

## *Risk of Cheatgrass Invasion After Fire in Selected Sagebrush Community Types*

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### Background

The recent emphasis on restoring natural fire processes to the land has created considerable interest and opportunities for the use of prescribed burning to treat sagebrush steppe ecosystems. Prescribed burning is a management tool that can be used to improve or maintain the health and productivity of these plant communities. The potential exists, however, for invasion and dominance of prescribed burn or wildfire sites by cheatgrass (*Bromus tectorum* L.). I discuss here the risk of cheatgrass invasion in Wyoming big sagebrush (*Artemisia tridentata* Nutt. ssp. *wyomingensis*) and mountain big sagebrush (*Artemisia tridentata* Nutt. ssp. *vaseyana*) ecological sites, with a brief reference to threetip sagebrush (*Artemisia tripartita* Rydb.) sites. Additionally, I outline some recommended practices for reducing these risks.

### The Problem

Cheatgrass is an exotic annual and, occasionally, biennial grass native to Eurasia and the Mediterranean. It was probably introduced in the Intermountain West in the 1880s in impure grain seed. By 1981, it was reported to be the dominant plant on more than 40.5 million ha (100 million acres) in the Intermountain West. Recent extensive wildfires in the Great Basin have greatly increased the areas dominated by cheatgrass.

Cheatgrass-dominated sites result in reduced forage on critical winter rangeland for mule deer (*Odocoileus hemionus*), American pronghorn (*Antilocapra americana*), and other game animals. Habitat for sage grouse (*Centrocercus urophasianus*) brood rearing and cover is lost. Cheatgrass has overtaken more than 50% of the Snake River Birds of Prey National Conservation Area, reducing the birds of prey food base and thus the numbers of birds. Competition with sensitive plant species for water and nutrients is increased, and a resultant increased fire frequency can eliminate these plant species from a site. Cheatgrass can dramatically decrease the amount of nitrogen available to perennial plants, since it directly uptakes and depletes nitrogen from the soil. It can also shade out biological soil crusts that fix nitrogen.

Because of its flammability, cheatgrass greatly increases the fire hazard on a site. It can change the fire recurrence interval from the natural 20 to 100 years for sagebrush grassland ecosystems to 3 to 5 years for cheatgrass-dominated sites. The rate of spread, size, and frequency of fire also increase. Cheatgrass fires spread rapidly and may extend into nearby stands of native vegetation, reducing the cover of valuable perennial species. Cheatgrass dominance increases the occurrence of fire earlier in the growing season, which negatively affects native herbaceous species. The frequent cycle of large fires eliminates native shrubs, forbs, and perennial grasses and results in a self-perpetuating stand of cheatgrass. Frequent fires remove all protective plant and litter cover, making the site susceptible to accelerated wind and water erosion and high runoff.

### Competitive Characteristics

Cheatgrass is a vigorous and opportunistic competitor. After

fall germination, its finely divided, fibrous roots grow rapidly and are well developed by the time spring growth begins. The root system quickly occupies the surface soil and takes up most of the soil moisture, depriving species that develop more slowly. Cheatgrass is a prolific seed producer, yielding as many seeds as 448 kg/ha (400 pounds/acre). The seed is normally high in viability and germinates within a few days under favorable conditions. Although less than 13% of seed survives until the following winter, a few seeds may survive for as long as 5 years. Cheatgrass monocultures have low vesicular-arbuscular mycorrhizal (VAM) fungal populations (beneficial fungi that penetrate and colonize the root of a plant, funneling nutrients back to the plant); this increases the difficulty of reestablishing sagebrush and native bunch grasses that require these mycorrhizae.

Cheatgrass is capable of adapting to new habitats. During the last two decades, cheatgrass has spread beyond the sagebrush ecosystem into salt desert communities, mountain brush types, and open conifer—especially Ponderosa pine (*Pinus ponderosa*)—woodlands. Cheatgrass has been identified as the C3 species most positively responsive to increased CO<sub>2</sub> and thus capable of benefiting from global atmospheric trends.

Cheatgrass completes its life cycle in spring, before the summer dry weather begins. Its complete drying and fine structure make it extremely flammable. Frequent fires favor cheatgrass by eliminating perennial vegetation. Its seeds survive in the unburned organic material on a site, either on or in the mineral soil. After fire releases a flush of available nitrogen, cheatgrass utilizes it before perennial grasses have a chance to use it. Rapid growth and vigorous



reproduction ensure cheatgrass dominance in the postburn stand.

### Invasion Risk in Selected Sagebrush Community Types

Wyoming big sagebrush ecological sites are warm and dry, and therefore have a high risk of cheatgrass invasion. Mountain big sagebrush sites have the lowest risk of cheatgrass invasion due to lower winter temperatures and more moisture availability for perennial grasses. Threetip sagebrush sites have intermediate risk in susceptibility to cheatgrass invasion.

### Recommendations

- Minimize burning on the Wyoming big sagebrush range sites.
- Don't burn on southern and western aspects.
- Burn threetip sagebrush sites only when adequate perennial grass exists to recolonize the site.
- Concentrate prescribed burning on the cooler, moister, mountain big sagebrush sites.
- Avoid burning on steep, granitic, drought-stricken sites—especially those with southern and western aspects. They tend to ravel, and they maintain sparse perennial grass cover even under good ecological conditions.

Open pine stands have a moderate to high risk of cheatgrass invasion, depending on elevation. Closed forested sites have a low risk of cheatgrass invasion after prescribed burning, as long as there is adequate postfire overstory or understory vegetation to shade it out.

Prefire assessment and postfire monitoring are important. Inspect all proposed burn sites for the presence of cheatgrass, and look at adjacent areas that could be a seed source. Cheatgrass is easy to identify from a long distance when it is in the purple stage just before senescence, usually in the latter part of June. The soil surface layer should also be examined for seed. Chemically treat

infested areas if possible, or select alternative burn sites. Assess the adequacy of preburn perennial grass cover. Perennial grasses should be vigorous, with at least one plant per square meter. Postfire monitoring should note the response of native vegetation to the burn and to the location, size, and density of cheatgrass invasions.

Burning tends to increase palatability of native forage and acts as a magnet for grazing animals. Burn an area large enough to not be easily overgrazed by a few livestock or elk (*Cervus canadensis*). When conducting smaller test burns, protect the burn area from grazing with electric fencing. On larger burn areas, use a mosaic burn pattern.

Instruct firefighters in precautions to avoid spreading cheatgrass by removing seeds from clothing and equipment transported into burn areas. Chemically treat helipads and fire lines infested with cheatgrass.

It is important to maintain good perennial grass cover on prescribed burn areas. Idaho fescue (*Festuca idahoensis* Elmer) is susceptible to damage from burning. Use prescriptions that are least harmful to Idaho fescue. Spring burns should be in March, before Idaho fescue breaks dormancy; however, fall burning during the cool conditions in late September or October is recommended. Some resource specialists recommend burning late enough that fescue will not break dormancy before winter sets in and freezes the burn areas. Other ecologists recommend not burning once fescue has broken dormancy in response to fall rains and is actively growing. California BLM personnel use sweet clover (*Melilotus* spp.) as a cover crop for the perennial grasses.

A recommended practice is to rest a planned burn area for one growing season before burning, to build up adequate fuels. However, the Fire Effects database (<http://www.fs.fed.us/database/feis/>)

recommends allowing grazing for 1–2 years before burning Idaho fescue to reduce mortality by eliminating some fuel buildup above the root crown. Burned areas should be rested at least 2 years to allow full recovery of perennial grasses. Long-term postfire management is important in maintaining perennial grasses and reducing cheatgrass invasion.

Biological soil crusts (e.g., microbial crusts, cryptogams) help deter cheatgrass invasion. The avoidance of livestock grazing on areas with good crust cover, during the dry season when they are most susceptible to damage, is recommended. Don't burn just for burning's sake. Prescribed burn goals and objectives should be ecologically based and achievable.

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