

Field Guide for Managing Cheatgrass in the Southwest



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Cheatgrass (*Bromus tectorum* L.)

Grass family (Poaceae), Bromeae tribe

Cheatgrass is an invasive plant common to the southwestern United States. It is listed in New Mexico as a Class C noxious weed species which allows management decisions to be determined at the local level based on feasibility of control and level of infestation.

This field guide serves as the U.S. Forest Service's recommendations for management of cheatgrass in forests, woodlands, rangelands, and deserts associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Cheatgrass (synonyms: downy brome, drooping brome, June grass, bronco grass, early chess, military grass, thatch brome grass, Mormon oats) is an introduced, early emerging annual grass native to southern Europe, northern Africa, and southwestern Asia. First identified in the northeastern U.S. in 1861, it is now found throughout all 50 states and is widely distributed across the western United States. As a seedling or young plant, cheatgrass is bright green with hairy blades and a dense, drooping seed head. Maturing foliage and seed heads are purplish in color that later change to brown and tan colors when dried out.

Growth Characteristics

- Annual or winter annual (biennial); shade intolerant; seed germinates mostly in late fall or early spring.
- Slender seed stalks grow erect or are decumbent at base; 4 to 30 inches tall.
- Slender, dense, 1-sided inflorescence with multiple drooping spikelets. Each spikelet has 5 to 8 florets.
- Twisting leaf blades glabrous to hispid (covered with stiff or rough hairs); soft, short hairs on leaf sheaths.
- Forms tillers with 1 to 2 tillers or as many as 20 tillers per main root.

- Fibrous root system continues to grow during winter thereby supporting greater penetration of the soil profile by spring. Plants also send out lateral roots to maximize access to soil moisture.
- Reproduces only by seed. Each plant may produce between 25 and 5,000 seeds which typically mature by middle to late June; seeds are awned and readily attach to clothing and fur. Seed may remain dormant for 2 to 3 years in the soil, even at high temperatures.

Ecology

Impacts/threats

Cheatgrass is an aggressive invader of sagebrush, pinyon-juniper, ponderosa pine, mountain brush, and other rangeland and forest communities. Its ability to rapidly grow and reproduce before most native grasses makes it especially troublesome on range, croplands, and pastures. Cheatgrass can alter the normal fire pattern in vegetated areas when its populations become dense and dominant. After wildfire, cheatgrass thrives and can out-compete native herbaceous and shrubby seedlings such as antelope bitterbrush. The presence of cheatgrass with its awned seed can diminish recreational opportunities, reduce available forage, degrade wildlife diversity and habitat, and decrease land values.

Location

Cheatgrass grows in a variety of habitats and climate zones, generally preferring areas with 6 to 22 inches of precipitation. It grows in most soil types, although it prefers relatively coarse-textured soils, and tends to avoid areas with saline or compacted soil. It commonly invades disturbed areas such as recently burned areas, roadsides, cleared areas, railway and utility rights-of-way, overgrazed rangelands, cultivated fields, and vegetation management projects that involved soil disturbance.

Spread

The hairy, sharply awned seeds of cheatgrass are transported by various mechanisms including wind, water, birds, small rodents, etc. They adhere easily to clothing, fleece, and animal fur. The seed is often a contaminant in grain, hay, and

straw. Seed carried on undercarriages of vehicles and road maintenance equipment is a major means of long distance transport.

Invasive Features

Cheatgrass germinates early, and its roots grow rapidly during winter which allows uptake of greater soil moisture for rapid spring growth, early maturation, and increased drought tolerance. Its potential for high population densities and fine-textured fuels increases the likelihood for fire ignition and spread. As a result, the greater frequency of fires occurring in cheatgrass infested areas tends to favor overall cheatgrass dominance by removing reproduction of competing native plants.

Management

Choice of actions to take for cheatgrass control primarily depends on the management goals and objectives for the site. Control is particularly necessary when dense, competitive populations of cheatgrass block attainment of goals and objectives for land management. When implementing cheatgrass management, an adaptive approach should be followed that will allow adjustments to be made as necessary. The following actions should be considered when planning the management approach:

- Maintain healthy plant communities to prevent or limit cheatgrass infestations.
- Limit disturbance and revegetate quickly with desirable plants following a major disturbance.
- Detect, map, and eradicate new populations of cheatgrass as early as possible. Keep annual records of reported infestations.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Encourage use of spray washing stations to reduce seed spread when mechanized equipment is utilized inside or near an infestation.

Prioritizing areas for treatment through a combination of

control methods will enhance the long-term success rate for managing cheatgrass. Before initiating any treatment, examine every proposed site closely to determine if native grasses will return naturally or if reseeding is necessary. If desirable native plants are common, they will often flourish once cheatgrass is removed, thereby allowing natural restoration. Reseeding should particularly be considered if native plants are nearly absent.

Table 1 summarizes management options for controlling cheatgrass under various situations. The selection of individual control method(s) for cheatgrass depends on the degree and density of infestation, current land use, and site conditions (accessibility, terrain, microclimate, other flora and fauna present, etc.). Other important considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

Physical Control

Physical methods to control cheatgrass should focus on removing plants and reducing seed production. Most methods require proper timing and may need to be repeated to reach an acceptable level of control. Seed reserves of desirable native species sufficient to repopulate a site following cheatgrass suppression or removal can increase effectiveness of control methods.

Manual Methods

Hand pulling, cutting, or digging – For small infestations of cheatgrass, hand pulling or hoeing before seeds are produced (approximately 1 week after flowering) will reduce seed but may not completely eliminate the infestation. Several consecutive years of hand removal may be required to reduce seed bank reserves. When pulling, extract as much of the root as possible.

Mechanical Methods

Tillage – Disking or other mechanical control methods alone may encourage further dominance, since disturbance coupled with a well-aerated seedbed favors cheatgrass establishment. When repeatedly done, disking or tillage

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fence lines, and noncrop areas	Mow or grade before seed production. Repeat every 2 to 3 weeks or until flowering is complete.	Implement sanitary requirements for vehicle operations and reporting of infestations along roads. Avoid excessive disturbance. Consider reseeding with desirable native perennials after cheatgrass control.	If practical, late fall and early spring grazing with livestock will reduce seed production and decrease risk of wildfire; however, heavy grazing may promote infestation.	Use truck spraying equipment. Wash underneath vehicle afterward to prevent spread.
Rangeland, pasture, or riparian corridors	Use tillage with disc or plow to bury seed 4 to 6 inches deep after cheatgrass emerges in spring. Avoid excessive disturbance. Repeat if necessary. Consider prescribed burning in combination with herbicide or reseeding efforts. Burning of pure stands may increase dominance.	Use certified weed-free seed and hay. When moving livestock or vehicles through infested areas, inspect and remove seed from animals, clothing, and vehicles before entering uninfested areas. Avoid excessive disturbance. Consider reseeding with desirable native perennials after cheatgrass control.	Late fall and early spring grazing with livestock will reduce seed production and decrease risk of wildfire; however, heavy grazing may promote infestation.	Use ground broadcast sprayer on fairly level ground or use backpack sprayer for areas difficult to access. Wash underneath vehicle afterward to prevent spread. Broadcast spraying by aerial methods may be used on thicker stands if allowed.
Wilderness, other natural areas, and/or small infestations	Manual methods (such as hand pulling) to remove plants may be needed to protect other resources.	Use certified weed-free seed and hay. When moving livestock through infested areas, inspect and remove seed from animals and clothing before entering uninfested areas. Post signs warning visitors to remove seed from clothing or animals before leaving infested areas. Avoid excessive disturbance. Consider reseeding with desirable native perennials after cheatgrass control.	Same as above.	Use backpack sprayer.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

operations may be effective if cheatgrass seed is buried at least 4 to 6 inches deep. The moldboard plow is an equipment option for this purpose but the implement is less effective when used in rocky soils.

Mowing – Repeated mowing every 2 to 3 weeks during spring and summer may be as effective as an application of glyphosate. However, mowing just a single time has not been found to be effective in preventing seed production since plants often rapidly regrow and still produce seed.

Prescribed Fire

Fire can be a highly disruptive tool in cheatgrass stands as it often leads to a displacement of native desirable plants and an increase in cheatgrass density and dominance. Prescribed burning in certain areas with mixed shrub and grasses during late spring to early summer has been used with some success as an aid to cheatgrass control. Prescribed burning is usually more effective when used in combination with other control methods such as chemical control or reseeding with desirable, native perennial species.

Cultural Control

Land managers, the local public, and road crews should be educated as to how to identify invasive species so they can help report all suspected infestations. Vehicles, humans, and livestock should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles and livestock should be implemented to help stop dispersal. In cultivated fields, crop rotation is widely used as a means of reducing cheatgrass. In some cases, reseeding with desirable native perennials may be necessary after cheatgrass control.

Biological Control

Grazing

Cheatgrass does not compete well with established perennial grasses; therefore, proper grazing management and practices that encourage growth of perennial grasses will aid in cheatgrass suppression. Cheatgrass provides good quality forage for about 6 to 8 weeks early in the season, which is also the optimal time to graze. However, mature cheatgrass can have negative effects on livestock when consumed in late spring and summer due to the presence of the stiff awns on its seed. To reduce cheatgrass density and size, graze while the cheatgrass is green during the spring and again in the fall by using a high intensity, short duration approach. Proper timing and close management of livestock is required to minimize impact to nontarget desirable plant species. Grazing newly emerged cheatgrass in the late summer or fall when it is less likely to regrow will reduce fuel levels during wildfire season. Although cheatgrass grazed in the spring may regenerate new culms and still produce seed, a reduction in seed production is possible if grazing is practiced twice per year for 2 consecutive years.

Classical Biological Control

At present, no biological control agents have been approved by USDA for use on cheatgrass. Potential biological control agents currently being researched include head smut fungus, a pink mold, and a variety of phytotoxins. Methods to manipulate nutrients and soil microbes as a means for

cheatgrass control are also being studied.

Chemical Control

Herbicides listed in table 2 will effectively control cheatgrass when properly applied; however, these herbicides may also impact nontarget species as they are generally nonselective in nature. Therefore, caution should be taken if nontarget plants (including woody species) need to be protected. Each herbicide product will have different requirements and restrictions. Thus, it is important to read the label carefully and follow all instructions and guidelines when mixing and applying chemical herbicides.

Herbicides approved for use on cheatgrass are usually best applied in fall or early winter before soils are frozen. An optimal period for fall application is between the first light frost and the first heavy frost after which all applications should be stopped. Herbicide treatments are less efficient in the spring once cheatgrass starts to enter its early leaf development stage. If a spring application is made, then plants should be sprayed when they are growing vigorously and are no more than 2 to 3 inches tall. Ideally, whenever any area is sprayed, nearby nontarget native plants should be dormant and protected from any off-target drift or soil movement.

All herbicides listed in table 2 can be applied by broadcast or spot spray methods. A calibrated backpack sprayer should be used for smaller, less dense infestations. For larger areas with a dense infestation, it may be more practical to use an ATV or UTV sprayer or a conventional boom sprayer that is pulled or mounted to a truck or tractor.

For control of cheatgrass over broad areas, herbicide spraying should be designed to be part of a complete restoration program. A herbicide program can reduce cheatgrass populations while allowing greater numbers of native plants to become established from the increase in soil moisture content. Fall is the preferred season to apply herbicide on cheatgrass, and it usually offers the greatest chance for seeding success on rangeland and pastures. Since reseeding is often problematical, it may take several replanting efforts to establish desired plants.

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example ¹	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example ²	Time of Application	Remarks
Imazapic	Plateau	2–12 ounces + 1 quart methylated seed oil (MSO)	0.25–1% + 1% MSO	Fall or spring	Amino acid inhibitor; residual. Broad spectrum weed control for roadsides and noncrop areas. Controls annual and perennial weeds with minimal effects on cool and warm season perennial grasses. May leach into groundwater. Not for use along streams and rivers.
Imazapic + glyphosate	Journey	16–21 ounces + 1 quart MSO	1% + 1% MSO	Fall or spring	Broad spectrum weed control for roadsides, wildlife habitat, and noncrop areas.
Glyphosate	RoundupPro, Rodeo, Accord, many others	0.5–1 pint	0.5–2%	Early spring, after cheatgrass emerges and before native perennial seedlings emerge. Has a narrow application window.	Nonselective amino acid inhibitor; will kill desirable vegetation, including native grasses, forbs, and woody species. Foliar application only; quickly inactivated in the soil.
Rimsulfuron	Matrix SG	3–4 ounces	3–4 ounces per 100 gallons of water	Apply in late fall on emerged seedlings for best results.	Labeled for roadsides and bare ground sites but not for rangeland. Preemergence or early postemergence timing will control several grass and broadleaf species.
Sulfometuron methyl + chlorsulfuron	Landmark XP	1–1.5 ounces	1–1.5 ounces per 100 gallons of water	Warm, moist conditions following application accelerates herbicide activity.	Registered for use in noncrop situations only. Read product label carefully before applying. Care should be exercised when used in the vicinity of desired plants. Has a 12 month grazing restriction.

¹ Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with cheatgrass.

² Herbicide/water ratio - As an example, a 3 percent mixture for a gallon of spray water is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached ($4 \text{ oz} \div 128 \text{ oz/gal} = 0.03$ or 3 percent).

Control Strategies

Because cheatgrass reproduces entirely from seed, control strategies should focus on preventing seed production and depleting seed bank reserves. Treatment priority should be assigned to small or sporadic infestations on otherwise healthy sites, which can be followed by treatment of larger infestations. In most cases, 3 or more consecutive years of treatment will be necessary to deplete the seed bank.

Monitoring and successive treatments are usually needed to control seed germination and emerging seedlings. The following strategies may be considered to contain and reduce cheatgrass populations over large areas:

- **Broadcast spray–reseed–spot spray strategy** – Use broadcast spraying to remove cheatgrass from the target area. If reseeding is needed, then use a range drill to plant desired native perennial species.

To protect newly planted material or to allow native grasses to return naturally, a coordinated prescribed grazing plan should be implemented with cooperating livestock operators. Sprayed areas should be monitored and re-treated as necessary with spot spraying. This multiyear program for cheatgrass control has been demonstrated to provide one of the best outcomes over the long term.

- **Tillage–reseed strategy** – Use spring tillage to interrupt cheatgrass growth. Follow up in the fall with repeat tillage and/or herbicide application to eliminate new seedlings. In late fall or early winter, consider reseeding with desirable perennial species.
- **Prescribed burn–reseed strategy** – Perform a prescribed burn in early summer when cheatgrass seed is still in the inflorescence stage or during the fall to prepare the site for later seeding during the fall/winter/spring. Use a range drill to seed desirable native perennial species. Coordinate with prescribed grazing to trample seed into the ground through hoof action and to protect newly planted material.

Adaptive Management

Cheatgrass is pervasive throughout the western United States and controlling it across broad areas is often impractical. Therefore, realistic goals and objectives should be established to manage cheatgrass infestations occurring extensively throughout a given landscape. To improve long-term success, consider using an adaptive management strategy with the overall goal of restoring desirable plant communities. The stepwise process for adaptive management involves:

1. Assessment of the overall weed problem,
2. Establishing management goals and objectives,
3. Implementation of control strategies,
4. Monitoring the effectiveness of management actions,

5. Evaluating actual outcomes in relation to expected results, and
6. Adjusting practices as necessary.

Steps of this process should be repeated in sequence as part of a continuous learning cycle that improves management planning and strategy by learning from the outcomes of previous management actions. In general, an adaptive management strategy may be considered to be successful if:

1. Stakeholders are actively involved and remain committed to the process,
2. Monitoring and assessment are used to adjust and improve management decisions, and
3. Management goals and/or objectives for the resource are being achieved.

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Suggested Web Sites

DCNR Invasive Exotic Plant Tutorial for Natural Land Managers:

http://www.dcnr.state.pa.us/Forestry/invasivetutorial/cheatgrass_M_C.htm

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide A-613 Sprayer Calibration at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online:

<http://www.cdms.net/LabelsMsds/LMDefault.aspx>

**For more information
or other field guides, contact:**

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
Albuquerque, NM 87102

Or visit:

<http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies>

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