



Warm-season native grasses for playable roughs

Can Hachita blue grama and Cody buffalograss provide a playable unmowed rough in the Midwest?



This research was funded in part by The Environmental Institute for Golf.

Tom Voigt, Ph.D.

Unmowed roughs can be found on many established and newly constructed Midwestern golf courses. Superintendents have come to realize that incorporating these areas often reduces labor, fuel and pest-control chemical expenses compared to mowed areas that are managed more intensely. In addition, because these areas also incorporate native and/or naturalized plants that can be well adapted to the site, the potential exists to reduce pest problems. Finally, other benefits of unmowed native and naturalized areas include an enhanced golfing experience and increased wildlife habitat and biodiversity. Conversely, superintendents must also realize that these areas should be sited with care. If not prudently planned, unmowed native and naturalized areas can increase nuisance insects and wildlife and also slow play.

Superintendent survey

This work was guided in large part by questions posed by superintendents, as well as by responses to a January 2005 survey of 90 randomly selected Class A and B members of the Midwest Association of Golf Course Superintendents (MAGCSA) located in northeastern Illinois. The objective of the survey was to find out about their unmowed rough areas. Establishment and management activities and the problems superintendents encountered with these areas were of particular interest (10).

Fifty-four completed surveys were returned by April 2005. Among the findings were 87% of the 54 respondents reported that some portion of their facility is covered with unmowed grassy areas, wildflower plantings or prairies and that weeds were the biggest problem associated with establishing and managing these areas (10). Half

of the respondents (40 superintendents answered this question) indicated that they would like to “incorporate *playable* (golf shots hit into area are relatively easy to locate and hit out) unmowed grassy areas in (their) course.”

Unmowed grassy areas

On courses where unmowed grassy areas were not part of the facility’s original design, 39% allowed the existing vegetation to grow to establish a new area (it can be assumed that the majority of the vegetation in these areas would be exotic turfgrasses), 28% planted native grasses and flowering plants, 15% planted only native grasses, and 6% planted either exotic grassy species such as fine fescue or exotic grassy species and flowering plants or other types of plants (10). Respondents reported that challenges faced when converting to or installing unmowed grassy areas were weeds (36%), unkempt appearance (26%), golfer resistance (18%), slow establishment (13%), lack of plant or establishment knowledge (5%) and unspecified other (1%) (10).

Superintendents have tried to grow many plant species in the unmowed grassy areas: exotic grasses such as fescue species, ryegrasses, bentgrass species, Timothy and bluegrass species; native grasses such as buffalograss, big bluestem, little bluestem, bottlebrush grass, bluejoint, cordgrass, Indian grass, prairie dropseed, switch grass and side-oats grama; and many forbs (herbaceous flowering plants) (10).

Mowing heights and frequencies varied, but the majority indicated that they mowed these areas once per year in early to mid-autumn at 3-6 inches (7.6-15.2 centimeters). Several reported removing the clippings, and some alternated

mowing and burning the unmowed areas every other year. Fifty-seven percent of respondents burned their unmowed grassy areas, with 80% of them conducting in-house burns in the spring, 17% conducting in-house burns in the autumn and 3% contracting burns in the autumn (10).

Weed control

The two biggest challenges associated with the unmowed grassy areas were weeds (including Canada thistle, wild carrot, chicory, foxtail, yellow nutsedge, white and yellow sweet clovers and lots of tree saplings) (41%) and an unkempt appearance (26%). Superintendents controlled weeds by spot application of herbicides (46%), hand pulling or mechanical removal (41%), and/or broadcast herbicides (13%) (10).

Previous University of Illinois on-site field studies also guided this research. Native and exotic grasses and native sedges and forbs have been evaluated in various studies (5-9,11,12). Establishment and management practices for Midwestern native and naturalized unmowed roughs were also studied.

Fine fescues

Many superintendents, designers and architects currently plant fine fescues or allow other cool-season grasses to grow unmowed in roughs. In recent work we found that tall and hard fescues can create attractive unmowed roughs (11). However, even when planted at rates as low as 1 pound/1,000 square feet (4.9 grams/square meter), the fescues created roughs so dense that it was difficult to locate an errant shot and almost impossible to strike a found ball. In addition, fine fescues often fall or lodge after flowering, creating unattractive tangled masses of leaves, flowers and stems that can add to the difficulty of finding a ball and making a shot.

Two native grasses

These studies revealed that plantings of two native grasses, blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) can create attractive unmowed roughs that are playable because their canopy is more open than in fescue plantings.

Blue grama is a perennial warm-season grass that grows to 24 inches (61 centimeters) tall when in flower (2,3). A native of the short-grass prairie region, it has an upright growth habit, spreads by short rhizomes and has fine-textured foliage (1,2,3). Seed is readily available, relatively inexpensive — less than \$13/pound (\$5.85/kilogram) pure live seed (PLS) — and germinates readily.



A canopy 10-12 inches tall is usually acceptable for finding and striking a golf ball from an unmowed rough. Photo by T. Voigt

In previous plantings, it has reached more than 75% coverage in the first season when seeded at 20 pounds/acre (22.4 kilograms/hectare) PLS. Blue grama has been planted alone and in mixtures in lawns, range areas, pastures, reclamation areas and roadsides (1,4).

Buffalograss is also a perennial warm-season, fine-textured, stoloniferous sod-former native to the short-grass prairie region of the U.S. Great Plains (1,2,3). A short grass growing 10 to 12 inches (25-31 centimeters) tall, it forms a stoloniferous sod (1-4). In our experience, buffalograss germinates slowly. Even at a seeding rate of greater than 90 pounds/acre (100.9 kilograms/hectare), it can take two growing seasons to completely cover. Seed is available and costs less than \$12/pound (\$5.40/kilogram) PLS. Buffalograss has been planted to control erosion, as a low-maintenance lawn and as a pasture (1,4).

Given the results of the 2005 survey of MAGCS members (10) and the findings of our most recent research (11), we developed objectives to guide this study and began field research in June 2006. The objectives were: to evaluate the survival and playability of cultivars of blue grama alone or mixed with buffalograss; to evaluate pre- and post-emergence chemical weed controls in these plantings; and to evaluate burning and mowing practices in order to identify the best method of removing dead, aboveground plant material.



% cover after 1 year

Grass	Seeding rate (pounds PLS/acre) [†]	% coverage		Playable unmowed rough
		Sep 8, 2006	Aug 29, 2007	
Alma blue grama	20	26.7 ab	71.7 a	
Alma blue grama + Cody buffalograss	10 + 44	70.0 cd	80.0 a-c	
Bad River blue grama	20	23.3 ab	70.0 a	
Bad River blue grama + Cody buffalograss	10 + 44	13.3 a	85.0 b-d	
Cody buffalograss	88	16.7 ab	90.0 cd	
Common blue grama	20	40.0 a-c	80.0 a-cd	X
Common blue grama + Cody buffalograss	10 + 44	21.7 ab	85.0 b-d	X
Hachita blue grama	20	20.0 ab	70.0 a	X
Hachita blue grama + Cody buffalograss	10 + 44	46.7 a-d	88.3 b-d	X
Lovington blue grama	20	83.3 d	78.3 ab	
Lovington blue grama + Cody buffalograss	10 + 44	55.0 b-d	91.7 d	

[†]PLS, pure live seed. 10 pounds/acre = 11.2 kilograms/hectare; 20 pounds/acre = 22.4 kilograms/hectare; 44 pounds/acre = 49.3 kilograms/hectare; 88 pounds/acre = 98.6 kilograms/hectare.

Table 1. Seeding rates, percent coverage of blue grama cultivars, Cody buffalograss, and blue grama + buffalograss mixes in September 2006 and August 2007, and creation of a playable unmowed rough in 2008 in Urbana, Ill. Plots were planted on July 6, 2006.

What we did

We began studies in early June 2006 at the Landscape Horticulture Research Center in Urbana, Ill. In the first study, we wanted to evaluate the notion that 20 pounds PLS/acre (22.4 kilograms/hectare) is an appropriate seeding rate for blue grama. In this study, we seeded plots at 10, 15, 20, 25 and 30 pounds PLS/acre (11.2, 16.8, 22.4, 28.0, 33.6 kilograms/hectare) using common blue grama seed. Percent cover was estimated several times in 2006, 2007 and 2008. This study was planted as randomized complete blocks with four replications in silty clay loam soil, mulched with clean wheat straw and irrigated as necessary to ensure germination.

Seeding rates

In the second study planted in June 2006 and replanted in July 2006, plots of blue grama cultivars alone or mixed with buffalograss were planted (Table 1) to evaluate suitability for unmowed playable roughs. Seeding rates were based on rates of 20 pounds blue grama PLS/acre (22.4 kilograms/hect-



A seeding rate of 10 pounds PLS/acre for common blue grama produced inadequate cover. Photos by Matt Mechenes



As the plots developed, a combination of Hachita blue grama and Cody buffalograss proved to be the best planting of the grasses evaluated.



Similar plot cover was provided by 20, 25 and 30 pounds PLS/acre of common blue grama.



Alma blue grama was too dense to allow golfers to easily locate errant shots.

are) and 88 pounds buffalograss PLS/acre (98.6 kilograms/hectare). When the grasses were combined, the seeding rate for each grass was halved. As in the seeding rate study, we seeded into silty clay loam soil, mulched with clean wheat straw and irrigated as necessary to ensure germination, but in this study we planted three replications. Percent cover was evaluated several times in 2006 and 2007. Suitability as unmowed playable roughs was subjectively evaluated in 2008, taking above-ground density and height into consideration.

Weed control and biomass removal

We also examined a herbicide for weed control, and burning and mowing for biomass removal. Neither 2006 study was treated with herbicides in 2006. In 2007, we applied Plateau (imazapic) at 3 ounces/acre (0.2 kilograms/hectare) to control a variety of grassy and broadleaf weeds in the 2006 seeding rate and cultivar studies. Also in July 2007, we applied Plateau at the same rate as a pre-emergence weed control at the time of seeding a 2007 blue grama/buffalograss planting. Finally, in spring 2008, we burned and mowed plantings of blue grama and buffalograss to identify differences in performance of the roughs.

What we learned

Seeding rate

In the seeding rate study, there were no significant differences in plot coverage in the planting year, nor in one or two years following planting, when common blue grama was seeded at 20, 25 or 30 pounds PLS/acre (22.4, 28.0 or 33.6 kilograms/hectare) (Table 2). Seeding at 10 or 15 pounds PLS/acre (11.2 or 16.8 kilograms/hectare) did not provide coverage as good in any of the first three as did the higher rates. Given the cost of seed, we recommend following the seeding rate of 20 pounds PLS/acre (22.4 kilograms/hectare) in order to provide acceptable coverage in the shortest time period for the most reasonable cost.

Cultivars

In the cultivar studies, percent coverage in 2006 and 2007 were estimated multiple times; one date from each of those years is presented in Table 1. When rated for acceptable playing conditions in July 2008, common and Hachita blue grama — both alone and combined with Cody buffalograss — produced acceptable playing conditions as unmowed roughs (Table 1). These grasses offered the desirable combination of open canopy for finding and striking a ball without being too tall. Only the combination of Hachita blue grama plus Cody buffalograss was in the top statistical group for plot coverage in 2006. In



2007, only Hachita blue grama planted alone was not in the top statistical group based on plot coverage. This grass, however, had coverage sufficient for an acceptable unmowed playable rough. At the July 2008 evaluation, all grasses in these plots were in flower and at peak attractiveness.

In 2008, the other grasses studied were judged to be either too dense or too tall to be acceptable unmowed playable roughs. Bad River blue grama and Cody buffalograss alone and Alma and Bad River blue grama plus Cody buffalograss were judged to be too dense, while Alma and Lovington blue grama and Lovington blue grama plus Cody buffalograss were considered too tall to be acceptable unmowed playable roughs.

The appearance of blue grama in mid-May following an April mowing in central Illinois is unacceptable due to a thin, open canopy. Photos by T. Voigt

% cover, 2006-2008

Seeding rate (PLS/acre) [†]	Sep 6, 2006	Aug 29, 2007	Jul 11, 2008
10 pounds	57.5 a	63.8 a	67.5 a
15 pounds	47.5 a	65.0 ab	61.3 a
20 pounds	68.8 ab	77.5 a-c	75.0 ab
25 pounds	85.0 b	80.0 bc	91.3 b
30 pounds	83.8 b	86.3 c	91.3 b

[†]PLS, pure live seed. 10 pounds/acre = 11.2 kilograms/hectare; 15 pounds/acre = 16.8 kilograms/hectare; 20 pounds/acre = 22.4 kilograms/hectare; 25 pounds/acre = 28 kilograms/hectare; 30 pounds/acre = 33.6 kilograms/hectare.

Table 2. Percent coverage of five seeding rates of common blue grama in 2006, 2007 and 2008 in Urbana, Ill., in plots planted on June 20, 2006.



Left: Blue grama in flower in mid-summer. Right: The cultivar plots in early summer.



Maintenance

Plateau controlled most weeds during the germination of blue grama and buffalograss in 2007 and shows promise as a treatment used to reduce weed competition and aid in coverage of the desirable native species. Plateau also was successfully applied as a post-emergence weed control to established plantings of blue grama and buffalograss, again controlling weedy species without damaging the desirable species.

Both spring burning and mowing the warm-season grasses in April before the onset of growth acceptably removed undesirable aboveground biomass, and neither treatment appeared to negatively affect summer growth of the grasses. Unfortunately, however, neither treatment resulted in an attractive setting, and the sites remained unattractive until new growth emerged in mid-to-late May in central Illinois. Because they are warm-season grasses, blue grama planted alone or mixed with buffalograss requires relatively warm temperatures to commence growth in the spring. In central Illinois and north, it is usually early May or later before much growth occurs and late May before an acceptable cover develops. From the period in April after mowing or burning until coverage became more established in mid-to-late May, the appearance of the blue grama and the buffalograss was unacceptable.

Conclusions

We learned that Hachita blue grama plus Cody buffalograss is easy to seed and tolerant of applications of Plateau herbicide for pre- and post-emergence weed control; it can be burned or mowed, can provide adequate cover during warm-weather months and can offer playable lies when unmowed. Unfortunately, we believe that the appearance of Hachita blue grama plus Cody buffalograss (as well as that of the other grasses in the study) is unacceptable in spring following mowing or burning. Thus, we cannot recommend blue grama alone or mixed with buffalograss for playable unmowed roughs, particularly for courses

where appearance is a major issue.

Through this and previous studies, we have been unable to identify grasses or management regimes that can create acceptable, unmowed playable roughs throughout the year in the Midwest. In much of this area, the soils are fertile and rainfall is adequate enough to support lush growth of desirable plants, as well as weeds. Developing roughs with plantings that are open enough to be playable, have season-long acceptable appearance and are not high cost or high maintenance continues to be a research challenge.

Funding

A Chapter Matching Grant from The Environmental Institute for Golf, the Central Illinois GCSA and the Midwest Association of Golf Course Superintendents supported this work.

Acknowledgments

Matt Mechenes, a University of Illinois graduate student, assisted with this project.

Literature cited

1. Beard, J.B. 1973. Turfgrass science and culture. Prentice-Hall, Englewood Cliffs, N.J.
2. Kucera, C.L. 1998. The grasses of Missouri. Revised ed. University of Missouri Press, Columbia, Mo.
3. Mohlenbrock, R.H. 2001. The illustrated flora of Illinois grasses *Panicum to Danthonia*. 2nd ed. Southern Illinois University Press, Carbondale and Edwardsville, Ill.
4. Pawnee Butte Seed. 2004. Guide to grasses. Pawnee Butte Seed, Greeley, Colo. www.pawneebutteseed.com/guide_to_grasses.htm (verified Nov. 21, 2008).
5. Voigt, T. 1993. Ornamental native grasses. *Grounds Maintenance* 28(3):48-57.
6. Voigt, T. 1996. Native grasses flourish on Midwestern golf courses. *Golf Course Management* 64(11):58-62.
7. Voigt, T. 1999. Natives in unlikely surroundings. *Illinois Steward* Spring, 8(1).
8. Voigt, T. 2000. Native Midwestern plants for golf course landscapes. *Erigenia* 18:56-63.
9. Voigt, T. 2001. Native plants for Midwestern golf courses. *Golf Course Management* 69(12):63-67.
10. Voigt, T. 2006. Results of the 2005 MAGCS-GCSAA un-mowed rough survey. *On Course* 60(4):5-19.
11. Voigt, T. 2006. Turf and native grasses for naturalized roughs. *Golf Course Management* 74(9):89-92.
12. Voigt, T., and J. Tallarico. 2004. Turf and native grasses for out-of-play areas. *Golf Course Management* 72(3):109-113.

GCM

Tom Voigt (tvoigt@illinois.edu) is an associate professor in the department of natural resources and environmental science at the University of Illinois, Urbana.



The research says

→ Previous studies and results from a survey of Midwestern superintendents indicated that two native grasses, blue grama and buffalograss, can create attractive unmowed roughs that are playable.

→ A three-year study of blue grama and buffalograss alone and in combinations showed that, alone or in combination, the grasses are unattractive after mowing or burning in spring and are therefore not acceptable for golf course roughs in the Midwest.