

**Turf Management Effect on Annual Broadleaf Weed Invasion and Field Bindweed
Management in Kentucky Bluegrass Turf**

Final Report

**Don W. Morishita and Kyle G. Frandsen
University of Idaho, Kimberly R&E Center**

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Summary-

Since the submission of the interim report August 31, 2014, we have completed collecting data from the first year of the two funded studies. In the irrigation rate and fertilizer rate study, white clover, common dandelion, and field bindweed, were primarily influenced by fertilizer rate. White clover density was consistently lowest in the highest fertilizer rate (6 lb N/1000 ft²) throughout the year. White clover in August, September and October averaged 28, 32, and 57 stems/ft², respectively with the highest rate. During this same period, white clover density in the 0 lb N/1000 ft² treatment averaged over 160 stems/ft². Irrigation rate did not influence white clover density. Dandelion was highest with the 0 lb N rate. Dandelion density was higher in 110 and 90% ET irrigation treatments compared to the 70% ET treatment at the last (October) evaluation date, but was not influenced by irrigation any other time. Field bindweed density was higher or at least tended to be higher with higher fertilizer rates (4 and 6 lb N). This was especially true early in May and June. Black medic density was not influenced by fertilizer or irrigation rate, except on the September evaluation date, where it had a lower density in the 70% ET irrigation treatment. Common mallow and meadow salsify were not influence by fertilizer or irrigation rate. It will be interesting to see what happens with another year of this study. No color differences were observed between the 0 and 4 lb N/1000 ft² rates at any of the evaluation dates. Turf quality was generally highest with the highest N rate and lowest with the lowest N rate. Under irrigating at 70% of ET, resulted in the poorest turf quality, but that was observed only in June and September.

A fall application of quinclorac + 2,4-D + dicamba + sulfentrazone (sold as Q4 by PBI Gordon) was applied at 7.5 pt/A on September 16. In our proposal, we planned to use quinclorac (Drive) alone, which was applied on October 24, 2013, to begin the study. With the diverse and dense weed population in this turf site, it was decided that more than Drive alone was needed. Weeds in this study site included field bindweed, Canada thistle, common dandelion, black medic, prostrate knotweed, meadow salsify, common mallow, and prickly lettuce. That was the reason for using Q4 in 2014 rather than Drive. Two more weed control evaluations were conducted in September and October, although the September evaluation was taken before the Q4 application. In the October evaluation, field bindweed, dandelion, black medic, and meadow salsify shoots or stems were reduced 97, 87, 91, and 100% in the Q4 treatments compared to no herbicide. Interestingly, we did not see a significant reduction in prostrate knotweed, common mallow and prickly lettuce. Fertilizer rate did not influence the control of these weeds. Based on the October observations, it appears that switching to Q4 was a good decision.

Results of the weed counts taken in the irrigation and nitrogen rate study are listed in Tables 1, 2, 3, 4, and 5.

Table 1. White clover response to fertilizer rate pooled across three irrigation rates¹. Irrigation rate did not influence clover densities.

Nitrogen rate ² lb/1000 ft ²	White clover						
	4/22	5/12	6/12	7/22	8/11	9/4	10/23
	-----stems/ft ² -----						
0	58 a	115 a	61 a	126 a	118 a	173 a	193 a
2	60 a	123 a	56 a	98 a	101 a	118 b	157 a
4	25 b	37 b	11 b	33 b	53 b	101 b	140 a
6	11 b	11 b	5 b	11 b	28 c	32 c	57 b

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²Fertilizer used was WilGro 31-3-7 manufactured by Wilbur Ellis Company.

Table 2. Common dandelion response to fertilizer rate pooled across three irrigation rates¹. Irrigation rate was a factor only at the 10/23 date.

Nitrogen rate ² lb/1000 ft ²	Common dandelion						
	4/22	5/12	6/12	7/22	8/11	9/4	10/23
	-----plants/yd ² -----						
0	2.20 a	2.65 a	1.80 a	2.59 a	2.65 a	1.65 a	1.31 a
2	0.83 b	1.57 b	0.90 a	1.42 a	1.50 b	0.99 a	0.91 b
4	0.60 b	1.00 b	0.75 a	1.33 a	1.15 b	0.65 b	0.96 b
6	0.61 b	0.87 b	0.67 a	1.03 a	1.12 b	0.92 b	0.78 b

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²Fertilizer used was WilGro 31-3-7 manufactured by Wilbur Ellis Company.

Table 3. Common dandelion response to irrigation rates pooled across fertilizer rates¹. The only significant response occurred on 9/4.

Evapotranspiration rate ² %	Common dandelion						
	4/22	5/12	6/12	7/22	8/11	9/4	10/23
	-----plants/yd ² -----						
110	1.30 a	1.65 a	1.27 a	2.07 a	2.15 a	1.26 a	1.23 a
90	1.10 a	1.70 a	1.05 a	1.49 a	1.45 a	1.03 a	1.06 a
70	0.80 a	1.27 a	0.78 a	1.22 a	1.23 a	0.69 b	0.87 a

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²Evapotranspiration rates based off of Agrimet Weather station located approximately 0.33 mile from study site.

Table 4. Field bindweed response to increasing fertilizer rates pooled across three irrigation rates¹.

Nitrogen rate ² lb/1000 ft ²	Field bindweed						
	4/22	5/12	6/12	7/22	8/11	9/4	10/23
	-----plants/yd ² -----						
0	0.43 a	8 b	0.43 b	0.70 a	0.16 a	0.26 b	0.02 a
2	0.01 a	7 b	0.44 b	0.63 a	0.17 a	0.14 b	0.11 a
4	1.42 a	20 a	0.69 b	0.45 a	0.39 a	0.28 ab	0.09 a
6	0.57 a	17 a	1.61 a	0.41 a	0.31 a	0.53 a	0.09 a

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²Fertilizer used was WilGro 31-3-7 manufactured by Wilbur Ellis Company.

Table 5. Black medic response to irrigation rates pooled across fertilizer rates. The only significant response at P>0.05 occurred on 9/4. However, there was a significant response at P>0.10 on 5/12 and 7/22.

Evapotranspiration rate ² %	Black medic						
	4/22	5/12	6/12	7/22	8/11	9/4	10/23
	0.01 a	0.08 a	0.12 a	0.15 a	0.05 a	0.20 a	0.15 a
110	0.05 a	0.13 a	0.16 a	0.06 b	0.07 a	0.18 a	0.21 a
90	0.00 a	0.02 b	0.07 a	0.01 b	0.02 a	0.07 b	0.12 a

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²Evapotranspiration rates based off of Agrimet Weather station located approximately 0.33 mile from study site.

Results of the weed counts taken in the herbicide and nitrogen rate study are listed in Table 6.

Table 6. Weed response to herbicide treatment pooled across fertilizer rates¹.

Herbicide ²	Field bindweed			Common dandelion	Black medic	Meadow salsify
	4/21	6/12	10/23	10/23	10/23	10/23
	-----shoots/yd ² -----					
No herbicide	719 a	1455 a	368 a	289 a	344 a	2 a
Paramount 0.33	6 b	399 b	1 b	39 b	32 b	0 b

¹Means followed by the same letter are not statistically different at the P>0.05 significance level.

²The herbicide applied in fall 2013 was Drive (quinclorac) at 7 oz/A and the herbicide applied in fall 2014 was Q4 (quinclorac + 2,4-D + dicamba + sulfentrazone) at 7.5 pt/A.



Figure 1. 90% ET irrigation plot with four nitrogen fertilizer subplots. From left to right the nitrogen rates are 0, 2, 4, and 6 pounds of nitrogen per 1000 square feet.



Figure 2. Closeup of nitrogen rates in each sub-plot

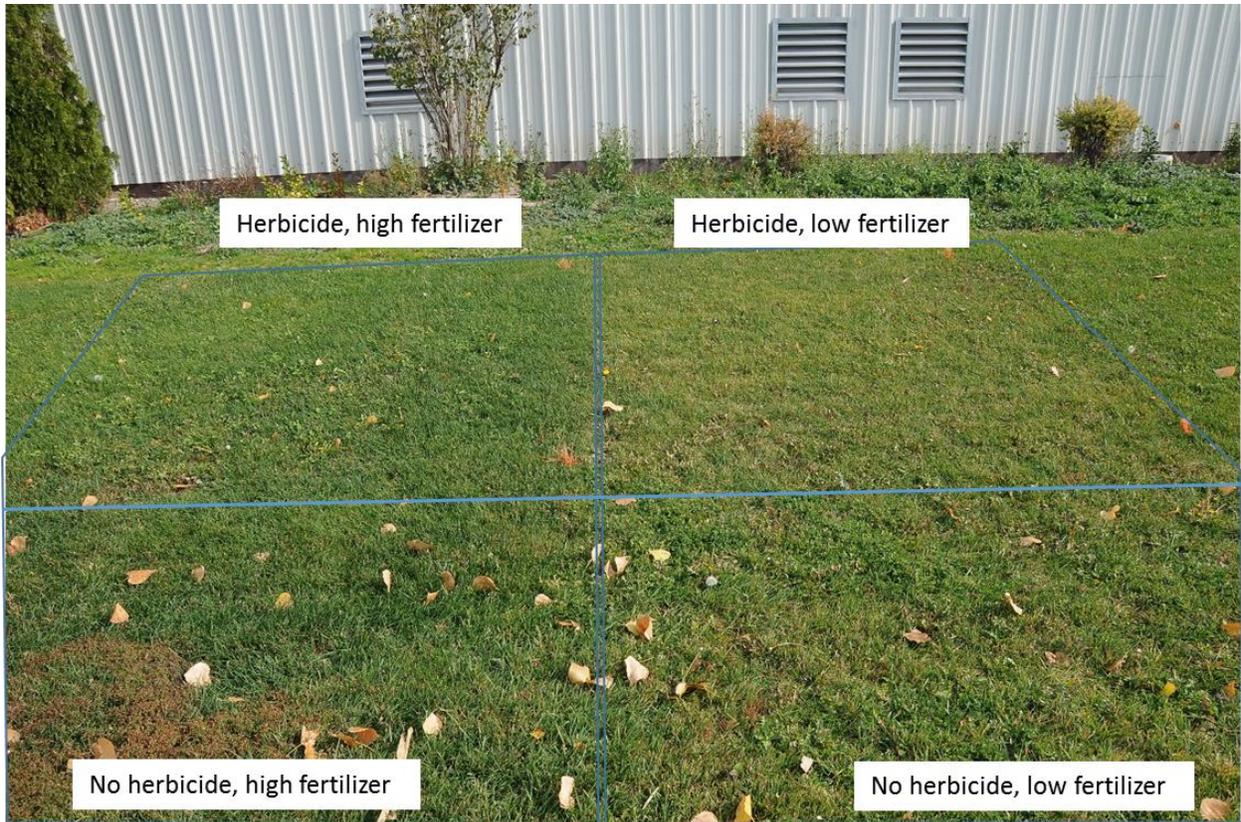


Figure 3. Layout of two split plots with fertilizer rate at the main plot and herbicide as the sub-plot