

*Bromus rubens* [简体中文](#) [正體中文](#)

**System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae

**Common name** foxtail chess (English), red brome (English), foxtail brome (English)

**Synonym** *Anisantha rubens* , (L.) Nevski  
*Bromus madritensis ssp. rubens* , (L.) Husnot

## Similar species

**Summary** *Bromus rubens* is a tufted, cool-season annual bunchgrass commonly found growing on shallow dry soil or poor textured, clayey soil. It becomes extremely competitive with other grasses and displaces native species. Red brome can produce large amount of biomass that increase the amount and continuity of fine fuels. The lack of a soil seed bank provides one avenue of control for this species.



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## Species Description

Red brome is a tufted, cool-season annual bunchgrass which characteristically reaches a height of 20cm to 50cm. Its annual growth pattern is a dense panicle with a purplish tinge and pubescent culm (Newman, 2001). The culms vary from 10-70cm tall. The inflorescence is a panicle, 3-11cm tall, with long awns (Simonin, 2001).

## Notes

The spread pattern of *B. rubens* is similar to that explained by the intermediate disturbance hypothesis: At intermediate levels of disturbances, certain species are able to exist at increased levels. These same species usually have reduced numbers of individuals in areas without disturbances or in areas with intense or frequent disturbances (Camp and Knight, 1998).

## Lifecycle Stages

Simonin (2001) states that, "\i>B. rubens's initiation and establishment is a direct response to fall rains. Initial growth is relatively slow, followed by a rapid increase in vegetative growth coinciding with warming spring temperatures. Flowering and fruiting generally occur in April and May. Seeds are disseminated in summer.\i>

## Uses

*Bromus rubens* may provide a source of forage for livestock. Desert cottontails prefer *B. rubens* with the heaviest use occurring in winter (Simonin, 2001).

## Habitat Description

*Bromus rubens* is commonly found growing on shallow dry soil or poor textured, clayey soil. It grows on south facing slopes, and is a common constituent in steppe regions. Newman (2001) states that, "\i>B. rubens occurs at low to medium elevations below 1,524m, in deserts and chaparral hillsides, and various places where competition from established herbaceous plants is minimal. It is common along roadsides, waste places, rangelands, and cultivated fields. It is a dominant species on some rangeland that, previous to the destruction of the vegetation, were abundant in perennial native grasses.\i>

## Reproduction

Newman (2001) states that, "Less than 2% of *B. rubens* seeds maintain their viability over a one year period. Wind carries florets of *B. rubens* a few metres from the parent plant. Rodent excavation may also be a means of disseminating the seeds. Other common mechanisms of seed dispersion, such as flood sediment transport and scattering by animals, most likely aid in the dissemination of *B. rubens* seeds." The authors also state that, "*B. rubens* is a prolific seed producer: an average of 76 seeds per plant in natural populations, 142 seeds per plant in experimental mixed stand plots, or 83,600 seeds per square metre of densely spaced plants." Salo (2004) reports that, "Unlike native annuals, *B. rubens* does not produce dormant seed and does not maintain a soil seed bank". Red brome exhibits nearly uniform germination under the cool, moist conditions that characterise winters in these regions. These characteristics cause the periodical decimation of populations of red brome and allow red brome to dominate annual communities in some years.

## Nutrition

Simonin (2001) states that, "*B. rubens* prefers disturbed sites in Mediterranean climates. In California, *B. rubens* prefers areas receiving less than 250mm of annual rainfall. It is a dominant species in California valley grasslands receiving less than 190mm of rainfall." The authors also state that, "*B. rubens* commonly occurs in small patches on shallow soils, growing best where there is little competition from other annuals. In southern Nevada, *B. rubens* occupies blackbrush communities with coarse-textured soils, showing best growth under shrubs and peripheries of shrub canopies. Upland clay and sandy loam ranges and rolling sandy hills receiving 203-305mm of precipitation promote good growth in southern Utah." The authors note that, *B. rubens* is often found in areas with relatively high levels of sulfur dioxide pollution."

## General Impacts

In the North American region red brome is reported to be invasive because it faces low herbaceous competition. Once established, it has the potential to compete with other grasses (Newman, 2001). The accumulation of litter and necromass has the potential to increase fire frequency in the desert south-west (Huxman *et al.* 1999). Red brome-fuelled fires result in the loss of native perennial species in invaded areas, resulting in disturbed areas that are ideal for increased growth of red brome (Esque and Schwalbe, 2002)}. According to Salo (2004), the germination requirements of *B. rubens* seem to be less demanding than those of native Sonoran and Mojave Desert annuals. This grass appears to be able to germinate following a precipitation event of 1cm, whereas native Mohave Desert annuals appear to require twice that amount, suggesting that red brome may be able to germinate before native annuals in years when early precipitation events are relatively small. The fact that they are excellent dispersers and early germinators makes them the first species to colonise disturbed sites. Yoder and Nowak (2000) in their study associate the decrease in biodiversity with *B. rubens* establishment. Studies report that nitrogen additions increased *Bromus* yields and led to competitive suppression of the native bunchgrass *Agropyron spicatum* (Wilson *et al.* 1966). The awns and florets are a direct threat to livestock and native fauna. The vegetation change from perennial grasses to this species and other annual introduced species influences the density of rabbits, grasshoppers, and kangaroo rats.

## Management Info

**Physical:** Annual removal of seed heads will significantly decrease the amount of red brome. Reduction in the number of weed seeds will produce available sites for native seeds to germinate and become established. Encouraging germination of native seeds will decrease the reproductive success of red brome. It is not competitive on vegetated sites and established native plants will out-compete the remaining seedlings. Removal of this annual weed, can be accomplished by hoeing the plants. Plants will not reach maturity if the seedlings are uprooted and thus no seed source for the following year will be produced. This repetitive task is time consuming, especially since seeds of red brome germinate from fall through spring. An alternate approach would be to remove all the red brome plants at one time during the spring before the majority of flowering occurs. Red brome plants are shallow rooted and can be easily removed from the soil by hand or with tools. Fire hazard from red brome biomass can be reduced with spring raking of the dead stems. Although this method disturbs the land, the number of plants and the seed source for the following year can be decreased. Grazing and burning may increase the amount of red brome by clearing vegetation and providing adequate sites for the seeds to germinate. Because seeds of annual species have a short dormancy period, they can utilise optimum conditions to germinate and complete their rapid life-cycle during the same period that disturbed perennials are slowly recovering. While burning can increase the invasiveness of red brome, Newman (2001) states that, "If burning comes at a time that will prevent seed production and if native perennial plants are encouraged to grow, burning may help in changing the balance of the plant community", he continues on to state that, "burning increases the abundance of red brome, especially in areas where the land had previously undergone disturbances. A reduction in the amount of available nitrogen in burned plots may have a greater detrimental effect on the native perennial plants than on the introduced annuals; no deleterious effects of these fires were observed on red brome.

**Chemical:** Newman (2001) states that, "due to the annual growth cycle of *B. rubens*, the most effective chemical control would be from pre-emergence herbicides". Pre-emergent herbicides now available do not kill seeds, but prevent emergence by interfering with root growth at germination or early seedling growth (Cindy Salo, pers.comm., 2004). Impacts of herbicides on native plants may counter the benefits from killing *B. rubens*. The soil-active herbicide atrazine is effective in reducing the amount of competition by annual brome species, as seen by an increased yield of range forage crops and sagebrush in California and Nevada (Kay 1971, Evans and Young 1977).

## Pathway

**Principal source:** [Element Stewardship Abstract for Bromus rubens \(Newman, 2001\)](#)  
**Index of Species:** [Bromus madritensis \(Simonin, 2001\)](#)

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

**Review:** Lucinda F. Salo, US Geological Survey, Forest and Rangeland Ecosystem Science Center, Snake River Field Station, Boise, ID, USA

**Publication date:** 2005-08-01

## ALIEN RANGE

[1] AUSTRALIA

[19] UNITED STATES

## BIBLIOGRAPHY

39 references found for *Bromus rubens*

### Managment information

Corbineau, F.; Belaid, D. and Come, D. 1992. Dormancy of *Bromus rubens* L. seeds in relation to temperature light and oxygen effects. Weed research. 32(4). 1992. 303-310

**Summary:** Study into the dormancy patterns of *B. rubens*.

Dyer, William E. 1995. Exploiting weed seed dormancy and germination requirements through agronomic practices. *Weed Science*. 43(3). 1995. 498-503

**Summary:** Discussion into how weeds can be managed using good cultural practices.

Esque, T. C. & C. R. Schwalbe. 2002. *Alien annual grasses and their relationship to fire and biotic change in Sonoran Desertscrub*. In Tellman, B. (ed.) *Invasive Exotic Species in the Sonoran Region*. Arizona-Sonora Desert Museum Studies in Natural History. University of Arizona Press, Tucson, Arizona: 165-194.

**Summary:** An excellent review of the effect of the invasive species on Sonoran Desert plant and animal communities.

[European and Mediterranean Plant Protection Organization \(EPPO\), 2006. Guidelines for the management of invasive alien plants or potentially invasive alien plants which are intended for import or have been intentionally imported. EPPO Bulletin 36 \(3\), 417-418.](#)

Forcella, F. & Gill, A. M. 1986. *Manipulation of buried seed reserves by timing of soil tillage in Mediterranean-type pastures*. *Australian Journal of Experimental Agriculture* 26: 71-77

**Summary:** A research paper that documents effects of soil tillage at different times to control weeds, including the invasive species, in Australia.

Fulton, M and Furness, G. 1988. Low volume applications of herbicides sprayed on to soil crop or pasture with a bluff plate sprayer. *Plant Protection Quarterly*. 3(3). 1988. 108-111

**Summary:** The use of a bluff plate on a herbicide sprayer allowed it to be more effective in lower volumes.

Huxman, Travis E.; Hamerlynck, Erik P.; Jordan, Dean N.; Salsman, Katrina J. and Smith, Stanley D. 1998. The effects of parental CO<sub>2</sub> environment on seed quality and subsequent seedling performance in *Bromus rubens*. *Oecologia*. 114(2). April, 1998. 202-208

**Summary:** Experiment to determine whether elevated CO<sub>2</sub> levels would have an effect on the growth of *Bromus rubens* seeds and seedlings.

## General information

Beatley, J. C. 1966. *Ecological Status of Introduced Brome Grasses (Bromus spp.) in Desert Vegetation of Southern Nevada*. *Ecology* 47(4): 548-554. [Accessed 30 June 2004]

**Summary:** A dated study that gives historical background on the species invasion, and also suggestions for further research

Beatley, J. C. 1974. *Phenological events and their triggers in Mojave Desert ecosystems*. *Ecology* 55: 856-863.

**Summary:** A research paper that documents phenology of growth of Mojave Desert USA plants, including the invasive species.

Brooks, Matthew L. 2002. Peak fire temperatures and effects on annual plants in the Mojave Desert. *Ecological Applications*. 12(4). August 2002. 1088-1102

**Summary:** Report into the effect of fire increases on the desert ecosystem.

Brooks, Matthew L. and Esque, Todd C. 2002. Alien plants and fire in desert tortoise (*Gopherus agassizii*) habitat of the Mojave and Colorado deserts. *Chelonian Conservation & Biology*. 4(2). December 2002. 330-340

**Summary:** Report into the effects that alien plants have on the desert tortoise habitat.

Brooks, M. L. 2003. *Effects of increased soil nitrogen on the dominance of alien annual plants in the Mojave Desert*. *Journal of Applied Ecology* 40: 344-353.

**Summary:** A research paper that documents growth and development of the species, and tests different nitrogen levels in order to determine health and reproduction viability.

Brown, D.E. and Minnich R.A. 1986. Fire and changes in Creosote bush scrub of the Western Sonoran Desert California USA. *American Midland Naturalist*. 116(2). 1986. 411-422

**Summary:** Report into the effects of fire damage on the desert s floral composition.

Camp, R. J., & R. L. Knight. 1998. *Effects of Rock Climbing on Cliff Plant Communities at Joshua Tree National Park, California*. *Conservation Biology* 12(6):1302-1306. [Accessed 04 January 2004]

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

[CONABIO. 2008. Sistema de informaci3n sobre especies invasoras en M3xico. Especies invasoras - Plantas. Comisi3n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.](#)

**Summary:** English:

The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), under the section Novedades for information on updates.

Invasive species - Plants is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

**Spanish:**

La lista de especies del Sistema de informaci3n sobre especies invasoras de m3xico cuenta actualmente con informaci3n acerca de nombre cient3fico, familia, grupo y nombre com3n, as3 como h3bitat, estado de la invasi3n en M3xico, rutas de introducci3n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p3gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci3n, por favor consulte la portada (<http://www.conabio.gob.mx/invasoras/index.php/Portada>), en la secci3n novedades, para conocer los cambios.

Especies invasoras - Plantas is available from: [http://www.conabio.gob.mx/invasoras/index.php/Especies\\_invasoras\\_-\\_Plantas](http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas) [Accessed 30 July 2008]

Fenni, M. 1996. *Seed longevity of Bromus rubens L. and Bromus rigidus Roth*. In Brighton Crop Protection Conference: Weeds. Brighton, England, 20-23 November, 1995. British Crop Protection Council, Surrey: 775-780.

**Summary:** A research paper that documents germination of seed of two *Bromus* species, including the invasive species, after storage.

Hamal, A.; Benbella, M.; Msatef, Y.; Bouhache, M. and Rzozi, S.B. 1998. Biological aspects of *Bromus rigidus* Roth, a weed of cereals in saïs area of Morocco. Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent. 63(3A). 1998. 813-815

**Summary:** Research into the ecology of the *Bromus* species.

Hamal, A.; Benbella, M.; Rzozi, S.B.; Bouhache, M. and Msatef, Y. 2001. Carthography and geographical spread of the weedy bromes (*Bromus* spp.) of cereals in the Sais area of Morocco. Mededelingen (Rijksuniversiteit Te Gent. Fakulteit van de Landbouwkundige en Toegepaste Biologische Wetenschappen). 66(2B). 2001. 761-768

**Summary:** Study into the abundance and presence of *B. rubens* in the Sais area of Morocco.

Hunter, R. 1991. *Bromus* invasions on the Nevada USA test site present status of *Bromus rubens* and *Bromus tectorum* with notes on their relationship to disturbance and altitude. Great Basin Naturalist. 51(2). 1991. 176-182

**Summary:** Study into the growing abundance and spread of *B. rubens* and its implications.

Huxman, T. E., E. P. Hamerlynck, and S. D. Smith. 1999. Reproductive allocation and seed production in *Bromus madritensis* spp. *rubens* at elevated atmospheric CO<sub>2</sub>. Functional Ecology 13: 769-777. [Accessed 30 June 2004]

**Summary:** Research project documenting the response of species to CO<sub>2</sub> and its reproductive and seed production output.

[ITIS \(Integrated Taxonomic Information System\), 2004. Online Database \*Bromus rubens\*](#)

**Summary:** An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.

Available from: [http://www.itis.gov/servlet/SingleRpt/SingleRpt?search\\_topic=TSN&search\\_value=40518](http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=40518) [Accessed December 31 2004]

Laude, H. M. 1956. *Germination of freshly harvested seed of some western range species*. Journal of Range Management 9: 126-129.

**Summary:** A research paper that documents germination rates of native and alien grasses, including the invasive species, common on western USA rangelands.

Martin, Brent E. and Van Devender, Thomas R. 2002. Seasonal diet changes of *Gopherus agassizii* (desert tortoise) in desert grassland of southern Arizona and its behavioural implications. Herpetological Natural History. 9(1). 2002. 31-42

**Summary:** Report into the diet of the desert tortoise.

McCrary, M. D. & P. H. Bloom. 1984. *Lethal effects of introduced grasses on red-shouldered hawks*, Journal of Wildlife Management 48: 1005-1008.

**Summary:** A scientific study of injuries to a native California USA raptor from seeds of alien grasses, including the invasive species.

Mock, I.T. 1987. Distribution and severity of brome grass in barley crops in the Victorian Mallee Australia. Plant Protection Quarterly. 2(3). 1987. 135-136

**Summary:** Report into the increase of this weed in Victoria in Australia.

[Newman, Dara. 2001. Element Stewardship Abstract for \*Bromus rubens\* The Nature Conservancy, 1815 North Lynn Street, Arlington, VA.](#)

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: <http://www.conserveonline.org/2000/12/b/en/bromrub.PDF> [Accessed 04 January 2004]

Pake, C. E. & D. L. Venable. 1996. *Seed banks in desert annuals: Implications for persistence and coexistence in variable environments*. Ecology 77: 1427-1435.

**Summary:** A research paper that uses 10 years of soil seed bank data for Sonoran Desert USA winter annuals, including the invasive species, to test theoretical models of species coexistence in variable climates.

Preston, K. P. 1993. *Selection for Sulfur Dioxide and Ozone tolerance in *Bromus rubens* along the South Central coast of California*. Annals of the Association of American Geographers 83(1): 141-155.

**Summary:** A study conducted that documented the effects of excess levels of ozone and sulfur dioxide on development of species.

Roy J., M. L. Navas, & L. Soni. 1991. *Invasion by annual brome grasses: a case study challenging the homoclimate approach to invasions*. In Groves, R. & F. DiCastrì F (eds.) Biogeography of Mediterranean invasions. Cambridge University Press, Cambridge: 207-224.

**Summary:** A scientific study that includes information on the distribution and spread of the invasive species around the world

Salo, L. F. 2004. *Population dynamics of red brome (*Bromus madritensis* subsp. *rubens*): times for concern, opportunities for management*. Journal of Arid Environments. 57(3):291-296.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

[Simonin, Kevin A. 2001. \*Bromus madritensis\*. Fire Effects Information System, \[Online Database\]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.](#)

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: <http://www.fs.fed.us/database/feis/plants/graminoid/bromad/> [Accessed 04 January 2004]

Stylinski, C. D., and E. B. Allen. 1999. *Lack of native species recovery following severe exotic disturbance in southern Californian shrublands*. Journal of Applied Ecology 36: 544-554.

**Summary:** A study that documents the spread of invasives in southern California and explains the reasoning behind their invasiveness.

[USDA-GRIN \(Germplasm Resources Information Network\). 2003. \*Bromus rubens\*. National Genetic Resources Program \[Online Database\] National Germplasm Resources Laboratory, Beltsville, Maryland.](#)

**Summary:** Information on common names, synonyms, and the distributional range of species.

Available from: [http://www.ars-grin.gov/cgi-bin/npgs/html/tax\\_search.pl?bromus+rubens](http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl?bromus+rubens) [Accessed 04 January 2004]

[USDA-NRCS \(Natural Resource Conservation Service\). 2002. \*Bromus rubens\*. The PLANTS Database Version 3.5 \[Online Database\] National Plant Data Center, Baton Rouge, LA.](#)

**Summary:** Available from: <http://plants.usda.gov/java/profile?symbol=BRRU2> [Accessed 10 March 2006]

Van Buren, Renee and Harper, K.T. 2003. Demographic and environmental relations of two rare *Astragalus* species endemic to Washington County, Utah: *Astragalus holmgreniorum* and *A. ampullarioides*. Western North American Naturalist. 63(2). April 2003. 236-243

**Summary:** Report into the state of two native plants affected by the spread of *B. rubens*.



Vanstone, Vivien A. and Russ, Michelle H. 2001. Ability of weeds to host the root lesion nematodes *Pratylenchus neglectus* and *P. thornei*. I. grass weeds. Australasian Plant Pathology. 30(3). 2001. 245-250

**Summary:** Experiment where nine different weed species were rated in their abilities to host root lesion nematodes.

Westbrooke, M.E. and Miller, J.D. 1995. The vegetation of Mungo National Park, Western New South Wales. Cunninghamia, 4(1). 63-80

**Summary:** Study into the vegetation that was present in Mungo National Park

[Wilson, A. M., G. A. Harris, and D. H. Gates. 1966. Fertilization of mixed cheatgrass-bluebunch wheatgrass stands. Journal of Range Management 19: 134-137.](#)

**Summary:** A research paper that documents growth of *Bromus tectorum* L., a related invasive species, and tests different nitrogen levels in order to determine vigor, relative to a native bunchgrass in southeastern Washington state, USA.

Available from: <http://jrm.library.arizona.edu/data/1966/193/8wils.pdf> [Accessed 10 August 2004]

Yoder, C. K., and R. S. Nowak. 2000. Phosphorus acquisition by *Bromus madritensis* ssp. *rubens* from soil interspaces shared with Mojave Desert shrubs. Functional Ecology 14: 685-692.

**Summary:** A scientific study that collected data on phosphorous uptake abilities of species.