing on a yearly basis. These systems of grazing management were designed to favor the recruitment of seedlings of native perennial grasses.

On ranges where sufficient perennial grasses persisted to provide a seed source, these grazing management systems have generally been very successful such that wildfires have returned to some of these lands, with native perennials providing the fuel. Most of the success stories have occurred at higher elevations where environmental potentials are greater and more perennial grasses persist because of steep terrain and distance from stock water.

On low elevation ranges, grazing management has generally been an ecological disaster. Perennial grass recruitment has not occurred and the accumulations of fuel during rest or deferred grazing years provided sufficient fuel for uncontrollable wildfires. The frequency of repeated fires has been sufficient to eliminate sagebrush and sprouting sub-dominant shrubs from large areas.

Cheatgrass as a Fuel

All vegetation will burn under specific conditions, but some vegetation is naturally more prone to burning than others. The very dense, finetextured nature of cheatgrass herbage increases both the chance of ignition and the rate of spread of wildfires. During years when the herbage production of cheatgrass is high, it is virtually impossible and very dangerous to try and suppress wildfires in this fuel type. Native perennial grasses do not mature until late August and September whereas cheatgrass matures in June. This changes the type of fires that occur with the dominance of cheatgrass and extends the fire season for nearly 2 months. Fires in pristine grasslands occurred with cooler night time temperatures as compared to mid summer. The occurrence of fire earlier in the growing season negatively interacts with the phenology of native herbaceous species. Plants that would be undamaged by September wildfires are killed by wildfires in July.

Consequences of Cheatgrass Wildfires

Some 25 years after their estimate that 1% of the sagebrush/bunchgrass ranges of Nevada had been converted to cheatgrass, Young et al. (1976) revised the estimate to 25%. When this second estimate was made it was greeted with disbelief by land managers. Recent estimates developed by land management agencies themselves indicate that the last estimate is actually too low.

During the last two decades, cheatgrass has spread beyond the sagebrush ecosystem into specific environments such as salt desert communities and up into conifer woodlands and mountain brush types of the Great Basin. In the salt desert, cheatgrass has brought catastrophic stand renewal to environments that rarely or have never experienced wildfires, opening up a whole new aspect to cheatgrass/wildfire ecology.

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