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# Barb Goatgrass: A Threat to California Rangelands

A. Peters, D.E. Johnson and M.R. George

Barb goatgrass (*Aegilops triuncialis* L.) is a noxious weed that is invading California's rangelands. This species evolved in Eurasia and was accidentally introduced to California in the early 1900s. Barb goatgrass was first noticed in 1914 on the border of Eldorado and Sacramento counties (Kennedy 1928). It first appeared after cattle from Mexico were imported and pastured. Within several years it had spread to several other counties in California.

## Morphology & Physiology

Barb goatgrass is an annual grass with stiff, erect culms 8–16 inches tall. In late spring, plants produce 3–5 large spikelets on cylindrical spikes (Figures 1 and 2). Glumes are very tough, each ending in three stiff and spreading long awns. The spikes tend to remain together through the summer and break into individual spikelets when soaked by fall rains (Crampton 1974). Awns are barbed so the sharp base of the spikelet penetrates through the thatch and then into the ground (Talbot and Smith 1930). Seeds normally germinate within the spikelet which often remains among the roots of the barb goatgrass plant (Figure 2).

In California, barb goatgrass normally "greens up" in February and begins to ripen in late June, but timing is dependent on seasonal rainfall and temperature. Barb goatgrass matures later than most of the other common annual grasses. In late spring, its reddish or purplish heads are easily distinguished from other drier associated grasses so that patches of barb goatgrass are easily seen on hill-sides.

Talbot and Smith (1930) reported that seeds may remain dormant for two or more seasons before germinating; however, recent work suggests that they may remain dormant for up to 5 years. Seeds of the related species, jointed goatgrass, can remain dormant in the soil up to five years with nearly 100% germinability (Willis et al., 1988). In an experiment conducted by Peters (1994) only 40% of barb goatgrass seeds within the intact seedhead germinated during a 28 day period with optimal conditions; however, seeds with the glumes removed germinated quickly and

completely (90%) at temperatures from 5° to 25°C.

As shown in Table 1, barb goatgrass roots grow more rapidly and to a greater depth than soft chess, medusahead rye, and subterranean clover. Slender wild oats roots grow deeper but spread less. Barb goatgrass normally develops three roots from the seed, which quickly occupy a large soil volume. This adaptation probably enhances the plant's competitiveness and its ability to occupy a site. Shoots and



Fig. 1. Barb Goatgrass. Mature barb goatgrass plant with seed-head and seeds (from Kennedy 1928).

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Fig. 2. Barb goatgrass (*Aegilops triuncialis* L.) seedheads.

leaf area of barb goatgrass also develop rapidly (Table 1). Rapid growth, low palatability, and deeply penetrating roots give this weedy species a dominant place in many California plant communities.

#### Problems with Barb Goatgrass

Barb goatgrass has become a serious range weed which can reduce livestock forage production from 50 to more than 75 percent (Jacobsen 1929). It not only crowds out desirable forage species (Crampton 1974) but also causes mechanical injury to cattle, sheep, dogs, and deer because of its sharp spikelets and barbed awns. Livestock try to avoid even walking through mature barb goatgrass patches. A report from Calaveras County, California, in 1927

stated that "the very pointed fruit entered the eyes of hogs, penetrating to the brain and causing death" (Kennedy 1928). Forage value of the plant is negligible, although horses may derive some nutritional benefit (Talbot and Smith 1930). Kennedy (1928) noted that stock eat sparingly even of the young grass and entirely avoid grazing the mature plant.

Goatgrass is easily dispersed. Awns can be carried in the wool of sheep or hair of deer, cattle and horses, transported by water, vehicles, clothing, or windblown along bare ground (Talbot and Smith 1930). Barb goatgrass is expanding its range annually. New areas are being reported and existing infestations are increasing in size (Figure 3). Although barb goatgrass has been documented as occurring only in California and Pennsylvania, it is quite likely that undiscovered or unreported infestations exist in other locations. The range of barb goatgrass is moving in a northerly direction in California. Oregon will likely have a goatgrass problem if control measures in California are not found and implemented.

Barb goatgrass first appears as scattered plants which rapidly multiply into solid patches (Kennedy 1928). Infestation of several acres develop "in which goatgrass comprises from 50 to 70%, and upwards, of the thick carpet of vegetation" (Talbot and Smith 1930). Foothill rangelands, whose flora is mainly composed of annual grasses and forbs, native-hay meadows, and grain fields are all areas where goatgrass has invaded (Figure 4). Cultivated lands can also be invaded (Kennedy 1928). The plant thrives on both open grasslands as well as oak woodlands. It occurs in level, rolling, and rough country on various classes of soil and at various elevations. Dense stands have also been

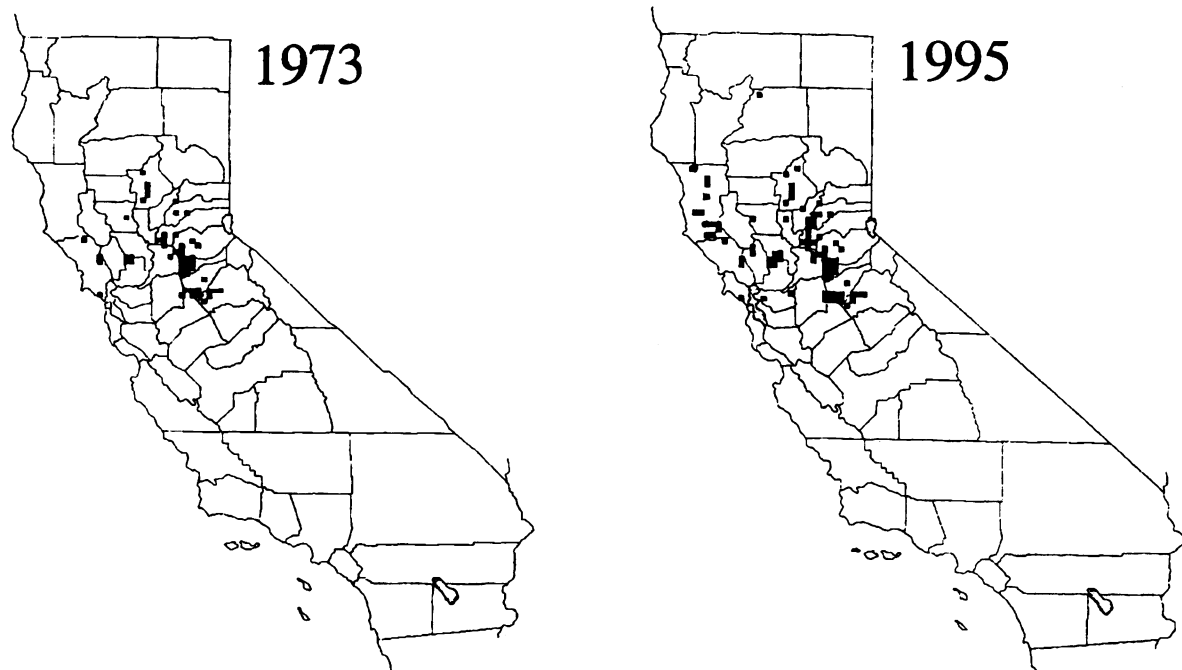


Fig. 3. Expansion of Goatgrass. Maps of California showing the expansion of barb goatgrass between the years 1973 and 1995. Maps are courtesy of Mr. Tom Fuller and Mr. Doug Barbe, Botany Laboratory, California Department of Food and Agriculture, Sacramento, California.

**Table 1. Mean maximum rooting depth, area on glass sided boxes that contained roots, and shoot height of five plants of each species. Plants were grown in potting soil in inclined glass sided boxes, watered daily, and measured 25 days after germination. Barb goatgrass growth was compared to each of the other species and the probability that they were similar was calculated.**

Plant Species	Maximum Rooting Depth	P1 for Root Depth	Observed Rooting Area	P for Root Area	Shoot Height	P for Shoot Ht.	Leaf Area	P for Leaf Area
	(cm)		(cm <sup>2</sup> )		(cm)		(cm <sup>2</sup> )	
Barb goatgrass	34.1		22.29		24.2		5.32	
Medusahead rye	21.9	0.097	1.02	0.014	16.5	0.001	0.85	0.001
Soft chess	23.3	0.136	0.70	0.015	14.4	0.001	0.82	0.001
Subclover	15.5	0.028	14.28	0.269	4.0	0.001	2.73	0.040
Slender wild oats	37.6	0.627	2.83	0.028	22.2	0.134	7.51	0.038

<sup>†</sup>Level of significance for a contrast between barb goatgrass and the species in each row.

observed on thin, gravelly soils (Talbot and Smith 1930). Within twenty years barb goatgrass can expand from a single infestation to dominance of a ranch.

### Control Measures

Barb goatgrass is designated "B" in the classification of noxious weed species in California. A "B" rating requires intensive control or eradication, where feasible, at the County level. Quarantine or other holding action is at the discretion of the California Agriculture Commissioner (McCaskill 1977).

Grazing, mowing, burning, and herbicide treatments are all potential control methods for goatgrass. Munz and Keck (1975) state that although cattle generally avoid goatgrass on rangelands, if the goatgrass infested areas are heavily grazed, the infestation may be reduced. Talbot and Smith (1930) found that mowing alone is ineffective, since very short or bent-over seed stalks are missed. Ironically, mowing may encourage barb goatgrass, because mowed plants "stool out" and produce seed within a month after cutting.



**Fig. 4.** California Annual Grassland with invading barb goatgrass on the Hopland Research and Extension Center, Hopland California.

Mowing combined with other treatments may be effective, however. Talbot and Smith (1930) suggest that burning may be the cheapest and most practical method of control on large areas of infested land that cannot be grazed sufficiently close to prevent goatgrass seeds from ripening. Burning when plants are dry is only a partial remedy since the beards may be singed without destroying the seed (Kennedy 1928).

Glyphosate (Roundup) applied at 1 lb ai/acre is an effective method of controlling barb goatgrass on rangelands (Peters 1994). The area should then be reseeded with an adapted perennial grass/clover mixture. More research needs to be completed on two fronts: control methods for barb goatgrass and revegetation techniques for desirable species that are able to replace barb goatgrass.

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