Plant Assessment Form

For use with the "Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands" by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association (Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial)**:**	*Bromus diandrus* Roth (USDA 2005)
Synonyms:	*Anisantha diandra* (Roth) Tutin ex Tzvelev, *Bromus gussonei* Parl., *Bromus rigidus* Roth var. *gussonei* (Parl.) Coss. & Durieu (USDA 2005)
Common names:	Ripgut brome
Evaluation date (mm/dd/yy)**:**	01/28/05
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Committee review date:	01/28/05
List date:	01/28/05
Re-evaluation date(s):	

Table 2. Scores, Designations, and Documentation Levels

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	**B**	Other published material	**"Impact"** **Section 1 Score:** **B**	**"Plant Score"** **Overall Score:** **Medium** **Alert Status:** **Alert**
1.2	Impact on plant community	**B**	Other published material		
1.3	Impact on higher trophic levels	**C**	Other published material		
1.4	Impact on genetic integrity	**U**	No information		
2.1	Role of anthropogenic and natural disturbance	**B**	Other published material	**"Invasiveness"** *For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:* **11 pts** **Section 2 Score:** **B**	
2.2	Local rate of spread with no management	**B**	Observational		
2.3	Recent trend in total area infested within state	**C**	Observational		
2.4	Innate reproductive potential	**U**	Other published material		
2.5	Potential for human-caused dispersal	**B**	Observational		
2.6	Potential for natural long-distance dispersal	**B**	Observational		
2.7	Other regions invaded	**B**	Other published material		RED FLAG **NO** Something you should know.
3.1	Ecological amplitude	**C**	Observational	**"Distribution"** **Section 3 Score:** **C**	
3.2	Distribution	**C**	Observational		

Table 3. Documentation

Question 1.1 Impact on abiotic ecosystem processes *Score:* **B** *Doc'n Level:* **Other pub.**
Identify ecosystem processes impacted: Fire dynamics.
Rationale: Hitchcock (1950) described ripgut brome (*Bromus diandrus* Roth) as a common weed that forms dense stands in open ground, waste places and lowlands in southern California. Along Arizona stream banks under riparian woodland trees and shrubs, ripgut brome has been observed covering 50 to 90% of the soil surface (F. Northam, personal observation, 2000–2004). Colonies of ripgut brome with mature plant heights ranging up to 1.0 meter tall are documented in Arizona and surrounding states (McDougall 1973, Welch et al. 1987, Baldwin et al. 2002). As a result, this species is capable of producing sufficient litter to increase fire hazards. Moist wildland areas that have been subjected to intense disturbance in which soil surfaces were denuded of endemic herbaceous and shrub vegetation are especially vulnerable to *B. diandrus* colonization. This level of disturbance may be the results of previous cultivation, clearing construction sites, trampling by domestic livestock or humans, excavation projects, military activities, intensive grazing, fire abatement operations, wildfires, etc. Subsequent erosion typically enhances this degree of disturbance.
Sources of information: See cited literature. Also considered field observations of F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003).

Question 1.2 Impact on plant community composition, structure, and interactions *Score:* **B** *Doc'n Level:* **Other pub.**
Identify type of impact or alteration: Replaces native species.
Rationale: Branson (1985) described how perennial grasslands of elevations below 3500 feet in California were replaced by introduced winter annual grasses to such an extent that <0.1% of the former range supports original plant communities. Southern California Spanish ranching operations began in the 1760s. Introduced winter annual grasses (including two species of wild oats, soft brome [*Bromus hordeaceus*], and ripgut brome) are the predominant monocot forage producers in California's interior valley, zootic-altered, annual range vegetation type (Western North American Range Vegetation Descriptions 2005). Landscape level domination by these non-native Eurasian species in California is due to (1) a long time-frame of European ranching and agricultural plant introductions, (2) destructive grazing practices using introduced European livestock and (3) drought and associated severe wildfires. Because of urban expansion and cultivated agriculture, most of California's current annual grasslands are distributed as a herbaceous understory layer in oak woodlands. Natural resource specialists managing grazing lands owned by California Polytechnical Institute in southern California attributed domination by Eurasian annuals to (1) quick germination after rains that enable these non-native plants to begin growing before native plants, (2) introduced, fall-germinating, winter annual species are the first plants to take moisture and nutrients at the start of each growing season (fall), and (3) these annuals, including ripgut brome, grow faster than perennials, which reduces light to later emerging native species (Plant Communities—Grassland 2005). Dense populations of ripgut brome have been observed under tree and shrub canopies along southwest interior riparian corridors of central Arizona (F. Northam, personal observations, 2000–2003). In these sites ripgut brome can become the dominant herbaceous species in which percent cover by this species can range between 50 to 70%. Within ripgut brome patches, however, percent cover exceeds 90% and non-woody native species are absent.
Sources of information: See cited literature. Also considered field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003) and information from Western North American Range Vegetation Descriptions (available online at: www.tarleton.edu/%7Erange/Home/home.htm; accessed January 26, 2005) and Plant Communities—

Grassland (available online at http://polyland.lib.calpoly.edu/overview/Archives/derome/grasslands.htm; accessed January 25, 2005).

Question 1.3 Impact on higher trophic levels *Score:* **C** *Doc'n Level:* **Other pub.**

Identify type of impact or alteration: *Bromus diandrus* causes physical injury to grazing animals, but it also produces good quality forage before inflorescences emerge.

Rationale: Ripgut brome florets are armed with stiff, barbed awns, plus a sharp callus at their base which can injure nose and eye tissues or lodge in ear cavities of grazing animals (Whitson et al. 2000). Proper timing of grazing will avoid animal injury from ripgut brome and allow livestock to harvest good quality forage produced by this grass (Western North American Range Vegetation Descriptions 2005).

Sources of information: See cited literature. Also considered information from Western North American Range Vegetation Descriptions (available online at www.tarleton.edu/%7Erange/Home/home.htm; accessed January 25, 2005).

Question 1.4 Impact on genetic integrity *Score:* **U** *Doc'n Level:* **No info.**

Identify impacts: Hybridization is unknown but potentially could occur.

Rationale: Several native *Bromus* species exist in Arizona (Kearney and Peebles 1960); however, no information was found indicating ripgut brome hybridizes with native bromes.

Sources of information: See cited literature. No sources were identified that address whether hybridization occurs.

Question 2.1 Role of anthropogenic & natural disturbance in establishment *Score:* **B** *Doc'n Level*: **Other pub.**

Describe role of disturbance: Surface disturbance of soil due to road/trail maintenance, cultivation, mined land reclamation, hazardous materials cleanup, timber harvest, mechanical brush control, wildfire abatement, human/livestock trampling and construction projects are necessary for widespread establishment of ripgut brome populations.

Rationale: Branson (1985) described how introduced winter annual grasses became dominate naturalized vegetation in California grasslands formerly occupied ed by perennial grasses. Human-induced disturbance opened the soil to colonization by Eurasian plants. Observations of established ripgut brome populations indicate this species will establish in sites where soil surfaces are disturbed by activities such as highway maintenance, mechanical weed control on vacant lots, abandoned cultivated ground, human/livestock trampling, bulldozed fire lines, all-terrain vehicle races, timber removal, wildfire, etc. (F. Northam, personal observations, 2000–2003).

Sources of information: See cited literature. Also considered field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003).

Question 2.2 Local rate of spread with no management *Score:* **B** *Doc'n Level:* **Obs.**

Describe rate of spread: Increasing but less rapidly than doubling in <10 years.

Rationale: Herbarium records (SEINet 2005) indicate currently infested wildland areas have had some level of infestation since the at least the 1970s. No recent increase, however, in herbarium records, published reports, or observations by scientists indicate ripgut brome infestations have had recent exponential colony growth.

Notwithstanding the preceding, natural and human-caused disturbances continue to occur in wildland riparian corridors and wetland environments. As a result, the Working Group inferred that these conditions have resulted in local ripgut brome populations continuing to expand into newly disturbed habitat.

Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed January 27, 2005). Score based on inference applied by Working Group members.

Question 2.3 Recent trend in total area infested within state *Score:* **C** *Doc'n Level:* **Other pub.**

Describe trend: Stable. Arizona herbarium collections of ripgut brome began in 1903, and 15 more collections from seven counties were added before 1950. Another 19 collections were added before 1980. Total collections are 61 from 11 counties. Collection trends do not indicate any recent range expansions.

Rationale: Herbarium specimens range from sites below 1500 feet to near 7000 feet elevation, but most occurred between 2500 and 6500 feet (SEINet 2005). Recent observations of thick ripgut brome stands in wildlands were along streams under riparian woodlands (F. Northam, personal observations, 2000–2003). These areas have been grazed since the 1880s. Grazing/trampling disturbance from decades of livestock harvesting, plus wild fires, and their impact on ripgut brome establishment agrees with the results of California grassland disturbance described above in questions 1.2 and 2.1 (Branson 1985). Furthermore, based on the early introductions into California of winter annual, Eurasian grasses previously described in questions 1.2 and 2.1, it is reasonable that ripgut brome populations probably have been associated with Arizona grazing industry for over 100 years. New population outbreaks in wildlands will require more disturbance in which surface layers of soil is broken by cultivation tools, construction equipment, additional livestock/ recreational trampling, excavation, etc.

Based on collection frequency from the early 1900s to present times, herbaria records do not: (1) indicate ripgut brome has recently colonized new ecological types or (2) suggest extensive increased colonization into non-infested areas of ecological types where this species has been historically recorded. Likewise, no published reports or observations by scientists indicate ripgut brome infestations have had significant range increases into non-infested areas of ecological types now infested. As a result, the Working Group inferred the total trend of infestation within the state is stable.

Sources of information: See cited literature. Also considered field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003) and information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed January 27, 2005). Score based on inference applied by Working Group members.

Question 2.4 Innate reproductive potential *Score:* **U** *Doc'n Level:* **Other pub.**

Describe key reproductive characteristics: Seeds (caryopses) are the only way this winter annual species reproduces (Baldwin et al. 2002). *Bromus diandrus* does not have vegetative reproduction or multi-season seed crops, and its flowering season is less than three months (Baldwin et al. 2002).

Rationale: Much of the seed dynamics of Arizona populations are unknown. See Worksheet A.

Sources of information: See cited literature.

Question 2.5 Potential for human-caused dispersal *Score:* **B** *Doc'n Level:* **Obs.**

Identify dispersal mechanisms: Transporting livestock and via contaminated equipment.

Rationale: Based on observations of current ripgut brome populations, dispersal of this species appears to be limited to human transport of caryopses from contaminated sites along road rights-of-way, construction sites or contaminated stream banks. Typical livestock operations on wildlands requires periodic movement of livestock from one site to another, and any weed seed contaminating hair or mud in hooves will also move. Furthermore, movement of restoration / reclamation ground seeding equipment, construction machines, fire abatement vehicles, off-road recreational vehicles, etc. through ripgut brome infestations are potential dispersal devices. Likewise, human foot traffic is a definite

transporter of numerous annual grass seeds in shoes, boots and socks (F. Northam, personal observations, 2000–2003).
Sources of information: Field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003).

Question 2.6 Potential for natural long-distance dispersal *Score:* ***B*** *Doc'n Level:* **Obs.**
Identify dispersal mechanisms: Movement by runoff water following precipitation events and by attachment to fur or feet of native mammals.
Rationale: As noted above, locations of many ripgut brome infestations along stream corridors expose native wildlife to opportunities to entangle ripe brome florets in fur or in mud on hooves. In addition, flood-water movement could provide enough energy to move caryopses long distances (F. Northam, personal observations, 2000–2003).
Sources of information: Field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003).

Question 2.7 Other regions invaded *Score:* **B** *Doc'n Level:* **Other pub.**
Identify other regions: In Utah disturbed sites in warm desert shrub, pinyon-juniper, and mountain brush communities are infested by *B. diandrus* (Welch et al. 1987). The last community is similar to southwestern interior chaparral scrub in Arizona. Grazing-disturbed canyon woodlands and bottomlands adjacent to riparian communities in southern California that are infested by *B. diandrus* (Plant Communities—Grasslands 2005) are similar to Great Basin conifer woodland in Arizona.
Rationale: Southwestern interior chaparral scrub and Great basin conifer woodland are two minor ecological types invaded elsewhere that are not yet invaded in Arizona.
Sources of information: See cited literature. Also considered information from Plant Communities—Grassland (available online at http://polyland.lib.calpoly.edu/overview/Archives/derome/grasslands.htm; accessed January 25, 2005).

Question 3.1 Ecological amplitude *Score:* **C** *Doc'n Level:* **Obs.**
Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: According to SEINet (2005) and observational data by F. Northam (personal observations, 2000–2003), Arizona's wildland populations of ripgut brome are concentrated in wetlands associated with Great Basin conifer, Petran mountain conifer, Great Basin desertscrub, southwestern interior chaparral, and semi-desert grassland plant communities, though not within these upland communities themselves. First herbarium record is from 1903 (SEINet 2005).
Rationale: Collections and observations of ripgut brome populations in wildland areas have been on sites where most native herbaceous vegetation has been eliminated by disturbances such as wildfires, livestock operations, recreational activities, or mining projects. No sites are known where this species has moved into mostly natural vegetation in which surface layers of the soil have not been broken open and mixed or scraped bare (F. Northam, personal observations, 2000–2003).
Sources of information: Field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003) and information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed January 27, 2005).

Question 3.2 Distribution *Score:* **C** *Doc'n Level:* **Obs.**
Describe distribution: No more than 20% in the wetland communities that are infested.
Rationale: Distribution records in SEINet (2005) indicate ripgut brome can tolerate macro-environmental and soil conditions ranging from Sonoran desertscrub in Tempe and Tucson to montane conifer forest in Prescott and Flagstaff. *Bromus diandrus*, however, is restricted to sites with winter precipitation or abundant runoff moisture and where soil-surface disturbance has removed most native

herbaceous plants. No sites are known where this species has moved into mostly undisturbed vegetation (F. Northam, personal observations, 2000–2003).
Sources of information: Field observations by F. Northam (Noxious Weed Program Coordinator, Arizona Department of Agriculture, 2000–2003) and information from SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: http://seinet.asu.edu/collections; accessed January 27, 2005).

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	**Yes**	**No**	**1 pt.**
Dense infestations produce >1,000 viable seed per square meter	**Yes**	**No**	**2 pt.**
Populations of this species produce seeds every year.	**Yes**	**No**	**1 pt.**
Seed production sustained for 3 or more months within a population annually	**Yes**	**No**	**1 pt.**
Seeds remain viable in soil for three or more years	**Yes**	**No**	**2 pt.**
Viable seed produced with *both* self-pollination and cross-pollination	**Yes**	**No**	**1 pt.**
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	**Yes**	**No**	**1 pt.**
Fragments easily and fragments can become established elsewhere	**Yes**	**No**	**2 pt.**
Resprouts readily when cut, grazed, or burned	**Yes**	**No**	**1 pt.**

Total pts: 3 Total unknowns: 3

Score : U

Note any related traits:

Worksheet B. Arizona Ecological Types

(*sensu* Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	
Desertlands	Great Basin desertscrub	
	Mohave desertscrub	
	Chihuahuan desertscrub	
	Sonoran desertscrub	
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	**D**
	southwestern interior wetlands	**C**
	montane wetlands	**D**
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	
	montane riparian	
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	
Tundra (alpine)	tundra (alpine)	

*A means >50% of type occurrences are invaded; B means >20% to 50%; C means >5% to 20%; D means present but ≤5%; U means unknown (unable to estimate percentage of occurrences invaded).

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