

Noncrop and Invasive Vegetation Management Weed Science

2020 Annual Research Report



**UNIVERSITY
OF KENTUCKY**

**College of Agriculture
Department of Plant and Soil Sciences**

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INFORMATION NOTE 2020 NCVM-1

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Forward

The information provided in this document represents a collaborative effort between the Roadside Environment Branch of the Kentucky Transportation Cabinet and the Department of Plant and Soil Sciences in the College of Agriculture at the University of Kentucky. The main priority of this project was to collect and disseminate information to the KTC REB to increase the efficiency of operations aimed at roadside environment management.

This report contains a summary of research conducted during the 2020 season. This document is primarily for the use of the Kentucky Transportation Cabinet. Other use is allowable if proper credit is given to the authors.

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The research could not have been accomplished if not for the generous contributions of product. Contributors of product used include:

BASF Corporation
Bayer Crop Science
Corteva Agriscience
Nufarm

We sincerely appreciate the effort and continued support of all our cooperators and look forward to future endeavors.

Species List

The following is a list of plant species discussed in the following document.

Scientific Name	Common Name
<i>Chamaesyce maculate</i>	Prostrate spurge
<i>Digitaria sanguinalis</i>	Large crabgrass
<i>Erigeron sp.</i>	Fleabane
<i>Festuca arundinaceum</i> (Schreb.) S.J. Darbyshire	Tall Fescue
<i>Medicago lupulina</i> L.	Black Medic
<i>Plantago lanceolata</i> L.	Buckhorn Plantain
<i>Poa pratensis</i> L.	Kentucky Bluegrass
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Yellow Foxtail
<i>Sorghum halepense</i> (L.) Pers.	Johnsongrass
<i>Stellaria media</i>	Common Chickweed
<i>Trifolium pratense</i>	Red clover
<i>Trifolium repens</i>	White clover

Herbicide List

The following is a list of herbicides discussed in the following document.

Product	Active Ingredient(s)	Concentration	Manufacturer
Acclaim Extra	fenoxaprop	0.57 lb per gallon	Bayer
Cleantraxx	penoxsulam + oxyfluorfen	0.083 lb + 3.93 lb per gallon	Dow AgroSciences
Clearcast	imazamox	1 lb ae per gallon	BASF
Detail	saflufenacil	2.85 lb per gallon	BASF
Escort XP	metsulfuron methyl	60% w/w	DuPont
Esplanade	indaziflam	1.67 lb per gallon	Bayer
Esplanade Sure	indaziflam + rimsulfuron	24.3 % + 16.7% w/w	Bayer
Freelexx	2,4-D, choline salt	3.8 lb ae per gallon	Dow AgroSciences
Fusilade II	fluazifop	2 lb per gallon	Syngenta
Fusion	fluazifop + fenoxaprop	2 lb + 0.56 lb per gallon	Syngenta
Hyvar X	bromacil	80% w/w	DuPont
Journey	imazapic + glyphosate	0.75 lb ae + 1.5 lb ae per gallon	BASF
Method	aminocyclopyrachlor	2 lb ae per gallon	Bayer
Milestone VM	aminopyralid	2 lb ae per gallon	Dow AgroSciences
MSMA	monosodium acid methanearsonate	6 lb per gallon	Drexel
Opensight	aminopyralid + metsulfuron	0.525 lb ae + 0.0945 lb ae per gallon	Dow AgroSciences
Oust XP	sulfometuron	75% w/w	DuPont
Oust Extra	sulfometuron + metsulfuron	56.25% + 15% w/w	DuPont
Outrider	sulfosulfuron	75% w/w	Monsanto
Overdrive	diflufenzopyr + dicamba	0.2 lb ae + 0.5 lb ae per gallon	BASF
Perspective	aminocyclopyrachlor + chlorsulfuron	39.5% + 15.8% w/w	DuPont
Polaris AC Complete	imazapyr	4 lb ae per gallon	Nufarm
Plainview SC	indaziflam + aminocyclopyrachlor + imazapyr	0.18 lb + 0.50 lb ae + 1.51 lb ae per gallon	Bayer
Plateau	imazapic	2 lb ae per gallon	BASF
Proclipse	prodiamine	65% w/w	Nufarm
Pyresta	2,4-D + pyraflufen-ethyl	3.5 lb ae + 0.0177 lb per gallon	Nichino America
Rodeo	Glyphosate (IPA salt)	4 lb ae per gallon	Dow AgroSciences

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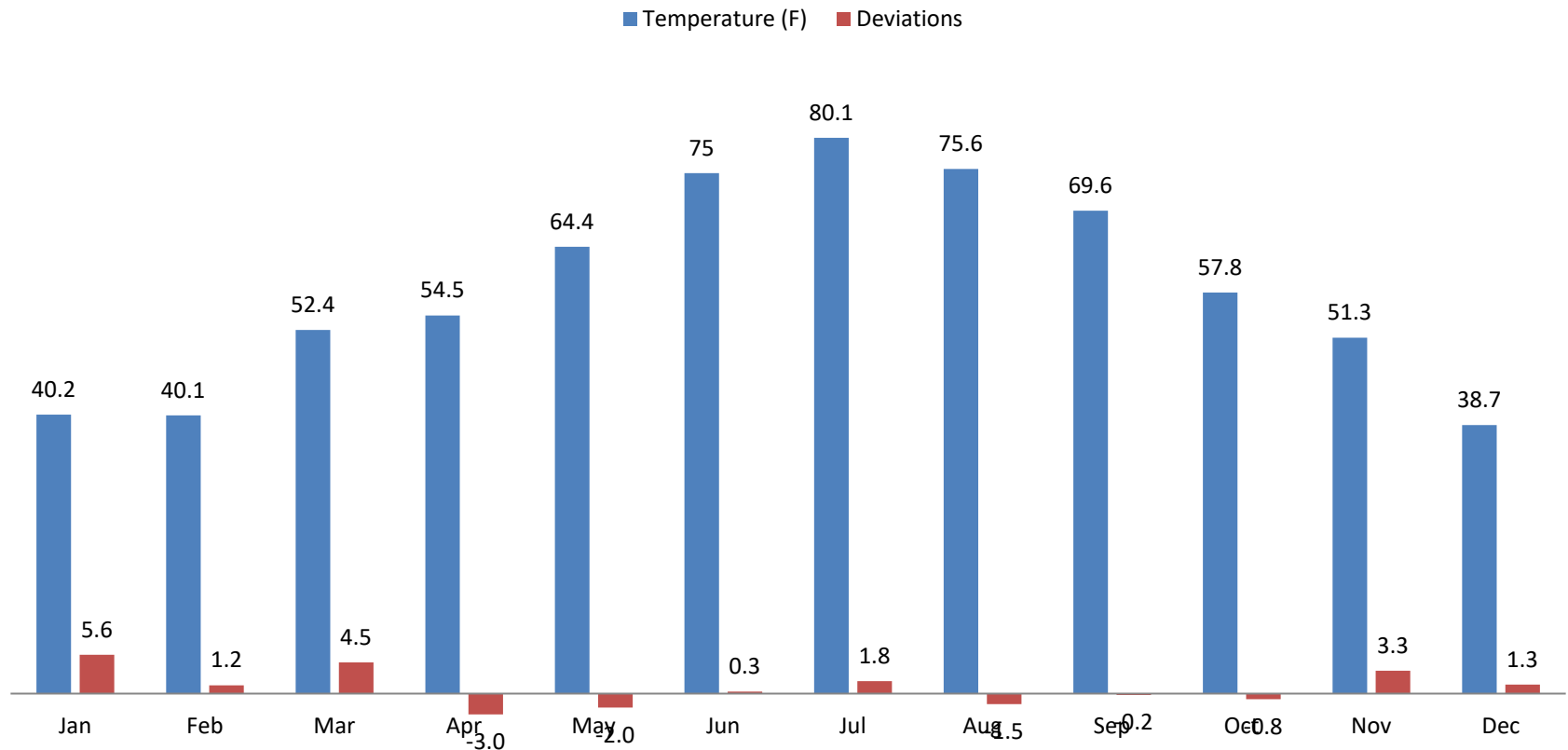
Roundup ProMax	Glyphosate (K salt)	4.5 lb ae per gallon	Monsanto
Sahara	diuron + imazapyr	62.22% + 7.78% w/w	BASF
Streamline	aminocyclopyrachlor + metsulfuron methyl	39.5% + 12.6% w/w	DuPont
TerraVue	aminopyralid + florpyrauxifen-benzyl	71.01 % + 6.00% w/w	Corteva
Vastlan	triclopyr	4 lb ae per gallon	Dow AgroSciences
Viewpoint	imazapyr + aminocyclopyrachlor + metsulfuron	31.6% + 22.8% + 7.3% w/w	DuPont

Map of Kentucky Climate Divisions



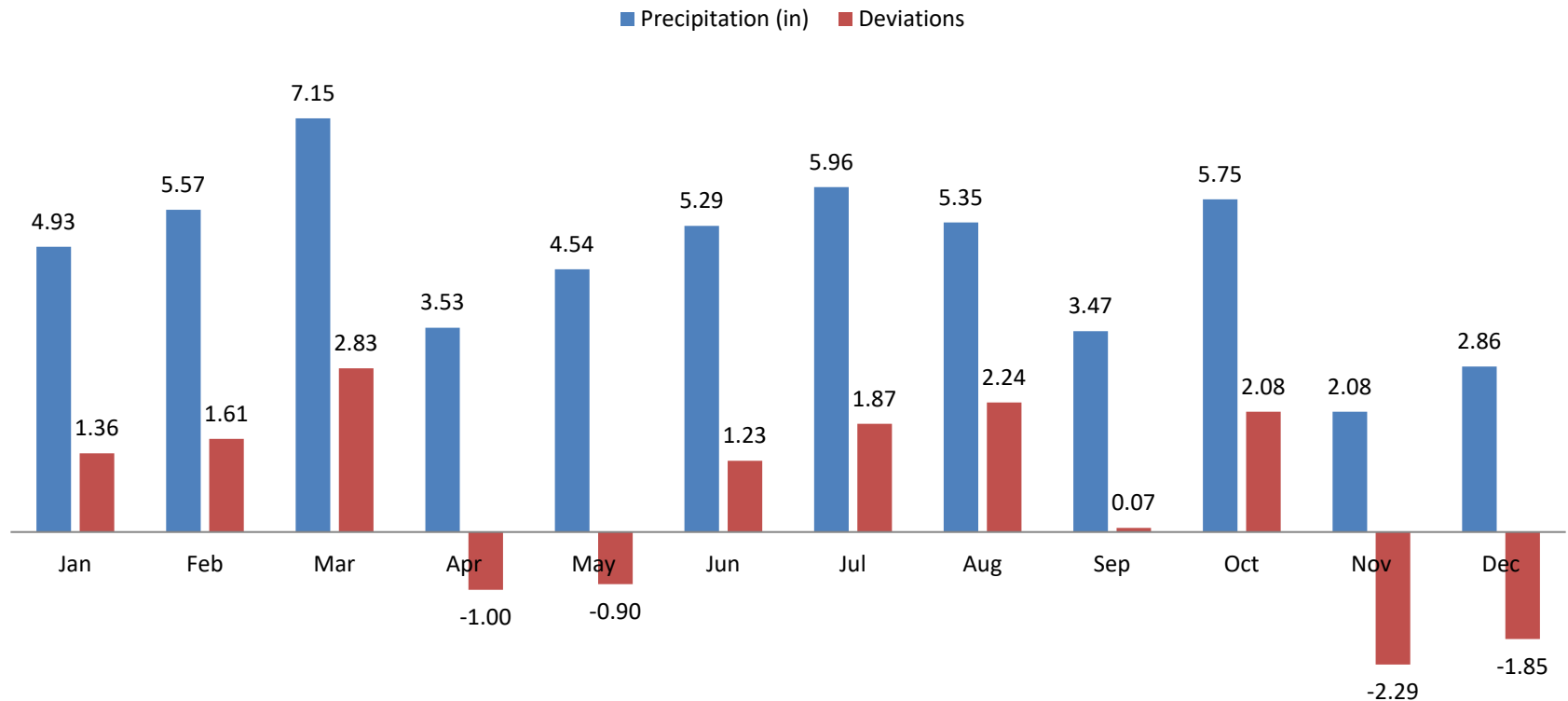
Western Region (CD1) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2020 (CD1)



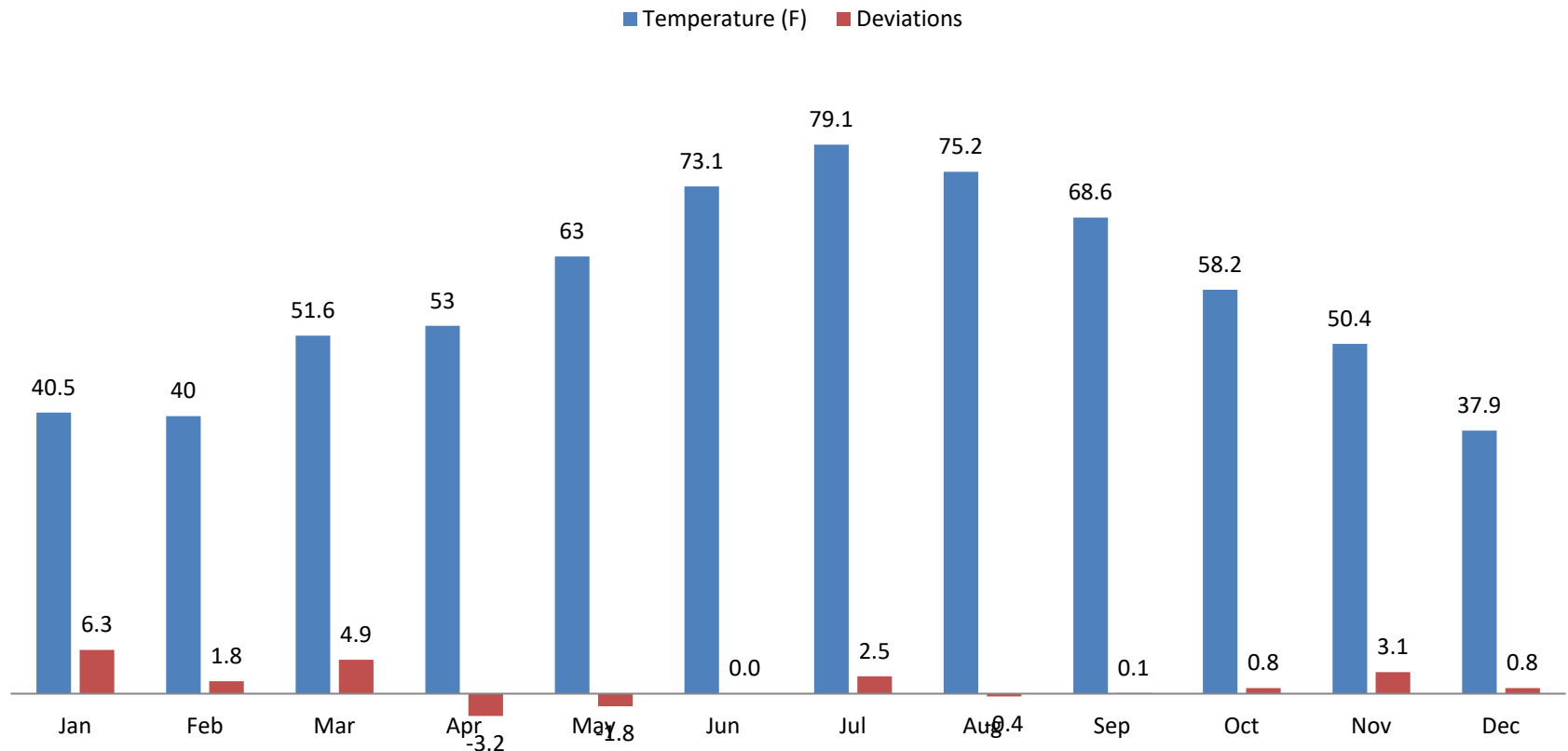
Western Region (CD1) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2020 (CD1)



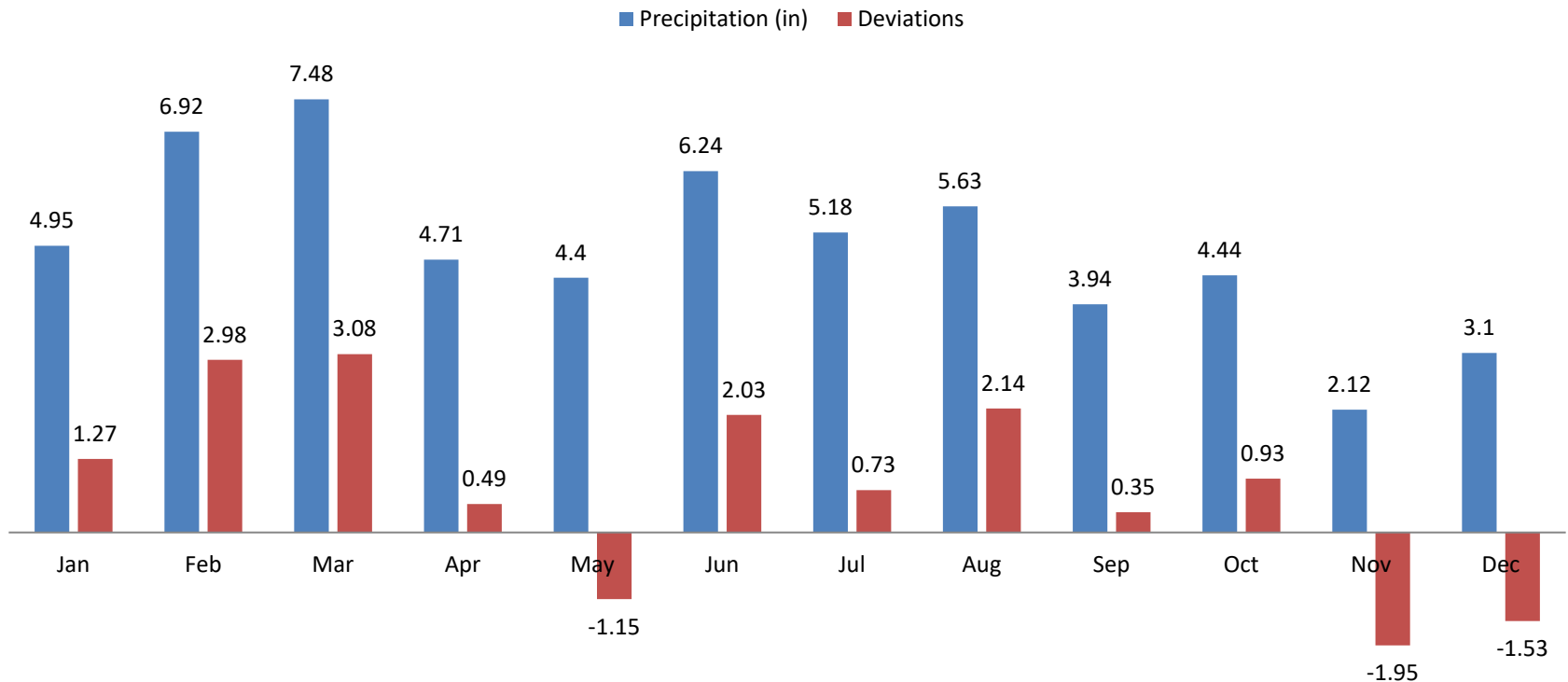
Central Region (CD2) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2020 (CD2)



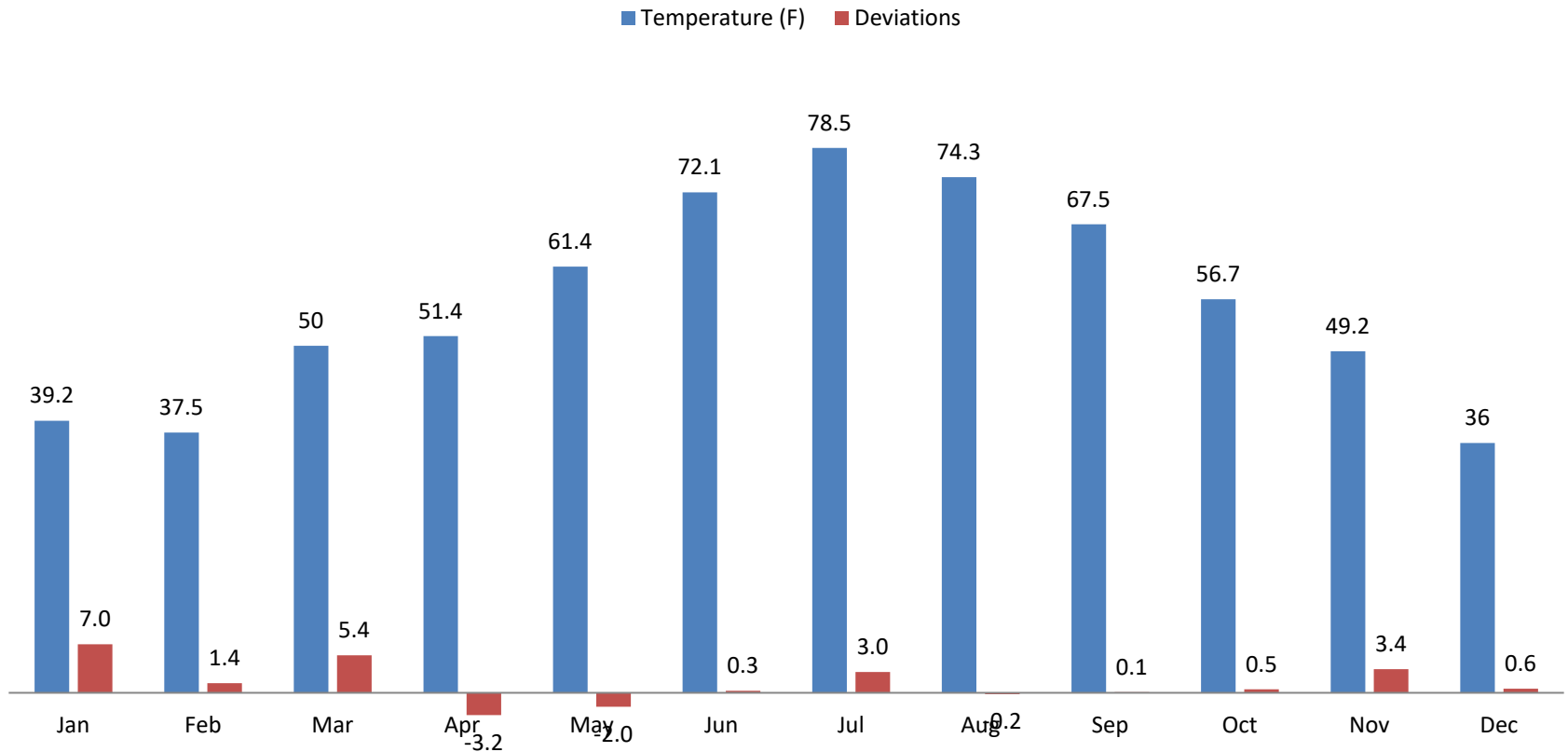
Central Region (CD2) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2020 (CD2)



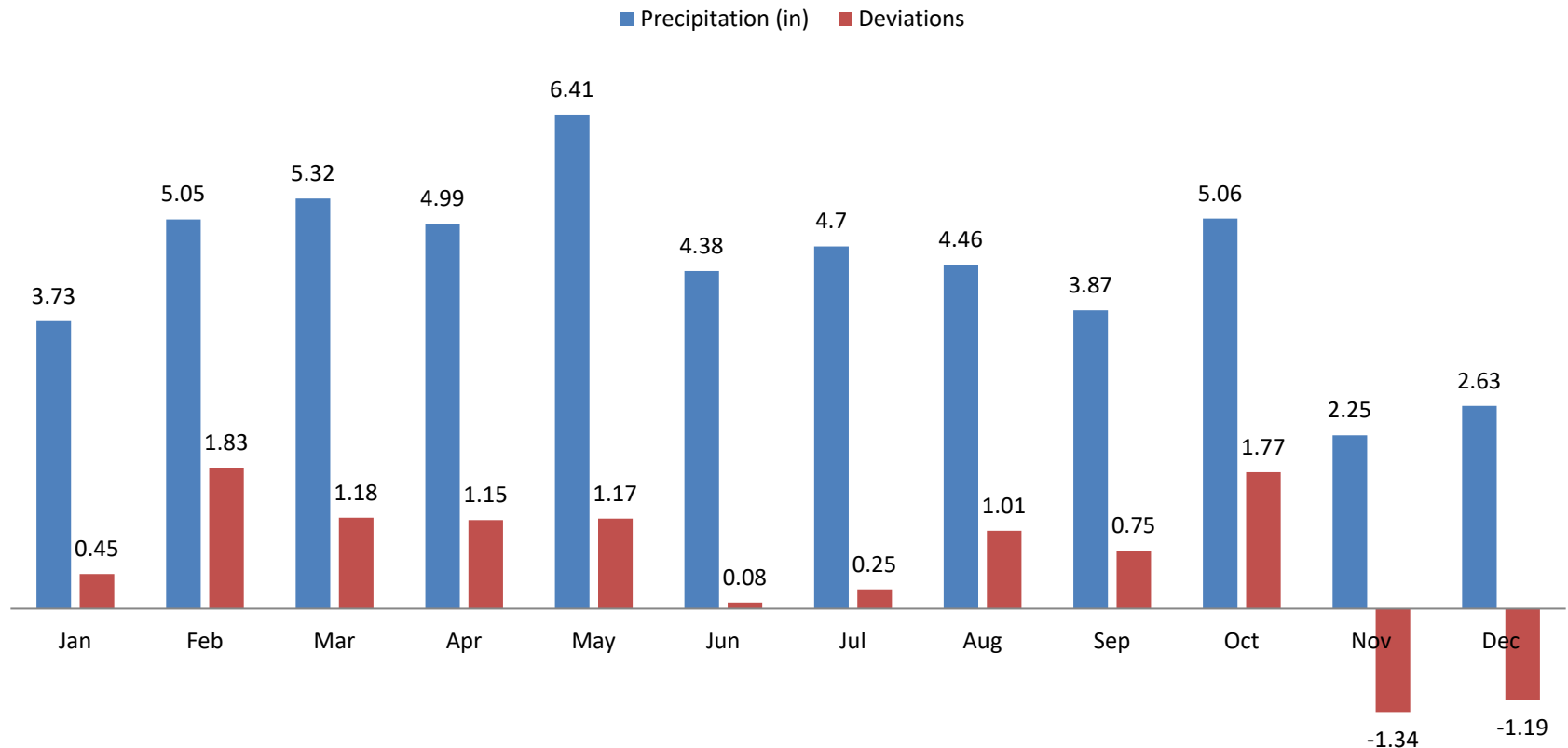
Bluegrass Region (CD3) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2020 (CD3)



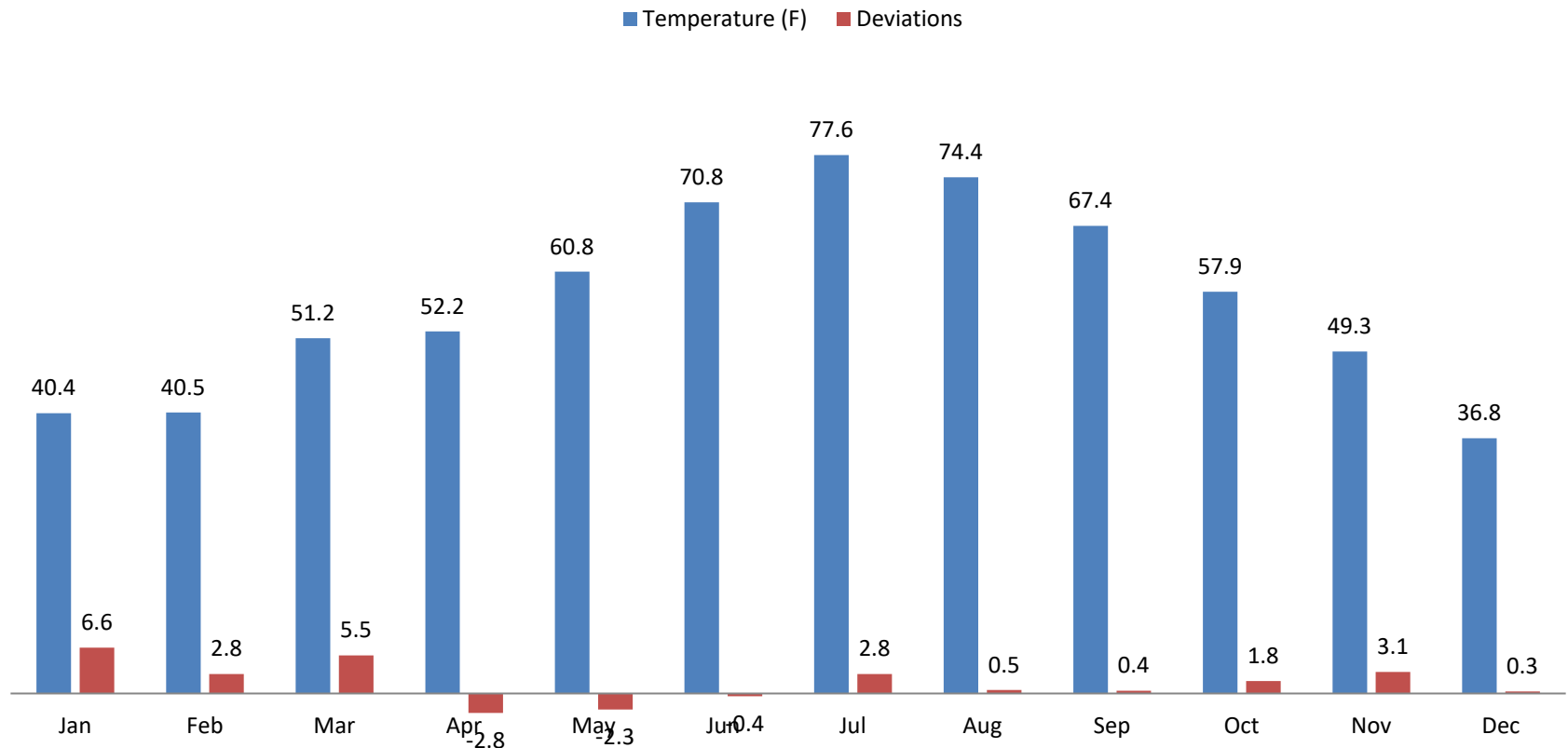
Bluegrass Region (CD3) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2020 (CD3)



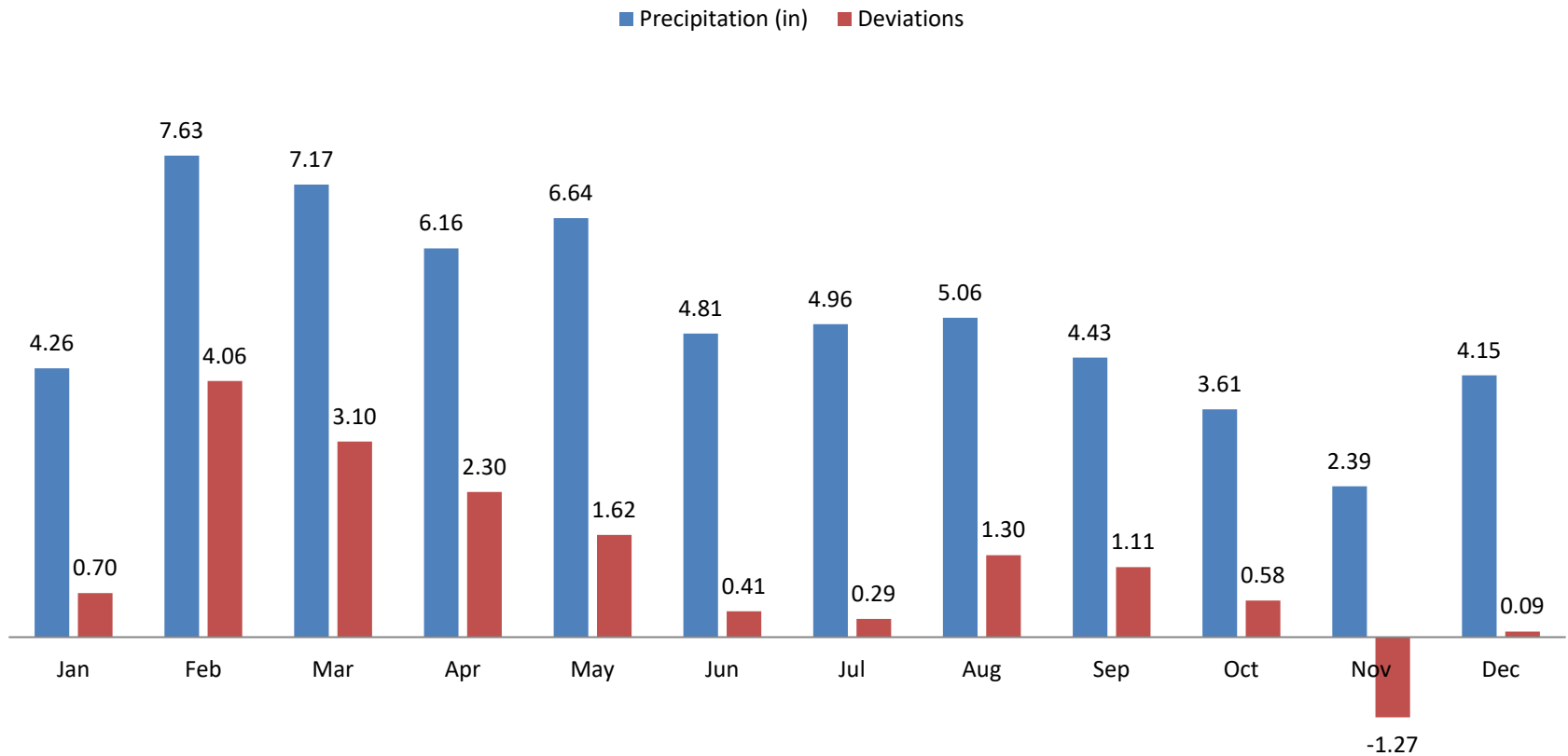
Eastern Region (CD4) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2020 (CD4)



Eastern Region (CD4) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2020 (CD4)



2019 Cable Barrier Bareground Trial in Louisville (including 2020 assessment)

Introduction

Median cable barriers are designed to protect drivers from crossover accidents on interstates and highways. However, the vegetation under and adjacent to them must be managed for safety and aesthetics. Usually, this means using herbicides to maintain a vegetation free (bare ground) zone underneath the barriers. Broad-spectrum soil applied preemergence residual herbicides, in combination with a broad-spectrum post emergence herbicide like glyphosate, are the mainstay for maintaining these bare ground zones. However, there may be turf adjacent to the bare ground zone that should be maintained. Ideally, the residual herbicides will last all season long (even into early the next spring) and not move off-site by leaching or erosion (movement of soil particles with adsorbed herbicide).

This trial was part of an ongoing effort to evaluate the vegetation control efficacy of a range of herbicide options when used for vegetation management under cable barriers.

Materials and Methods

The trial was established in the median along I-265 in Louisville, KY under and beside a cable barrier with a mixed stand of turf species. A total of 20 treatments and 3 replications were arranged in a randomized complete block design. Herbicide treatments were applied at 25 gallons per acre onto 6.5 ft wide by 20 ft long plots on May 21, 2019. All treatments, except Roundup ProMax alone (Treatment 1) and Rodeo + Detail + MSO (Treatment 18) included Activator 90 non-ionic surfactant at 0.25% v/v (Table 1a and 1b). Roundup ProMax (glyphosate) has no residual activity so other herbicides were included in the combination treatments to provide residual and pre-emergent control for the bare ground treatments. Different herbicide combinations also broadened the weed control spectrum and reduced the risk of developing problems with resistant weeds by using different Mechanisms of Action (MOA) groups (Table 1a and 1b).

The trial included treatments which have been long term “standards” as well as newer products and combinations currently being used on Kentucky right-of-way areas. This year’s treatment list had a few changes from the previous year. One of our best performing treatments in 2018 was the combination of Viewpoint plus Esplanade but since it is more expensive this year Viewpoint alone was applied (Treatment 7). In 2018 one of the combinations recommended was the combination of Method @ 12 fl oz plus Esplanade (Treatment 13) while in 2019 the recommendation was reduced to Method @ 6 fl oz to reduce the risk of damage from movement after application to sensitive crops, like tobacco (Treatments 14 & 15). The current recommendation also includes the addition of NuFilm IR to reduce the risk of movement from where the herbicide was applied (Treatment 15). New treatments this year also included Detail (saflufenacil) @ 6 fl oz (Treatment 18) and one without glyphosate designed to control broadleaf weeds and suppressing grass growth behind guardrails (Treatment 19). Detail may be useful in areas with sensitive crops nearby as it is less persistent than other herbicides.

The Louisville weather station reported 0.41 inches of rain May 26 following application which should have activated the soil residual herbicide treatments. Additional rainfall was recorded from May 29 to 30 (1.31 inches). Species present at application included flowering buckhorn plantain (12 inches to seedhead), flowering tall fescue (24 inches to seedhead), flowering Kentucky bluegrass (12 inches to seedhead) and flowering black medic (5 inches to seedhead).

Visual assessments of the proportion (%) of bare ground, grasses, and broadleaf weeds were taken 64 days after treatment (DAT) (7/24/2019). The trial area had recently been mowed and string trimmed by mistake. Assessments for (%) bareground, annual grasses, crabgrass, perennial grasses, broadleaf weeds, and prostrate spurge were done 114 DAT (9/12/2019) and 157 DAT (10/25/2019). At the beginning of the next season, visual assessments of the proportion (%) of bare ground, grasses, and broadleaf weeds were taken 342 DAT (4/27/2020). Data were analyzed using ARM research management software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

All the treatments with glyphosate (Treatments 1 to 18) had more bareground (27 to 96%) than those that did not (Treatments 19 and 20) (8%) 64 DAT (Tables 2a and 2b). The treatments with soil active herbicides that included Esplanade were in the top grouping with 89 to 96% bareground. These were Perspective + Esplanade (Treatment 5), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Method + Esplanade (Treatments 13 – 15), Esplanade + Milestone (Treatment 16), and Esplanade + Oust Extra (Treatment 17). Turf damage beyond the spray pattern due to herbicide movement after application was not observed to the same extent as in 2018. Treatments without glyphosate (Treatments 19 and 20) had 82-83% grass cover.

By 114 DAT some treatments had less bareground as annual grasses (mostly yellow foxtail and crabgrass) and broadleaves (mostly prostrate spurge) colonized the space (Figure 1) (Tables 3a and 3b). Treatments in the top group for bareground (75 to 89%) were the same ones that included Esplanade listed above at 64 DAT. A number of treatments had the same percent bareground (10-23%) as the nontreated check. These included Roundup ProMax (Treatment 1), Perspective + Proclipse (Treatment 6), Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), Cleantraxx + Milestone (Treatment 11), Cleantraxx (Treatment 12), Detail (Treatment 18), and Method + Escort + Plateau (Treatment 19). The treatments with most annual grass cover (48-60%) included Roundup ProMax (Treatment 1), Roundup ProMax + Polaris AC Complete (Treatment 8), and Rodeo + Detail (Treatment 18). Some treatments had higher levels of crabgrass cover (17-35%). These included Roundup ProMax (Treatment 1), Rodeo + Detail (Treatment 18), and two treatments containing imazapyr, Viewpoint (Treatment 7) and Polaris AC Complete (Treatment 8). A similar pattern was observed in a 2016 guardrail trial near Louisa with imazapyr herbicides and crabgrass. The treatments with the most broadleaf cover (42-70%) (mostly spurge) included Hyvar (treatment 3), Oust (Treatment 4), Perspective + Proclipse (Treatment 6), Cleantraxx + Milestone (Treatment 11) and Cleantraxx (Treatment 12). The two treatments without glyphosate (Treatments 19 and 20) had 52-62% perennial grass cover.

By the end of the season (157 DAT) the top treatments were still the same as at 64 DAT but had more vegetative cover but still had 70-83% bareground (Tables 4a and 4b). The study location (Central Region CD2) had a very dry September with 0.19" which is 3.40" less than the long term average. This may have reduced the growth of emerged vegetation and germination/emergence of new vegetation. Plots with the greatest annual grass (47-58%), particularly crabgrass cover (18-33%), stood out. These included Roundup ProMax (Treatment 1), and glyphosate + Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), or Detail (Treatment 18). Plots with the most broadleaf cover (48-68%) (mostly prostrate spurge) were the same treatments as observed at 114 DAT. Treatments without glyphosate (Treatments 19 and 20) had 42-55% perennial grass cover.

At the beginning of the 2020 season (342 DAT), most of the vegetation on the plots were low growing winter annuals such as chickweed (Figure 2). The top bareground treatments (55-91%) included Roundup ProMax by itself (Treatment 1) as well as a number of the treatments with residual herbicides. The other treatments had the same percent bareground as the nontreated check (8-42%). These included Oust XP (Treatment 4), Polaris AC Complete (Treatment 8), Cleantraxx by itself (Treatment 12), Detail (Treatment 18), and the treatment without glyphosate but with Method + Escort + Plateau (Treatment 19). The treatments with the most perennial grass cover (48-57%) were Method + Escort + Plateau (Treatment 19) and the untreated check (Treatment 20). The group of treatments with the most broadleaf cover (45-82%) included Oust XP (Treatment 4), Viewpoint (Treatment 7), Polaris XP Complete (Treatment 8), Cleantraxx by itself (Treatment 12), and Detail (Treatment 18). Treatments without

The vegetation under the cable barrier at this location provided a good trial on the performance of bare ground herbicides over a season and into the next year, which will continue to provide information for roadside managers.

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Table 1a. Herbicide Treatments, Active Ingredients, Application Rates, and Mechanism of Action (MOA) Groups for Cable Barrier Bareground Trial. (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)	MOA Groups
1	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	glyphosate diuron + imazapyr	1.5 LB AE 6.2 LB + 12.4 OZ	9 7 + 2
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	glyphosate bromacil	1.5 LB AE 8 LB	9 5
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	glyphosate sulfometuron	1.5 LB AE 2.3 OZ	9 2
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	glyphosate aminocyclopyrachlor + chlorsulfuron indaziflam	1.5 LB AE 3.6 OZ + 1.4 OZ 0.7 OZ	9 4 + 2 29
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	glyphosate aminocyclopyrachlor + chlorsulfuron prodiamine	1.5 LB AE 3.6 OZ + 1.4 OZ 1.5 LB	9 4 + 2 3
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	glyphosate aminocyclopyrachlor + imazapyr + metsulfuron	1.5 LB AE 4.1 OZ + 5.7 OZ + 1.3 OZ	9 4 + 2 + 2
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	glyphosate imazapyr	1.5 LB AE 16 OZ AE	9 2
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	glyphosate indaziflam sulfometuron	1.5 LB AE 0.7 OZ 2.3 OZ	9 29 2
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	glyphosate aminocyclopyrachlor + metsulfuron indaziflam imazapic	1.5 LB AE 3.2 OZ + 1 OZ 1 OZ 1.3 OZ AE	9 4 + 2 29 2
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	glyphosate penoxsulam + oxyfluorfen aminopyralid	1.5 LB AE 0.5 OZ + 23.6 OZ 1.8 OZ AE	9 2 + 14 4
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	glyphosate penoxsulam + oxyfluorfen	1.5 LB AE 0.7 OZ + 35.4 OZ	9 2 + 14

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.
Treatment 18 included MSO @ 1%

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Table 1b. Herbicide Treatments, Active Ingredients, Application Rates, and Mechanism of Action (MOA) Groups for Cable Barrier Bareground Trial (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)	MOA Groups
13	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Method	12	FL OZ/A	aminocyclopyrachlor	3 OZ AE	4
	Esplanade	5	FL OZ/A	indaziflam	1 OZ	29
14	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Method	6	FL OZ/A	aminocyclopyrachlor	1.5 OZ AE	4
	Esplanade	6	FL OZ/A	indaziflam	1.2 OZ	29
15	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Method	6	FL OZ/A	aminocyclopyrachlor	1.5 OZ AE	4
	Esplanade	6	FL OZ/A	indaziflam	1.2 OZ	29
	NuFilm IR	24	FL OZ/A	pinolene		
16	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Esplanade	6	FL OZ/A	indaziflam	1.3 OZ	29
	Milestone VM	7	FL OZ/A	aminopyralid	1.8 OZ AE	4
17	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Esplanade	3.5	FL OZ/A	indaziflam	0.7 OZ	29
	Oust Extra	1.5	OZ/A	sulfometuron + metsulfuron	0.8 OZ + 0.2 OZ	2 + 2
18	Rodeo	32	FL OZ/A	glyphosate	1 LB AE	9
	Detail	6	FL OZ/A	saflufenacil	2.1 OZ	14
19	Method	4	FL OZ/A	aminocyclopyrachlor	1 OZ AE	4
	Escort	0.33	OZ/A	metsulfuron	0.2 OZ	2
	Plateau	3	FL OZ/A	imazapic	0.75 OZ AE	2
20	Nontreated Check					

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

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Table 2a. Results for Cable Barrier Trial 64 DAT¹ (July 24, 2019) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Grass	% Broadleaves
				64 DAT		
1	Roundup ProMax	1.3	QT/A	27 f ²	43 c	30 bc
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	73 bc	5 f	22 bcde
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	50 de	13 def	37 ab
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	70 c	9 ef	21 bcdef
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	89 ab	8 ef	2 g
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	65 cd	9 ef	26 bcde
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	40 ef	23 de	37 ab
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	40 ef	27 d	27 bcd
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	93 a	4 f	3 fg
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	96 a	2 f	1 g
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	40 ef	10 ef	53 a
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	52 de	15 def	37 ab

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 2b. Results for Cable Barrier Trial 64 DAT¹ (July 24, 2019) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Grass	% Broadleaves
				64 DAT		
13	Rodeo	32	FL OZ/A	92 a ²	8 ef	0 g
	Method	12	FL OZ/A			
	Esplanade	5	FL OZ/A			
14	Rodeo	32	FL OZ/A	89 ab	10 ef	0 g
	Method	6	FL OZ/A			
	Esplanade	6	FL OZ/A			
15	Rodeo	32	FL OZ/A	90 ab	10 ef	0 g
	Method	6	FL OZ/A			
	Esplanade	6	FL OZ/A			
	NuFilm IR	24	FL OZ/A			
16	Rodeo	32	FL OZ/A	93 a	7 f	0 g
	Esplanade	6	FL OZ/A			
	Milestone VM	7	FL OZ/A			
17	Rodeo	32	FL OZ/A	96 a	1 f	3 fg
	Esplanade	3.5	FL OZ/A			
	Oust Extra	1.5	OZ/A			
18	Rodeo	32	FL OZ/A	28 f	65 b	13 cdefg
	Detail	6	FL OZ/A			
19	Method	4	FL OZ/A	8 g	83 a	8 efg
	Escort	0.33	OZ/A			
	Plateau	3	FL OZ/A			
20	Nontreated Check			8 g	82 a	10 defg

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 3a. Results for Cable Barrier Trial 114 DAT¹ (September 12, 2019) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	%	% Annual	% Crabgrass	% Perennial	%	% Spurge
				Bareground	Grass		Grass	Broadleaves	
114 DAT									
1	Roundup ProMax	1.3	QT/A	22 cd ²	48 ab	17 abcd	0 c	27 cde	23 ef
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	40 b	10 cd	3 d	7 c	43 bc	42 cde
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	27 bc	15 cd	2 d	0 c	58 ab	57 abc
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	27 bc	21 cd	2 d	0 c	53 ab	45 bcd
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	81 a	4 d	0 d	3 c	13 de	8 f
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	23 cd	6 d	0 d	2 c	69 a	65 ab
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	15 cd	42 b	25 abc	0 c	43 bc	43 cde
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	20 cd	50 ab	30 ab	0 c	30 cd	23 ef
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	75 a	9 cd	5 cd	0 c	16 de	13 f
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	80 a	4 d	0 d	1 c	14 de	14 f
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	12 cd	18 cd	5 cd	0 c	70 a	70 a
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	17 cd	23 c	10 bcd	0 c	61 ab	58 abc

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 3b. Results for Cable Barrier Trial 114 DAT¹ (September 12, 2019) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Annual Grass	% Crabgrass	% Perennial Grass	% Broadleaves	% Spurge
				114 DAT					
13	Rodeo	32	FL OZ/A	80 a ²	6 cd	0 d	5 c	9 de	9 f
	Method	12	FL OZ/A						
	Esplanade	5	FL OZ/A						
14	Rodeo	32	FL OZ/A	84 a	3 d	0 d	6 c	7 e	6 f
	Method	6	FL OZ/A						
	Esplanade	6	FL OZ/A						
15	Rodeo	32	FL OZ/A	82 a	4 d	0 d	7 c	7 e	7 f
	Method	6	FL OZ/A						
	Esplanade	6	FL OZ/A						
	NuFilm IR	24	FL OZ/A						
16	Rodeo	32	FL OZ/A	89 a	4 d	0 d	1 c	6 e	6 f
	Esplanade	6	FL OZ/A						
	Milestone VM	7	FL OZ/A						
17	Rodeo	32	FL OZ/A	87 a	3 d	1 d	0 c	10 de	9 f
	Esplanade	3.5	FL OZ/A						
	Oust Extra	1.5	OZ/A						
18	Rodeo	32	FL OZ/A	15 cd	60 a	35 a	0 c	25 cde	25 def
	Detail	6	FL OZ/A						
19	Method	4	FL OZ/A	12 cd	23 c	3 d	52 b	13 de	13 f
	Escort	0.33	OZ/A						
	Plateau	3	FL OZ/A						
20	Nontreated Check			10 d	14 cd	5 cd	62 a	14 de	10 f

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 4a. Results for Cable Barrier Trial 157 DAT¹ (October 25, 2019) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	%	% Annual	% Crabgrass	% Perennial	%	% Spurge
				Bareground	Grass		Grass	Broadleaves	
157 DAT									
1	Roundup ProMax	1.3	QT/A	25 bcd ²	58 a	18 abc	1 b	16 fg	13 ef
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	35 b	11 de	2 c	12 b	42 bcde	40 bcd
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	30 bc	20 cde	0 c	2 b	48 abcd	46 abc
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	28 bcd	19 cde	0 c	0 b	52 abc	41 bcd
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	77 a	5 de	0 c	6 b	12 fg	6 f
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	23 bcd	7 de	0 c	3 b	67 ab	63 ab
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	18 cde	47 ab	33 a	0 b	35 cdef	33 cde
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	23 bcd	50 ab	30 a	0 b	27 defg	21 def
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	70 a	6 de	3 c	0 b	24 defg	14 ef
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	80 a	4 e	0 c	1 b	15 fg	15 ef
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	17 cde	21 cde	3 c	1 b	61 ab	60 ab
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	13 de	18 cde	7 bc	0 b	68 a	66 a

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.
Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 4b. Results for Cable Barrier Trial 157 DAT¹ (October 25, 2019 (Part 2 of 2))

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Annual Grass	% Crabgrass	% Perennial Grass	% Broadleaves	% Spurge
				157 DAT					
13	Rodeo	32	FL OZ/A	80 a ²	4 e	0 c	8 b	7 g	6 f
	Method	12	FL OZ/A						
	Esplanade	5	FL OZ/A						
14	Rodeo	32	FL OZ/A	79 a	4 e	0 c	9 b	8 g	3 f
	Method	6	FL OZ/A						
	Esplanade	6	FL OZ/A						
15	Rodeo	32	FL OZ/A	78 a	4 e	0 c	12 b	6 g	5 f
	Method	6	FL OZ/A						
	Esplanade	6	FL OZ/A						
	NuFilm IR	24	FL OZ/A						
16	Rodeo	32	FL OZ/A	83 a	4 de	0 c	5 b	7 g	7 f
	Esplanade	6	FL OZ/A						
	Milestone VM	7	FL OZ/A						
17	Rodeo	32	FL OZ/A	82 a	4 e	0 c	0 b	14 fg	12 ef
	Esplanade	3.5	FL OZ/A						
	Oust Extra	1.5	OZ/A						
18	Rodeo	32	FL OZ/A	18 cde	52 ab	25 ab	3 b	27 defg	20 def
	Detail	6	FL OZ/A						
19	Method	4	FL OZ/A	7 e	32 bc	0 c	42 a	20 efg	13 ef
	Escort	0.33	OZ/A						
	Plateau	3	FL OZ/A						
20	Nontreated Check			5 e	25 cd	5 bc	55 a	15 fg	8 f

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 5a. Results for Cable Barrier Trial 342 DAT¹ (April 27, 2020) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Perennial Grass	% Broadleaves
				342 DAT		
1	Roundup ProMax	1.3	QT/A	62 abcd ²	2 b	36 bcde
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	85 a	2 b	13 de
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	70 abcd	6 b	24 bcde
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	18 e	0 b	82 a
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	73 abcd	2 b	25 bcde
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	78 a	5 b	16 cde
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	55 abcd	0 b	45 abcd
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	39 cde	0 b	61 ab
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	74 abc	0 b	26 bcde
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	91 a	3 b	7 de
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	60 abcd	1 b	39 bcde
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	38 de	2 b	60 ab

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

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Table 5b. Results for Cable Barrier Trial 342 DAT¹ (April 27, 2020) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bareground	% Grass	% Broadleaves
				342 DAT		
13	Rodeo	32	FL OZ/A	77 ab ²	12 b	12 de
	Method	12	FL OZ/A			
	Esplanade	5	FL OZ/A			
14	Rodeo	32	FL OZ/A	87 a	9 b	4 e
	Method	6	FL OZ/A			
	Esplanade	6	FL OZ/A			
15	Rodeo	32	FL OZ/A	78 a	13 b	8 de
	Method	6	FL OZ/A			
	Esplanade	6	FL OZ/A			
	NuFilm IR	24	FL OZ/A			
16	Rodeo	32	FL OZ/A	87 a	6 b	7 de
	Esplanade	6	FL OZ/A			
	Milestone VM	7	FL OZ/A			
17	Rodeo	32	FL OZ/A	86 a	2 b	12 de
	Esplanade	3.5	FL OZ/A			
	Oust Extra	1.5	OZ/A			
18	Rodeo	32	FL OZ/A	42 bcde	5 b	53 abc
	Detail	6	FL OZ/A			
19	Method	4	FL OZ/A	8 e	48 a	43 bcd
	Escort	0.33	OZ/A			
	Plateau	3	FL OZ/A			
20	Nontreated Check			8 e	57 a	35 bcde

*All herbicide treatments (except trt. #1 & #18) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 18 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Figure 1: View of Plots in the Cable Barrier Trial on September 12, 2019 (114 Days After Treatment)

Plots covered with annual grasses in the foreground along with a group of plots largely bareground closer to the truck.



Figure 2: View of Plots in the Cable Barrier Trial on April 27, 2020 (342 Days After Treatment)
Visual effects of the treatments at the beginning of the next season.



2020 Cable Barrier Bareground Trial in Louisville

Introduction

Median cable barriers are designed to protect drivers from crossover accidents on interstates and highways. However, the vegetation under and adjacent to them must be managed for safety and aesthetics. Usually, this means using herbicides to maintain a vegetation free (bare ground) zone underneath the barriers. Broad-spectrum soil applied preemergence residual herbicides, in combination with a broad-spectrum post emergence herbicide like glyphosate, are the mainstay for maintaining these bare ground zones. However, there may be turf adjacent to the bare ground zone that should be maintained. Ideally, the residual herbicides will last all season long (even into early the next spring) and not move off-site by leaching or erosion (movement of soil particles with adsorbed herbicide).

This trial was part of an ongoing effort to evaluate the vegetation control efficacy of a range of herbicide options when used for vegetation management under cable barriers.

Materials and Methods

The trial was established in the median along I-265 in Louisville, KY under and beside a cable barrier with a mixed stand of turf species. A total of 21 treatments and 3 replications were arranged in a randomized complete block design. Herbicide treatments were applied at a spray volume of 25 gallons per acre onto 6.5 ft wide by 20 ft long plots on June 2, 2020. All treatments, except Roundup ProMax alone (Treatment 1) and Rodeo + Detail + MSO (Treatment 16) included Activator 90 non-ionic surfactant at 0.25% v/v (Table 1a and 1b). Roundup ProMax (glyphosate) has no residual activity so other herbicides were included in the combination treatments to provide residual and pre-emergent control for the bare ground treatments. Different herbicide combinations also broadened the weed control spectrum and reduced the risk of developing problems with resistant weeds by using different Mechanisms of Action (MOA) groups (Table 1a and 1b).

The trial included treatments which have been long term “standards” as well as newer products and combinations currently being used on Kentucky right-of-way areas. This year’s treatment list had a few changes from the previous year. Last year industry reps recommended Method @ 6 fl oz + Esplanade @ 6 fl oz plus NuFilm IR to reduce the risk of damage from movement after application to sensitive crops, like tobacco. The current industry recommendation is Method @ 9 fl oz + Esplanade @ 7 fl oz (Treatment 13). NuFilm IR is also still recommended but was not included in this research trial. New treatments from 2019 repeated this year included Detail (saflufenacil) @ 6 fl oz (Treatment 16) and one without glyphosate designed to control broadleaf weeds and suppressing grass growth behind guardrails (Treatment 20). Detail may be useful in areas with sensitive crops nearby as it is less persistent than other herbicides. A new product tested this year, Esplanade Sure (Treatment 19), is also one which is positioned as one useful near sensitive sites. It’s a combination of indaziflam and rimsulfuron. Other new products included Terravue @ 5.7 oz/a (Treatment 17) which is the bareground rate and Plainview SC @ 64 fl oz/a (Treatment 18). Terravue is a combination of aminopyralid and a new chemistry, florpyrauxifen-benzyl, which broadens the range of species controlled. Plainview SC is a combination of indaziflam + aminocyclopyrachlor + imazapyr.

The Louisville weather station reported 1.98 inches of rain June 4 which activated the soil residual herbicide treatments and resulted in herbicide movement and damage to adjacent areas (Figures 3-5). Species present at application included headed tall fescue (37 inches to seedhead), flowering black medic (9 inches to seedhead) and patches of flowering fleabane.

Visual assessments of the proportion (%) of bare ground, perennial grasses, annual grasses, and broadleaf weeds were taken 63 (8/4/2020) and 134 (10/14/2020) days after treatment (DAT). Data were analyzed using ARM research management software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

Almost all the treatments with glyphosate (Treatments 1 to 19) had more bareground (37 to 100%) than those that did not (Treatments 16, 20 and 21) (7 to 20%) 63 DAT (Tables 2a and 2b). Many of the treatments with soil active herbicides were in the top grouping with 82 to 100% bareground. These treatments included Sahara (Treatment 2), Hyvar (Treatment 3), Perspective + Esplanade (Treatment 5), Perspective + Proclipse (Treatment 6), Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Cleantraxx (Treatment 12), Method + Esplanade (Treatments 13), Esplanade + Milestone (Treatment 14), Esplanade + Oust Extra (Treatment 15), Plainview SC (Treatment 18), and Esplanade Sure (Treatment 19). Treatments without glyphosate (Treatments 20 and 21) had 60-67% perennial grass cover. There wasn't much annual grass cover but the treatments without residual herbicides (Treatments 1, 20, and 21) had the most (6-8%). Most of the broadleaf cover was from spurge (56 to 83%) in the following treatments: Roundup by itself (Treatment 1), Oust XP (Treatment 4), and Detail (Treatment 16).

The heavy rainfall (1.98 inches two days after application) resulted in grass damage from herbicide movement. This was especially evident in rep 1 where there was a shallow ditch beyond the spray pattern (Figures 1-6). The plots with Sahara (Treatment 2) (Figure 3), Hyvar (Treatment 3) (Figure 4), and Oust XP (Treatment 4) (Figure 5) showed severe damage.

By the end of the season (134 DAT) many of the top treatments were still the same as at 63 DAT but still had 75-99% bareground (Tables 3a and 3b). These were Sahara (Treatment 2), Oust XP (Treatment 4), Perspective + Esplanade (Treatment 5), Perspective + Proclipse (Treatment 6), Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Method + Esplanade (Treatments 13), Esplanade + Milestone (Treatment 14), Esplanade + Oust Extra (Treatment 15), Plainview SC (Treatment 18), and Esplanade Sure (Treatment 19). Treatment 20 without glyphosate but with Method + Escort + Plateau had 60% perennial grass cover. The treatments with the most annual grass coverage were Detail (Treatment 16) and the untreated check (Treatment 21). At 63 DAT Detail had 83% coverage from mostly spurge while by 134 DAT it was only 8%. A similar decrease was seen in some plots while it increased in others. Perhaps it was due to droughty "soil" conditions which varied along the length of the trial which resulted in death of spurge plants. The greatest broadleaf cover (25 to 43%) was with Hyvar (Treatment 3), and both Cleantraxx treatments (Treatments 11 and 12).

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The vegetation under the cable barrier at this location provided a good trial on the performance of bare ground herbicides over a season. The power of these trials increases as they add to results observed from previous years. These plots will be reassessed in spring 2021, which will continue to provide information for roadside managers.

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Table 1a. Herbicide Treatments, Active Ingredients, Application Rates, and Mechanism of Action (MOA) Groups for Cable Barrier Bareground Trial. (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)	MOA Groups
1	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	glyphosate diuron + imazapyr	1.5 LB AE 6.2 LB + 12.4 OZ	9 7 + 2
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	glyphosate bromacil	1.5 LB AE 8 LB	9 5
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	glyphosate sulfometuron	1.5 LB AE 2.3 OZ	9 2
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	glyphosate aminocyclopyrachlor + chlorsulfuron indaziflam	1.5 LB AE 3.6 OZ + 1.4 OZ 0.7 OZ	9 4 + 2 29
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	glyphosate aminocyclopyrachlor + chlorsulfuron prodiamine	1.5 LB AE 3.6 OZ + 1.4 OZ 1.5 LB	9 4 + 2 3
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	glyphosate aminocyclopyrachlor + imazapyr + metsulfuron	1.5 LB AE 4.1 OZ + 5.7 OZ + 1.3 OZ	9 4 + 2 + 2
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	glyphosate imazapyr	1.5 LB AE 16 OZ AE	9 2
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	glyphosate indaziflam sulfometuron	1.5 LB AE 0.7 OZ 2.3 OZ	9 29 2
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	glyphosate aminocyclopyrachlor + metsulfuron indaziflam imazapic	1.5 LB AE 3.2 OZ + 1 OZ 1 OZ 1.3 OZ AE	9 4 + 2 29 2
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	glyphosate penoxsulam + oxyfluorfen aminopyralid	1.5 LB AE 0.5 OZ + 23.6 OZ 1.8 OZ AE	9 2 + 14 4
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	glyphosate penoxsulam + oxyfluorfen	1.5 LB AE 0.7 OZ + 35.4 OZ	9 2 + 14

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 16 included MSO @ 1%

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Table 1b. Herbicide Treatments, Active Ingredients, Application Rates, and Mechanism of Action (MOA) Groups for Cable Barrier Bareground Trial (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)	MOA Groups
13	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Method	9	FL OZ/A	aminocyclopyrachlor	2.25 OZ AE/A	4
	Esplanade	7	FL OZ/A	indaziflam	1.5 OZ/A	29
14	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Esplanade	6	FL OZ/A	indaziflam	1.2 OZ/A	29
	Milestone VM	7	FL OZ/A	aminopyralid	1.8 OZ AE/A	4
15	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Esplanade	3.5	FL OZ/A	indaziflam	0.7 OZ/A	29
	Oust Extra	1.5	OZ/A	sulfometuron + metsulfuron	0.8 OZ + 0.2 OZ/A	2 + 2
16	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Detail	6	FL OZ/A	saflufenacil	2.1 OZ/A	14
17	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Terravue	5.7	OZ/A	aminopyralid + florpyrauxifen-benzyl	3.4 OZ AE + 0.34 OZ/A	4 + 4
18	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Plainview SC	64	FL OZ/A	indaziflam + aminocyclopyrachlor + imazapyr	1.44 OZ + 4 OZ AE + 12.1 OZ AE/A	29 + 4 + 2
19	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Esplanade Sure	6	OZ/A	indaziflam + rimsulfuron	1.4 OZ + 1 OZ/A	29 + 2
20	Method	6	FL OZ/A	aminocyclopyrachlor	1.5 OZ AE/A	4
	Escort	0.33	OZ/A	metsulfuron	0.2 OZ/A	2
	Plateau	3	FL OZ/A	imazapic	0.75 OZ AE/A	2
21	Nontreated Check					

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.
Treatment 16 included MSO @ 1%

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Table 2a. Results for Cable Barrier Trial 63 DAT¹ (August 4, 2020) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Broadleaves
				63 DAT			
1	Roundup ProMax	1.3	QT/A	37 def ²	1 b	6 ab	56 ab
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	99 a	0 b	0 c	1 e
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	97 a	0.3 b	0 c	3 e
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	42 cde	0 b	0 c	58 ab
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	97 a	2 b	0 c	0.3 e
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	97 a	1 b	0.3 c	2 e
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	94 a	0 b	0 c	6 cde
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	82 ab	0 b	0 c	18 cde
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	99 a	0.3 b	0 c	0.3 e
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	98 a	1 b	0 c	1 e
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	65 bc	1 b	3 bc	32 bc
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	85 ab	2 b	0 c	13 cde

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 16 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 2b. Results for Cable Barrier Trial 63 DAT¹ (August 4, 2020) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Broadleaves
				63 DAT			
13	Rodeo	32	FL OZ/A	97 a ²	3 b	0 c	0.3 e
	Method	9	FL OZ/A				
	Esplanade	7	FL OZ/A				
14	Rodeo	32	FL OZ/A	90 ab	7 b	0 c	4 de
	Esplanade	6	FL OZ/A				
	Milestone VM	7	FL OZ/A				
15	Rodeo	32	FL OZ/A	99 a	0.3 b	0.3 c	1 e
	Esplanade	3.5	FL OZ/A				
	Oust Extra	1.5	OZ/A				
16	Rodeo	32	FL OZ/A	12 fg	3 b	2 c	83 a
	Detail	6	FL OZ/A				
17	Rodeo	32	FL OZ/A	64 bcd	2 b	3 bc	32 bcd
	Terravue	5.7	OZ/A				
18	Rodeo	32	FL OZ/A	100 a	0 b	0 c	0 e
	Plainview SC	64	FL OZ/A				
19	Rodeo	32	FL OZ/A	98 a	0.3 b	0 c	2 e
	Esplanade Sure	6	OZ/A				
20	Method	6	FL OZ/A	20 efg	60 a	8 a	12 cde
	Escort	0.33	OZ/A				
	Plateau	3	FL OZ/A				
21	Nontreated Check			7 g	67 a	7 ab	20 cde

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 16 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 3a. Results for Cable Barrier Trial 134 DAT¹ (October 14, 2020) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Broadleaves
				134 DAT			
1	Roundup ProMax	1.3	QT/A	65 cde ²	1 d	12 bcd	23 bcd
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	94 ab	0 d	0 e	6 cde
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	70 bcde	2 cd	4 de	25 abc
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	88 abc	0 d	1 e	11 cde
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	91 abc	5 cd	2 e	2 e
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	75 abcde	5 cd	4 de	16 bcde
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	80 abcd	0 d	5 cde	15 cde
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	88 abc	0 d	2 e	10 cde
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	98 a	0 d	0.3 e	2 e
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	97 a	2 cd	0 e	1 e
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	52 ef	2 cd	3 de	43 a
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	57 def	5 cd	4 de	34 ab

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 16 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

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Table 3b. Results for Cable Barrier Trial 134 DAT¹ (October 14, 2020) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Broadleaves
				134 DAT			
13	Rodeo	32	FL OZ/A	84 abc ²	15 c	0.3 e	1 e
	Method	9	FL OZ/A				
	Esplanade	7	FL OZ/A				
14	Rodeo	32	FL OZ/A	78 abcd	10 cd	4 de	7 cde
	Esplanade	6	FL OZ/A				
	Milestone VM	7	FL OZ/A				
15	Rodeo	32	FL OZ/A	97 a	1 cd	1 e	1 e
	Esplanade	3.5	FL OZ/A				
	Oust Extra	1.5	OZ/A				
16	Rodeo	32	FL OZ/A	57 def	10 cd	25 a	8 cde
	Detail	6	FL OZ/A				
17	Rodeo	32	FL OZ/A	70 bcde	5 cd	13 bc	12 cde
	Terravue	5.7	OZ/A				
18	Rodeo	32	FL OZ/A	99 a	0 d	0 e	1 e
	Plainview SC	64	FL OZ/A				
19	Rodeo	32	FL OZ/A	93 ab	2 cd	2 e	3 e
	Esplanade Sure	6	OZ/A				
20	Method	6	FL OZ/A	22 g	60 a	13 bc	5 de
	Escort	0.33	OZ/A				
	Plateau	3	FL OZ/A				
21	Nontreated Check			33 fg	42 b	18 ab	7 cde

*All herbicide treatments (except trt. #1 & #16) contained the adjuvant, Activator 90 at 0.25% v/v.

Treatment 16 included MSO @ 1%

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Figure 1: View of Plots in the Cable Barrier Trial on August 4, 2020 (63 Days After Treatment)
Spray pattern observed on both sides of the cable barrier.



Figure 2: Roundup ProMax by itself (Treatment 1) on August 4, 2020 (63 Days After Treatment)
No grass damage beyond spray pattern.



Figure 3: Sahara (Treatment 2) on August 4, 2020 (63 Days After Treatment)

Note the grass damage downslope from site of application. Shallow ditch located in the foreground.



Figure 4: Hyvar (Treatment 3) on August 4, 2020 (63 Days After Treatment)

Note the dead grass downslope from site of application. Shallow ditch located in the foreground.



Figure 5: Oust XP (Treatment 4) on August 4, 2020 (63 Days After Treatment)

Note the grass damage downslope from site of application. Shallow ditch located in the foreground.



Figure 6: Perspective + Esplanade (Treatment 5) on August 4, 2020 (63 Days After Treatment)
No grass damage beyond spray pattern.



2019 Johnsongrass Control Trial [Georgetown] (including 2020 assessment)

Introduction

Johnsongrass (*Sorghum halepense*) is a perennial warm-season grass, often listed as a noxious weed, that can be a common problem on Kentucky right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. However, some of these are nonselective or are selective for johnsongrass but can still damage desirable cool-season turf, such as tall fescue. One of the safer johnsongrass control herbicides to use on tall fescue is Fusion but a label change in 2012 made it unavailable for use on right-of-way sites. This trial is a continuation of the evaluation of herbicide options for johnsongrass control or suppression.

Materials and Methods

The trial was established on an area next to the Toyota plant near Georgetown, KY with a sizable stand of johnsongrass on August 5, 2019. The trial had 18 treatments with 3 replications arranged in a randomized complete block design with 7 ft by 15 ft plots. Blank (unused) plots were included within each block due to variable distribution (very sparse areas) of johnsongrass plants. Application volume was at 30 gallons /acre. The johnsongrass canopy was 45 inches tall with 25% flowering plants at time of application. Johnsongrass control was assessed 30 (9/4/2019), 77 (10/21/2019), and 403 (9/11/2020) days after treatment (DAT). Data were analyzed using ARM software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The 2011 Fusion label rates for selective control of johnsongrass were 7 to 9 oz/A (Treatments 1 and 2). The labeled Fusilade II rates are 16 to 24 oz/A (Treatments 3 and 4). The Acclaim Extra label lists 20 oz/A per acre to control seedling johnsongrass 12 – 24 inches tall (Treatment 5); 39 oz/A to control rhizome johnsongrass 24 to 60 inches tall (Trt. 6); and a combination of Acclaim Extra plus Fusilade II (0.5 plus 3.5 oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider label rates for selective johnsongrass control in tall fescue turf are 0.75 to 1 oz/A (Treatments 8 and 9). Treatment 10 is MSMA applied alone and Treatment 11 is MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 12) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 13 will severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 14) with enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 15) was one suggested to suppress johnsongrass growth, in areas such as behind guardrails. Roundup ProMax (Treatment 16) and Journey (Treatment 17) are non-selective.

Results and Discussion

At the first evaluation 30 DAT many of the treatments were not showing much control, less than observed in some previous trials. It should be noted that the johnsongrass plants were larger than the label range for good control with some of the treatments. The most effective group of treatments had 53 to 75% control (Table 2). They included both rates of Fusion (Treatments 1 and 2), both Fusilade rates (Treatments 3 and 4), both Acclaim rates (Treatment 5 and 6), the Acclaim + Fusilade combination (Treatment 7), and both treatments with MSMA (Treatments 10 and 11).

In some years we see regrowth of the johnsongrass plants after treatment but none was observed this year (2019). This may be because we had almost no rain for the month of September. The Bluegrass Region CD3 had 0.19” which was 2.93” less than the long term average. At the end of the season 77 DAT more of the treatments were in the top grouping (63 to 85% control). They included both rates of Fusion (Treatments 1 and 2), the low rate of Fusilade II (Treatment 3), the high rate of Acclaim Extra (Treatment 6), the Acclaim Extra + Fusilade II combination (Treatment 7), both Outrider rates (Treatments 8 and 9), MSMA (Treatment 10), Clearcast (Treatment 12), both Plateau treatments (Treatments 13 and 14), Roundup ProMax (Treatment 16), and Journey (Treatment 17).

The Method + Detail + Plateau combination (Treatment 15) did not have high control ratings but did reduce the growth of johnsongrass and might have utility in controlling growth in areas such as behind guardrails early in the season.

After a few months of growth in the 2020 season, 403 DAT, the top group of treatments had 60 to 92% control (Table 2). They include both rates of Fusilade II (Treatments 3 and 4), the low rate of Acclaim Extra (Treatment 5), the Acclaim Extra + Fusilade II combination (Treatment 7), both Outrider rates (Treatments 8 and 9), MSMA (Treatment 10), Clearcast (Treatment 12), Plateau by itself (Treatment 13), Roundup ProMax (Treatment 16), and Journey (Treatment 17). Late season applications of MSMA (Treatment 10) have controlled johnsongrass well in previous trials. The addition of Detail to Plateau (Treatment 14) did not show faster symptoms and it resulted in less control under drought conditions. Perhaps leaf damage from the additional herbicide explains the antagonistic response.

The treatments showing aboveground control more quickly may not necessarily be the ones with the best long term control.

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Table 1. Herbicide Treatments, Active Ingredients and Application Rates.

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	fenoxaprop fluazifop	0.5 oz 3.5 oz
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz
10	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz
12	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae
13	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	aminocyclopyrachlor saflufenacil imazapic	1.5 oz ae 0.36 oz 0.75 oz ae
16	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae
17	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae
18	Nontreated Check				

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Table 2. Herbicide Treatments and % Control 30, 77, and 403 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	30 DAT	77 DAT	403 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	57 abcde ¹	68 abcd	52 cde
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	65 abc	75 abc	58 bcde
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	58 abcde	63 abcd	92 a
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	57 abcde	62 bcd	72 abcd
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	73 a	57 cd	60 abcde
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	72 ab	78 abc	47 de
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	75 a	75 abc	72 abcd
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	22 hi	75 abc	87 ab
9	Outrider Activator 90	1 0.25	OZ/A % V/V	48 bcdefg	77 abc	85 ab
10	MSMA	32	FL OZ/A	53 abcdef	80 abc	82 abc
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	63 abcd	45 d	82 abc
12	Clearcast MSO	32 1	FL OZ/A % V/V	30 fgh	85 ab	73 abcd
13	Plateau MSO	8 1	FL OZ/A % V/V	38 efgh	85 ab	82 abc
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	25 gh	65 abcd	57 bcde
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	42 cdefgh	55 cd	28 ef
16	Roundup ProMax	22	FL OZ/A	40 defgh	80 abc	80 abc
17	Journey MSO	21.3 1	FL OZ/A % V/V	47 cdefg	88 a	72 abcd
18	Nontreated Check			0 i	0 e	0 f

¹ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

² Herbicide treatments applied August 5, 2019. Visual evaluations taken 30 DAT (Sept 4, 2019), 77 DAT (Oct 21, 2019), and 403 DAT (Sept 11, 2020).

2020 Johnsongrass Control Trial [Lexington]

Introduction

Johnsongrass (*Sorghum halepense*) is a perennial warm-season grass, often listed as a noxious weed, that can be a common problem on Kentucky right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. However, some of these are nonselective or are selective for johnsongrass but can still damage desirable cool-season turf, such as tall fescue. One of the safer johnsongrass control herbicides to use on tall fescue is Fusion but a label change in 2012 made it unavailable for use on right-of-way sites. This trial is a continuation of the evaluation of herbicide options for johnsongrass control or suppression.

Materials and Methods

The trial was established on an old hay field with regular mowing and a stand of johnsongrass along Citation Blvd in Lexington, KY on August 26, 2020. Johnsongrass was allowed to regrow after marking the plots. The trial contained 18 treatments with 3 replications arranged in a randomized complete block design with 7 ft by 20 ft plots. Blank (unused) plots were included within each block due to variable distribution and height of johnsongrass plants. Application volume was at 30 gallons /acre. The johnsongrass canopy was 36 inches tall with 20% flowering plants at time of application. Johnsongrass control was assessed 15 (9/10/2020), 36 (10/1/2020), and 50 (10/15/2020) days after treatment (DAT). Data were analyzed using ARM software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The 2011 Fusion label rates for selective control of johnsongrass were 7 to 9 oz/A (Treatments 1 and 2). The labeled Fusilade II rates are 16 to 24 oz/A (Treatments 3 and 4). The Acclaim Extra label lists 20 oz/A per acre to control seedling johnsongrass 12 – 24 inches tall (Treatment 5); 39 oz/A to control rhizome johnsongrass 24 to 60 inches tall (Trt. 6); and a combination of Acclaim Extra plus Fusilade II (0.5 plus 3.5 oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider label rates for selective johnsongrass control in tall fescue turf are 0.75 to 1 oz/A (Treatments 8 and 9). Treatment 10 was MSMA applied alone and Treatment 11 was MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 12) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 13 will severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 14) with enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 15) was one suggested to suppress johnsongrass growth, in areas such as behind guardrails. Roundup ProMax (Treatment 16) and Journey (Treatment 17) are non-selective.

Results and Discussion

At the first evaluation 15 DAT, which is early for observing the symptoms and final control, the range of control observed was from 22 to 90% (Table 2). It should be noted that the johnsongrass plants were larger than the label range for good control with some of the treatments. The most effective group of treatments had 83 to 90% control. They included both treatments with MSMA (Treatments 10 and 11), and Roundup ProMax (Treatment 16).

By 36 DAT the range of control was from 32 to 93%. The top treatments were the same as at 15 DAT plus Journey (Treatment 17) with control from 77 to 93%. At the end of the season, 50 DAT, the range of control was from 55 to 97%. In some years considerable regrowth of johnsongrass plants after treatment can occur, but not much regrowth was observed this year following the late season application. The most effective group of treatments 50 DAT were the same as at 36 DAT plus the high rate of Acclaim Extra (Treatment 6) with control from 82 to 97%.

The treatments showing aboveground control more quickly may not necessarily be the ones with the best long-term control. These plots will be assessed again in the 2021 season.

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Table 1. Herbicide Treatments, Active Ingredients and Application Rates.

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	fenoxaprop fluazifop	0.5 oz 3.5 oz
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz
10	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz
12	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae
13	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	aminocyclopyrachlor saflufenacil imazapic	1.5 oz ae 0.36 oz 0.75 oz ae
16	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae
17	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae
18	Nontreated Check				

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Table 2. Herbicide Treatments and % Control 15, 36, and 50 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	15 DAT	36 DAT	50 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	22 c ¹	32 hi	55 e
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	23 c	37 ghi	62 de
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	25 bc	32 hi	70 cde
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	22 c	53 efgh	70 cde
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	42 b	47 fghi	70 cde
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	42 b	70 bcde	83 abc
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	22 c	48 efghi	75 bcd
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	28 bc	50 efghi	60 de
9	Outrider Activator 90	1 0.25	OZ/A % V/V	25 bc	30 i	55 e
10	MSMA	32	FL OZ/A	83 a	83 abc	87 ab
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	90 a	93 a	97 a
12	Clearcast MSO	32 1	FL OZ/A % V/V	22 c	52 efghi	65 de
13	Plateau MSO	8 1	FL OZ/A % V/V	28 bc	60 def	75 bcd
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	33 bc	65 cdef	72 bcd
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	27 bc	58 defg	63 de
16	Roundup ProMax	22	FL OZ/A	85 a	90 ab	93 a
17	Journey MSO	21.3 1	FL OZ/A % V/V	33 bc	77 abcd	82 abc
18	Nontreated Check			0 d	0 j	0 f

¹ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

² Herbicide treatments applied August 26, 2020. Visual evaluations taken 15 DAT (Sept 10, 2020), 36 DAT (Oct 1, 2020), and 50 DAT (Oct 15, 2020).

2019 Fescue Damage Relative to Johnsongrass Control Options (including 2020 assessments)

Introduction

Johnsongrass (*Sorghum halepense*) is a perennial warm-season grass, listed as a noxious weed in Kentucky, that is a common problem on right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. However, some of these are nonselective or are selective for johnsongrass but can still damage desirable cool-season turf, such as tall fescue. One of the safer johnsongrass control herbicides to use on tall fescue is Fusion but a label change in 2012 made it unavailable for use on right-of-way sites. This trial is a continuation of the evaluation of a range of herbicide options for johnsongrass control/suppression and how they affect tall fescue.

Materials and Methods

The trial was established August 6, 2019 at Spindletop Research Farm near Lexington, KY on a tall fescue field when the plants were 10 inches high. The trial had 18 treatments with 3 replications of each arranged in a randomized complete block design with 3.5 ft by 10 ft plots and 1.5 ft wide unsprayed buffers between each of the plots. Application was at 30 gallons per acre carrier volume. Tall fescue color was assessed by comparison to the running check strips. The color rating ranges from 0 (dead) to 9 (full green). The color of the non-treated check strips was set at 8. Plots were assessed 30 (9/5/2019), and 84 (10/29/2019) days after treatment (DAT). Visual estimates of fescue density (0-10) were assessed at 272 (5/4/2020), 288 (5/20/2020), and 315 (6/16/2020) DAT. Data were analyzed using ARM software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The 2011 Fusion label rates for selective control of johnsongrass were 7 to 9 oz/A (Treatments 1 and 2). The labeled Fusilade II rates were 16 to 24 oz/A (Treatments 3 and 4). The Acclaim Extra label indicates 20 oz/A per acre to control seedling johnsongrass 12–24 inches tall (Treatment 5); 39 oz/A to control rhizome johnsongrass 24 to 60 inches tall (Trt. 6); and a combination of Acclaim Extra plus Fusilade II (0.5 plus 3.5 oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider label rates for selective johnsongrass control in tall fescue turf are 0.75 to 1 oz/A (Treatments 8 and 9). Treatment 10 is MSMA applied alone and Treatment 11 is MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 12) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 13 can severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 14) with enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 15) was one suggested to suppress johnsongrass growth, in areas such as behind guardrails. Roundup ProMax (Treatment 16) and Journey (Treatment 17) are non-selective treatments.

Results and Discussion

Some treatments showed good safety on tall fescue with color ratings that were not different from the nontreated check over all the ratings while others showed recovery of color following an initial decrease by the end of the season (Table 2). Regrowth of the tall fescue may have been reduced by the drought in September. The Bluegrass Region CD3 had 0.19” which was 2.93” less than the long-term average. Treatments with color ratings unchanged from the control 30 DAT included both rates of Fusion (Treatments 1 and 2), both rates of Acclaim Extra (Treatments 5 and 6), high rate of Outrider (Treatment 9), and MSMA by itself (Treatment 10) plus in combination with Outrider (Treatment 11). Treatments that where color recovered by 84 DAT included the low rate of Fusilade II (Treatment 3), the combination of Acclaim Extra + Fusilade II (Treatment 7), and the low rate of Outrider (Treatment 8). Fescue color in plots treated with the high rate of Fusilade II (Treatment 4), Clearcast (Treatment 12), all Plateau treatments (Treatments 13 to 15), Roundup ProMax (Treatment 16), or Journey (Treatment 17) did not recover before the end of the season. These treatments would be not be recommended if one wants to preserve existing fescue in the application area.

Many of the treatments had fescue densities similar to control in the spring of 2020 by 272 DAT (Table 3). These included both rates of Fusion (Treatments 1 and 2), both rates of Fusilade II (Treatments 3 and 4), both rates of Acclaim Extra (Treatments 5 and 6), Acclaim Extra + Fusilade II (Treatment 7), both rates of Outrider (Treatments 8 and 9), and both treatments with MSMA (Treatments 10 and 11). At 288 DAT the same treatments with visual densities similar to the control also included Method + Detail + Plateau (Treatment 15). By 315 DAT this group of treatments was joined by Detail + Plateau (Treatment 14). The Clearcast (Treatment 12), Plateau (Treatment 13), Roundup ProMax (Treatment 16), and Journey (Treatment 17) treatments did not recover fescue density by the end of the assessment period. These treatments would not be recommended as far as fescue safety was concerned.

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Table 1. Herbicide Treatments, Active Ingredients and Application Rates.

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	fenoxaprop fluazifop	0.5 oz 3.5 oz
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz
10	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz
12	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae
13	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	aminocyclopyrachlor saflufenacil imazapic	1.5 oz ae 0.36 oz 0.75 oz ae
16	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae
17	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae
18	Nontreated Check				

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Table 2. Herbicide Treatments and Color (0-9) 30, and 84 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	30 DAT	84 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	8.0 a ¹	7.8 ab
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	7.0 abc	8.0 a
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	6.3 cd	7.3 abc
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	5.0 e	7.0 c
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	7.0 abc	7.8 ab
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	7.7 ab	8.0 a
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	6.7 bcd	7.7 abc
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	6.7 bcd	7.3 abc
9	Outrider Activator 90	1 0.25	OZ/A % V/V	7.0 abc	7.2 bc
10	MSMA	32	FL OZ/A	8.0 a	7.7 abc
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	7.7 ab	7.5 abc
12	Clearcast MSO	32 1	FL OZ/A % V/V	2.3 g	1.8 h
13	Plateau MSO	8 1	FL OZ/A % V/V	2.7 fg	4.0 ef
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	3.7 f	4.7 e
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	5.7 de	6.2 d
16	Roundup ProMax	22	FL OZ/A	3.7 f	3.7 f
17	Journey MSO	21.3 1	FL OZ/A % V/V	3.0 fg	2.7 g
18	Nontreated Check			8.0 a	8.0 a

¹ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

² Herbicide treatments applied August 6, 2019. Visual observations taken 30 DAT (Sept 5, 2019) and 84 DAT (Oct 29, 2019).

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Table 3. Herbicide Treatments and Fescue Density (0-10) 272, 288, and 315 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	272 DAT	288 DAT	315 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	7.7 a ¹	7.7 ab	8.2 a
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	7.8 a	7.3 abc	8.3 a
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	7.7 a	7.7 ab	8.0 ab
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	7.3 ab	7.5 ab	7.3 abcd
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	7.8 a	7.7 ab	7.8 abc
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	8.0 a	8.0 a	8.5 a
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	7.2 ab	7.5 ab	8.2 a
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	7.0 abc	6.7 bcd	8.2 a
9	Outrider Activator 90	1 0.25	OZ/A % V/V	7.2 ab	7.3 abc	8.5 a
10	MSMA	32	FL OZ/A	8.0 a	7.5 ab	8.7 a
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	7.2 ab	7.8 ab	7.8 abc
12	Clearcast MSO	32 1	FL OZ/A % V/V	2.2 e	2.0 f	4.7 e
13	Plateau MSO	8 1	FL OZ/A % V/V	5.3 d	5.8 de	6.5 bcd
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	5.7 cd	6.2 cd	7.3 abcd
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	6.2 bcd	7.7 ab	8.2 a
16	Roundup ProMax	22	FL OZ/A	5.0 d	6.0 d	6.3 cd
17	Journey MSO	21.3 1	FL OZ/A % V/V	4.8 d	4.7 e	6.0 de
18	Nontreated Check			8.0 a	8.0 a	8.8 a

¹ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

² Herbicide treatments applied August 6, 2019. Observed fescue densities assessed 272 DAT (May 5, 2020), 288 DAT (May 20, 2020), and 315 DAT (June 16, 2020).

2020 Fescue Damage Relative to Johnsongrass Control Options

Introduction

Johnsongrass (*Sorghum halepense*) is a perennial warm-season grass, listed as a noxious weed in Kentucky, that is a common problem on right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. However, some of these are nonselective or are selective for johnsongrass but can still damage desirable cool-season turf, such as tall fescue. One of the safer johnsongrass control herbicides to use on tall fescue is Fusion but a label change in 2012 made it unavailable for use on right-of-way sites. This trial is a continuation of the evaluation of a range of herbicide options for johnsongrass control/suppression options and how they affect tall fescue.

Materials and Methods

The trial was established August 27, 2020 at Spindletop Research Farm near Lexington, KY on a tall fescue field when the plants were 10 inches high. The trial had 18 treatments with 3 replications of each arranged in a randomized complete block design with 3.5 ft by 10 ft plots and 1.5 ft wide unsprayed buffers between each of the plots. Application was at 30 gallons per acre carrier volume. Tall fescue color was assessed by comparison to the running check strips. The color rating ranges from 0 (dead) to 9 (full green). The color of the non-treated check strips was set at 8. Plots were assessed 14 (9/10/2020), 30 (9/30/2020), 49 (10/15/2020), and 85 (11/20/2020) days after treatment (DAT). Data were analyzed using ARM software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The 2011 Fusion label rates for selective control of johnsongrass were 7 to 9 oz/A (Treatments 1 and 2). The labeled Fusilade II rates were 16 to 24 oz/A (Treatments 3 and 4). The Acclaim Extra label indicates 20 oz/A per acre to control seedling johnsongrass 12–24 inches tall (Treatment 5); 39 oz/A to control rhizome johnsongrass 24 to 60 inches tall (Treatment 6); and a combination of Acclaim Extra plus Fusilade II (0.5 plus 3.5 oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider label rates for selective johnsongrass control in tall fescue turf are 0.75 to 1 oz/A (Treatments 8 and 9). Treatment 10 is MSMA applied alone and Treatment 11 is MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 12) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 13 can severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 14) with enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 15) was one suggested to suppress johnsongrass growth, in areas such as behind guardrails. Roundup ProMax (Treatment 16) and Journey (Treatment 17) are non-selective treatments.

Results and Discussion

Some treatments showed good safety on tall fescue with color ratings that were not different from the nontreated check while others showed recovery of color following an initial decrease by the end of the season (Table 2). Treatments with color ratings unchanged from the control 14 and 30 DAT included both rates of Acclaim Extra (Treatments 5 and 6) and MSMA by itself (Treatment 10). Treatments with the lowest color rating at the first two assessments were Clearcast (Treatment 12) and Roundup ProMax (Treatment 16). At 49 DAT the same treatments were the same as control while only Clearcast (Treatment 12) had the lowest color rating. By 85 DAT both rates of Fusion (Treatments 1 and 2), the high rate of Fusilade II (Treatment 4), both rates of Acclaim Extra (Treatments 5 and 6), and the treatments with MSMA (Treatments 10 and 11) had color ratings similar to control. Clearcast (Treatment 12) remained with the lowest color rating, which would not be recommended if one wants to preserve existing fescue in the application area. Fescue density will be assessed in spring 2021.

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Table 1. Herbicide Treatments, Active Ingredients and Application Rates.

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	fenoxaprop fluazifop	0.5 oz 3.5 oz
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz
10	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz
12	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae
13	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	aminocyclopyrachlor saflufenacil imazapic	1.5 oz ae 0.36 oz 0.75 oz ae
16	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae
17	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae
18	Nontreated Check				

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Table 2. Herbicide Treatments and Color (0-9) 14, 30, 49, and 85 Days After Treatment (DAT)

Trt. No.	Product Name	Rate	Rate Unit	14 DAT	30 DAT	49 DAT	85 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	6.7 cde ¹	6.3 b	6.2 b	7.3 abc
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	6.8 cd	6.2 bc	6.3 b	6.8 abcd
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	6.5 cde	4.7 de	5.0 c	6.5 cd
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	6.3 de	4.0 e	4.5 c	6.8 abcd
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	7.8 ab	8.0 a	7.5 a	7.7 abc
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	8.0 a	8.0 a	8.0 a	7.8 ab
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	6.3 de	5.3 cd	5.0 c	6.0 de
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	7.0 cd	6.3 b	6.2 b	7.2 abcd
9	Outrider Activator 90	1 0.25	OZ/A % V/V	6.8 cd	6.5 b	6.3 b	6.7 bcd
10	MSMA	32	FL OZ/A	8.0 a	8.0 a	7.7 a	7.8 ab
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	7.2 bc	6.8 b	6.2 b	7.2 abcd
12	Clearcast MSO	32 1	FL OZ/A % V/V	4.8 gh	1.7 h	1.2 f	2.0 h
13	Plateau MSO	8 1	FL OZ/A % V/V	6.0 ef	3.0 fg	3.0 de	5.0 ef
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	5.5 fg	3.8 ef	3.2 d	5.0 ef
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	6.5 cde	5.3 cd	5.2 c	6.5 cd
16	Roundup ProMax	22	FL OZ/A	4.7 h	2.5 gh	2.2 e	3.3 g
17	Journey MSO	21.3 1	FL OZ/A % V/V	5.5 fg	3.0 fg	2.5 de	4.2 fg
18	Nontreated Check			8.0 a	8.0 a	8.0 a	8.0 a

¹ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

² Herbicide treatments applied August 27, 2020. Visual observations taken 14 DAT (Sept 10, 2020), 30 DAT (Sept 30, 2020), 49 DAT (Oct 15, 2020), and 85 DAT (Nov 11, 2020).

2019 Selective Broadleaf Control Trials near Richmond (including 2020 assessment)

Introduction

One of the objectives of roadside vegetation management is selective control of broadleaf weeds without damaging desirable grasses, such as tall fescue. Other objectives include brush control and grass growth regulation. There are a number of herbicides and tank mix combinations of products available for roadside managers. This trial evaluated the efficacy of various herbicide products for broadleaf weed control.

Materials and Methods

The trial was established June 14, 2019 on a roadside area mowed periodically, following the first mowing of the season, located along I75 near Richmond, KY. The trial consisted of 15 treatments with 3 replications arranged in a randomized complete block design with 7 ft by 20 ft plots. Application volume was at 25 gallons per acre. The area had a mix of broadleaf weeds along with some desirable grasses. Tall fescue was 9 inches tall and the undesirable johnsongrass was 22 inches tall at time of application. Most of the plots contained red clover (18 inches tall) as well as flowering buckhorn plantain (19 inch seedheads). Other legumes present included white clover (8 inches tall) and black medic (8 inches tall).

Herbicide treatments and active ingredients are listed in Table 1. Many were applied at their maximum rate which included Milestone (Treatment 1) and Opensight (Treatment 2). Perspective (Treatment 3) and Streamline (Treatment 4) were applied at the maximum selective rate, although both can be applied at higher rates for bareground. Even the selective rate can result in turf grass yellowing and reduced growth. In some cases the reduced growth may even be desirable. Method (Treatments 6 thru 8) is a new product with only the aminocyclopyrachlor component of Perspective and Streamline. Method at 7.2 fl oz per acre contains the same amount of active ingredient concentration as 4.5 oz per acre of Perspective and Streamline. The Method label indicates when applied alone good plantain and brush control from 10 to 18 fl oz per acre. Combinations of Milestone or Method + Plateau (Treatments 12 and 13) had been suggested for grass growth reduction as well as broadleaf weed control. A higher rate of Method + Plateau (Treatment 14) was suggested for grass growth regulation plus brush control behind guardrails. The FreeLexx + Escort combination (Treatment 11) is also one suggested for greater woody vegetation control.

Plots were assessed 48 (8/1/2019), 83 (9/5/2019), 131 (10/23/2019), and 341 (5/20/2020) days after treatment (DAT). Data were analyzed using ARM software (GDM Solutions, Inc.) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

By 48 DAT, most of the red clover plants were brown, including those in the control plots. Growth of all plants was less than in nearby areas with thicker soil, and regrowth of plants like plantain was limited by the thin soil as well as the drought. The Bluegrass Region CD3 had 0.19” which was 2.93” less than the long-term average in September.

The predominant broadleaf weed was buckhorn plantain whereby most of the treatments had good control ratings (45 to 87%) (Table 2). However, Milestone (Treatment 1), Perspective (Treatment 3), and Milestone + Plateau (Treatment 12) had statistically equivalent control ratings as the nontreated control (Treatment 15) 48 DAT. All the treatments had ratings different from control for overall broadleaf control (40 to 92%). The greatest grass damage (13 to 17%) was with the Method + Plateau treatments (Treatments 13 and 14).

At 83 DAT the buckhorn plantain seedheads were largely brown, but there was some new rosette leaf growth which resulted in somewhat lower control ratings for many of the treatments (Table 2). Milestone (Treatment 1), Milestone + Plateau (Treatment 12), and the low rate of Method + Plateau (Treatment 13) had visual ratings equivalent to the untreated control at this evaluation timing. Most of the treatments had ratings different from control for overall broadleaf control (40 to 80%).

By the last assessment of the season 131 DAT the dead/damaged plants were not evident but plantain regrowth was visible after receiving some rain. The amount of buckhorn plantain cover (%) was assessed and it should be noted that the initial cover was not uniform. The only treatments with less buckhorn plantain cover than the untreated control were Streamline (Treatment 4), Freelexx + Vastlan (Treatment 10), and Freelexx + Escort (Treatment 11).

In the spring of 2020, 341 DAT, only two treatments did not have any buckhorn plantain cover. These were the high rate of Method (Treatment 8) and the high rate of Method + Plateau (Treatment 14).

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Table 1. Herbicide Treatments, Active Ingredients and Application Rates.

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	ai Rate (per acre)
1	Milestone VM	7	FL OZ/A	aminopyralid	1.8 OZ AE/A
2	Opensight	3.3	OZ/A	aminopyralid + metsulfuron	1.7 OZ AE + 0.3 OZ/A
3	Perspective	4.5	OZ/A	aminocyclopyrachlor + chlorsulfuron	1.8 OZ + 0.7 OZ/A
4	Streamline	4.5	OZ/A	aminocyclopyrachlor + metsulfuron	1.8 OZ + 0.6 OZ/A
5	Pyresta	24	FL OZ/A	2,4-D + pyraflufen-ethyl	0.66 LB AE + 0.05 OZ/A
	Proclipse	2	LB/A	prodiamine	1.3 LB/A
6	Method	4	FL OZ/A	aminocyclopyrachlor	1 OZ AE/A
7	Method	6	FL OZ/A	aminocyclopyrachlor	1.5 OZ AE/A
8	Method	12	FL OZ/A	aminocyclopyrachlor	3 OZ AE/A
9	Overdrive	5	OZ/A	diflufenzopyr + dicamba	1 OZ AE + 2.5 OZ AE/A
	Vastlan	16	FL OZ/A	triclopyr	8 OZ AE/A
10	Freelexx	48	FL OZ/A	2,4-D	22.8 OZ AE/A
	Vastlan	32	FL OZ/A	triclopyr	16 OZ AE/A
11	Freelexx	32	FL OZ/A	2,4-D	15.2 OZ AE/A
	Escort	1	OZ/A	metsulfuron	0.6 OZ/A
12	Milestone VM	6	FL OZ/A	aminopyralid	3 OZ AE/A
	Plateau	3	FL OZ/A	imazapic	0.75 OZ AE/A
13	Method	6	FL OZ/A	aminocyclopyrachlor	1.5 OZ AE/A
	Plateau	3	FL OZ/A	imazapic	0.75 OZ AE/A
14	Method	12	FL OZ/A	aminocyclopyrachlor	3 OZ AE/A
	Plateau	3	FL OZ/A	imazapic	0.75 OZ AE/A
15	Nontreated Check				

All herbicide treatments contained the adjuvant, Activator 90 at 0.25% v/v.

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Table 2. Herbicide Treatments, Application Rates, and Data.

Trt. No.	Product Name	Rate	Rate Unit	Broadleaf Control (%)	Buckhorn Plantain Control (%)	Grass Damage (%)	Broadleaf Control (%)	Buckhorn Plantain Control (%)	Buckhorn Plantain Cover (%)	Buckhorn Plantain Cover (%)
				48 DAT ¹			83 DAT		131 DAT	341 DAT
1	Milestone VM	7	FL OZ/A	47 c ²	38 bcd	0 b	40 bcd	33 bcde	10 a	7 abc
2	Opensight	3.3	OZ/A	67 abc	55 abc	3 b	48 abcd	47 abcd	5 abcd	9 a
3	Perspective	4.5	OZ/A	60 bc	37 bcd	0 b	52 abcd	48 abcd	5 abcd	7 abc
4	Streamline	4.5	OZ/A	80 ab	70 ab	3 b	60 abc	58 abc	1 d	7 abc
5	Pyresta	24	FL OZ/A	78 ab	87 a	0 b	78 a	87 a	8 ab	3 cd
	Proclipse	2	LB/A							
6	Method	4	FL OZ/A	67 abc	67 ab	0 b	73 ab	50 abcd	6 abcd	4 bcd
7	Method	6	FL OZ/A	75 ab	65 abc	2 b	57 abcd	63 ab	3 bcd	3 bcd
8	Method	12	FL OZ/A	67 abc	70 ab	2 b	80 a	70 ab	2 cd	0 d
9	Overdrive	5	OZ/A	67 abc	72 ab	0 b	63 abc	50 abcd	5 abcd	2 cd
	Vastlan	16	FL OZ/A							
10	Freelexx	48	FL OZ/A	92 a	85 a	0 b	67 abc	53 abcd	2 d	2 cd
	Vastlan	32	FL OZ/A							
11	Freelexx	32	FL OZ/A	85 ab	78 ab	0 b	67 abc	58 abc	1 d	5 abcd
	Escort	1	OZ/A							
12	Milestone VM	6	FL OZ/A	40 c	23 cd	3 b	33 cde	18 cde	7 abcd	8 ab
	Plateau	3	FL OZ/A							
13	Method	6	FL OZ/A	60 bc	45 abc	17 a	23 de	13 de	8 ab	6 abc
	Plateau	3	FL OZ/A							
14	Method	12	FL OZ/A	67 abc	67 ab	13 a	50 abcd	47 abcd	3 bcd	0 d
	Plateau	3	FL OZ/A							
15	Nontreated Check			0 d	0 d	0 b	o e	0 e	7 abc	8 abc

¹ DAT = Days after treatment ² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05

INTRODUCTION

Johnsongrass (*Sorghum halepense*) is a perennial warm season grass, listed as a noxious weed, and a common problem on right-of-way sites. There are a number of herbicides labeled and available to control johnsongrass and most rely on translocation from the leaves to the rhizomes for greatest efficacy. However, mowing also is part of roadside management and one common question is: How long after herbicide application do we need to wait before mowing without reducing herbicide efficacy on johnsongrass control?

OBJECTIVE

The objective of this study was to evaluate the effect of the amount of time between herbicide application and mowing on johnsongrass control.

MATERIALS & METHODS

This study was initiated August 14, 2014 and repeated August 24, 2015 at an interchange near Bardstown KY. It was repeated August 30, 2019 on a field in Lexington. Four herbicide treatments were applied to 3 m x 18 m strips at 280 L/ha (Table 1). Average johnsongrass height was 75 cm. Six time of mowing treatments (Table 2) were applied as 3 m x 12 m strips across the herbicide treatments (Fig. 1) in a split block design, replicated three times (4 times in 2015 and 2019). The mowing height was 13 cm. The herbicide treatments were Outrider (sulfosulfuron), Fusilade II (fluazifop), Acclaim Extra (fenoxaprop), and Fusilade + Acclaim. The time of mowing treatments were as follows: no mowing, same day as herbicide application, as well as 1 day, 2 days, 1week, and 2 weeks after application.

Visual assessments of percent johnsongrass control were done 34 (9/17/2014), 70 (10/23/2014), and 350 (7/30/2015) days after herbicide treatment (DAT) for the 2014 trial. Assessments were done 32 (9/25/2015), 45 (10/8/2015), 53 (10/16/2015), and 298 (6/17/2016) DAT for the 2015 trial. Assessments were done 31 (9/30/2019) and 60 (10/29/2019) DAT for the 2019 trial. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

RESULTS & DISCUSSION

Differences in johnsongrass control among herbicide treatments with mowing within hours of application were evident 34 DAT in the 2014 trial (Table 3A) with Outrider providing greater control than other herbicide treatments with the same day mowing treatment. There may have been more soil uptake with Outrider than other herbicide treatments as well as faster translocation to the rhizomes. Acclaim Extra had less control than the other herbicide treatments at many of the shorter mowing intervals (Table 3A & B) (Fig. 2). By 350 DAT, control in the top set of treatment combinations ranged from 43 to 92% (Table 3C).

Regrowth of johnsongrass after mowing was slower in 2015 and 2019 than in 2014. One reason may be the timing and amount of rainfall. There was 16.1 cm in Aug. 2014 but only 7.1 cm in Aug. 2015 (long term average is 8.9 cm). In 2019 there was only 0.5 cm in the month of September. We saw 89% johnsongrass control with the Outrider and Fusilade II treatments when mowed the same day 32 DAT and 81 to 85% control 53 DAT in 2015 (Table 4A). In 2019 we observed 93 to 96% control with the Outrider, Fusilade II, and Acclaim + Fusilade plots that were mowed the same day 31 DAT (Table 4B).

Table 1. Herbicide treatments, application rates, and active ingredients used in this trial.

Trt. No.	Product(s)	Rate per acre	Active Ingredients
1	Outrider	1 oz	sulfosulfuron
	Activator 90	0.25% v/v	
2	Fusilade II	24 fl oz	fluazifop
	Activator 90	0.25% v/v	
3	Acclaim Extra	39 fl oz	fenoxaprop
	Activator 90	0.25% v/v	
4	Acclaim Extra	7 fl oz	fenoxaprop
	Fusilade II	14 fl oz	fluazifop
	COC	1%	



Figure 1. Mowing on day of application (August 14, 2014).



Figure 2. Overview of Rep 1 plots 34 DAT in 2014 trial. Red flags mark edge of block while yellow and blue flags mark center of herbicide strips.

Table 2. Timing of mowing treatments used in this trial.

Trt No.	Timing of Mowing Treatments
1	Same day as herbicide application
2	1 Day after
3	2 Days after
4	1 Week after
5	2 Weeks after
6	No mowing

Table 3. Herbicide x mowing treatment combinations and % johnsongrass control 34 DAT (A), 70 DAT (B) and 350 DAT (C) in 2014 trial.

(A)	Mowing Time				Acclaim + Fusilade
Mowing Time	Outrider	Fusilade II	Acclaim Extra	Fusilade	
Same Day	83 cd	39 gh	45 g	30 h	
1 Day After	97 ab	90 abcd	65 f	87 bcd	
2 Days After	98 a	91 abcd	68 f	91 abcd	
1 Week After	99 a	91 abcd	72 ef	93 abc	
2 Weeks After	99 a	95 ab	83 cd	93 abc	
No Mowing	70 f	87 bcd	82 de	87 bcd	

(B)	Mowing Time				Acclaim + Fusilade
Mowing Time	Outrider	Fusilade II	Acclaim Extra	Fusilade	
Same Day	88 ab	0 f	17 ef	14 ef	
1 Day After	99 a	94 a	37 de	96 a	
2 Days After	100 a	97 a	48 cd	98 a	
1 Week After	100 a	97 a	67 bc	99 a	
2 Weeks After	100 a	100 a	94 a	99 a	
No Mowing	93 a	99 a	92 a	97 a	

(C)	Mowing Time				Acclaim + Fusilade
Mowing Time	Outrider	Fusilade II	Acclaim Extra	Fusilade	
Same Day	55 a-h	8 h	13 gh	40 b-h	
1 Day After	75 a-e	78 abc	27 e-h	28 d-h	
2 Days After	68 a-f	88 ab	35 c-h	50 a-h	
1 Week After	72 a-e	92 a	43 a-h	55 a-h	
2 Weeks After	72 a-e	33 c-h	20 fgh	38 c-h	
No Mowing	62 a-g	76 a-d	58 a-g	61 a-g	

Means within a rating time followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$.

Table 4. Herbicide x mowing treatment combinations and % johnsongrass control 53 DAT (A) in 2015 trial and 31 DAT (B) in 2019 trial.

(A)	Mowing Time				Acclaim + Fusilade
Mowing Time	Outrider	Fusilade II	Acclaim Extra	Fusilade	
Same Day	81 abc	85 abc	72 c	75 bc	
1 Day After	83 abc	91 a	91 a	90 ab	
2 Days After	93 a	89 ab	90 ab	87 ab	
1 Week After	90 ab	86 abc	88 ab	93 a	
2 Weeks After	87 ab	88 ab	89 ab	91 a	
No Mowing	89 ab	87 ab	95 a	96 a	

(B)	Mowing Time				Acclaim + Fusilade
Mowing Time	Outrider	Fusilade II	Acclaim Extra	Fusilade	
Same Day	96 abc	93 c	86 d	94 bc	
1 Day After	99 a	98 ab	85 d	96 abc	
2 Days After	99 a	98 ab	93 c	97 ab	
1 Week After	99 a	98 ab	94 bc	98 ab	
2 Weeks After	99 a	97 ab	96 abc	97 ab	
No Mowing	69 f	74 e	69 f	74 e	

Means within a rating time followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

SUMMARY

Mowing timing did affect herbicide efficacy. The 2014 results suggest that mowing 1 or 2 days after application will not reduce the efficacy of Outrider, Fusilade, or Acclaim + Fusilade. However, one should wait 2 weeks before mowing if Acclaim Extra was applied. While there was less regrowth following the treatments in 2015 compared to 2014 and 2019, the results support the same delay before mowing for these herbicides.

INTRODUCTION

Johnsongrass (*Sorghum halepense*) is a perennial warm-season grass, that is a common problem on right-of-ways. There are a number of herbicides labeled and available to control johnsongrass on right-of-ways. However, some of these are nonselective or are selective for johnsongrass but can still damage desirable cool-season turf, such as tall fescue. One of the safer johnsongrass control herbicides to use on tall fescue is Fusion but a label change in 2012 made it unavailable for use on right-of-way sites.

OBJECTIVE

This trial evaluated a range of johnsongrass control/suppression options along with the damage and recovery of tall fescue after application. Which options resulted in the best control with the least damage?

MATERIALS & METHODS

The johnsongrass site had late season regrowth (120 cm canopy) and was treated August 30, 2017 in Rowan County KY. The tall fescue trial was established August 27, 2017 in Fayette County KY when the plants were 25 cm high. The trial had 20 treatments with three replications arranged in a randomized complete block design with 2.1 m by 6.1 m johnsongrass plots and 1 m by 3 m fescue plots with 0.5 m unsprayed buffers between each of the plots.

Application was at 280 L/ha. Johnsongrass control was assessed 23 (9/22/2017), 53 (10/22/2017), and 302 (6/28/2018) days after treatment (DAT). Tall fescue color was assessed every two weeks by comparison to the running check strips. The color rating ranges from 0 (dead) to 9 (full green). The color of the check strips was set at 8. Plots were assessed 14 (9/9/2017), 29 (9/24/2017), 45 (10/10/2017), 57 (10/22/2017), and 75 (11/9/2017) days after treatment (DAT).

In the spring tall fescue stand density was assessed visually from 0 (none) to 10 (full stand) 262 (5/15/2018) and 276 (5/29/2018) DAT. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

RESULTS & DISCUSSION

At 53 DAT the top group of treatments had 83 to 93% johnsongrass control with many of the same treatments as at 23 DAT. At the second rating they were the high rate of Fusion (Trt 2), both rates of Envoy (Trts 3 and 4), both rates of Fusilade II (Trts 5 and 6), the high rate of Acclaim Extra (Trt 8), the combination of Acclaim + Fusilade (Trt 9), Roundup ProMax (Trt 18), and Journey (Trt 19) (Table 1).

Next spring at 302 DAT the top group of treatments had 69 to 93% control and many of these were not in the top in the 2017 ratings. At this spring rating they were both rates of Envoy (Trts 3 and 4), the high rate of Fusilade II (Trt 6), both rates of Outrider (Trts 10 and 11), both MSMA by itself and in combination with Outrider (Trts 12 and 13), Clearcast (Trt 14), Plateau (Trt 15), Roundup ProMax (Trt 18), and Journey (Trt 19).

The treatments showing aboveground control more quickly may not necessarily be the ones with the best long term control. Outrider performed well in our trials but is slower to show foliar control.

Some treatments showed good safety on tall fescue with color ratings that were consistently not different from the nontreated check over all the ratings while others showed recovery by the end of the season. Treatments with color ratings consistently not different from control included both rates of Fusion (Trts 1 and 2), both rates of Acclaim Extra (Trts 7 and 8), MSMA by itself (Trt 12) and in combination with Outrider (Trt 13).

Table 1. Herbicide treatments, application rates, active ingredients used in these trials along with % johnsongrass control and fescue color and stand density.

Trt.	Product Name	Rate	Active Ingredient(s)	Ai Rate (per ha)	Johnsongrass Control (%)			Fescue Color (0-9)			Stand Density (0-10)	
					23 DAT ¹	53 DAT	302 DAT	29 DAT	57 DAT	75 DAT	262 DAT	276 DAT
1	Fusion Activator 90	7 fl oz/A 0.25 % V/V	fluazifop + fenoxaprop	123 g + 34 g	40 <i>efg</i> ²	75 <i>cde</i>	55 <i>cde</i>	7.9 <i>a</i>	8.0 <i>a</i>	7.9 <i>a</i>	8.0 <i>a</i>	8.3 <i>a</i>
2	Fusion Activator 90	9 fl oz/A 0.25 % V/V	fluazifop + fenoxaprop	158 g + 44 g	60 <i>bcde</i>	88 <i>ab</i>	60 <i>bcde</i>	7.5 <i>ab</i>	7.5 <i>abc</i>	8.0 <i>a</i>	6.0 <i>ab</i>	9.0 <i>a</i>
3	Envoy COC	16 fl oz/A 1 % V/V	clethodim	133 g	70 <i>abcd</i>	87 <i>abc</i>	77 <i>abc</i>	2.7 <i>fg</i>	5.2 <i>e</i>	7.0 <i>ab</i>	6.3 <i>ab</i>	6.8 <i>ab</i>
4	Envoy COC	32 fl oz/A 1 % V/V	clethodim	273 g	77 <i>ab</i>	88 <i>ab</i>	83 <i>ab</i>	1.3 <i>h</i>	3.2 <i>f</i>	3.8 <i>d</i>	3.2 <i>cd</i>	5.0 <i>bc</i>
5	Fusilade II Activator 90	16 fl oz/A 0.25 % V/V	fluazifop	280 g	72 <i>abc</i>	87 <i>abc</i>	60 <i>bcde</i>	6.3 <i>bcd</i>	7.2 <i>abc</i>	7.9 <i>a</i>	4.8 <i>bc</i>	7.0 <i>ab</i>
6	Fusilade II Activator 90	24 fl oz/A 0.25 % V/V	fluazifop	420 g	75 <i>ab</i>	88 <i>ab</i>	69 <i>abcde</i>	4.7 <i>e</i>	5.7 <i>de</i>	7.3 <i>a</i>	6.3 <i>ab</i>	8.0 <i>a</i>
7	Acclaim Extra Activator 90	20 fl oz/A 0.25 % V/V	fenoxaprop	98 g	85 <i>a</i>	73 <i>de</i>	47 <i>ef</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	7.0 <i>ab</i>	9.0 <i>a</i>
8	Acclaim Extra Activator 90	39 fl oz/A 0.25 % V/V	fenoxaprop	195 g	68 <i>abcd</i>	85 <i>abcd</i>	52 <i>de</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	7.0 <i>ab</i>	8.3 <i>a</i>
9	Acclaim Extra Fusilade II COC	7 fl oz/A 14 fl oz/A 1 % V/V	fenoxaprop fluazifop	35 g 245 g	78 <i>ab</i>	93 <i>a</i>	45 <i>ef</i>	6.2 <i>cd</i>	7.3 <i>abc</i>	8.0 <i>a</i>	6.0 <i>ab</i>	9.0 <i>a</i>
10	Outrider Activator 90	0.75 oz/A 0.25 % V/V	sulfosulfuron	40 g	23 <i>gh</i>	72 <i>e</i>	78 <i>abc</i>	5.7 <i>de</i>	6.7 <i>bcd</i>	7.8 <i>a</i>	6.0 <i>ab</i>	8.7 <i>a</i>
11	Outrider Activator 90	1 oz/A 0.25 % V/V	sulfosulfuron	53 g	32 <i>fg</i>	78 <i>bcde</i>	80 <i>ab</i>	6.2 <i>cd</i>	6.3 <i>cde</i>	7.9 <i>a</i>	5.3 <i>abc</i>	7.3 <i>ab</i>
12	MSMA	32 fl oz/A	monosodium acid methanearsonate	1681 g	43 <i>efg</i>	77 <i>bcde</i>	83 <i>ab</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	7.0 <i>ab</i>	7.7 <i>a</i>
13	Outrider MSMA	0.75 oz/A 32 fl oz/A	sulfosulfuron monosodium acid methanearsonate	40 g 1681 g	50 <i>cdef</i>	80 <i>bcde</i>	87 <i>a</i>	7.3 <i>abc</i>	7.7 <i>ab</i>	8.0 <i>a</i>	6.7 <i>ab</i>	8.7 <i>a</i>
14	Clearcast MSO	32 fl oz/A 1 % V/V	imazamox	280 g <i>ae</i>	27 <i>fg</i>	72 <i>e</i>	75 <i>abcd</i>	3.3 <i>f</i>	1.5 <i>g</i>	2.8 <i>d</i>	1.5 <i>d</i>	1.2 <i>e</i>
15	Plateau MSO	8 fl oz/A 1 % V/V	imazapic	140 g <i>ae</i>	33 <i>fg</i>	80 <i>bcde</i>	91 <i>a</i>	5.5 <i>de</i>	2.7 <i>fg</i>	5.7 <i>bc</i>	2.7 <i>cd</i>	4.0 <i>cd</i>
16	Poast Plus MSO	2.25 pt/A 1 % V/V	sethoxydim	315 g	72 <i>abc</i>	52 <i>f</i>	23 <i>fg</i>	3.2 <i>f</i>	5.3 <i>e</i>	6.7 <i>ab</i>	3.0 <i>cd</i>	3.0 <i>cde</i>
17	Poast Plus MSO	3.75 pt/A 1 % V/V	sethoxydim	525 g	75 <i>ab</i>	75 <i>cde</i>	27 <i>f</i>	2.5 <i>fgh</i>	3.7 <i>f</i>	6.8 <i>ab</i>	1.8 <i>d</i>	2.3 <i>de</i>
18	Roundup ProMax	22 fl oz/A	glyphosate	869 g <i>ae</i>	75 <i>ab</i>	87 <i>abc</i>	92 <i>a</i>	3.0 <i>f</i>	5.7 <i>de</i>	7.2 <i>ab</i>	1.7 <i>d</i>	2.7 <i>cde</i>
19	Journey MSO	21.3 fl oz/A 1 % V/V	imazapic + glyphosate	140 g <i>ae</i> + 280 g <i>ae</i>	47 <i>defg</i>	83 <i>abcde</i>	93 <i>a</i>	1.7 <i>gh</i>	2.5 <i>fg</i>	4.2 <i>cd</i>	3.0 <i>cd</i>	2.7 <i>cde</i>
20	Check				0 <i>h</i>	0 <i>g</i>	0 <i>g</i>	8.0 <i>a</i>	8.0 <i>a</i>	8.0 <i>a</i>	6.8 <i>ab</i>	9.0 <i>a</i>

¹ Days After Treatment ² Means within a rating time followed by the same letter are not different according to Fisher's Protected LSD at $P < 0.05$.

Treatments that recovered by 75 DAT included the low rate of Envoy (Trt 3), both rates of Fusilade (Trts 5 and 6), the combination of Acclaim + Fusilade (Trt 9), both rates of Outrider (Trts 10 and 11), both rates of Poast (Trts 16 and 17), and Roundup (Trt 18). The high rate of Envoy (Trt 4), Clearcast (Trt 14), Plateau (Trt 15), and Journey (Trt 19) did not recover before the end of the season.

In the spring the tall fescue stand density improved for many treatments between the two rating dates in 2018. By late May (276 DAT) the top group of treatments had density ratings from 6.8 to 9.0 while the sparsest treatments ranged from 1.2 to 5. The latter group included the high rate of Envoy (Trt 4), Clearcast (Trt 14), Plateau (Trt 15), both rates of Poast (Trts 16 and 17), Roundup (Trt 18), and Journey (Trt 19). These would not be recommended if one wants to preserve existing fescue in the application area.

INTRODUCTION

Poison hemlock (*Conium maculatum*) is a highly toxic biennial, listed as a noxious weed in Kentucky, that is a common problem on right-of-ways. Infestations occur along roadsides, field margins, ditches, marshes, meadows, and low-lying areas, but this plant prefers shaded areas with moist soil. It can grow up to ten feet tall. The stems are ribbed and hollow with purplish streaks or splotches, which are characteristic for identification. Poison hemlock reproduces by seeds that fall near the plant and disperse via fur, birds, water, and, to a limited extent, wind. Most seeds fall from September through December, but they can fall as late as the end of February. The seeds germinate in the fall, but the plant usually does not bolt and produce flowers until the second spring, which is when they are most noticeable.

OBJECTIVE

Evaluate a number of herbicide control options including new formulations of 2,4-D with lower volatility (DMA4 vs Freelexx) plus the new formulation of triclopyr (Garlon 3A vs Vastlan).

MATERIALS & METHODS

The trial was established May 7, 2018 on an area mowed once a year along I75 near Richmond, KY with a thick stand of poison hemlock. The trial had 9 treatments with 3 replications arranged in a RCBD design with 2.1 m by 7.6 m plots. Application was at 187 L ha⁻¹. The poison hemlock plants had bolted (80 to 120 cm tall) but not yet flowered. There were also Canada thistle (*Cirsium arvense*) plants (average of 60 cm tall) and common teasel (*Dipsacus fullonum*) plants (average of 30 cm tall) in most of the plots at application. Plots were assessed visually 9 (5/16/2018), 52 (6/28/2018), and 374 (5/16/2019) days after treatment (DAT). It was not possible to assess the plots later in the 2018 season as giant foxtail (*Setaria faberi*) was covering the treated plot area. Vetch (*Vicia sp*) was covering the control plot area. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at p = 0.05.

Figure 1. View of the Opensight and Control Plots 9 DAT (May 16, 2018)

The effects of the herbicide treatment are quite dramatic on the poison hemlock!



RESULTS & DISCUSSION

Table 1. Herbicide treatments, active ingredients and application rates.

Trt. No.	Product Name	Rate per ha	Active Ingredient(s)	ai Application Rates (per ha)
1	DMA 4	9.4 L	2,4-D	0.86 kg ae
2	Freelexx	9.4 L	2,4-D	0.86 kg ae
3	Milestone	0.37 L	aminopyralid	35.4 g ae
4	Method	1.1 L	aminocyclopyrachlor	106 g ae
5	Solution Water Soluble	2.56 kg	2,4-D	0.83 kg ae
6	Garlon 3A	3.5 L	triclopyr	0.51 kg ae
7	Vastlan	2.6 L	triclopyr	0.51 kg ae
8	Opensight	175 g	aminopyralid + metsulfuron	37.1 g ae + 6.8 g
9	Nontreated Check			

Table 2. Herbicide treatments and results in 2018.

Trt. No.	Product Name	Rate per ha	Hemlock Control (%)	Teasel Control (%)	Canada Thistle Control (%)	Hemlock Control (%)
			9 DAT ¹	9 DAT ¹	9 DAT ¹	52 DAT
1	DMA 4	9.4 L	52 ab ²	10 cde	55 ab	98 a
2	Freelexx	9.4 L	35 ab	10 cde	13 d	90 abc
3	Milestone	0.37 L	40 ab	30 b	50 abc	82 c
4	Method	1.1 L	68 a	55 a	25 bcd	98 a
5	Solution Water Soluble	2.56 kg	45 ab	20 bcd	63 a	91 abc
6	Garlon 3A	3.5 L	33 bc	5 de	5 d	97 ab
7	Vastlan	2.6 L	50 ab	13 cde	18 cd	98 ab
8	Opensight	175 g	40 ab	25 bc	58 ab	87 bc
9	Nontreated Check		0 c	0 e	0 d	0 d

¹ DAT = Days after treatment

² Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05

All the herbicide treatments (Table 1) contained the adjuvant, Activator 90 at 0.25% v/v and had dramatic effects on the tall poison hemlock plants (Figure 1) 9 DAT. There were no differences in control between the DMA 4 and Freelexx formulations 9 or 52 DAT (Table 2). However, the older Garlon 3A was slower (33% control) than Vastlan (50% control) 9 DAT but had the same % control at 52 DAT (97 to 98% control). Most of the hemlock plants were brown and dry 52 DAT but there was still some green tissue and % control was lower for the Milestone and Opensight than the other treatments. Method had the best early control (55%) on common teasel but it was not possible to get teasel rating on the second date. The best early control ratings on Canada thistle (50 to 63% control) were for DMA 4, Milestone, Solution Water Soluble, and Opensight 9 DAT.

An early spring assessment was done in 2019 to evaluate if there is extended control with soil residual herbicides, like Milestone, Method, and Opensight but there was too much variability among the plots (data not shown). However, there were no teasel plants in any of the Method plots 374 DAT.

**Vegetation Management for Highway Rights of Way Workshop
Wednesday July 29, 2020 (Virtual via Zoom from Lexington KY)**

Agenda

- 8:30 – 9:00 a.m. Online Meeting Room Opens, Introductions
- 9:00 – 9:50 a.m. Weed/plant ID (Dr. JD Green) (live)
- 9:55 – 10:45 a.m. Ticks, stinging pests and other hazards (Dr. Jonathan Larson) (live)
- 10:50 – 11:00 a.m. Break
- 11:00 – 11:30 a.m. Pollinator Habitat and Communication Strategies (Amanda Breseman) (pre-recorded) (General)
- 11:35 – 12:00 p.m. Updates on Pollinator Plantings and Other KYTC Initiatives (Casey Cruikshank) (live) (General)
- 12:00 – 12:45 p.m. Lunch
- 12:45 – 1:15 p.m. Invasive Plant Species to Look Out For (Jess Slade) (pre-recorded) (General)
- 1:20 – 1:50 p.m. Roadside Sprayer Demonstration (D7 Crew) (pre-recorded) plus discussion (live) (Cat. 3, 5, 6, 10, 12)
- 1:50 – 2:00 p.m. Overview of Pin Oak / Oran Little Research Center Farm Operations (Shannon Rudd) (pre-recorded)
- 2:00 – 3:00 p.m. Tour of Herbicide Injury / Technology Demo Plots (Dr. Joe Omielan) (pre-recorded) (Cat. 3, 5, 6, 10, 12)

CEU's in this workshop: 3 General and 3 Specific (Categories 3, 5, 6, 10, 12) (approved)

For more information contact Joe Omielan at 859-967-6205, e-mail joe.omielan@uky.edu

Register by July 28 for Zoom Webinar via this link (you'll receive a custom link to join the meeting):

https://uky.zoom.us/webinar/register/WN_qsUtPfqSQFWO1TBqc3mB9Q

Dr. JD Green will provide information and practice in identifying crops and weeds. (Cat. 3, 5, 6, 10, 12)

Dr. Jonathan Larson will present information about ticks, stinging pests and other hazards and how to protect yourself from them. (General)

Amanda Breseman will discuss and show examples of pollinator habitat and communication strategies with the public. (General)

Casey Cruikshank will update us on recent and future pollinator plantings and other KYTC initiatives. (General)

Jess Slade will discuss some invasive species currently in KY and ones to watch out for. (General)

Non-Crop and Invasive Vegetation Management Weed Science
2020 Annual Research Report

The D7 Crew demonstrated sprayer calibration along with a discussion of some challenges. Let's hear about your challenges during the discussion. *(Cat. 3, 5, 6, 10, 12)*

Dr. Joe Omielan will lead the group in an exercise examining herbicide injury symptoms on different crop species
(Cat. 3, 5, 6, 10, 12)

Attendance: 31 KYTC, 3 UK, 8 Industry

2020 KYTC Tree Management Workshop

Wednesday September 23, 2020 (Virtual via Zoom from Lexington KY)

Agenda

- 8:30 – 9:00 a.m. Online Meeting Room Opens, Introductions
- 9:00 – 9:50 a.m. Benefits and Ecosystem Services of Our Green Infrastructure and How to Maintain It (Cindi Sullivan, Trees Louisville) (live)
- 9:55 – 10:25 a.m. Green Heart Project and Health Benefits of Urban Trees (Chris Chandler, The Nature Conservancy) (live)
- 10:30 – 10:40 a.m. Break
- 10:40 – 11:10 a.m. How to Properly Plant Trees (Cindi Sullivan and Cindy Marquel, KYTC) (pre-recorded video plus live discussion)
- 11:15 – 12:05 p.m. Selection, Planting and First Year Care of Trees and Shrubs (Dr. Bill Fountain, UK) (live)
- 12:05 – 12:50 p.m. Lunch
- 12:50 – 1:40 p.m. How to Recognize Hazardous/Dangerous Trees and What are the Next Steps to Take (Dave Leonard, Dave Leonard Tree Specialists) (live)
- 1:45 – 2:25 p.m. The KYTC Tree Risk App (Mitchell Masarik and Tim King, KYTC) (live)
- 2:30 – 2:40 p.m. Break
- 2:40 – 3:30 p.m. Communicating with the Public and Using the Notify Your Neighbor Resources (Stacie Songer, Corteva) (resource videos plus live presentation)

CEU's in this workshop: 2 General and 1 Specific (Categories 3, 5, 6, 10, 12) (approved)

Arborist CEU's (5.75 CEUs) [BCMA Practice (2.75), BCMA Science (1), BCMA Management (2)] (approved).

Engineering PDH's (5 Hours) (approved).

For more information contact Joe Omielan at 859-967-6205, e-mail joe.omielan@uky.edu

Register in advance for this meeting:

<https://uky.zoom.us/meeting/register/tJlodOihTMtE9NNQij3GorJLTX2i5jxFSph>

After registering, you will receive a confirmation email containing information about joining the meeting.

Topics to be covered in the Workshop

Benefits and Ecosystem Services of Our Green Infrastructure and How to Maintain It (Cindi Sullivan, Trees Louisville)

- Cindi will explain the importance of trees/green infrastructure that includes Ecosystem services provided along with advice on maintaining it (practical tree care) and some higher altitude reasons why it's important.

Green Heart Project and Health Benefits of Urban Trees (Chris Chandler, The Nature Conservancy)

- Chris will speak about the Green Heart Project in Louisville which is studying the health benefits of urban trees.

How to Properly Plant Trees (Cindi Sullivan, Trees Louisville, and Cindy Marquel, KYTC)

- Cindi and Cindy will demonstrate and discuss how to properly plant trees so they survive and thrive.

Selection, Planting and First Year Care of Trees and Shrubs (Dr. Bill Fountain, UK)

- It's important to pick the right tree for the location, plant it properly, and maintain it. Mortality of freshly planted trees can be quite high. Bill will provide guidance on early tree and shrub care for better results.

How to Recognize Hazardous/Dangerous Trees and What are the Next Steps to Take (Dave Leonard, Dave Leonard Tree Specialists)

- Dave will present photos of different examples of situations one may encounter when doing windshield surveys, how to recognize hazardous trees, what should be done next, and how to follow through.

The KYTC Tree Risk App (Mitchell Masarik and Tim King, KYTC)

- Mitchell will demonstrate the KYTC Tree Risk App and Tim will share tips as a user.

Communicating with the Public and Using the Notify Your Neighbor Resources (Stacie Songer, Corteva)

- We may be tasked with informing land owners about maintenance work and/or may be asked/challenged as we're doing it by members of the public. Stacie will present and discuss some of the videos/pamphlets/resources available to help.

Attendance: 48 KYTC, 3 UK, 19 Industry