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NORTHEASTERN NEVADA WILDFIRES 2006 PART 1 - FIRE AND LAND-USE HISTORY

Kent McAdoo, Area Natural Resources Specialist, UNCE
Brad Schultz, Extension Educator, UNCE
Sherm Swanson, State Range Specialist, UNCE
Gary Back, Principal Ecologist, SRK Consulting (U.S.), Inc.

INTRODUCTION

What can be learned from the conditions leading up to the large wildland fires that burned approximately one million acres in Elko County, Nevada during 2006? Can these fires be avoided? If not, can the large acreages affected be reduced in the future? What is the role of wildland fire as a "natural" occurrence? In order to find answers to these and other wildfire-related questions, the history of the Great Basin landscape must be examined. This is the first of three fact sheets that address the 2006 wildfires in northeastern Nevada. The other two deal with the use of livestock for wildfire reduction (McAdoo et al. 2007a) and how to rehabilitate fire-impacted areas (McAdoo et al. 2007b).

HISTORICAL PERSPECTIVE

Pre-settlement Vegetation

Before settlement by Euro-Americans, much of the Intermountain West was visually dominated by shrubs (Vale 1975). However, "spotty and occasional wildfire probably created a patchwork of young and old sagebrush stands across the landscape, interspersed with grassland openings, wet meadows, and other shrub communities" (Paige and Ritter 1999). The journal accounts of early explorers indicate that some fires appeared quite large. Whether or not Native Americans historically applied widespread use of fire as a land management tool in the Great Basin is still open to debate, although many historical accounts give that indication (Griffin 2002).

In drier regions of the Great Basin where the "Wyoming" subspecies of big sagebrush dominates, fire ecology was different than that in higher precipitation areas (typically upper elevations) where the "mountain" subspecies of big sagebrush is more common. According to Miller and Eddleman (2001):

> "The Wyoming big sagebrush and low sagebrush cover types, with less frequent disturbance events but slower recovery rates, and the mountain big sagebrush cover type, with more frequent disturbance but faster recovery rates, created a mosaic of multiple vegetation successional stages across the landscape. In addition, fire patterns were patchy, leaving unburned islands, particularly in Wyoming big sagebrush cover types because of limited and discontinuous fuels. Plant composition ranged from dominant stands of sagebrush to grasslands."

Miller and Eddleman further stated that, before Euro-American settlement, much of the lower elevation sagebrush steppe landscape was probably composed of sparse shrub stands with a substantial component of

perennial grasses and forbs (wildflowers). Lightning-generated and/or man-caused fires in the mountainous areas created similar mosaics. Differences in slope and aspect, broken topography, and variation in fuel loads resulted in unburned patches after a fire. Extreme weather conditions and insect outbreaks also affected historic patterns of vegetation composition on sagebrush landscapes. The historic vegetation differences among sagebrush plant communities across landscapes and through time are important vegetation management considerations for land managers and users to ponder.

What Caused the Existing Conditions on the Landscape?

Climate changes have obviously influenced fire ecology. According to Miller and Eddleman (2001), the climate for several hundred years prior to settlement by Euro-Americans (the "Little Ice Age") consisted of cooler temperatures and higher precipitation as compared to today's climate. These authors also indicated that post-settlement changes in disturbance factors have changed the sagebrush mosaic pattern on Great Basin landscapes. Factors listed by the authors include altered fire ecology, introduction of exotic plant species, improper livestock grazing, cultivation, pesticides, water diversion, roads, mining, recreation, urban development, and the increase in atmospheric content of nitrogen and carbon. Of these, the combined impacts of the first two (altered fire ecology and exotic species, like cheatgrass) have probably had the most widespread effects on sagebrush-grass plant communities.

ECOLOGICAL CHANGES ON THE LANDSCAPE

Society faces many difficult vegetation management challenges on Great Basin rangelands, and understanding how the existing conditions developed over time is integral to addressing these challenges intelligently. As indicated below, the effects of even "natural" lightning-caused wildland fires can have varying impacts, depending on the site-specific situation.

Not Enough Fire and Discontinuous Fuel Conditions

By starting with the mosaic of grasses and various aged shrub-dominated plant communities described by Paige and Ritter (1999) and Miller and Eddleman (2001), then considering the historic levels of cattle and sheep grazing from the late 1800s through the early 1900s (Young and others 1979), we can reconstruct a likely scenario that initiated the altered fire ecology mentioned above. Historic grazing patterns/levels reduced the native perennial grasses (season-long grazing by cattle) and forbs (spring grazing by sheep), and probably kept the shrubs in check (fall browsing by sheep). When lightning struck, fewer ignitions occurred and few fires spread very far. Large range fires (greater than 10,000 acres) between 1900 and 1960 were uncommon. This is indicated by the lack of range fires reported in the local newspapers of the day (Northeastern Nevada Stewardship Group 2004).

Grazing on public lands came under better management in the 1930s after the Taylor Grazing Act, and the large numbers of sheep declined. As a result of this grazing reduction and especially the continued absence of fire (Gruell 1986), sagebrush responded by increasing in canopy cover and density. This probably resulted in increased competition with grasses and forbs, which further decreased their abundance. The historic excessive grazing levels also allowed halogeton and cheatgrass, both undesirable weeds, to increase. Cheatgrass, an accidental introduction, was first observed in Elko County in 1906 (Young and others 1987). It slowly spread into the low elevation, low precipitation, grass-depleted sagebrush ranges. Although not considered an invasive species early on, cheatgrass did dominate some small areas. But more importantly, it began spreading across the sagebrush landscape, filling the empty spaces between shrubs that were created by the historic overgrazing on perennial grasses (Young and others 1987).

By the 1960s, several large wildland fires occurred in northern Nevada. This was the result of increased shrub densities/canopies capable of allowing range fires to spread as crown fires – spreading from shrub to shrub with or without fine fuels in the understory. The discontinuity of fuels that limited rangeland fires for many decades had changed. Now the continuous fine fuels (cheatgrass under the shrubs) and continuous

heavy fuels (dense sagebrush) resulted in intense and large fires. These intense fires caused high mortality of the remaining perennial grasses and forbs, opening the door for cheatgrass to spread even more and dominate vast acreages.

Too Much Fire and No Perennial Grasses or Shrubs

Millions of acres of sagebrush-dominated Great Basin rangelands have burned in the last 10 years. Approximately one million acres burned during 2006 in Elko County alone. As a result, large portions of lower elevation sagebrush-grass areas are dominated by cheatgrass, an exotic annual invasive weed species. Cheatgrass germinates before most native species; therefore, this weed is highly competitive with desirable native perennial plants for both moisture and soil nutrients. Cheatgrass is also more flammable than native grass species. Fires fueled by cheatgrass are now much more frequent (every 2 to 15 years) than during the pre-settlement period when fires burned approximately every 50 to more than 100 years (Miller and Eddleman 2001) in arid sagebrush rangelands.

The continuous nature of the fuel in large areas almost entirely dominated by cheatgrass (called "monocultures") allows fires to become larger and burn more uniformly than historical fires in the former sagebrush-perennial grass plant communities. The decline of native plant diversity and amounts in the face of this self-perpetuating cycle puts large areas of the Great Basin in danger of further degradation from invasion by perennial invasive weeds that occur in the region. This situation presents an enormous challenge in areas of the Intermountain West where this downward spiral is occurring. For management to succeed and maintain productive rangelands, society must:

(1) reduce the loss of both sagebrush and its perennial understory as a dynamic, but self-sustaining plant community, and
(2) revegetate these large expanses of cheatgrass with resilient shrub-grass-forb communities that will provide habitat for diverse wildlife communities, forage for livestock, and properly functioning plant communities for other land uses.

Not Enough Fire and Too Many Pinyon and Juniper Trees

In some portions of the Great Basin, native pinyon and juniper trees have encroached into adjacent sagebrush communities. Part of this change may be driven by warmer and moister winters and earlier run-off periods, allowing for better tree seedling survival. However, this invasion has been accelerated by a change in fire frequency. Decades of fire control combined with the grazing of fine fuels (primarily grasses) has decreased the frequency of natural fires that historically kept pinyon and juniper restricted to higher elevations.

Miller and Tausch (2001) estimated that pinyon and juniper woodlands in the Intermountain West have increased 10-fold during the last 130 years. Fire every 40 to 50 years, on average, would have periodically removed the pinyon and juniper from sagebrush stands and restricted them to comparatively "fire-safe" sites. Litter (dead plant material) accumulation, changes in soil chemistry, and/or juniper's intensive year-round competition for soil moisture suppress the establishment of shrub and herbaceous species under tree canopies. This in turn reduces the plant diversity that supports sagebrush-associated wildlife species and provides forage for livestock. The management challenge is restoring periodic fire or some fire "surrogate" (something that has similar impacts), like tree thinning or chaining, to re-create the dynamic tension among herbaceous plants, sagebrush, and scattered small trees. Appropriate balance in the composition of the vegetation allows the vegetation to return to a perennial grass-forb state after disturbance, then eventually shrubs, thus maintaining a resilient cycle.

Too Much Sagebrush, Little Perennial Grass, and Areas at Risk to Cheatgrass Conversion

Another habitat condition is perhaps being overshadowed by the cheatgrass and pinyon-juniper problems. Much of the Great Basin has large expanses of sagebrush habitat where sagebrush canopy cover is very dense and the desired perennial grasses and forbs are almost absent (McAdoo and others 2004). Some areas have large amounts of cheatgrass beneath the sagebrush. Areas with abundant

sagebrush and no perennial grasses are one lightning strike (or match) away from becoming only cheatgrass and losing most of their resource productivity. Keeping these sites diverse and productive for all current and future land uses requires reducing the amount of mature sagebrush, increasing the amount of desired perennial grasses and forbs, and facilitating the regeneration of young sagebrush (McAdoo and others 2004). Planned wisely, such management would create a patchwork of sagebrush plant communities with different ages of sagebrush and amounts of perennial grasses and forbs. Both wildlife and livestock would benefit, the plant communities would be less likely to become cheatgrass after fires (which are inevitable), and fires may be smaller and have fewer long-term adverse effects.

CONCLUSION

Since settlement by Euro-Americans, many changes have occurred on the Great Basin landscape. Examining land-use in the context of history provides a reference point for land managers. An increasing number of scientists and bioregional historians have recently indicated that active vegetation management of landscapes, particularly where wildland fire is concerned, is necessary (Pyne 2004; Wisdom et al. 2005; Mann 2005). More detail on active vegetation management of Nevada's rangelands is provided in the third fact sheet of this 3-part series (McAdoo and others 2007b).

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