



## TEXAS TECH UNIVERSITY CENTER FOR MULTIDISCIPLINARY RESEARCH IN TRANSPORTATION

Research Project Summary Report 0-4903-S

Project 0-4903

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### Right-of-Way Mowing Height Research: Summary

There are concerns that current mowing practices are not timed to maximize the viability of the mixture of plants, especially native grasses, found in highway rights-of-way. It is hoped that mowing frequency can be reduced in some locations to minimize right-of-way maintenance costs. However, some mowing is required to reduce fire hazards in the fall and winter months. This project was intended to determine the optimum mowing height with respect to maintaining a viable stand of acceptable vegetation, and the frequency of required mowing. The existing vegetation on the roadside needs to be maintained in a healthy status to prevent soil erosion with the least amount of inputs. Excessive mowing limits carbohydrate storage, damaging the overall plant status during periods of stress, and in time leads to population decline (Nofal et al., Journal of Range Management, 57:497-502, 2004). Grass species produce a deeper root system in proportion to the amount of leaf area left to photosynthesis.

#### What We Did...

To accomplish the above objectives, plots were established near Andrews, Brady, Lufkin, and Tahoka, and responses measured the effects of mowing height, frequency of mowing, and root mass. From a separate set of plots, measurements were taken of plant population changes, morphological development, and carbohydrate reserves in plants. In another location, data were collected on mowing height and mower speed versus rooster tails.

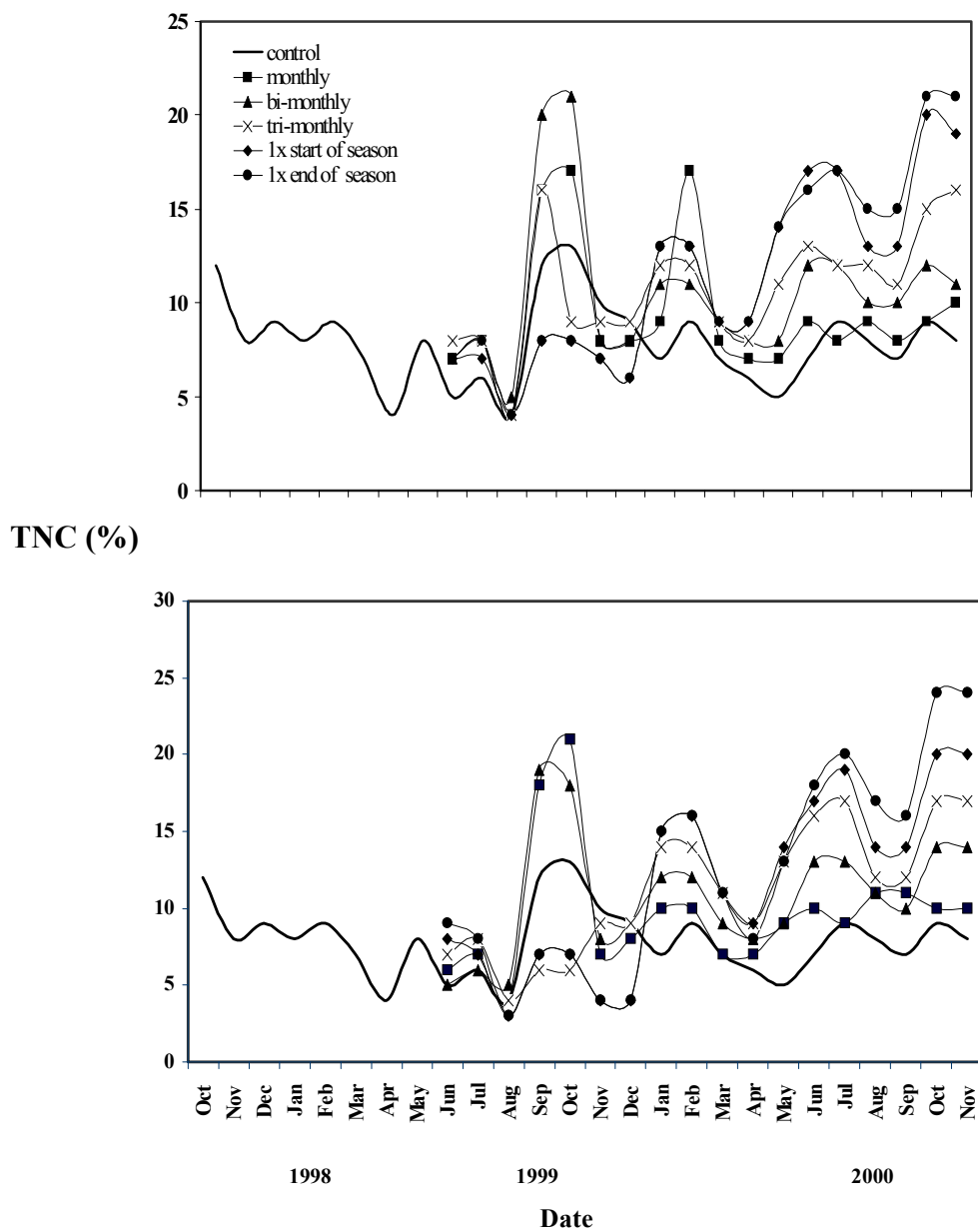
To determine the effects of commercial mowing practices on changes in species composition and root density, species composition was measured near Tahoka, Andrews, Brady, and Lufkin. Mowing treatments were initiated in May 1999 and repeated as scheduled through 2003. Treatments at each location included three stubble (mowing) heights (2, 4, and 8 inches), three frequencies (1 time/year, October; 2 times/year, July and October; and 3 times/year, May, July, and October). Each treatment was

replicated four times. Changes in species composition and root density were monitored over the 5 year period of the study.

In Lynn County west of Tahoka on US 380 and in Crosby county east of Crosbyton on FM 2591, 33 plots were established at each location. The experimental design consisted of 5 mowing frequencies, 2 mowing heights, a control (no mowing), and 3 replications. Total nonstructural carbohydrates (TNC) concentrations, internode elongation, number of tillers, number plants, biomass, fuel moisture, and plant height were measured on a monthly basis for silver bluestem at Tahoka and blue grama at Crosbyton.

A series of experiments were conducted at two locations in Central Texas—approximately 15 miles north of Brady on highways FM 1028 and FM 502 and approximately 10 miles north of Waco on FM 933, to document the relationship between mowing speed and rooster tails. One trial was installed at Brady in June





**Figure 1.** Basal crown and stem base TNC (%) for silver bluestem at 0, 2-inch, 4-inch (bottom) mowing stubble heights at different mowing frequencies.



2000 and 2 trials were installed at Waco in June 2001. Each trial consisted of 45 plots with 3 speeds (2, 4, and 6 mph), 3 set heights (4, 6, and 8 inches), and 5 replications in a completely randomized design. The plots were one width of the mower (15 ft) wide and 100 feet in length.

## What We Found...

It appears that the mowing practices to control vegetation on Texas right-of-ways can eliminate the native, climax grasses. In Andrews, a relatively dry location, Black Grama, a major climax specie for the region, hardly ever contributed to the species composition of mowed plots. It was apparent at all locations mowed that there was serious damage to plants when mowed at 2 inches to the extent that all mid-seral and tallgrass species would be eliminated by mowing. There was some concern that certain mowing treatment would affect Johnsongrass. However, it was found that its abundance was not the result of any mowing treatment, but that it accumulates where water is abundant.

For blue grama, plants mowed one-time at the end of the growing season, regardless of stubble height, had the greatest amount of stored total nonstructural carbohydrate (TNC) (Figure 1). The greatest amount of injury to blue grama can be caused from mowing frequently at <4-inch stubble height and by mowing in late summer. Total for silver bluestem plants TNC were lowest in plots not mowed as well as in the plots mowed frequently (~10%). Silver bluestem plants mowed one-time only at either the beginning or the end of the growing season had the highest TNC (~22%).

There is a significant interaction between the tractor speed and the mower height setting on the number of pop-ups or rooster tails. The number of pop-ups becomes greater (25 vs. 75) when both the cutting height of the mower and the speed of the tractor are increased. The actual height of the verdure did exhibit a trend of increasing in height as the speed of the mower increased. The grass stems evidently are bent over by the front of the mower increasingly as the speed of the mower increases.

## The Researchers Recommend...

The general recommendation for a mowing height of approximately 7 inches was supported by the results of this project. In addition, the following observations and recommendations are made.

- Dominant short-grasses such as blue grama and buffalograss are not affected by short mowing unless mowed to a very short stubble height (<4 inches).
- For mid-seral and tall grasses, defoliation (not severe) does not cause severe injury to grasses if they are in the vegetative (short-shoot) stage. However, if they have shifted from the vegetative stage to the reproductive (long-shoot) stage, they can easily be damaged by, and ultimately killed by, short mowing (<4 inches).
- For blue grama, mowing frequently and at shorter stubble heights (<4 inches) is not recommended. Therefore, for the health and vigor of blue

grama (and other short-grasses), mowing at a stubble height of 4 inches, or more, one-time only at the end of the growing season is most desirable.

- As shown for silver bluestem, any stubble height (<4 inches) removes stem bases and basal crowns. These areas are crucial for plant growth because carbohydrates are stored or tiller recruitment and initiation begins in these regions.
- The results of this study indicate that operators should slow to near 2 mph when mowing Johnsongrass or any other tall, coarse species. Rooster tails increase from 25 at 2 mph to 75 at 6 mph.
- A forward speed of approximately 4-5 mph is the suggested optimum with pull behind rotary mowers to ensure sufficient cuts with minimal pop-ups. Based on the results of this study, a speed of 4 mph and a set cutting height of 6 inches would be recommended, providing an actual verdure of 7 inches.



### *For More Details...*

The research is documented in the following:

7-4903 - Right-Of-Way Mowing Height Research: Final Report

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## **Your Involvement Is Welcome...**

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