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Field Guide for Managing Red Brome in the Southwest

Forest Service
Southwestern Region
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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

Red brome is an invasive grass that can pose a wildfire hazard 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 administers 4 national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Red brome (synonyms: foxtail chess, foxtail brome) is an early emerging annual grass that was originally native to the Mediterranean region. 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 gives 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; 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 about 75 seeds of which less than 2 percent remain viable into the following year 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.

Site/Distribution

Disturbed and undisturbed 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 with shallow, dry, and sandy loam to clayey soil. It grows best in locations with mild, moist winters and hot, dry summers with 4 to 10 inches of precipitation. This annual grass is now widely distributed in patches across western States.

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 seed 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 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. A shared management goal for red brome and cheatgrass is to reduce the fire hazard resulting from their presence. 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. Red brome may have an even greater impact than cheatgrass in that red brome readily invades undisturbed areas, thereby damaging fire-sensitive shrub species. In the harsh environments where red brome generally grows, there is relatively little opportunity for rehabilitating burned-over areas. Therefore, control strategies for established red brome infestations should focus on removal of seed production and increasing competition by herbaceous perennial plants.

The following actions should be considered when planning an overall management approach to red brome::

- Maintain healthy plant communities and the presence of ground litter. This may involve improving grazing management practices to prevent excessive grazing and the reseeding of disturbed areas with adaptable grasses and forbs.
- 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 backcountry areas.
- Encourage use of spray washing stations to reduce seed spread when mechanized equipment is utilized inside or near an infestation.
- Detect and eradicate new populations of red brome as early as possible, especially in desert shrub areas.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Implement monitoring and a follow-up treatment plan for missed plants or seedlings.
- Map and keep annual records on reported large infestations.

Table 1 summarizes some management options for red brome control under various situations. Further details on these management options are explained below. Choice of control method depends on current land use and site conditions, accessibility, terrain, microclimate; density and extent 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.

Mulching or soil solarization –Mulching with 2-3 inches of organic material or using plastic sheeting to cover the ground can aid in red brome control, especially when followed by reseeding or planting desirable perennial species. These methods are most practical on accessible sites such as those along roadways or in campgrounds.

Table 1. Management options*

Site	Physical Control	Cultural Control	Biological Control	Chemical Control
Roadsides, fence lines, and non-crop areas	Mow or grade before flowering. Repeat mowing if necessary. Mulch with 2 to 3 inches of organic material or cover with plastic sheet.	Use seed, mulch, and fill materials certified to be weed-free. Avoid excessive disturbance. Implement requirements for vehicle operations and for reporting of infestations along roads.	No classical biocontrol 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 seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas. When moving livestock or vehicles through infested areas, inspect and remove any seeds from animals, clothing, and vehicles before entering un-infested areas. Encourage competition from desirable perennial plants.	Winter and early spring grazing can reduce density and decrease risk of wildfire; however, heavy grazing may promote infestation. No classical biocontrol agents have been approved for use by USDA.	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.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas. Post warning signs to 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 the land resource.

Mechanical Methods

If machinery is used to manage red brome, the equipment should be cleaned after use to prevent movement of seed into un-infested areas.

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.

Raking or mowing – Raking dead standing plant material with a drag chain or other implement in the spring can reduce fire hazard. 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

Seed and materials used for mulch, forage, or fill should be certified to be weed-free; pellets may be used for horses in backcountry areas. 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 (e.g., increasing phosphorous, potassium, or reducing nitrogen in the soil) is used as a means of reducing red brome.

Biological Control

Grazing

Red brome does not compete well with established perennials, especially native grasses. Proper grazing management that encourages growth of perennial grass competitors will aid in suppression. Red brome grazed by livestock while it is yet 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 with stocking, and close management of livestock are recommended to minimize impact to nontarget plant species.

Classical Biological Control

At present, no classical biocontrol agents (insects, pathogens, etc.) have been approved by USDA for use on red brome.

Chemical Control

Herbicides listed in table 2 will effectively control red brome when properly applied, 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.

Herbicide Application

Red brome presence varies from season to season; but the grass has nearly uniform germination and establishment when soil moisture becomes available, especially in the fall. Herbicide use is favored during this period since the seedling stage of red brome is the most vulnerable.

Herbicides may be applied with backpack or hand-held sprayers, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. Any equipment used to spray herbicide should be calibrated. 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 pre-emergent herbicide is the preferred way to prevent red brome establishment.

Management Strategies

New infestations of red brome should be prevented. To treat areas already infested by red brome, a combination of control methods and, if feasible, reseeding should be used to enhance long-term success. Initial treatment should attempt to eliminate as many live plants and disrupt as much seed production as possible. Secondary treatments should prevent seed formation and increase completion from desirable perennial plants.

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example[1]	Broadcast Treatment (rate per acre)	Spot Treatment (spray solution)[2]	Time of Application	Remarks
Atrazine[3]	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 of Crop Reserve Program (CRP) lands, but not rangeland.
Imazapic	Plateau	2–12 ounces + 1 quart methylated seed oil (MSO)	0.25–1.5% + 1% methylated seed oil (MSO)	Either as a pre-emergent 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 non-crop 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 methylated seed oil (MSO)	Pre-emergent: late summer or fall. Post-emergent: after green up.	Broad spectrum; residual. If used as a post-emergent in spring, limit to areas with fewest desirable non-target plants.
Fluazifop-p-butyl	Fusilade 2000 Fusilade DX	1–1.5 pints	0.5% + 0.5% oil or a 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.
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 bare ground sites but not for rangeland. Pre-emergence or early post-emergence timing will control several grass and broadleaf species.
Sulfometuron methyl	Oust XP Spyder	Oust: 1 ounce Spyder:1-1/3 to 2 ounces	NA	Late fall or winter; pre-emergence and post-emergence. Best if applied right before rainfall.	Extremely potent; can damage non-target 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 non-crop 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.

Table 2. Herbicide recommendations (cont.)

Common Chemical Name (active ingredient)	Product Example[1]	Broadcast Treatment (rate per acre)	Spot Treatment (spray solution)[2]	Time of Application	Remarks
Sulfometuron methyl	Oust XP Spyder	Oust: 1 ounce Spyder:1-1/3 to 2 ounces	NA	Late fall or winter; pre-emergence and post-emergence. Best if applied right before rainfall.	Extremely potent; can damage non-target 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 non-crop 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 red brome.

[2] Spray solution is the herbicide/water ratio in a spray mix that may be used for spot treatment with backpack or hand-held sprayers. The amount of product applied during an annual growing season must not exceed the maximum application rate per acre as specified by the product label – refer to the product label for the site type and application.

[3] Atrazine is a restricted-use pesticide. A certified applicator's license is required for purchase and use.

The key to controlling red brome is to encourage growth of desirable plants that will directly compete for soil moisture, nutrients, light, and space. In many instances, suppression or removal of red brome will enable native plants to return naturally without undergoing the added expense and difficulties associated with reseeding. Reseeding red brome-infested areas after herbicide treatment can be problematic because precipitation is often very low and choice of adaptable species for planting can be limited. In areas where reseeding is planned, glyphosate can be broadcast sprayed 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).

In most cases, several years of treatment will be 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. Since it is ordinarily useless to treat an area only one time without retreatment, sufficient resources must be allocated for the area where control is attempted. After initial treatment, it is important that resources are also available to respray or retreat the treated area as necessary. Previously treated areas should be monitored continuously to detect and control recovering red brome. It is also important to monitor the return of desirable native plant species.

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 approach with the overall goal of restoring desirable plant communities. The stepwise process for adaptive management involves:

1. Assessing the overall weed problem,
2. Establishing management goals and objectives,
3. Implementation of control strategies and measures,
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 approach is 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:

National Invasive Species Information Center

http://www.invasivespeciesinfo.gov/

Invasive.Org

https://www.invasive.org/weedus/index.html

For information about calibrating spray equipment: NMSU Cooperative Extension Service Guide A-613 *Sprayer Calibration.* Available at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online: http://www.cdms.net/

For more information or other field guides, contact:

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

Or visit the Southwestern Region's website for invasive species:

http://www.fs.usda.gov/goto/r3/invasivespecies