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Barb Goatgrass

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Figure 1. Mature barb goatgrass. *Photo:* J. S. Davy.

Barb goatgrass (*Aegilops triuncialis* L.; see fig. 1) is a winter annual that is native to Mediterranean Europe and western Asia. Although barb goatgrass was first identified in California in the early 1900s, its rapid spread is relatively recent. Its first introduction into California was associated with the importation of Mexican cattle to El Dorado and Sacramento Counties.

This species is expanding throughout Northern California and the Central and South Coast in areas below 1,100 meters (3,600 feet) in elevation. Barb goatgrass populations quickly create a devastating monoculture (fig. 2) that diminishes species diversity, forage quality and quantity, and wildlife habitat of infested areas. It primarily inhabits dryland fields, roadsides, annual rangelands, and oak woodlands in both disturbed and undisturbed sites. Infestations generally do not occur in irrigated areas. A distinguishing feature of barb goatgrass is its ability to proliferate in varying types of conditions, including serpentine soils where many annual grasses have not prospered.

Barb goatgrass is one of three goatgrass species prevalent in California. The others are jointed goatgrass (*Aegilops cylindrical* Host) and ovate goatgrass (*Aegilops ovata* L.). All three goatgrass species can hybridize with winter wheat (*Triticum aestivum* L.) and are currently B-rated noxious weeds in California by the California Department of Food and Agriculture. A rating of B indicates goatgrass as a species that has a detrimental economic importance, as it is the second-highest of five possible ratings (A, B, C, Q, or D). The rating system is used as a guideline for county agricultural commissioners to establish priority in dealing with pests. Ratings are based on the impact of the pest, the distribution of the pest, and the resulting ability for it to be controlled or eradicated.

Figure 2. Barb goatgrass infestation. *Photo:* J. S. Davy.

Impact of Barb Goatgrass on Rangelands

Barb goatgrass grows in dense stands with a deep and rapidly establishing root system that makes it extremely competitive on annual rangelands. The tillering habit of seedlings (fig. 3) and slowly decomposing thatch creates a mulch that crowds out all other desirable forage and native perennial species and creates monotypic stands that can quickly infest an entire ranch. Barb goatgrass is generally unpalatable to livestock, especially when it matures. Its long awns protrude from the seed head and can cause serious physical injury to grazing animals. Barb goatgrass infestations reduce forage quality and quantity by up to 50 to 75 percent. Because livestock tend to avoid the plant, selective defoliation of more desirable plants promotes the spread of barb goatgrass.

Figure 3. Tillers of barb goatgrass seedling. *Photo:* J. S. Davy.

Identification

Barb goatgrass is generally 20 to 50 centimeters (8-20 in) tall. It is a winter annual that thrives in northern and much of coastal California's mild winter weather. Fine hairs are typically present on the collar, sheath margin, and leaf margin, and sparsely cover the upper and lower leaf. Barb goatgrass ligules are membranous and the auricles are clasping. The young leaves appear rolled when protruding from the sheath of older leaves. The immature stems are solid but become hollow as the plant reaches maturity. Plants in vegetative state can be easily identified by uprooting them and carefully inspecting the base of the plant. Almost all plants are still attached to the spikelet that contained the seed. Once the plant is uprooted, these spikelets are easily identified.

Barb goatgrass frequently grows within medusahead (*Taeniatherum caput-medusae* (L.) Nevski) patches, but it produces a very different seed head that resembles the inflorescence of wheat (fig. 4). It differs from wheat in that the spike is compact and breaks into joints at the nodes of the rachis. The spike typically has four spikelets, or segments, each with one or two florets. The bottom two spikelets usually have two florets, each fertile, while the top two spikelets are generally reduced in fertility and tend to have only one floret each. Although the foliage is generally gray-green throughout the growing season, the spikelets and stem may turn red just prior to maturity. Three long, barbed awns protrude from each glume. These awns have very small barbs and can cause injury to grazing livestock and other wildlife.

Figure 4. Barb goatgrass comparison with other common annual range plants. *Photo:* J. S. Davy.

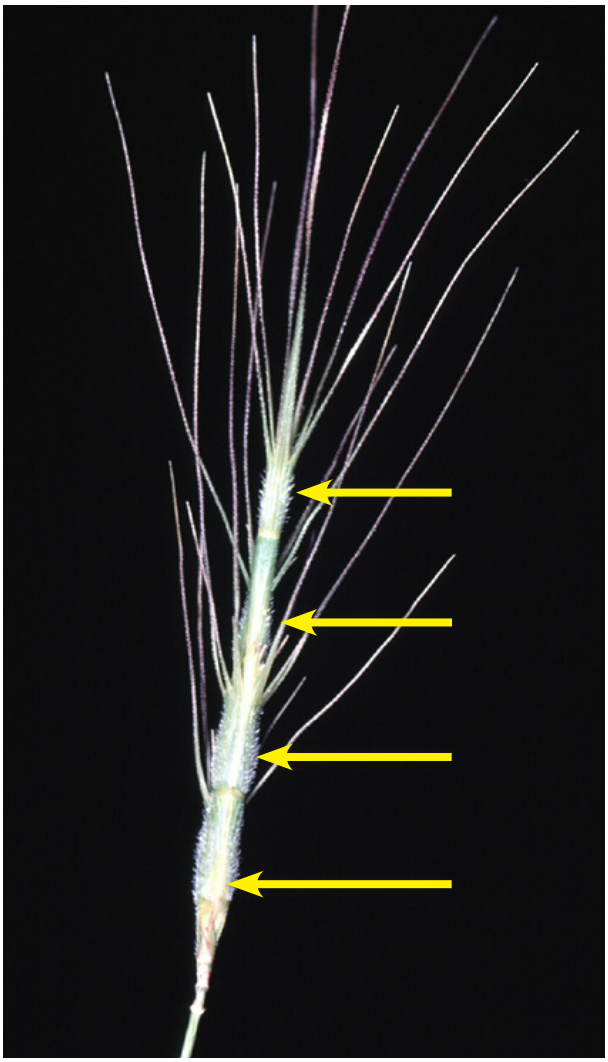

Figure 5. Spikelets of barb goatgrass inflorescence. *Photo:* J. M. DiTomaso.

Figure 6. Individual barb goatgrass spikelet. *Photo:* J. M. DiTomaso.

Life Cycle

Barb goatgrass is a winter annual that germinates with the onset of fall rains and matures between May and August after most common annual grasses, such as soft chess (*Bromus hordeaceus* L.), wild oats (*Avena fatua* L.), annual ryegrass (*Lolium multiflorum* Lam.), ripgut brome (*Bromus diandrus* Roth.), and medusahead (*Taeniatherum caput-medusae* (L.) Nevski). Timing of maturity depends on location, moisture, soil type, and temperature. At maturity, its entire spike drops from the stem and remains intact on the soil surface until it eventually breaks into typically four joints that each contain a spikelet (fig. 5). Even late in the fall it is easy to find entire spikes on the ground in infested areas. In contrast, medusahead seeds drop from the spike individually, leaving a seedless, awned spike in the fall.

Each plant is typically capable of producing four to six seeds. The lower two spikelets are very fertile, while the upper two are less fertile and often sterile. Within each barb goatgrass spikelet (fig. 6), the plant produces two seeds, one larger and another smaller. Researchers (Scott and Dyer 1996) have shown that the large seeds germinate during the first season after seed drop. The large seed, as well as the maternal tissue surrounding the seeds, inhibits the germination of the smaller seed. This can cause the smaller seed to remain dormant for up to 5 years, but more typically 2 years, ensuring the persistence of the infestation even when no new seeds are produced for an entire season. Because of this, effective control strategies require at least 2 years to eliminate most of the smaller dormant seeds in the soil.

Following onset of fall rains, the goatgrass seed germinates inside the spikelet, which remains

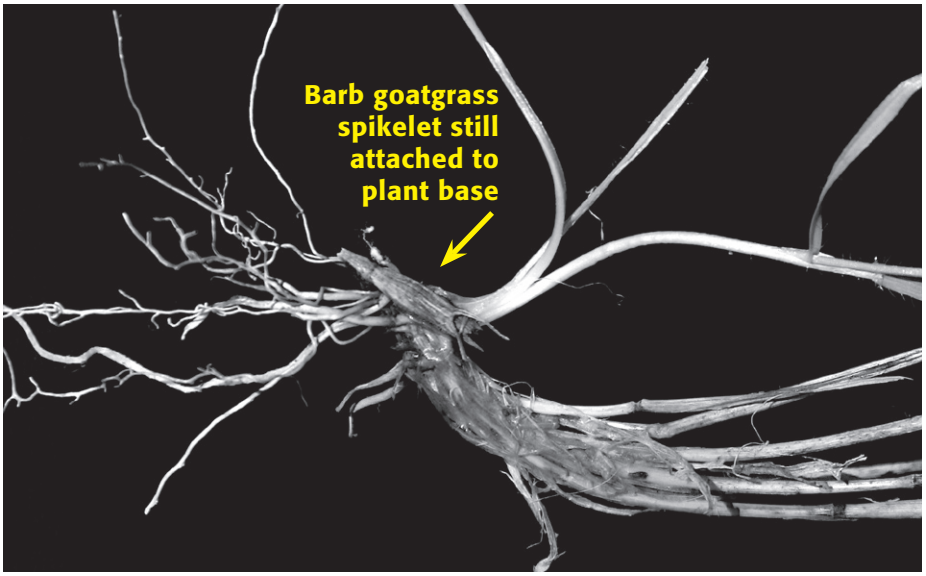

Figure 7. Barb goatgrass seedling with spikelet still attached. *Photo:* E. A. Laca.

attached to the embryonic stalk just below the soil surface (fig. 7). The spikelets of the seed head can be easily viewed when seedling plants are dug up. During the seedling and early vegetative stages, plants grow slightly prostrate and produce numerous tillers, which help to crowd out other annual forages. Barb goatgrass becomes erect during the spring, as maturity nears.

Control

The most important factor in controlling barb goatgrass is early detection. Since seeds do not fall far from the mother plant, early infestations are generally restricted to small areas. However, the barbed awns attach easily to livestock and wildlife, enabling widespread seed distribution through animal movement. In as little as 3 years, an entire pasture or ranch can become infested with barb goatgrass. Seeds of barb goatgrass are also dispersed in hay from dryland pastures, thus spreading to more distant feeding areas and roadsides. Small patches are manageable; however, control of large infestations is extremely difficult. Various control methods have been tested with differing levels of success. In all cases where treatment requires the removal of litter, such as burning, desirable clover or grass species should be reseeded to prevent reinfestation or establishment of another undesirable species.

Burning

Data from research (DiTomaso et al. 2001) at the UC Hopland Research and Extension Center demonstrated that a thorough burn in the late spring when sufficient fire fuel was available, but when seedheads were still attached to the stems, for 2 consecutive years gave excellent control of barb goatgrass infestations. A single burn was not effective, because the dormant seeds remained viable in the seedbank. Multiple burns were also found to increase populations of native species, particularly perennial grasses.

Chemical

Since barb goatgrass populations primarily inhabit rangelands, the options for chemical control are limited. No grass-selective herbicides are registered for rangelands in California for control of barb goatgrass. Chemical control with glyphosate is a practical and effective method if small patches are detected early. Spraying selected patches is very effective in the winter or spring, but it may take 2 years of application to ensure that the seed bank is depleted. When using nonselective herbicides containing glyphosate as a primary ingredient, caution should be taken because they will generally kill all surrounding perennial and annual grasses, forbs, and legumes.

Mowing and Grazing

Early-growing-season mowing alone has shown limited benefit in barb goatgrass control, as low-growing or prostrate plants often escape injury. Heavy grazing during the growing period, followed by rest in late spring, tends to increase the density of barb goatgrass due to the elimination of competing plants and barb goatgrass's strong ability to regrow. Although livestock typically avoid barb goatgrass, intensive grazing or mowing at early stages of seedhead emergence negates the selective feeding behavior of

animals and can be very successful in preventing goatgrass seed formation. Heavy defoliation at and just prior to seed head emergence can be very effective in limiting seed production, because plant maturity typically occurs when soil moisture is depleted for the growing season and root reserves are nearly exhausted from attempting seed formation. Mowing provides a longer window for defoliating plants because grazing time is limited by the protrusion of awns once the seedheads emerge.

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UC Integrated Pest Management Program Web site, http://www.ipm.ucdavis.edu/index.html.

UC Weed Research and Information Center Web site, http://wric.ucdavis.edu/information/information.html.

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