Turfgrass and Environmental Research Online

…Using Science to Benefit Golf

Research at the University of Nebraska, Kansas State University, and Utah State University demonstrates that buffalograss is indeed more responsive to nitrogen fertilizer applications than previously believed.

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PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 215 projects at a cost of $21 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf***.

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Buffalograss Management Research: The Results May Surprise You

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SUMMARY

Research at the University of Nebraska, Kansas State University, and Utah State University investigated the fertility and mowing requirements of seeded and vegetative cultivars of buffalograss (*Buchloe dactyloides*).

- In 1996, the first year of nitrogen treatments after establishment, there were virtually no differences in buffalograss quality, color, or density among the nitrogen rates, especially at the Kansas site.
- By 1998, the third year of nitrogen treatments, buffalograss was displaying a very favorable response to the nitrogen applications at all locations.
- Contrary to popular notion, there was no observed increase in weed infestation as nitrogen rate increased.
- At the one-inch mowing height, the vegetative propagated cultivars 378 and NE 91-118 had good color, quality, and density. The seed-propagated cultivars, Cody and Texoka, performed poorly at the one-inch mowing height, and rarely had acceptable density, even at the four-pound N rate.
- Cody and Texoka responded well to the two-inch and three-inch mowing heights. In contrast, 378 and NE 91-118, generally had higher quality when mowed at two inches rather than three. At the three-inch mowing height, NE 91-118 often lacked uniformity.

Buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] is a warm- season grass native to the Great Plains region of the United States (1, Figure 1). The only turfgrass species native to North America, it has long claimed to being a low maintenance grass with reduced irrigation, nitrogen, and mowing requirements (5, 6, 8).

The Need for Research

In response to a 1984 call for proposals from the USGA to develop reduced-maintenance turfgrasses, a team of scientists from the University of Nebraska led by Drs. Edward Kinbacher, Terrance Riordan, and Robert Shearman began evaluating buffalograss for use as a turfgrass. Interest in water conservation and reducing chemical inputs for turfgrass culture made buffalograss a desirable choice (6). USGA-sponsored breeding efforts to improve buffalograss for use as a turfgrass have been very successful and have resulted in the release of eight buffalograss cultivars.

As the new buffalograss cultivars entered the market, it became evident that there was a need for research to investigate fundamental management practices. After all, this was not the same buffalograss that had been growing on the Great Plains for many, many thousands of years, but rather this was buffalograss that had been selected for favorable turfgrass traits such as color, density, uniformity, and vigor of spread.

Most management recommendations have supported the low maintenance philosophy by advocating little or no fertilizer applications, as well as infrequent or no mowing (2, 6). In low-maintenance areas where expectations are simply based on having ground cover, buffalograss managed in this manner is acceptable. However, for those who have planted buffalograss in golf course roughs or home lawns following these management recommendations has often led to disappointment with the quality of turf achieved.

University of Nebraska Responds

Common perceptions of buffalograss are that it is generally non-responsive to nitrogen applications and high nitrogen rates do not benefit buffalograss, but only increase weed interference (2, 3, 4, 6). There are also questions about mowing height adaptation for different buffalograss cultivars. With these questions in mind, and funding from USGA's Turfgrass and Environmental Research Program, research was initiated in 1995

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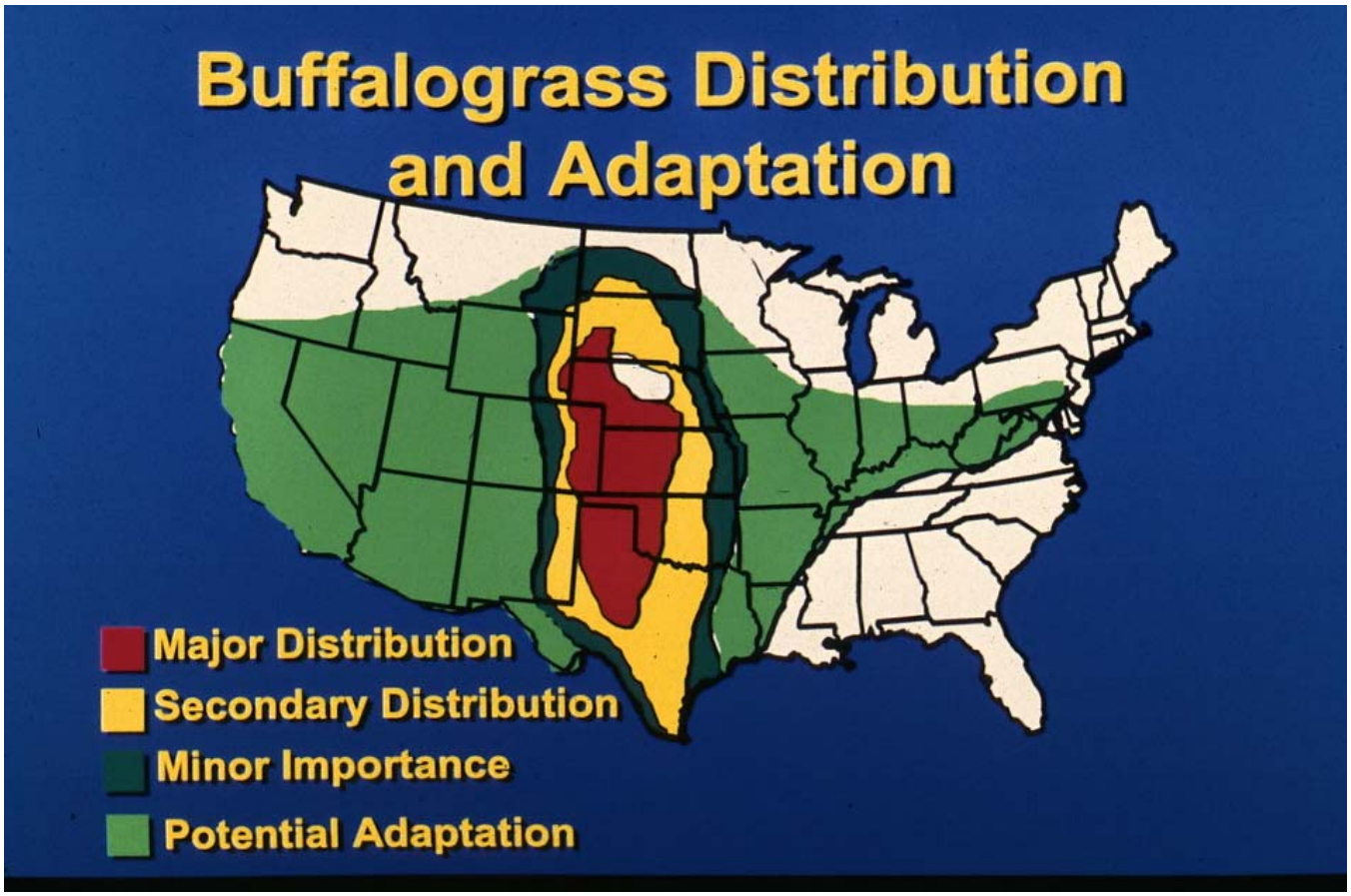


Figure 1. Buffalograss is the only turfgrass that is native to the U.S., and it has at least potential adaption throughout much of the country. (Adapted from Wenger, 1943).

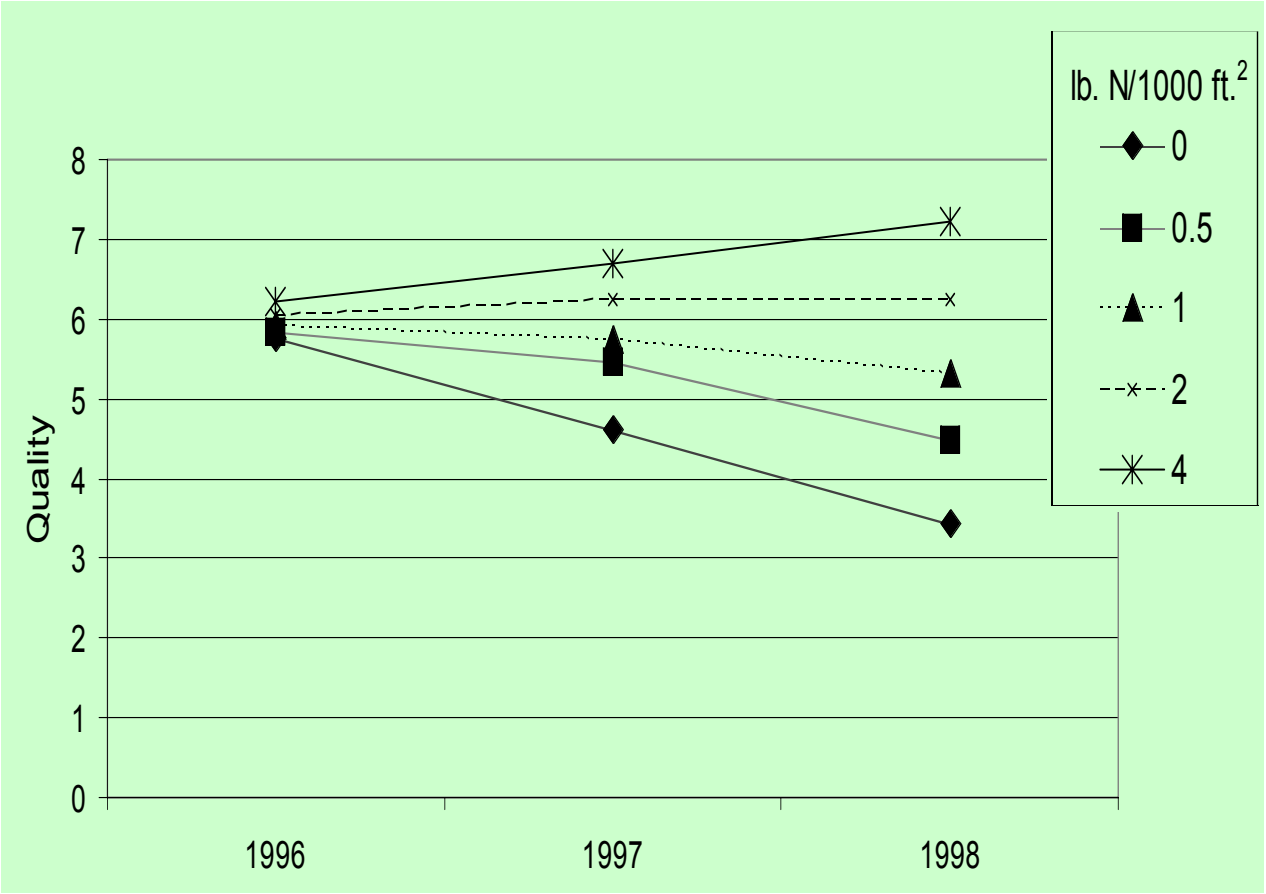
to investigate nitrogen rate and mowing height effects on four different buffalograss cultivars.

Two vegetatively established cultivars, '378' and NE 91-118, and two seeded cultivars, 'Cody' and 'Texoka' were planted at three sites in 1995. The three sites were the John Seaton Anderson Turfgrass and Ornamental Research Facility located at the University of Nebraska Agricultural Research and Development Center near Mead, the Kansas State University Rocky Ford Turfgrass Research Center at Manhattan, and the Utah State University Greenville Research Farm at Logan.

Buffalograss was established in 1995, and management treatments were initiated in 1996 and continued through 1998. The mowing heights were one, two, and three inches. The one-inch height was mowed twice per week, while the two-inch and three-inch heights were mowed once per week. Nitrogen rates were applied in two equal applications with the first application in early June and the second application in mid-July, six weeks after the first application.

A polymer coat fertilizer (36-1-6, N-P- K) was used to apply total nitrogen amounts of 0.5, 1.0, 2.0, and 4.0 pounds per 1000 square feet. An untreated control (no fertilizer) was included as a comparison. Immediately following nitrogen application, the plots were irrigated with one half-inch of water. After adjusting for precipitation, one inch of water was applied every two weeks throughout the duration of the research. Preemergence herbicides were applied each year from 1996 to 1998 to control annual weeds.

Turfgrass quality, color, and density were rated visually on a scale of 1-9 as used by the National Turfgrass Evaluation Program (NTEP). The rating scale for quality was 1 is extremely poor, 9 is excellent, and 6 is acceptable. Ratings were taken every two weeks starting two weeks after the first nitrogen application and continued until six weeks after the second nitrogen applica-



Although no differences in turfgrass quality were evident when the study began in 1996, by 1998, higher rates of nitrogen produced significantly higher quality turf.

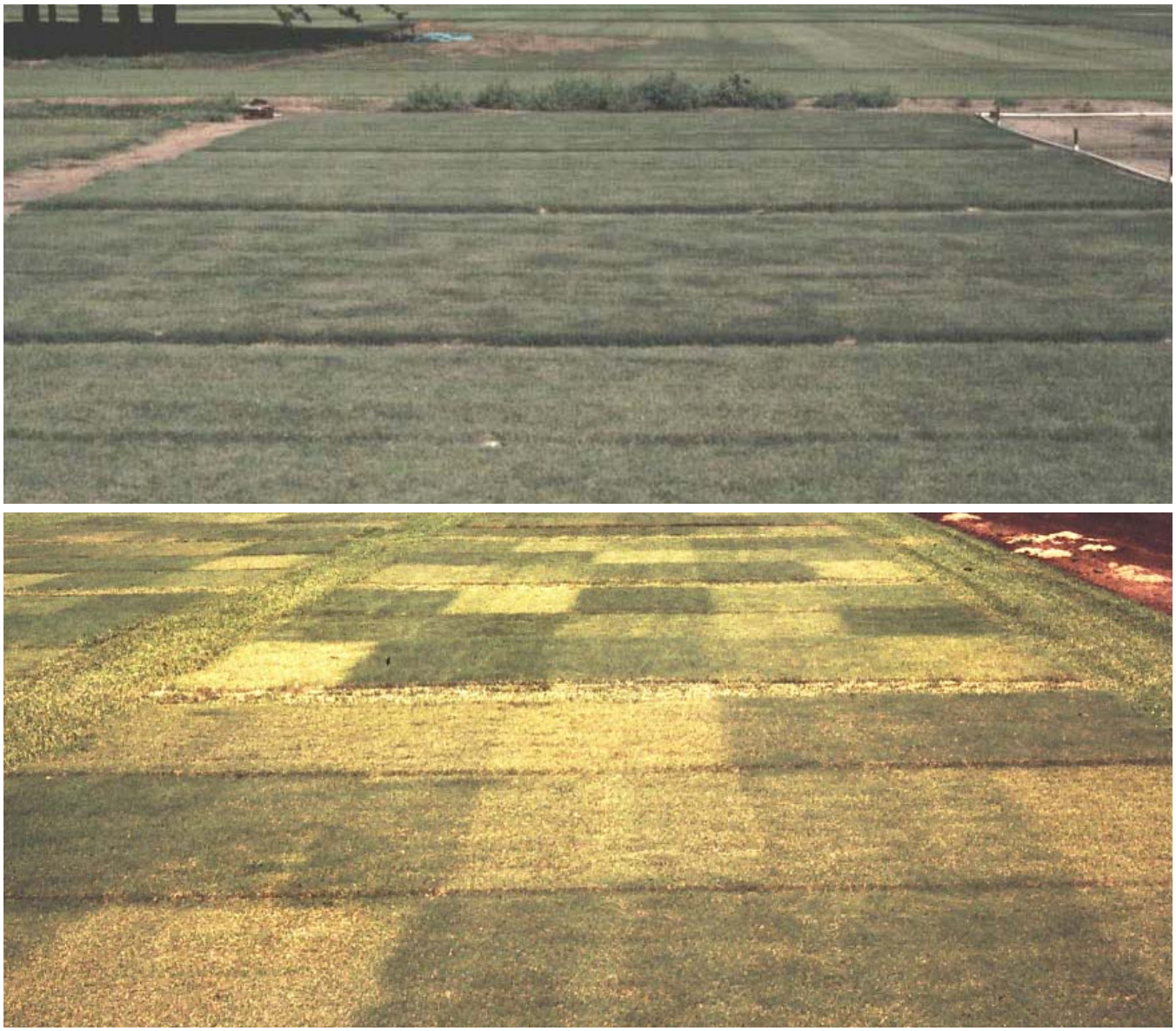
tion. Clippings were harvested four weeks after each fertilizer treatment, oven-dried, and weighed.

Buffalograss Responds to Nitrogen

The results of the nitrogen rate applications to the buffalograss revealed several interesting trends. In 1996, the first year of nitrogen treatments after establishment, there were virtually no differences in buffalograss quality, color, or density among the nitrogen rates, especially at the Kansas site. Without prior knowledge of the research, most people would have not even recognized that different nitrogen rates had been applied to the buffalograss. Perhaps results such as these led to the belief that buffalograss is unresponsive to nitrogen applications.

However, successive years of nitrogen treatments revealed otherwise. By 1998, the third year of nitrogen treatments, buffalograss was displaying a very favorable response to the nitrogen applications at all locations. As nitrogen rate increased from 0 to 4 pounds N per 1000 square feet per year, buffalograss quality, color, and density all increased. Although the difference in quality among nitrogen rates was very small in 1996, by 1998 the effects of nitrogen rate had become clear. It was also evident that quality declined from 1996 to 1998 for nitrogen rates less than 2 pounds N per 1000 square feet, remained relatively constant for the 2 pound N rate, and increased for the 4 pound N rate.

Contrary to popular notion, there was no observed increase in weed infestation as nitrogen rate increased. Buffalograss responded to the nitrogen applications just as all other turfgrasses do, with improved color, quality, and density. The lack of response to the nitrogen applications in the first year of treatments was likely due to adequate levels of soil fertility. As the residual soil nitrogen was utilized by the buffalograss over the next couple years, the beneficial effects of the nitrogen



Buffalograss management research plots at the Kansas site at four weeks after the second fertilizer application in 1996 (top) and buffalograss management research plots at the Nebraska site in 1998 (bottom) showing differential response to different nitrogen applications.

applications became more evident. This may explain previous observations that buffalograss is unresponsive to nitrogen applications. If our research had been conducted for only one year, it is likely we would have drawn the same conclusion.

Buffalograss Use on Golf Courses and Lawns

The following recommendations are relevant to irrigated buffalograss that is mowed weekly. Buffalograss that is maintained in this manner is not considered to be low maintenance, but representative of common lawn management or golf course rough management practices. Buffalograss that is not irrigated to prevent dormancy or not mowed regularly would have lower expectations and different management recommendations. Although the buffalograss cultivars had the highest color, quality, and density ratings at the four pound N per thousand square feet rate, our recommendations are to apply two pounds N per 1000 square feet per year as split applications approximately six weeks apart.

There are two reasons for making the two-pound N rate recommendation. First of all, the

clipping weights at the four-pound N per 1000 square feet per year rate were significantly higher than at the other nitrogen rates. Although buffalograss had the highest quality, color, and density at the four-pound N rate, it also had the greatest clipping production, thereby effectively eliminating any potential buffalograss has for reduced mowing frequency. Secondly, if we were to recommend the four-pound N rate, we would also be eliminating the reduced fertility requirement of buffalograss. Recommending a four-pound N rate would place buffalograss under essentially the same fertilization program as other turfgrasses such as Kentucky bluegrass.

Mowing Height Recommendations Vary by Cultivar

Buffalograss response to the three mowing heights varied among cultivars. At the one-inch mowing height the vegetative propagated cultivars 378 and NE 91-118 had good color, quality, and density. The seed-propagated cultivars, Cody and Texoka, performed poorly at the one-inch mowing height, and rarely had acceptable density, even at the four-pound N rate. Cody and Texoka responded well to the two-inch and three-inch mowing heights. In contrast, 378 and NE 91-118, generally had higher quality when mowed at two inches rather than three. At the three-inch mowing height, NE 91-118 often lacked uniformity. Although this appearance would be suitable for low maintenance areas, on higher profile areas this would be unacceptable.

Mowing height recommendations vary based on seeded or vegetative cultivars and end-users' expectations and desired use. In a low maintenance area, all of the buffalograss cultivars could be mowed only once or twice a year, but if a more aesthetic turf were desired, the following recommendations would pertain. For vegetative cultivars, mowing heights of one-half to three inches are acceptable. The half-inch mowing height would only be recommended for use as golf course fairways. As mentioned previously, some vegetative cultivars such as NE 91-118 have better uniformity at the two-inch mowing height. Due to poor density at low mowing heights, the mowing height recommendation for seeded cultivars is two to three inches.

Matching Expectations with Management

Our research has shown that although buffalograss may still be considered a low maintenance turfgrass, it does respond favorably to nitrogen applications and can produce a high quality turfgrass with regular mowing and nitrogen applications. The key to successful buffalograss management is to determine your expectations and then tailor the management program to meet them. Although we recommend nitrogen applications to buffalograss to achieve a good quality turfgrass, the amounts recommended, two pounds N per 1000 square feet per year, are certainly less than the amounts of fertilizer many turfgrasses require.

If you have buffalograss and haven't been satisfied with its performance, consider modifying your management scheme to reflect these recommendations. In the proper setting, with the proper expectations and management scheme, it may surprise you. After all, this is not the buffalograss that this nation's pioneers traveled across 200 years ago.

Acknowledgments

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