

# Field Guide for Managing Red Brome in the Southwest



## Cover Photos

*Top: John M. Randall, The Nature Conservancy, Bugwood.org*

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# Red Brome (*Bromus rubens* L.; synonym: *B. madritensis* ssp. *rubens*)

Grass family (Poaceae), Bromeae tribe

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Red brome is an invasive grass that poses a wildfire concern in desert communities. This field guide serves as the U.S. Forest Service's recommendations for management of red brome in forests, woodlands, and rangelands 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

Red brome (synonyms: foxtail chess, foxtail brome) is an introduced, early emerging annual grass that is native to the Mediterranean region. It is now widely distributed in patches across western States. Red brome is short lived and actively grows for only about 4 to 6 weeks. Mature foliage and seed heads have a distinctly reddish color that contributes to its name.

## Growth Characteristics

- Cool season, tufted, annual bunchgrass; 8 to 20 inches tall.
- Each plant has several stems growing from an erect or slightly spreading base; the stems have narrow, short, flat, hairy, prominently-veined blades and a hairy sheath.
- Roots are very shallow; it grows slowly in the winter and more rapidly as soils warm in spring.
- Panicles (2 to 3 inches long) are dense, compact, and brush-like with 7 to 11 upright florets.
- Reproduction is solely by seed. Each plant produces approximately 75 seeds of which less than 2 percent will carry over into the following year and remain viable thereby creating a relatively short-lived seed bank. Mature seed remains mostly dormant through the hot, dry summer; germination is highest in the fall.

- Seedlings are bright green, hairy, and slender; the grass is purplish-red with barbed awns at maturity and tawny to brown when it is dry.

## Ecology

### Impacts/threats

Red brome prefers open spaces within shrub and grassland communities. As the grass matures, red brome provides a fine-fuel source that decomposes slowly and greatly increases the fire potential, intensity, and burn speed in areas where it has invaded. It alters the fire pattern in many plant communities and has been especially harmful to desert plants that are not fire adapted such as blackbrush (*Coleogyne ramosissima*). Its awned presence can injure wildlife and livestock, reduce available forage, diminish recreational opportunities, degrade wildlife diversity and habitat, and decrease land values.

### Location

Disturbed and nondisturbed areas; along roadsides and railroads; rangeland, pastures, and cultivated fields, usually in warmer areas and at lower elevations than cheatgrass (*Bromus tectorum*). Red brome prefers south-facing slopes and areas of shallow, dry, or poor textured clayey soil. It grows best in locations with mild, moist winters and hot, dry summers with 4 to 10 inches of precipitation.

### Spread

Seed have barbed awns that adhere to clothing, fleece, and animal fur; they may be carried by wind, water, or by small rodents. Seed may also be a contaminant in grain, hay, straw, or mud and be carried for long distances on undercarriages of vehicles and road maintenance equipment. Eighteen percent of seeds produced will reach a suitable site to germinate and establish seedlings. Of those seedlings that emerge, only about 10 percent reach maturity.

### Invasive Features

Red brome requires about half as much water as most native plants to germinate. Red brome seed can germinate with only 0.5 inch precipitation and has nearly uniform

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germination under cool, moist conditions. Seedlings produced in the fall will overwinter and grow slowly until the spring. As soils warm, red brome accesses a greater portion of soil moisture, which allows rapid growth and early maturation. The presence of red brome can lead to repeated wildfires at higher frequencies that favor future dominance by red brome.

## Management

Red brome and cheatgrass are somewhat similar in appearance and share a common history in the way they were introduced and how efforts have been made to manage them. However, red brome populations tend to be more localized and patchier as compared to cheatgrass; the seed source is less abundant and less viable; and red brome is more sensitive to frost, shading, and competition from herbaceous perennials. Both of these exotic grasses are now naturalized across the western U.S., and the goal for their management is directed primarily at reducing the fire hazard resulting from their presence. Control strategies for both of these introduced grasses have focused on removing seed production and increasing competition from herbaceous perennial plants. Red brome may be having an even greater impact than cheatgrass in that red brome readily invades nondisturbed areas, thereby damaging fire sensitive shrub species. In the harsh environments where red brome generally grows, there is little opportunity for rehabilitating burned-over areas.

In most cases, several years of treatment is necessary to remove all seed producing red brome plants, followed by 1 to 2 years of monitoring and implementing further measures to control new seedlings. The following actions should be considered when planning an overall management approach:

- Maintain healthy plant communities and the presence of ground litter to limit red brome infestations. This may involve using improved grazing management to prevent excessive grazing and reseeding areas with adaptable grasses and forbs after disturbance.

- Detect, map, and eradicate new populations of red brome as early as possible, especially in areas of desert shrub. Keep annual records of reported infestations.
- Implement monitoring and a followup treatment plan for missed plants or seedlings.
- Check hay, straw, and mulch for presence of weed seed before using them in weed-free areas; certified weed-free hay or pellets should be fed to horses used in back-country areas.
- Encourage use of spray washing stations to reduce seed spread when mechanized equipment is utilized inside or near an infestation.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.

Table 1 summarizes some management options for red brome control under various situations. Choice of control method depends on the current land use and site conditions; accessibility, terrain, and climate; red brome density and degree of infestation; and nontarget flora and fauna present. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. More than one control method may be needed for each site.

## Physical Control

Physical methods to control red brome should focus on removing plants and preventing seed production. Most methods require proper timing and may need to be repeated to reach an acceptable level of control. Planting adaptable species should always be considered in combination with mechanical control.

### **Manual Methods**

**Hand removal** – If performed before the majority of seed heads are produced in early spring, hand pulling or hoeing will prevent plants from reaching seed production and maturity. Several return visits to a site may be required to eliminate new plants. Remove as much of the root as possible.

**Table 1. Management options\***

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fence lines, and noncrop areas	Mow or grade before flowering. Repeat mowing if necessary.  Mulch with 2 to 3 inches of organic material or cover with plastic sheet.	Avoid excessive disturbance.  Implement requirements for vehicle operations and for reporting of infestations along roads.	No classical biological control agents have been approved for use by USDA.	Use truck or tractor spraying equipment. Wash underneath to prevent spread.
Rangeland or pasture areas	Raking surface to clear litter in the spring will reduce wildfire risk.  Use shallow mechanical disking in suitable areas.  Consider prescribed burns in late fall followed by reseeding perennial plants.	Use certified weed-free seed and hay.  When moving livestock or vehicles through infested areas, inspect and remove any seeds from animals, clothing, and vehicles before entering uninfested areas.	Winter and early spring grazing can reduce density and decrease risk of wildfire; however, heavy grazing may promote infestation.  Encourage red brome suppression via competition from desirable perennial plants.	Use ground broadcast sprayer; or for areas difficult to access, use backpack sprayer.
Wilderness, other natural areas, and/or small infestations	Manual methods, such as hoeing or hand pulling in localized areas may be needed to protect other resources.	Post signs warning visitors to remove seeds.	When feasible, encourage desert cottontails, mule deer, desert bighorn sheep, and other wildlife to feed on red brome before it matures.	Use backpack sprayer; Broadcast spraying by other methods may be used on thicker stands, if allowed.

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

**Raking, mulching, or soil solarization** – Raking dead standing plant material with a drag chain or other implement in the spring can reduce fire hazard. Mulching with a 2<sup>1</sup>/<sub>3</sub> inch deep layer of organic material or using plastic sheeting to cover the ground can aid in control of red brome, especially when followed by reseeding or planting desirable perennial species. These methods are most practical on easily accessed sites such as along a roadway or in campgrounds.

**Mechanical Methods**

**Tillage** – Disking or other mechanical control methods are often impractical on areas where red brome is found and should always be considered with caution. In many instances mechanical disturbance encourages further dominance. Tillage should always be considered in combination with reseeding of desirable perennial species.

**Mowing** – When conditions are suitable, mowing in late winter or early spring before seeds are developed will

reduce plant size but may cause the plant to increase the number of stems produced. Expect the need to repeat mowing during this time because cutting just once has not been found to be effective in preventing seed production. Mowing after seed production is useful for fire prevention by eliminating standing mature litter.

**Prescribed Fire**

Planned burning can produce variable results and may lead to an increase in red brome populations if done improperly. In southern California, planned burns done very early in the growing season (as early as January) have been used with some success to control red brome. Consider burning in combination with other control methods such as herbicide spraying and later reseeding with adaptable perennial species.

**Cultural Control**

Vehicles, humans, and domestic animals should be discouraged from traveling through areas infested with



red brome; and a program to check and remove seeds from vehicles, clothing, and domestic animals should be implemented to help stop dispersal. In cultivated fields, crop rotation and manipulation of nutrient levels (such as increasing phosphorous, potassium, or reducing nitrogen in the soil) is used as a means of reducing red brome.

## Biological Control

### Grazing

Red brome is not highly competitive with established perennials, especially native grasses. Proper grazing management that encourages growth of perennial grass competitors will aid in suppression. Red brome that is grazed by livestock while it is green can reduce plant density and size. Grazing alone will not provide complete red brome control, but it can be used to reduce fuel

levels. Proper timing, a low density approach, and close management of livestock are recommended to minimize impact to nontarget plant species.

### Classical Biological Agents

At present, no biological control agents have been approved by USDA for use on red brome.

## Chemical Control

Red brome presence varies from season to season; but when soil moisture is available, the grass has nearly uniform germination and establishment, especially in the fall. This characteristic favors herbicide use by controlling plants shortly after they emerge when they are most vulnerable in the seedling stage. Herbicides listed in table 2 will effectively control red brome when properly applied,

**Table 2. Herbicide recommendations**

Common Chemical Name (active ingredient)	Product Example <sup>1</sup>	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example <sup>2</sup>	Time of Application	Remarks
Atrazine <sup>3</sup>	Aatrex	1–2 pints	1–2%	In fall on early emergent seedlings when desirable plants are dormant.	Up to 60–100 day half-life in soil. High soil mobility and groundwater contamination potential.  Labeled for roadsides and reseeding Crop Reserve Program (CRP) lands, but not rangeland.
Imazapic	Plateau	2–12 ounces + 1 quart methylated seed oil (MSO)	0.25–1.5% + 1% MSO	Either as a preemergent in fall (use lower rate) or for active growth in the spring.	Broad spectrum; residual; amino acid inhibitor; controls annual and perennial weeds without adverse effects to perennial grasses.  Labeled for roadsides and noncrop areas. Not for use along streams and rivers. May leach into groundwater.
Imazapic + glyphosate	Journey	1 1/3 to 2 pints	1–13% + 1% v/v MSO	Preemergent: late summer or fall.  Postemergent: after green up.	Broad spectrum; residual.  If used as a postemergent in spring, limit to areas with fewest desirable nontarget plants.
Fluazifop-p-butyl	Fusilade 2000, Fusilade DX	1–1.5 pints	0.5% + 0.5% oil or 1% nonionic surfactant	After emergence in spring, but before seed head is detectable.	Soil active; attacks meristematic tissues of annual and perennial grasses. Does not affect broad-leaved plants.

**Table 2. Herbicide recommendations (continued)**

Common Chemical Name (active ingredient)	Product Example <sup>1</sup>	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example <sup>2</sup>	Time of Application	Remarks
Glyphosate	Roundup Pro, Rodeo, Accord	0.5–1 pint	0.5–2%	Apply either to young seedlings in the winter or when flowering in the spring. May also apply during both periods.	Nonselective amino acid inhibitor; will kill desirable vegetation, including 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 or early spring on emerged seedlings for best results.	Labeled for roadsides and bareground sites but not for rangeland. Preemergence or early postemergence timing will control several grass and broadleaf species.
Sulfometuron methyl	OustXP, Spyder	Oust: 1 ounce Spyder: 1-1/3 to 2 ounces	NA	Late fall or winter; preemergence and postemergence.  Best if applied right before rainfall.	Extremely potent; can damage nontarget vegetation if not applied correctly. Read product label carefully before applying.
Sulfometuron methyl + chlorsulfuron	Landmark XP	1–1.5 ounces	1–1.5 ounces per 100 gallons of water	Warm, moist conditions following application will accelerate 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.

<sup>1</sup>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 red brome.

<sup>2</sup>Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture 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).

<sup>3</sup>Atazine is a restricted use pesticide. A certified applicator’s license is required for purchase and use.

although some are nonselective and will also impact nontarget species. Therefore, caution should be taken if desirable 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. Consult the registrant if you have questions or need further detail.

Herbicides may be applied in several ways including backpack, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck.

For sparse populations, one person or a small team can spot spray red brome with an adjustable spray nozzle attached to a hand-held or backpack sprayer. The foliage should be sprayed wet without allowing dripping. In some localized situations, use of a preemergent herbicide is the preferred way to prevent red brome establishment.

Reseeding an area following herbicide treatment can be problematic in many areas where red brome occurs because precipitation is often very low and there are few adaptable species choices for planting purposes. In areas where reseeding is planned, glyphosate can be broadcast sprayed

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for site preparation when red brome is green in the fall, coupled with perennial plant seeding in late autumn as a dormant seeding (i.e., desired seedlings will not emerge until the following spring).

## Control Strategies

Regardless of the initial strategy used, the key to red brome control is to encourage growth of other desirable plants that will directly compete for soil moisture, light, nutrients, and space. In many cases, suppression or removal of red brome will enable the natural return of native plants without undergoing the added expense and difficulties associated with reseeding. Prioritization of areas for treatment by using a combination of control methods and reseeding, if feasible, will enhance the long-term success rate for managing red brome. Initial treatment should attempt to eliminate as many live plants and disrupt as much seed production as possible. Secondary treatment should aim to prevent seed formation and increase competition from desirable perennial plants.

## Adaptive Management

Red brome is commonly found throughout the western U.S. and controlling it across broad areas is often impractical. Therefore, realistic goals and objectives should be established to manage red brome infestations occurring extensively throughout a given landscape. To improve long-term success in controlling red brome, 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.

## References and Further Information

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## Suggested Web Sites

For information on invasive species:

<http://www.invasivespeciesinfo.gov/>

<http://www.invasive.org/weedus/index.html>

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](http://aces.nmsu.edu/pubs/_a/A-613.pdf)

Herbicide labels online:

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





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**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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