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## Measurable Increases in Fairway Bentgrass Populations Associated with Lightweight Mowing

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Since the late 1970's and early 80's, increased attention has been focused on maintenance practices to improve manageability, playability, and aesthetics of fairways. These newer management strategies, the cornerstone of which is "lightweight" mowing, not only increases the quality of the playing surface, but also appears to favor bentgrass competitiveness over *Poa annua*. Dramatic increases in percentages of bentgrass in fairways have been reported after only one or two seasons of lightweight mowing.

Much discussion and experimentation among area superintendents has ensued, especially in regard to: which types of mowers should be used; whether to collect clippings; timing and amounts of irrigation, fertilization, and aerification; use and abuse of growth retardants; and other issues that may impact *Poa annua* survival, seed production, and competitiveness with the desired bentgrass.

The consensus at this time is that you can indeed see increases in bentgrass with changes in management. But how much of an increase in bentgrass can you get? And, how soon can you get it? In order to try to answer these two questions, we began a study in early 1986 to measure increases in bentgrass populations in fairways that were previously mowed in gang mowers, but were subsequently mowed with lighter weight units (triplex or pentaplex).

### Methods

Two Chicago-area country clubs were chosen where mixtures of bentgrass and *Poa annua* were indigenous in fairways, and where superintendents had recently (1983-86) introduced lightweight mowing and other management strategies to reduce *Poa* competition. Also, the clubs were selected to represent two different environmental and geographical areas.

To the north lies the Knollwood Club in Lake Forest, which is near the lake shore and exposed to cooler temperatures at various times of the year. At Knollwood, superintendent Randy Wahler has converted a number of fairways using Roundup, and has been on lightweight mowing of all fairways since 1983 or '84 (Jake HF-5's). Certain fairways at Knollwood have received treatments of Cutless and TGR as well.

On the south side, superintendent Dave Ward then at Ravisloe CC began lightweight mowing of fairways (GM 3's) on par 3s and decks in 1982. He added a few full fairways in 1984 and all fairways were used on the fairways during the study, as well as little or no N.

Two separate methods were used to assess the increase in bentgrass in fairways over the next two seasons. First, a visual assessment of percentage bent vs. *Poa* was made on large scale areas of fairways. Several candidate fairways were selected at each club, than % bent was estimated on rectangular segments (plots) of fairway delineated by sprinkler head locations. Most plots were 6-8000 sq. ft. Ratings were made in spring of '86 and again in spring of '88.

The second method used was to map and measure individual patches of bentgrass within certain defined, relatively small plot  
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(Lightweight Mowing cont'd.)

areas. These small plots were located near permanent markers such as sprinkler heads or valve boxes, and were mapped on clear plastic sheets. The sheets were marked so that they could be replaced in the exact same location season after season. In this way, changes in the size and shape of bent patches could be monitored over time, and the appearance of new patches could be detected. Patches were marked in the spring of '86, '86, and '88; patches were much more visible and easy to mark in spring because of color differences between bent, *Poa*, and rye.

Surface areas of the mostly irregular shaped patches were estimated using the average radius technique commonly used to measure putting greens and other irregular surfaces on the golf course:

$$\pi \cdot \left( \frac{\text{sum } r(1..n)}{n} \right)^2 = \text{S.A.} \quad \text{where } r = \text{radius} \\ n = \# \text{ of radii measured}$$

where  $r$  = radius

$n$  = # of radii measured

### Results

A common measurement for superintendents is to estimate percent bentgrass of entire fairways (i.e. looking at the big picture). Table 1 shows over all results from the four Knollwood and five Ravisloe fairways that were studied. Note the 11.5% average increase in bentgrass for the 2 year period, also the amount of variability observed (6-22% increases).

TABLE 1. Large Area Visual Assessments - Entire Fairways, 1986-88.

----- Percent Bentgrass -----					
Fairway #	notes	1986	1988	change	
KWD 8	cutless	66	79	+13	
11	no pgr	68	74	+6	
16	cutl./tgr	62	69	+7	
18	cutless	65	78	+13	
RAV 2	1st year	58	73	+15	
8	1st year	60	69	+9	
10	3rd year	68	75	+7	
16	1st year	57	79	+22	
17	1st year	54	71	+17	
18	3rd year	73	79	+6	
mean:		63.1	74.6	+11.5	

note: values for 1986 are the initial ratings  
Knollwood #16 received Cutless in '86 and Scotts TGR in '87  
Ravisloe #10 and #18 had been lightweight mowed for two years prior to '86; other fairways were in their 1st year of lightweight mowing

Also of note were the apparent effects of Cutless applications on Knollwood #8 and #18 vs. untreated #11. Knollwood #16 decreased in percent *Poa annua*, but increased in ryegrass. Fairways at Ravisloe that were in their 3rd year of lightweight mowing at the beginning of this study showed less increase in bentgrass compared to fairways in their 1st year of lightweight mowing. However, the initial bentgrass populations of fairways #10 and #18 were higher, which could account for this observation. (As % bent increases over time, further increases are slower and more difficult?)

Because of the variable nature of the turf population within a single fairway, we broke down the ratings within individual fairways as described in Figure 1. Tables 2 and 3 contain the results of these population estimates. Note that some areas increased by as much as 20-25% while other areas decreased by 7-10%. Again, on average, we saw an approximate 10% increase in bentgrass after 2 years of study. However, site to site variability is quite high, and in certain areas increases in bentgrass can be more dramatic than five or ten percent.

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(Lightweight Mowing cont'd.)

TABLE 2. Breakdown of Fairway Ratings - selected fairways at Ravisloe CC.

Site	Percent Bentgrass - Visual Ratings								
	#8 Fairway			#16 Fairway			#10 Fairway		
	'86	'88	% +/- <sup>c</sup>	'86	'88	% +/-	'86	'88	% +/-
turn <sup>a</sup>	72	87	+15	57	95	+38	67	80	+13
deck <sup>b</sup>	55	80	+25	52	75	+23	67	82	+15
mean	60	69	+9	57	79	+22	68	75	+7

<sup>a</sup>turn = tee end of fairway ("turnaround")

<sup>b</sup>deck = approach to green...

<sup>c</sup>% +/- = percent increase or decrease in observed bentgrass populations

TABLE 3. Breakdown of Fairway Ratings - selected fairways Knollwood Club.

Site	Percent Bentgrass - Visual Ratings								
	#11 Fairway			#16 Fairway			#18 Fairway		
	'86	'88	% +/- <sup>c</sup>	'86	'88	% +/-	'86	'88	% +/-
turn <sup>a</sup>	53	75	+22	55	67	+12	53	70	+17
deck <sup>b</sup>	67	75	+8	50	70	+20	73	80	+7
mean	68	74	+6	62	69	+7	65	78	+13

<sup>a</sup>turn = tee end of fairway ("turnaround")

<sup>b</sup>deck = approach to green

<sup>c</sup>% +/- = percent increase or decrease in observed bentgrass populations

These dramatic increases in percent bentgrass in isolated areas are also evident when looking at the individual small plot/bentgrass patch measurements. Table 4 shows data from six such plot areas. These results include percent bentgrass (total area) for each plot and the number of patches measured. These plot areas had clearly defined bentgrass patches, but generally had lower percent bentgrass coverage at the beginning of the study

than other fairways areas. Some areas more than doubled in bentgrass coverage, up to as much as 90% bentgrass.

Note that as percent bent increased over time and patches expanded, the number of patches measured decreased, since many patches grew together ("coalesced"). Of note also is the plot that did not have a large increase in bentgrass (Knollwood 16a), but did increase in perennial rye as *Poa annua* populations decreased. The increase in ryegrass observed here may be related to use of Cutless and TGR growth retardants, which have no inhibitory effect on perennial rye.

TABLE 4. Small Plot - Individual Bentgrass Patch Measurements:

Plot #	Percent Bentgrass <sup>a</sup> (# of patches) <sup>b</sup>			Plot area
	Spr '86	Spr '87	Spr '88	
RAV 2	42 (8)	61 (10)	91 (2)	21.2 ft <sup>2</sup>
RAV 8	31 (7)	61 (5)	90 (3)	16.3 ft <sup>2</sup>
RAV 10	55 (8)	74 (5)	88 (2)	47.6 ft <sup>2</sup>
RAV 16	41 (10)	70 (3)	86 (2)	28.0 ft <sup>2</sup>
KWD 16A <sup>c</sup>	19	20	28	39.3 ft <sup>2</sup>
KWD 16B	44 (11)	52 (9)	75 (4)	47.2 ft <sup>2</sup>

<sup>a</sup> Percent surface area covered by bent patches within a defined plot area.

<sup>b</sup> numbers in parentheses are the number of patches in each surveyed area.

<sup>c</sup> this plot contaminated by increasing amount of ryegrass - percent of *Poa annua* in plot decreased more dramatically than data indicates...

Table 5 shows data on selected individual patches of bentgrass. These numbers were included only as a summary of our observations on patches; many patches could not be followed over two years because of coalescence. Note that patch diameters increased two to three inches per year on average. These relatively small increases in patch diameter often led to as much as a doubling in surface area covered by the patch.

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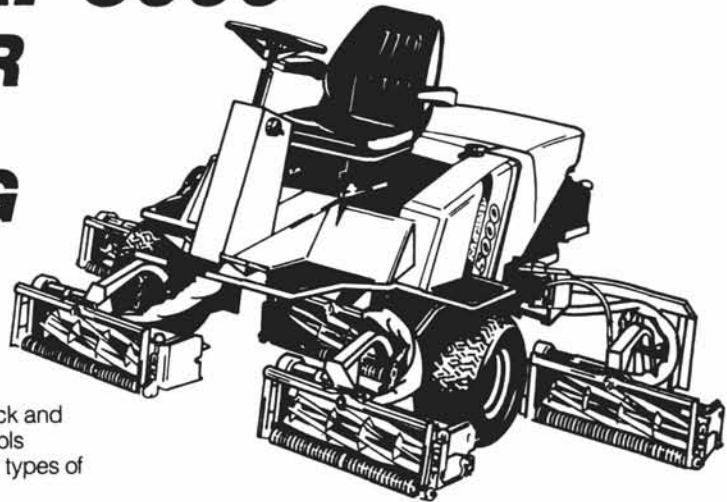
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(Lightweight Mowing cont'd.)

TABLE 5. Increase in Diameter of Selected Individual Patches

patch #	--- patch diameter (in) ---			--- patch area (in <sup>2</sup> ) ---		
	Spr 86	Spr 87	Spr 88	Spr 86	Spr 87	Spr 88
1	14.2	17.6	21.0	160	242	350
2	12.5	15.0	18.0	123	179	265
3	11.5	15.6	16.7	105	192	219
4	8.7	12.0	14.4	60	114	163

note: a 2 - 4 inch increase per year in patch diameter was often seen before patches coalesced.

**Summary**

It appears that the claims of increased bentgrass populations following lightweight mowing have not been exaggerated! In some fairway areas the rapid increase in bentgrass was quite surprising. The reader should note that there were no control areas or check plots that were mowed with heavy gang mowers. Therefore, the observed increases in bentgrass may have been influenced by hot, dry weather patterns of 1986-88 or other environmental factors that we could not detect. In other years, we may not have seen these increases in bentgrass; for example, the weather in '89 may have been more conducive to *Poa annua*, but we have no data for this.

Also, other management factors probably play a role in increasing bentgrass populations. For example, at Ravisloe, very little fertilizer has been added to the fairways (virtually no N) for the past few years, and irrigation and aerification practices have been changed. Also, as mentioned at Knollwood, the use of pgr's may have had an effect. In any case, we have seen from this study what the potential for increasing bentgrass populations can be, given appropriate management inputs and favorable environmental conditions.

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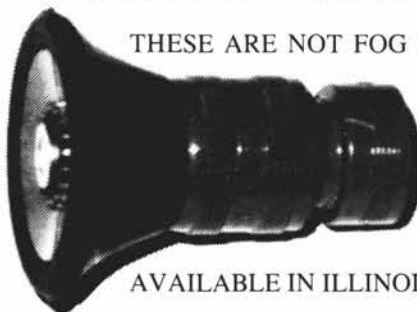


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