Optimal Management Practices for Kikuyugrass Quality and Playing Conditions

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Kikuyugrass (*Pennisetum clandestinum* Hochst. ex Chiov.) is considered either an invasive weed or the desired species on many golf courses and other turf areas along coastal and inland California. As part of a comprehensive project aimed at kikuyugrass improvement and management, a field study was initiated in August 2011 to identify cultural and chemical practices that are most important for producing quality turf and optimal playing conditions on golf course fairways. The cultivar 'Whittet' was established from sod on a Hanford fine sandy loam. A two-level, five-factor factorial design was used to evaluate mowing frequency (three vs. six times/wk), cultivation (grooming three times/wk vs. verticutting twice/yr), Primo Maxx (0 vs. 0.3 oz/1000 ft^2 biweekly), nitrogen (2 vs. 5 lbs/1000 ft^2/yr), and fungicide treatment (0 vs. monthly preventative applications according to disease activity). Turf quality was assessed visually and by an instrument that measures "greenness" or normalized difference vegetation index (NDVI). Turf firmness and ball roll were measured with a Clegg Soil Impact Tester (2.5 kg hammer Gmax) and Pelz meter, respectively.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	2^5 Factorial with six replications
Plot Size:	Main plots (mowing frequency and cultivation) are 20 ft x 20 ft; Sub-plots (N, Primo, fungicide) are 5 ft x 5 ft
Sod Established:	25 July 2011
Species/Cultivars	Kikuyugrass 'Whittet'
Fertility:	0.5 lbs N /1000ft^2 $(NH4)_2SO_4$ was applied monthly starting in April 2012 to high and low nitrogen factors resulting in a total of 3.5 lbs N/year and 1.5 lbs N/year on the high and low treatments, respectively by date of the 2012 field day.
Mowing Regime:	0.45 inches 3 days or 6 days/wk using a Baroness walk-behind tee mower

Cultivation Regime: Grooming (light verticutting) 3 times/wk with verticutting unit on Baroness mower or aggressive verticutting 4 June and 22 August 2012 using a Ryan Mataway walk behind machine

Irrigation Regime: Historic ETo for warm-season turf/DU

Data Collection: Turfgrass quality and % brown cover measured visually; Firmness measured with Clegg Soil Impact Tester; Color measured with NDVI; Ball roll measured with Pelz meter; Tension test measured with Ag Operations tension cart. All measurements are taken monthly.

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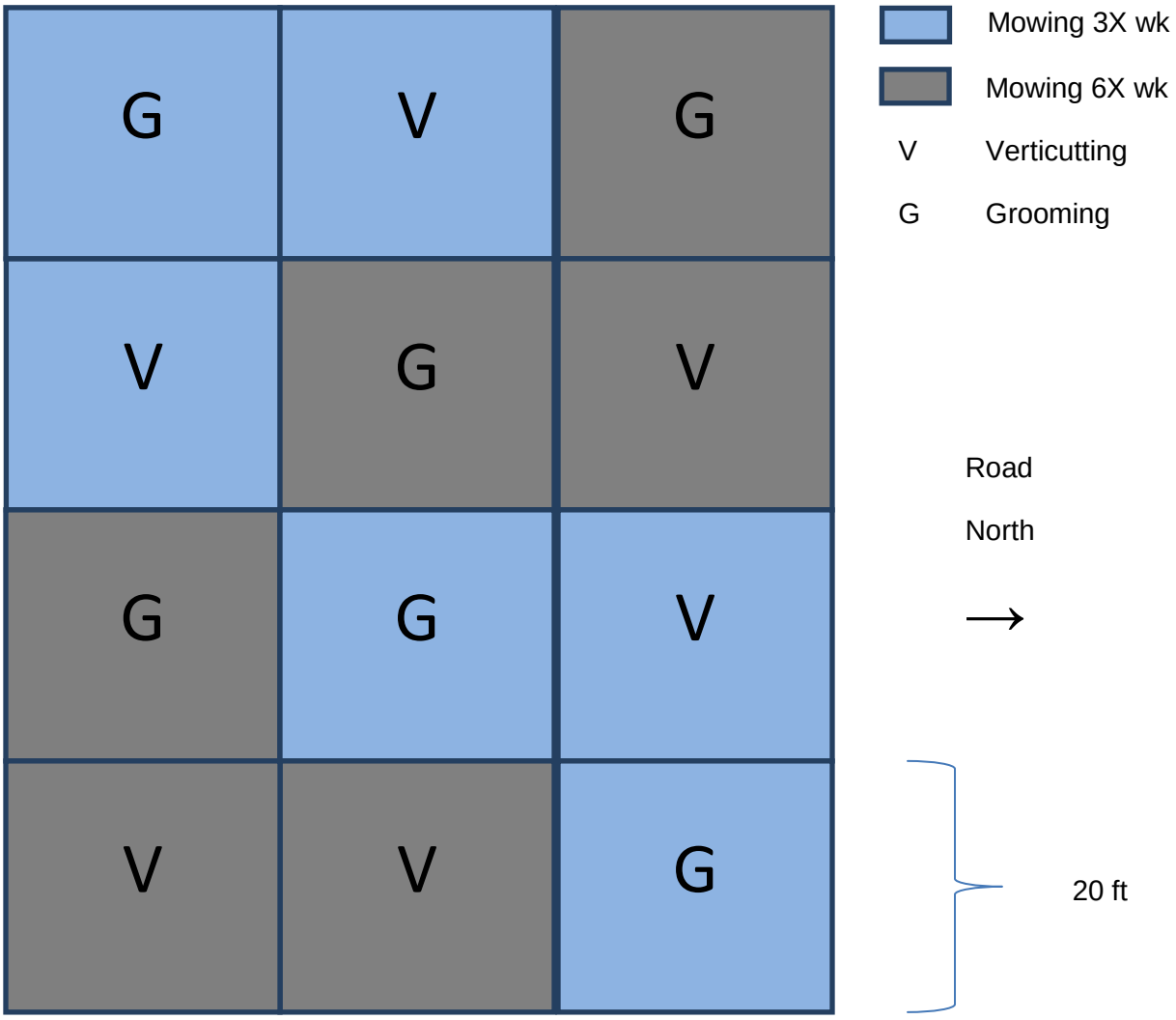
Field Map



Preliminary Results and Conclusions:

- ✓ Bi-weekly applications of Primo Maxx have demonstrated the greatest response in Kikuyugrass by improving turf quality, ball roll, color, as well as reducing scalping. However, Primo Maxx reduced turf firmness. This may be a result of increased lateral shoot growth from the PGR that provided greater cushion in the turf canopy.
- ✓ Although a significant increase in labor, fuel, and time, mowing six times/wk resulted in significantly greater ball roll distance on a species that is often referred to as "Velcro." Increased firmness and a smaller improvement in color also resulted from increased mowing frequency.
- ✓ Only two months of data have been collected thus far since the verticutting treatment has been implemented. From those two months we can compare how weekly grooming stands up to a twice a year verticutting regime. What we have found to date was that verticutting provided better color, turf quality, reduced scalping, and had higher tensile strength when compared to the grooming treatment. However, the grooming treatment did result in increased ball roll when compared to the verticutting treatment.
- ✓ As far as combinations of treatments are concerned, the best turf quality and color and least scalping have come from combinations of Primo Maxx, verticutting, and mowing 6 times/wk.

Table 1. Linear regression correlation coefficients depicting the response of treatments on Kikuyugrass performance in May 2012. The effect is based on the greater or more aggressive level of each treatment. Numbers are further highlighted in red or green to indicate whether the effect would be undesirable or desirable, respectively from the standpoint of Kikuyugrass management. For example, the higher rate of N resulted in a greater percentage of brown turf, probably due to scalping, and thus a lesser but still negative effect was found with NDVI or "greenness." On the other hand, use of Primo Maxx resulted in darker green turf or a very strong negative correlation with % brown turf. Primo also increased ball roll, turf quality, and NDVI, but decreased tensile strength slightly and firmness to a greater degree. Use of fungicides, increased mowing frequency, and grooming produced the effects shown below.

	Nitrogen	Primo	Fungicide	Mow	Grooming
Tension		-0.13	-0.16		-0.28
NDVI	-0.003	0.023	0.023	-0.003	0.029
Firmness		-2.12	-1.90	0.89	-3.24
Turf Quality		1.16	0.37		0.40
Ball Roll		1.97		0.65	1.59
%Brown Turf	1.07	-8.52			-3.29

Table 2. Linear regression correlation coefficients depicting the response of treatments on Kikuyugrass performance in June 2012, prior to the aggressive verticutting treatment. Note that Primo and the higher mowing frequency resulted in the most positive effects on Kikuyugrass performance.

	Nitrogen	Primo	Fungicide	Mow	Grooming
Tension		-0.28	-0.11	0.04	-0.19
NDVI		0.08		-0.01	0.04
Firmness		-2.84		1.05	-0.37
Turf Quality		1.35		-0.07	
Roll		2.63			
%Brown Turf		-11.35	2.94	0.87	

Table 3. Linear regression correlation coefficients depicting the response of treatments on Kikuyugrass performance in July 2012. Note that this is the first rating following the aggressive verticutting treatment performed in June. Thus, the response indicates that verticutting resulted in less ball roll and greater brown turf relative to the grooming treatment.

	Nitrogen	Primo	Fungicide	Mow	Verticut
Tension		-0.19		0.12	0.28
NDVI					
Clegg		-2.28	1.50	0.94	
Quality					
Roll		2.41		0.48	-2.07
%Brown Turf	0.05	0.54	-0.28	0.25	4.53

Table 4. Linear regression correlation coefficients depicting the response of treatments on Kikuyugrass performance in August 2012. Note that once the turf recovered from aggressive verticutting, greater turf quality and color was observed compared to grooming. Overall, these data demonstrate the positive effects of Primo Maxx, mowing 6x/wk, and verticutting on Kikuyugrass performance.

	Nitrogen	Primo	Fungicide	Mow	Verticut
Tension	0.31			0.09	0.18
NDVI		0.05		0.02	0.07
Firmness	-0.26	-2.33	2.35	1.02	
Turf Quality		0.74		0.27	1.09
Roll		1.52	-1.23	0.27	-1.70
%Brown Turf		-5.96		-1.85	-10.31