# Plateau® herbicide succeeds in controlling cheatgrass

BASF
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Photo by Chris Evans, Illinois Wildlife Action Plan, Bugwood.org

## Non-native cheatgrass cheats farmers and ranchers out of their land

### 100+ million acres affected

More than 100 million acres of land in the western United States are infested with cheatgrass, making it the most abundant invasive species in the nation.

As its name implies, cheatgrass cheats landowners and ranchers from earning the full economic benefit of their land by displacing native plants, reducing biodiversity, and spreading fires. According to Cornell University researchers, invasive species such as cheatgrass cost the nation some $138 billion annually in ecosystem damages, reduced yields, lost forest products, and control efforts.[1]

Cheatgrass is the name for several types of annual brome grasses. The most common type, downy brome *(Bromus tectorum)*, is most prevalent in Idaho, Nevada, and Utah, where it has turned massive and once-flourishing rangelands into arid, desolate fields. Nearly 17.5 million acres in Idaho and Utah are almost totally infested by cheatgrass. Increasing by an estimated 20 percent each year, cheatgrass also threatens significant areas in Colorado, Kansas, Montana, North Dakota, Oregon, South Dakota, Washington, and Wyoming.

### An alien grass

Cheatgrass is an alien grass. It was first introduced into the western U.S. in the late 1800s as a packing material in imported goods from Asia. Distributed initially along the rail lines of the rural West, cheatgrass spread rapidly over the past century and is now found in all 50 states. It is most predominant in the West.

Cheatgrass seeds spread easily, with small spines or awns that are about a half-inch long and readily attach to clothing or animals. Additionally, cheatgrass seed is easily dispersed, lodging within moving vehicles and being deposited many miles away.

Covering the ground in a fine weedy mat, cheatgrass is an annual weed that is often first green. Its narrow leaves grow quickly in the spring, and at maturity its foliage and seedheads often turn purplish before drying completely and appearing brown or tan. Cheatgrass typically reaches 50 to 60 cm (20 to 24 inches) tall, and its finely divided, fibrous root system may reach a depth of about 30 cm (12 inches).

Cheatgrass is a prolific seed producer. A single stalk of cheatgrass can produce 1,000 seeds, and an acre can generate more than 500 pounds of seed. In comparison, it normally takes just 10 to 20 pounds of grass seed per acre to establish a lawn in the typical American yard. Even at a mature height of just 5 to 10 cm (2 to 4 inches), cheatgrass can still flower and produce viable seed.

Reproducing solely from seed, cheatgrass usually germinates in fall or winter, continues to root and grow over winter, and siphons away all available water and nutrients in early spring. While cheatgrass can be found in rangeland, ponderosa pine forests, and even the desert, it's most common in land that's been disturbed or neglected, such as recently burned rangeland and wildlands, waste areas, abandoned fields, eroded areas, and overgrazed grasslands.

PLATEAU herbicide

## The problems of cheatgrass

While many in the West use cheatgrass to provide early-season forage for cattle and sheep, its nutritional benefits are minimal and short-lived. Cheatgrass can be grazed in the spring, when it is in its vegetative state, but it remains a nutritional forage source for just two to three weeks — whereas perennial grasses can provide good forage for three to four months. Even then, cheatgrass has a much lower crude protein and ash content than such grasses as soft chess and filaree, according to a report from the University of California, Davis.

> Because of the thick mat and flammability of cheatgrass, a cheatgrass-driven fire can be very dangerous to humans and dwellings standing in its way, shooting flames skyward 15 feet or higher.

Once cheatgrass is nearly mature and dries, it isn't used as forage by deer, cattle, or other grazing animals because it provides almost no nutritional value. Typically by late spring, its long, stiff seeds are sharp enough to puncture the lining of the mouth, throat tissue, and intestines of livestock and other grazing animals, causing sores and infection and reducing feed intake and weight gain.[2] It can also injure the eyes of grazing livestock.

In cropland, the tendency of cheatgrass is to extract higher levels of moisture and nutrients from the soil over desired species, reducing yields. Because cheatgrass roots grow during the winter, they can control of a site, outcompeting established perennial bunch grasses that don't come out of dormancy until later in the spring. Cheatgrass also can gain control of newly seeded sites, stealing moisture and nutrients before the seedlings of other species are established.

A study conducted in the mid-1990s showed that cheatgrass was costing wheat farmers in the West an estimated $350 million to $375 million in lost yield and control costs annually.[3] And in a 2001 study, cattle that grazed on cheatgrass-infested rangeland gained 2.0 to 2.3 pounds less per head per day than cattle that grazed on non-cheatgrass-infested land.[4]

The tendency of cheatgrass to displace native vegetation is particularly troublesome. For instance, in the Great Basin, cheatgrass has shunted away the native sagebrush steppe and now dominates 25 million acres — roughly one-third of the region. That's significant because sagebrush, in addition to being much less flammable than cheatgrass, also provides food and shelter for animals. A 2002 report from the U.S. Geological Survey reports that the loss of sagebrush ecosystems in the West negatively impacts many of the more than 350 species of plants and animals that rely on sagebrush for food or shelter. The Bureau of Land Management estimates that cheatgrass invades 4,000 acres each day.

## A dire fire danger

Potentially the greatest negative effect of cheatgrass is its tendency to burn rapidly and often. Because cheatgrass dries four to six weeks earlier than native perennials and is susceptible to fire one to two months longer in the fall, it is the primary source of major fires throughout the West each year. In 2002, wildfires cost $1.4 billion to suppress in the United States, according to the U.S. Forest Service.

While fire is a natural part of the sagebrush grassland ecosystem, fires in these types of areas usually occur at intervals of 60 to 100 years, and burn only a few hundred acres. In contrast, cheatgrass-infested areas burn at a frequency of every three to five years and consume hundreds of thousands of acres during one wildfire.[5] The disparity is due to the fact that cheatgrass dries out early in the season, forms a continuous mat and is fine-textured, increasing its chances to ignite and spread.

Because of the thick mat and flammability of cheatgrass, a cheatgrass-driven fire can be very dangerous to humans and dwellings standing in its way, shooting flames skyward 15 feet or higher. Some cheatgrass fires have traveled an estimated 20 to 40 mph, overrunning firefighters and their equipment.[6]

Fires that occur in areas with native vegetation burn in patches, leaving some areas of wildlife habitat remaining. But cheatgrass fires spread farther, carrying fire to otherwise isolated plant communities and completely devastating vast stretches of land.

As native sagebrush, serviceberry, bitterbrush, rabbitbrush, and perennial grasses are burned away in cheatgrass-fueled fires, they are replaced entirely by cheatgrass, creating a monoculture — a plant community of one. Unless cheatgrass is controlled and proactive reseeding is conducted, it is virtually impossible for native grasses and brush to re-establish themselves.

While fire may destroy cheatgrass plants, it does nothing to the thousands of cheatgrass seeds typically in the soil. Once fire scorches an area, the remaining cheatgrass seedbank outcompetes native plants and ultimately destroys the native ecosystem.

## The solution is at hand

Removing cheatgrass can often be difficult and costly, depending on the measures used. Current control measures include grazing and prescribed burning programs. But these methods are limited and can be costly and not wholly effective.

It's possible to partially control cheatgrass through grazing, but there are significant costs. First, you need to fence in a large number of animals within a small area for a brief amount of time, requiring labor and fencing supply costs. Even if all of this is done correctly, a cheatgrass plant still needs to be clipped off (bitten off) at least 12 times to stop seedhead formation. This is nearly impossible even under intensive grazing.

The long-term ability to control cheatgrass through prescribed burning is uncertain, because of the tendency of cheatgrass to proliferate in post-burn areas and reduce the prevalence of desirable plants. For example, a 2002 report by the Natural Resources Conservation Service in Idaho found that a prescribed burn may prevent heavy cheatgrass re-establishment, it usually resulted in a greater seed set. However, prescribed burning can be appropriate if used to remove thatch and followed by herbicide treatment and reseeding. Whether or not herbicide treatment is necessary after a prescribed burn depends on the original vegetation. For example, areas that are mostly sagebrush with a cheatgrass understory will burn very hot, killing the majority of seed (including cheatgrass) as well as brush and bunchgrass crowns. In such instances, it may be possible to revegetate without using an herbicide and keep the sagebrush community intact. However, areas that are dominated exclusively by cheatgrass will not burn hot enough to kill the cheatgrass seed and will require herbicide treatment and aggressive replanting to reclaim.

Many landowners and governmental agencies are exploring the use of a **Smart Herbicide**™ to help successfully control cheatgrass infestations.

A **Smart Herbicide** controls cheatgrass while allowing desirable native plants to flourish, especially if used in conjunction with a competitive plant reseeding program.

**Plateau® herbicide**, a **Smart Herbicide** from BASF Corporation, attacks a specific enzyme found only in plants — not humans or animals – to control growth. Unlike other herbicides, **Plateau herbicide** is the first product to effectively control cheatgrass without affecting other desirable types of plants. It's nonvolatile and has no grazing restrictions.

Fall is the ideal season for treatment of cheatgrass with **Plateau herbicide**. **Plateau herbicide** is most effective as a preemergence treatment, and glyphosate may be used with **Plateau herbicide**, offering a second mode of action to aid in control of cheatgrass. This combination may be applied in the spring after cheatgrass has emerged, although such applications should be limited in areas where desirable grasses are not present. Through application of **Plateau herbicide** or **Plateau herbicide** plus glyphosate, landowners and wildlife managers can enhance the development of desired vegetation, improve forage quality, and reduce the risk and cost of deadly wildfires.

### Plateau herbicide can reduce the impact of wildfires

Results of a study released in 2002 by BASF and Synergy Resource Solutions Inc. show that fire intensity can be significantly reduced in cheatgrass-infested areas treated by **Plateau herbicide**. The study found that the height of flames in treated areas can be reduced by as much as 88 percent and the rate at which the fire spreads can be lowered by as much as 95 percent, compared to untreated areas. Reducing fires to this level can allow firefighters to control blazes with hand tools and create effective firebreaks for communities in cheatgrass-infested areas.

# Application recommendations for Plateau herbicide on cheatgrass following a fire event

## For release of remnant vegetation after fire

**Fall Application. Plateau herbicide** can be used to control cheatgrass to reduce competition and aid in release of remnant vegetation after a fire.

After a fire event, when the majority of carbon residue has blown away, apply **Plateau herbicide** at 2 to 8 oz./A, prior to cheatgrass emergence. A combination of **Plateau herbicide** plus glyphosate may be also used if cheatgrass has begun to emerge. Rainfall and soil type are important factors when selecting the appropriate application rate of **Plateau herbicide**.

**Plateau herbicide rate (2 to 8 oz./A)**
**Plateau herbicide plus glyphosate (Plateau herbicide 2 to 8 oz./A, glyphosate 4 to 14 oz./A)**

| **Regional rainfall** | |
|---|---|
| Low moisture | Lower end of rate range |
| High moisture | Higher end of rate range |
| **Soil type** | |
| Coarse (light) soils | Lower end of rate range |
| Clay, high organic matter (heavy) soil | Higher end of rate range |

An adjuvant is needed only if cheatgrass is emerged. If cheatgrass is beyond the four-leaf stage, prior to tillering, increase the rate of **Plateau herbicide** to 6 oz./A plus surfactant or use **Plateau herbicide** plus glyphosate plus surfactant.

## For revegetation after fire

**Fall Application**. After an area has burned, leaving no vegetation or ground litter, **Plateau herbicide** can be used to stop reinvasion of cheatgrass and aid in revegetation of desirable grasses and forbs. After a fire event and after the majority of carbon residue has blown away, apply **Plateau herbicide** prior to cheatgrass emergence at these recommended rates:

| Regional rainfall | Plateau herbicide rate (oz./A) | Plateau herbicide and glyphosate rate oz./A |
|---|---|---|
| Less than 7” | 2 to 4 | Plateau herbicide 2 to 4, glyphosate 4 to 8 |
| 7” to 12” | 4 to 6 | Plateau herbicide 4 to 6, glyphosate 8 to 10 |
| Greater than 12” | 6 to 8 | Plateau herbicide 6 to 8, glyphosate 10 to 14 |

If cheatgrass is emerged, use **Plateau herbicide** plus glyphosate at the recommended rates above, plus nonionic surfactant (NIS). If cheatgrass is beyond the four-leaf stage or beginning to tiller, use 2 to 4 oz. **Plateau herbicide** and 16 to 20 oz. of glyphosate + NIS. Apply prior to planting only. Cheatgrass must be actively growing to achieve acceptable results.

## Time of herbicide application versus time of planting recommendation for best results

| Type of planting | Plateau herbicide application |
|---|---|
| Drill seeding | Prior to planting |
| Broadcast seeding/ no incorporation | Prior to seeding |
| Broadcast seeding/ shallow incorporation | After incorporation |

# Application recommendations for Plateau herbicide on cheatgrass, unrelated to a fire event

## For release of desirable vegetation/removal of fine fuel from existing vegetation

**Areas with Less than 30% Ground Litter:**
**Fall Application.** In areas where cheatgrass is becoming a fire hazard and/or threatening desirable plant species through competition, **Plateau herbicide** can selectively remove the cheatgrass and release the desirable grasses, forbs and shrubs in the area.

For a release treatment or fuel break, use a fall application of 6 to 8 oz./A of **Plateau herbicide** applied prior to cheatgrass emergence.

If cheatgrass is emerged, but prior to the four-leaf stage and before a hard freeze, add an adjuvant. Up to 12 oz./A **Plateau herbicide** may be used. See label for desirable species tolerance.

**Areas with Greater than 30% Ground Litter:**
**Fall Application.** In some areas where cheatgrass has been long established, a thick mat or duff layer of dried cheatgrass has accumulated. This thick mat makes it difficult for **Plateau herbicide** to reach the soil and prevent cheatgrass germination. To ensure a greater rate of success in this type of situation, follow this set of recommendations:

- 10 to 12 oz./A **Plateau herbicide** must be applied in fall, prior to cheatgrass emergence.
- Apply herbicide in at least 20 gallons per acre of water for ground application.

## For revegetation into cheatgrass-infested area

**For best results - Fall application**. Remove cheatgrass plant litter (i.e., intense grazing, disking, raking, etc.).

After removal of as much plant litter as possible, apply **Plateau herbicide** at 4 to 8 oz./A prior to cheatgrass emergence. **Plateau herbicide** plus glyphosate may also be used in these environments as a preemergence or early postemergence treatment where desirable species are not present. Site considerations such as rainfall and soil type are necessary to select the appropriate rate of **Plateau herbicide**.

**Plateau herbicide rate (4 to 8 oz./A)**
**Plateau herbicide plus glyphosate (Plateau herbicide 4 to 8 oz./A, glyphosate 8 to 14 oz./A)**

| Regional rainfall | |
|---|---|
| Low moisture | Lower end of rate range |
| High moisture | Higher end of rate range |
| **Soil type** | |
| Coarse (light) soils | Lower end of rate range |
| Clay, high organic matter (heavy) soil | Higher end of rate range |

An adjuvant is needed only if cheatgrass is emerged.

Planting into cheatgrass litter often results in revegetation failures due to poor “soil to seed” contact. Cheatgrass litter is a poor seeding condition.

If cheatgrass is beyond the four-leaf stage or beginning to tiller, add glyphosate at 12 oz./A to the **Plateau herbicide** plus nonionic surfactant mix. Apply prior to planting only. Cheatgrass must be actively growing to achieve acceptable results. All remnant plants will be removed with this treatment.

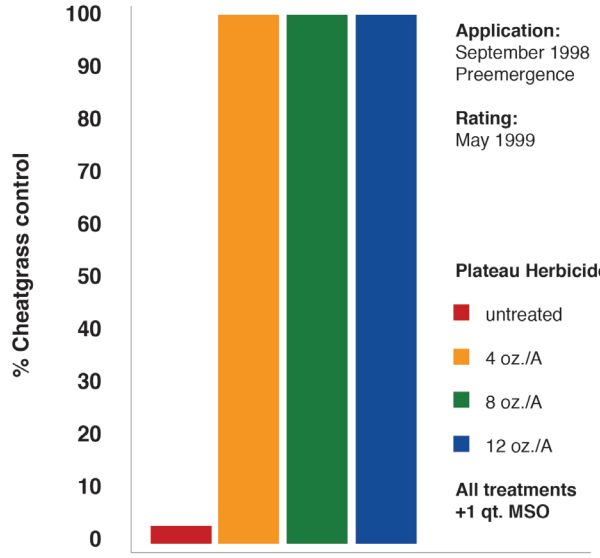
## Time of herbicide application versus time of planting, recommendation for best results

| Type of Planting | Plateau herbicide application |
|---|---|
| Drill seeding | Prior to planting |
| Broadcast seeding/ no incorporation | Prior to seeding |
| Broadcast seeding/ shallow incorporation | After incorporation |

**Spring applications are not recommended because of poor cheatgrass control and inconsistent response from desirable plant species.**

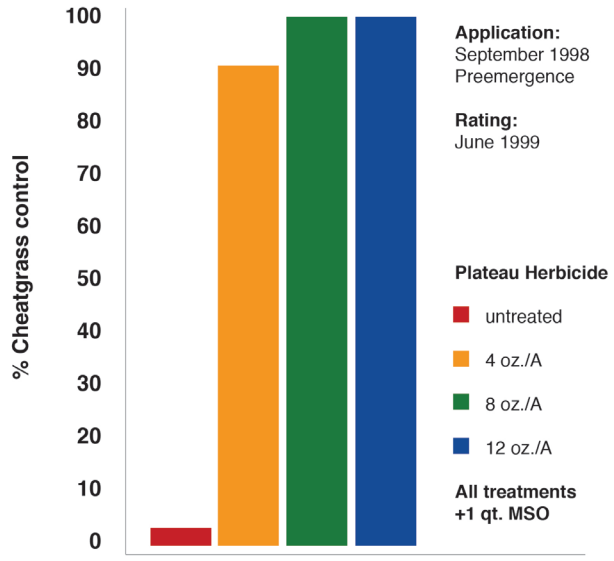
The following information is a summary for control and restoration of Bromus-infested areas using **Plateau herbicide**. Several BASF, university, and private research trials have been conducted, with the majority of trials established in the same manner. All the plot work reviewed in the following tables was sprayed with a backpack sprayer and a 10-foot boom. Nozzle size, gallons per acre, pressure (psi), and plot size varied between researchers. All treatments contained a methylated or ethylated seed oil surfactant at 1 quart per acre, unless noted otherwise. Contributing researchers include Dr. Steve Dewey at Utah State University; Celestine Duncan of Weed Management Services; and Dr. Dan Beran, Dr. Joe Vollmer, and Dr. Jennifer Vollmer of BASF.

**Table 1. Cheatgrass control/Fall application, Methow Wildlife Area, Wash.**



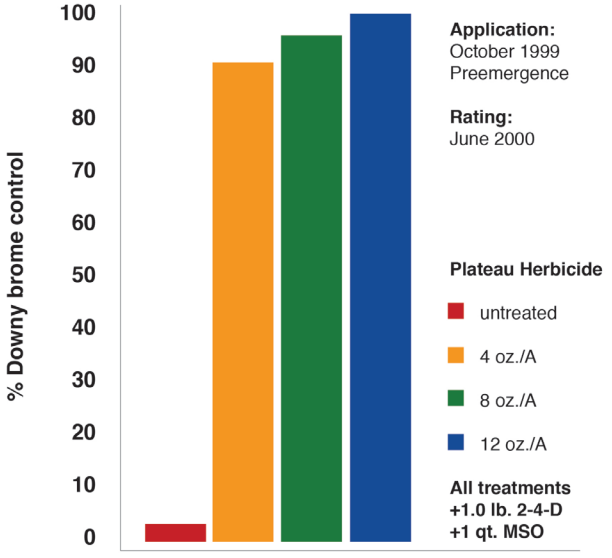

Fall applications, or applications preemergence to cheatgrass germination, show the most consistent cheatgrass control results. One study that illustrates this was conducted at Methow Wildlife Area in Washington by Dr. Joe Vollmer. Applications were made in September 1998. Spring ratings showed 100% control from even the low rate of 4 oz./A of **Plateau herbicide**.

**Table 2. Downy brome control/Fall application, East Helena, Mont.**




A second study illustrating control at low rates when applied preemergence was conducted in East Helena, Mont., by Celestine Duncan. Applications were made in September 1998. Spring ratings showed 91% control from the low rate of 4 oz./A and increased control of 100% by the 8 oz./A rate of **Plateau herbicide**.

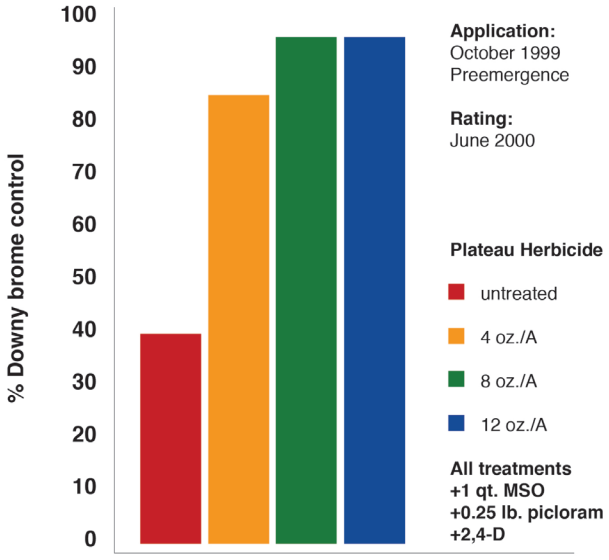
**Table 3. Downy brome control/Fall application, Cedar City, Utah**




In areas where broadleaf weeds are the target species but an annual brome is present, **Plateau herbicide** can be added to the tank to remove the annual brome and aid in release of the desirable species. Research conducted by Dr. Dan Beran showed excellent downy brome control when 4 oz./A **Plateau herbicide** was added to a standard 1.0 lb. rate of 2,4-D.

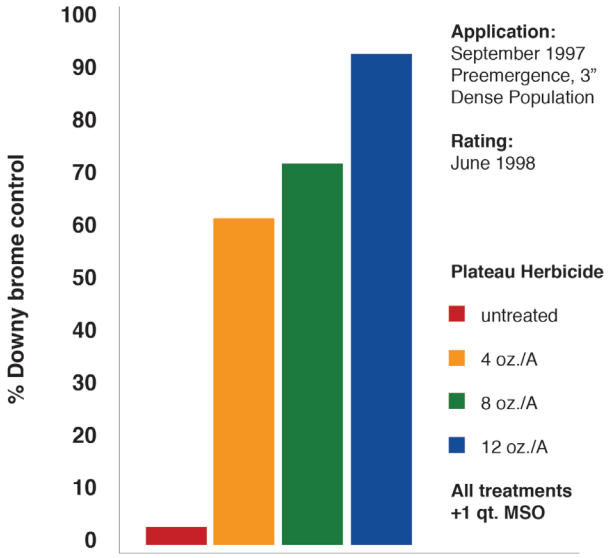
Photo by Tom Heutte, USDA Forest Service, Bugwood.org

**Table 4. Downy brome control/Fall application, Cedar City, Utah**




Control of spotted knapweed with picloram will often release a carpet of downy brome. Desirable species have little competitive advantage over the brome and will have a difficult time revegetating the area until the brome is removed. Addition of 4 oz./A **Plateau herbicide** to a picloram or picloram plus 2,4-D tank mix will control the annual brome and aid in release of the desirable species.

**Table 5. Downy brome control/Fall application, Utah State University**




Fall applications of **Plateau herbicide** applied postemergence are not as consistent in annual brome control as a preemergence application. This trial emphasizes the importance of applying **Plateau herbicide** prior to emergence of the annual brome. A trial conducted at Utah State University by Dr. Steve Dewey showed that treatment of a dense population of 3" downy brome required 12 oz./A **Plateau herbicide** to achieve acceptable control.

## Citations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[3]Gurusiddaiah, S., D.R. Gealy, A.C. Kennedy, and A.G. Ogg, Jr. 1994. "Isolation and characterization of metabolites from *Pseudomonas florescens* strain D7 for the control of downy brome (*Bromus tectorum* L.)." Weed Science 42:492-50

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[5]Whisenant, S.G., 1990 "Changing fire frequencies on Idaho's Snake River Plains; ecological and management implications." Pages 4-10 in E.D. McArthur, E.M. Romney, S.D. Smith, and P.T. Tueller, eds. Proceedings of a Symposium on Cheatgrass Invasion, Shrub Die-off, and Other Aspects of Shrub Biology and Management. U.S. Forest Service Gen. Tech. Rep. INT-276. Intermountain Forest and Range Experiment Station, Ogden, UT.

[6]Devine, R. 1993. "The cheatgrass problem." Atlantic Monthly 271:40-45.


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