

Noncrop and Invasive Vegetation Management Weed Science

2021 Annual Research Report



**UNIVERSITY
OF KENTUCKY**

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

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INFORMATION NOTE 2021 NCVN-1

Table of Contents

Forward	i
Acknowledgements	ii
Species List	iii
Herbicide List	iv
2021 Weather Summary	vi
2020 Cable Barrier Bareground Trial in Louisville (including 2021 assessment).....	1
2021 Cable Barrier Bareground Trial near Morehead	25
2020 Johnsongrass Control Trial [Lexington] (including 2021 assessment)	40
2021 Johnsongrass Control Trial [Lexington]	44
2020 Fescue Damage Relative to Johnsongrass Control Options (including 2021 assessments)	48
2021 Fescue Damage Relative to Johnsongrass Control Options	53
2021 Fescue PGR at Spindletop	57
Posters Presented at Meetings	66
Field Days / Workshops	67

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 2021 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>Coryza canadensis</i>	Marestail
<i>Chamaesyce maculate</i>	Prostrate Spurge
<i>Dactylis glomerata</i>	Orchard Grass
<i>Erigeron sp.</i>	Fleabane
<i>Festuca arundinaceum</i> (Schreb.) S.J. Darbyshire	Tall Fescue
<i>Lepidium virginicum</i>	Pepperweed
<i>Medicago lupulina</i> L.	Black Medic
<i>Melilotus officianalis</i>	Sweet Clover
<i>Plantago lanceolata</i> L.	Buckhorn Plantain
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Yellow Foxtail
<i>Sonchus oleraceus</i>	Sow Thistle
<i>Sorghum halepense</i> (L.) Pers.	Johnsongrass
<i>Stellaria media</i>	Common Chickweed
<i>Trifolium repens</i>	White clover

Herbicide List

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

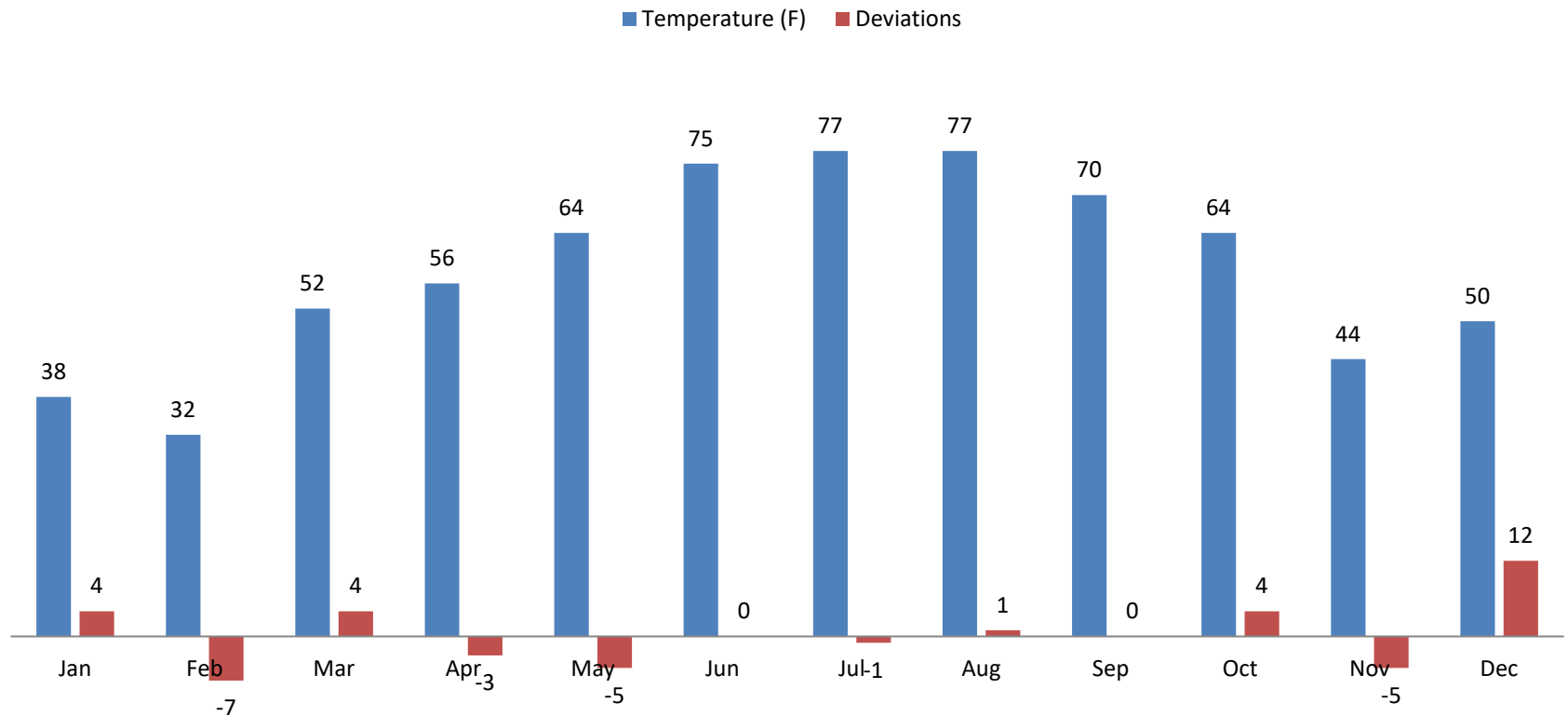
Product	Active Ingredient(s)	Concentration	Manufacturer
Acclaim Extra	fenoxaprop	0.57 lb per gallon	Bayer
Cleantraxx	penoxsulam + oxyfluorfen	0.083 lb + 3.93 lb per gallon	Dow AgroSciences
Clearcast	imazamox	1 lb ae per gallon	BASF
Detail	saflufenacil	2.85 lb per gallon	BASF
Escort XP	metsulfuron methyl	60% w/w	DuPont
Esplanade	indaziflam	1.67 lb per gallon	Bayer
Esplanade Sure	Indaziflam + rimsulfuron	24.3 % + 16.7% w/w	Bayer
Fusilade II	fluazifop	2 lb per gallon	Syngenta
Fusion	fluazifop + fenoxaprop	2 lb + 0.56 lb per gallon	Syngenta
Garlon 4 Ultra	triclopyr	4 lb ae per gallon	Dow AgroSciences
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
Oust XP	sulfometuron	75% w/w	DuPont
Oust Extra	sulfometuron + metsulfuron	56.25% + 15% w/w	DuPont
Outrider	sulfosulfuron	75% w/w	Monsanto
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
Rodeo	glyphosate	4 lb ae per gallon	Dow AgroSciences
Roundup ProMax	glyphosate	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

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

TerraVue	aminopyralid + florpyrauxifen-benzyl	71.01 % + 6.00% w/w	Corteva
Viewpoint	imazapyr + aminocyclopyrachlor + metsulfuron	31.6% + 22.8% + 7.3% w/w	DuPont

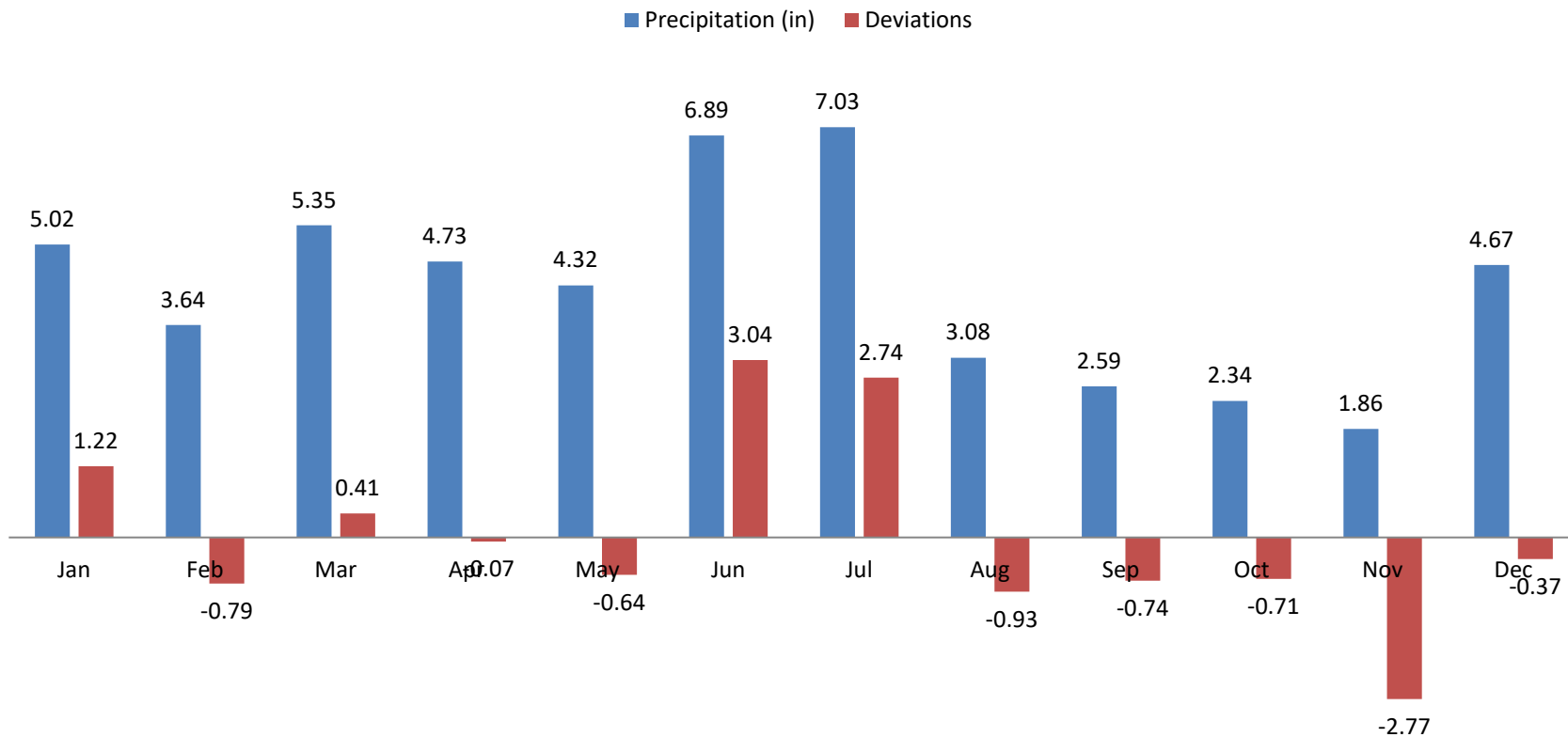
Princeton (CD1) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2021 (Princeton) (CD1)



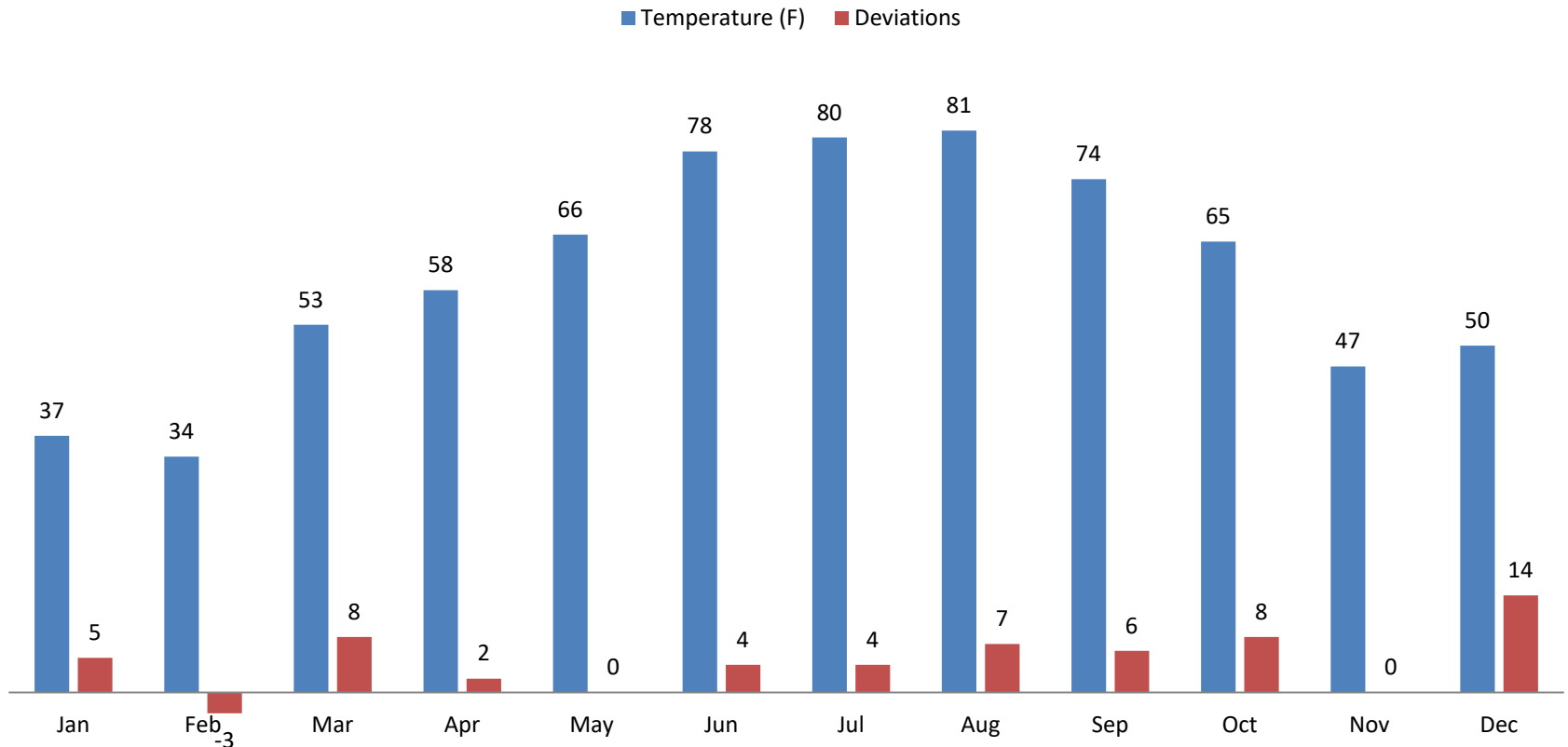
Princeton (CD1) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2021 (Princeton) (CD1)



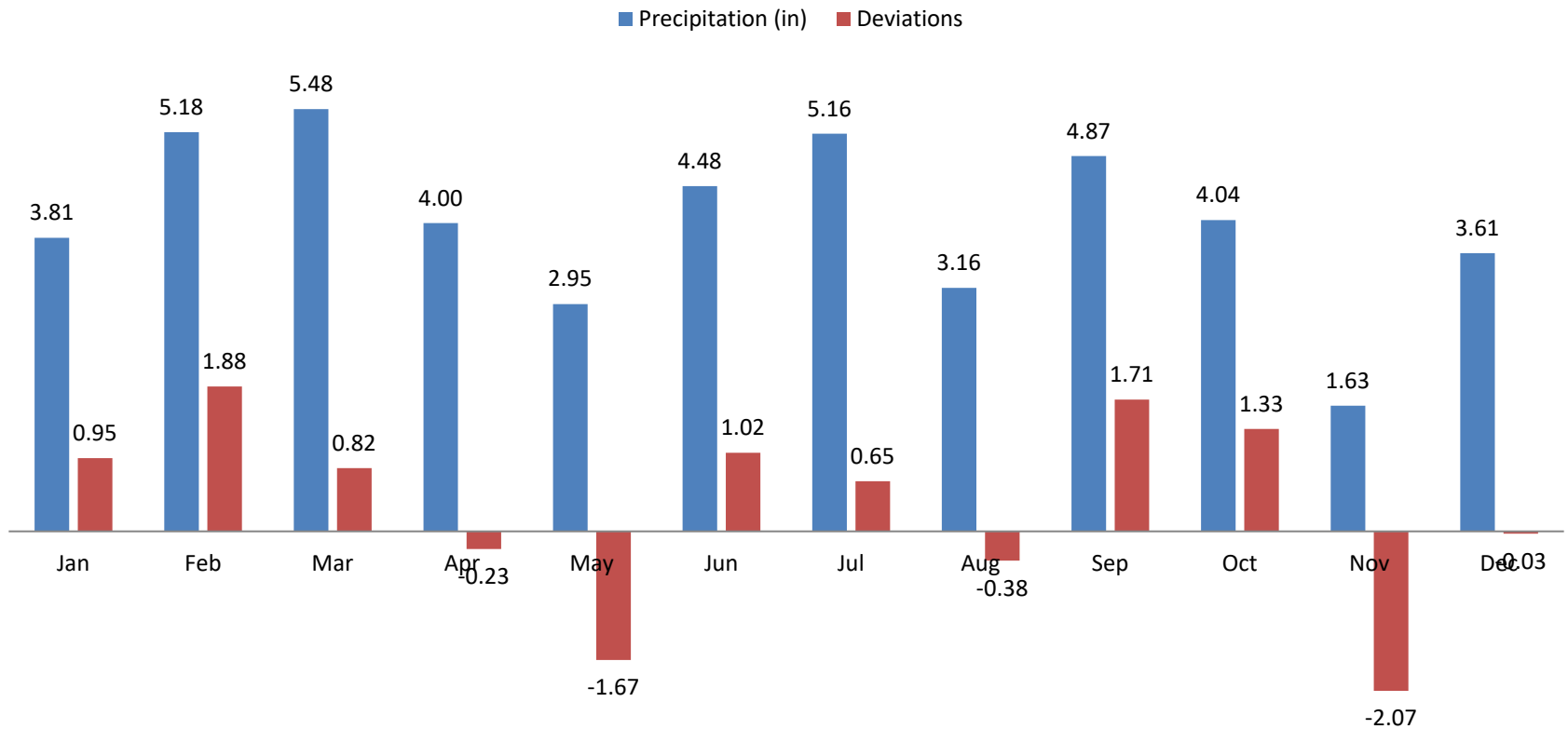
Louisville (CD2) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2021 (Louisville) (CD2)



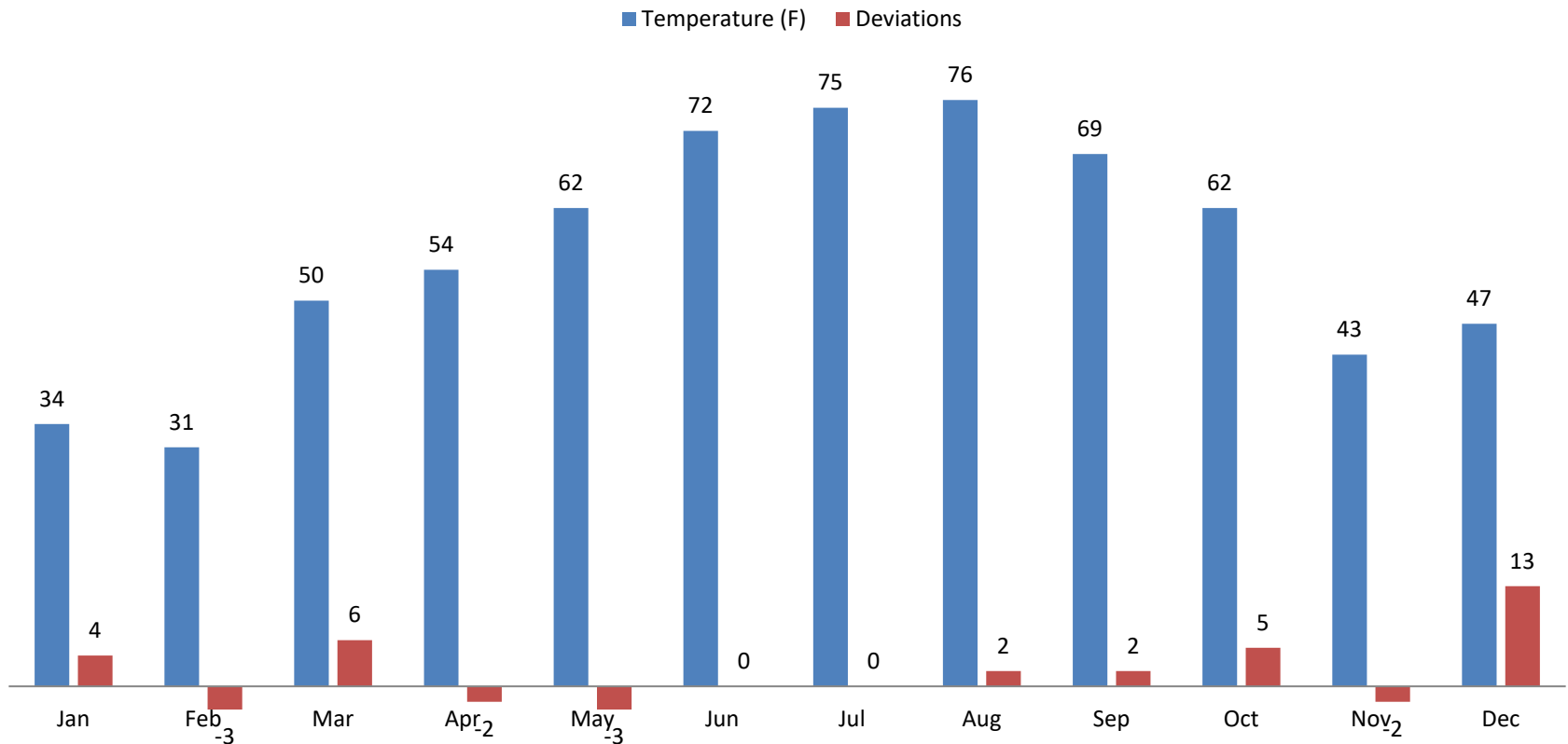
Louisville (CD2) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2021 (Louisville) (CD2)



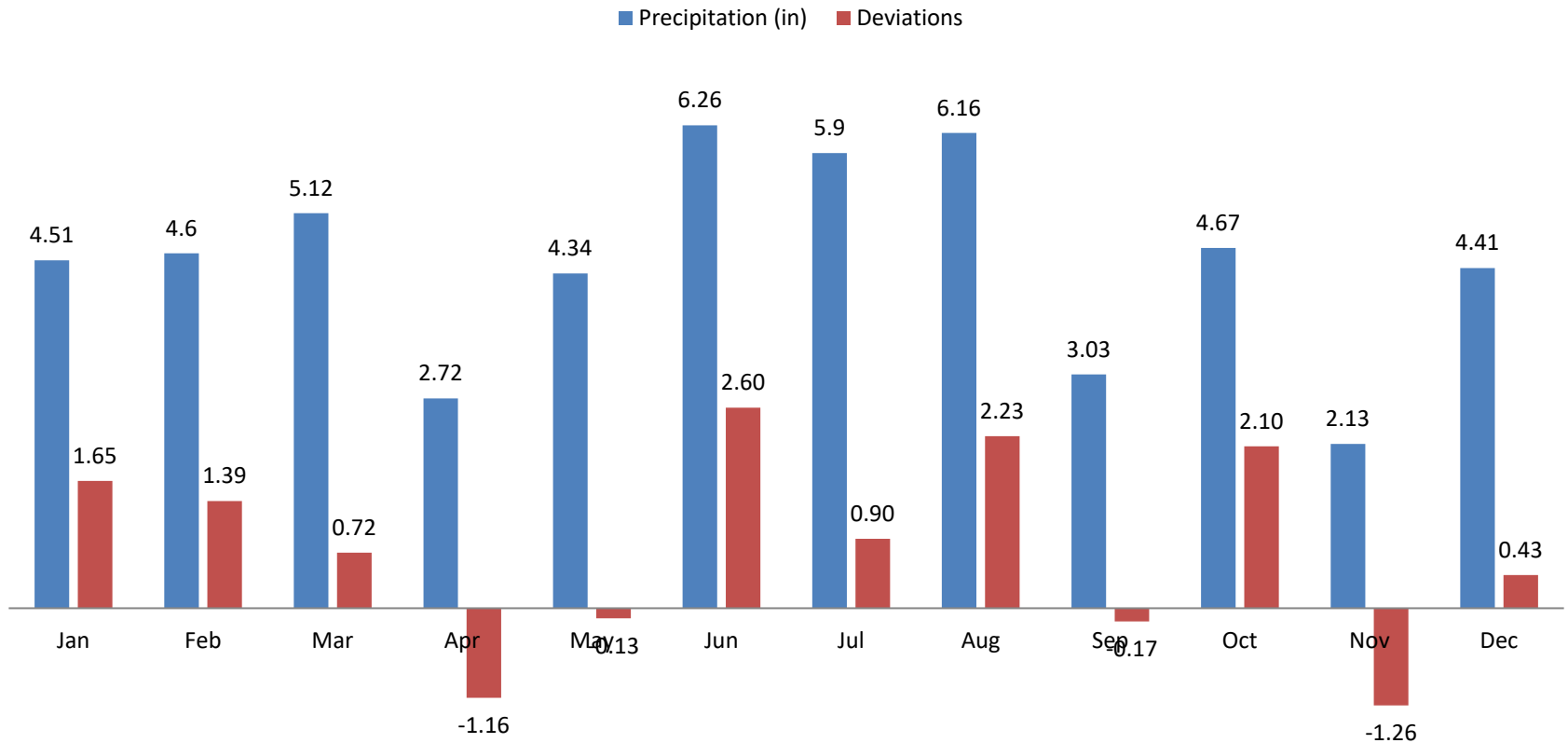
Spindletop (CD3) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2021 (Spindletop) (CD3)



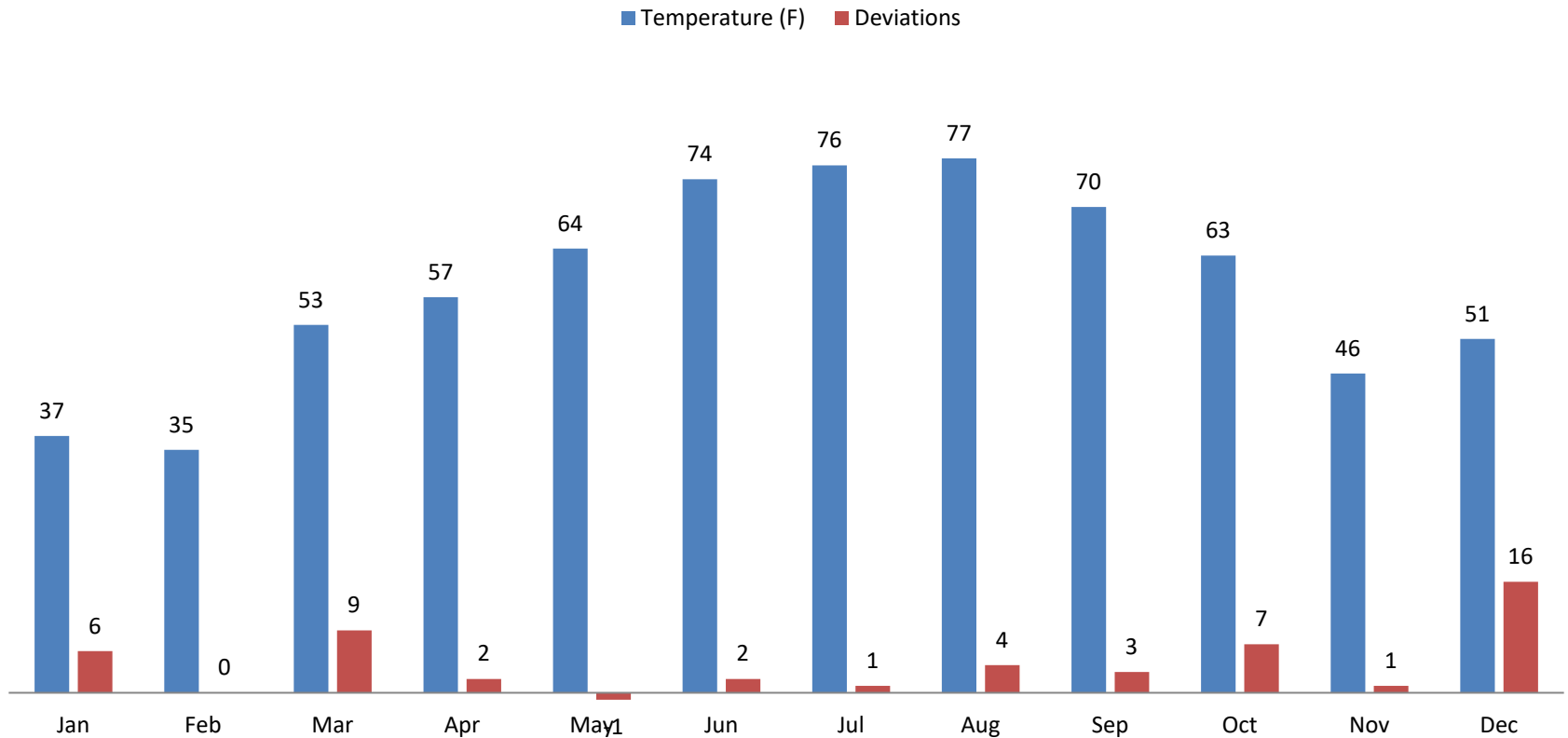
Spindletop (CD3) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2021 (Spindletop) (CD3)



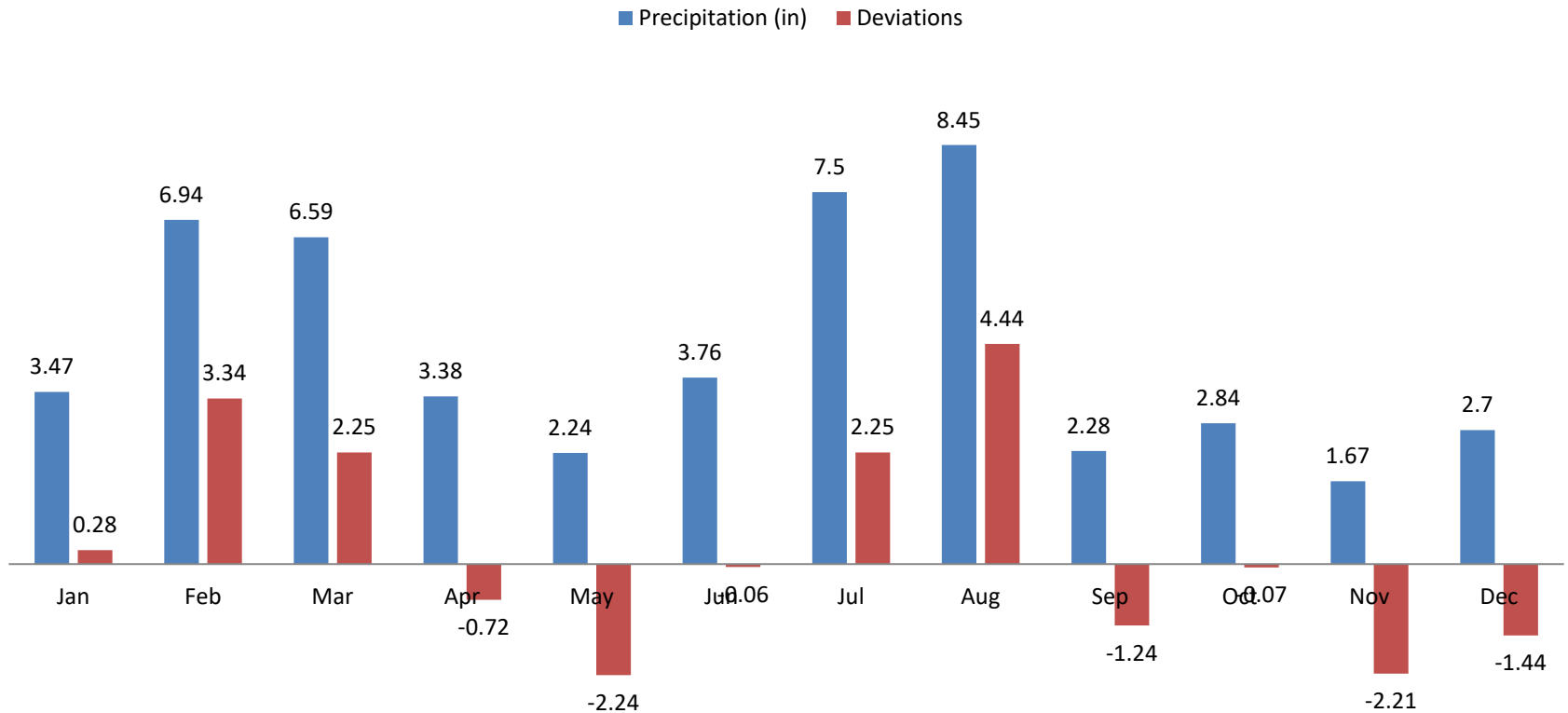
Jackson (CD4) Monthly Temperatures and Deviations from Normal (UKWAC)

Summary for 2021 (Jackson) (CD4)



Jackson (CD4) Monthly Precipitation and Deviations from Normal (UKWAC)

Summary for 2021 (Jackson) (CD4)



2020 Cable Barrier Bareground Trial in Louisville (including 2021 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 residual herbicides with preemergence activity, 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 of I-265 in southeast Louisville, KY under and beside a cable barrier with a mixed stand of turf species. The 21 herbicide treatments and 3 replications were arranged in a randomized complete block design. Treatments were applied at 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 control for the bare ground treatments. Different herbicide combinations also broadened the weed spectrum controlled and reduced the risk of developing problems with resistant weeds by using different Site of Action (SOA) 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 in Kentucky. The treatment list had a few changes from the previous year. Industry contacts had recommended Method @ 6 fl oz + Espanade @ 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 it was not included in these trials. Treatments from 2019 repeated this year included Detail (saflufenacil) @ 6 fl oz (Treatment 16) and one without glyphosate designed to control broadleaf weeds and suppress grass growth behind guardrails (Treatment 20). Detail may be useful in areas where sensitive crops are growing nearby as it is less persistent than other herbicides. A new product added this year for evaluation, Esplanade Sure (Treatment 19), is also a herbicide product positioned for use near sensitive sites. Esplanade Sure is a combination of indaziflam and rimsulfuron. Other new products included Terravue @ 5.7 oz/a, which is the bareground rate, (Treatment 17) and Plainview SC @ 64 fl oz/a (Treatment 18). Terravue is a combination of aminopyralid and a new chemistry, florpiauxifen-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 (2 days after treatment applications) which helped activate 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), flowering black medic (9 inches) and patches of flowering fleabane.

Visual assessments of the proportion (%) of bare ground, perennial grasses, annual grasses, and broadleaf weeds were taken in 2020 on August 4, October 14, and April 26, 2021 at 63, 134, and 328 days after treatment (DAT), respectively. Data were analyzed using ARM research management software (Gylling Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

Almost all the treatments with glyphosate plus a residual herbicide (Treatments 2 to 19) had more bareground (42 to 100%) than those that did not plus Detail (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 were Sahara (Treatment 2), Hyvar (Treatment 3), Perspective + Esplanade (Treatment 5), Perspective + Proclimax (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), Milestone + 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 prostrate spurge (56 to 83%) in the following treatments: Roundup alone (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 + Proclimax (Treatment 6), Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Method + Esplanade (Treatment 13), Milestone + Milestone (Treatment 14), Esplanade + Oust Extra (Treatment 15), Plainview SC (Treatment 18), and Esplanade Sure (Treatment 19). Method + Escort + Plateau, a treatment without glyphosate (Treatment 20) had 60% perennial grass cover. The treatments with the most annual grass coverage (18 to 25%) were Detail (Treatment 16) and the untreated check (Treatment 21). At 63 DAT Detail had 83% coverage from mostly prostrate spurge while by 134 DAT coverage was only 8%. A similar decrease was observed in some treatments 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 some prostrate spurge plants. The greatest broadleaf cover (25 to 43%) was with Hyvar (Treatment 3), and both Cleantraxx treatments (Treatments 11 and 12).

The following spring (328 DAT), the top treatments had 80 to 97 bareground (Tables 4a and 4b). These consisted of Roundup alone (Treatment 1), Oust XP (Treatment 4), Polaris XP Complete (Treatment 8), Esplanade + Oust XP (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), both Cleantraxx treatments (Treatments 11 and 12), Method + Esplanade (Treatment 13), Esplanade + Oust Extra (Treatment 15), Plainview SC (Treatment 18), and Esplanade Sure (Treatment 19). The treatments without glyphosate, Method + Escort + Plateau (Treatment 20) and the untreated check (Treatment 21), had 57 to 70% grass cover. Most of the broadleaf cover was from winter annuals such as common chickweed and Hyvar (Treatment 3) had the most at 40% cover.

The vegetation under the cable barrier at this location provided a good trial on the performance of bare ground herbicides over a season. These trials continue to add to data collected from previous years and provide information for roadside managers.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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)	SOA Groups
1	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
2	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Sahara	10	LB/A	diuron + imazapyr	6.2 LB + 12.4 OZ	7 + 2
3	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Hyvar	10	LB/A	bromacil	8 LB	5
4	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Oust XP	3	OZ/A	sulfometuron	2.3 OZ	2
5	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Perspective	9	OZ/A	aminocyclopyrachlor + chlorsulfuron	3.6 OZ + 1.4 OZ	4 + 2
	Esplanade	3.5	FL OZ/A	indaziflam	0.7 OZ	29
6	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Perspective	9	OZ/A	aminocyclopyrachlor + chlorsulfuron	3.6 OZ + 1.4 OZ	4 + 2
	Proclipse	2.3	LB/A	prodiamine	1.5 LB	3
7	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Viewpoint	18	OZ/A	aminocyclopyrachlor + imazapyr + metsulfuron	4.1 OZ + 5.7 OZ + 1.3 OZ	4 + 2 + 2
8	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Polaris AC Complete	2	PT/A	imazapyr	16 OZ AE	2
9	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Esplanade	3.5	FL OZ/A	indaziflam	0.7 OZ	29
	Oust XP	3	OZ/A	sulfometuron	2.3 OZ	2
10	Roundup ProMax	1.3	QT/A	glyphosate	1.5 LB AE	9
	Streamline	8	OZ/A	aminocyclopyrachlor + metsulfuron	3.2 OZ + 1 OZ	4 + 2
	Esplanade	5	FL OZ/A	indaziflam	1 OZ	29
	Plateau	5	FL OZ/A	imazapic	1.3 OZ AE	2
11	Rodeo	1.5	QT/A	glyphosate	1.5 LB AE	9
	Cleantraxx	3	PT/A	penoxsulam + oxyfluorfen	0.5 OZ + 23.6 OZ	2 + 14
	Milestone VM	7	FL OZ/A	aminopyralid	1.8 OZ AE	4
12	Rodeo	1.5	QT/A	glyphosate	1.5 LB AE	9
	Cleantraxx	4.5	PT/A	penoxsulam + oxyfluorfen	0.7 OZ + 35.4 OZ	2 + 14

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

Treatment 16 included MSO @ 1%

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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)	SOA 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%

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 4a. Results for Cable Barrier Trial 328 DAT¹ (April 26, 2021) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Grass	% Broadleaves
				328 DAT		
1	Roundup ProMax	1.3	QT/A	82 abcd ²	2 f	16 bcd
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	78 bcd	1 f	21 b
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	58 e	2 f	40 a
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	91 abc	1 f	8 bcd
5	Roundup ProMax Perspective Esplanade	1.3 9 3.5	QT/A OZ/A FL OZ/A	76 cd	6 ef	19 bc
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	77 cd	10 def	13 bcd
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	77 cd	2 f	21 b
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	83 abcd	1 f	16 bcd
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	96 a	1 f	2 d
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	91 abc	4 f	5 cd
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	88 abcd	7 ef	5 cd
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	90 abc	8 ef	2 d

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 4b. Results for Cable Barrier Trial 328 DAT¹ (April 26, 2021) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Grass	% Broadleaves
				328 DAT		
13	Rodeo	32	FL OZ/A	80 abcd ²	18 cd	2 d
	Method	9	FL OZ/A			
	Esplanade	7	FL OZ/A			
14	Rodeo	32	FL OZ/A	75 cde	23 c	2 d
	Esplanade	6	FL OZ/A			
	Milestone VM	7	FL OZ/A			
15	Rodeo	32	FL OZ/A	91 abc	7 ef	2 d
	Esplanade	3.5	FL OZ/A			
	Oust Extra	1.5	OZ/A			
16	Rodeo	32	FL OZ/A	72 de	14 cde	14 bcd
	Detail	6	FL OZ/A			
17	Rodeo	32	FL OZ/A	77 cd	8 def	18 bc
	Terravue	5.7	OZ/A			
18	Rodeo	32	FL OZ/A	97 a	1 f	3 d
	Plainview SC	64	FL OZ/A			
19	Rodeo	32	FL OZ/A	95 ab	4 f	1 d
	Esplanade Sure	6	OZ/A			
20	Method	6	FL OZ/A	20 f	70 a	10 bcd
	Escort	0.33	OZ/A			
	Plateau	3	FL OZ/A			
21	Nontreated Check			33 f	57 b	10 bcd

*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 on both sides of the cable barrier.



Figure 2: Roundup ProMax alone (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)

Grass damage downslope from site of application. There is a shallow ditch in the foreground.



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

Dead grass downslope from site of application. There is a shallow ditch in the foreground.



Figure 5: Oust XP (Treatment 4) on August 4, 2020 (63 Days After Treatment)
Grass damage downslope from site of application. There is a shallow ditch in the foreground.



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



Figure 7: View of Plots at the start of the Cable Barrier Trial on April 26, 2021 (328 Days After Treatment)

Areas damaged by herbicides moving beyond the spray pattern on some treatments. Trt 1 - Roundup ProMax alone is just beyond the sign.



Figure 8: View of Plots in the Cable Barrier Trial on April 26, 2021 (328 Days After Treatment)
Spray pattern on both sides of the cable barrier, and how well some treatments are still suppressing vegetation.



2021 Cable Barrier Bareground Trial near Morehead

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 residual herbicides with preemergence activity, in combination with a broad-spectrum post emergence herbicide like glyphosate, are the mainstay for maintaining these bare ground zones. 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 and beside cable barriers and guardrails.

Materials and Methods

The trial was established in the median of I-64 near Morehead, KY beside a cable barrier which had been recently constructed. The contractor had sown a mix of grasses and legumes on the area between the concrete and the edge of pavement. The 24 herbicide treatments and 3 replications were arranged in a randomized complete block design. Treatments were applied at 25 gallons per acre onto 4 ft wide by 10.5 ft long plots on May 27, 2021 (Figure 1). 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 control for the bare ground treatments. Different herbicide combinations also broadened the weed spectrum controlled and reduced the risk of developing problems with resistant weeds by using different Site of Action (SOA) 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 in Kentucky. Industry contacts had recommended for applications near sensitive sites a reduced rate of Method @ 9 fl oz + Esplanade @ 7 fl oz (Treatment 13). NuFilm IR is also still recommended to reduce movement after application, but was not included in these trials. Treatments from previous years included Detail (saflufenacil) @ 6 fl oz (Treatment 16) and one without glyphosate designed to control broadleaf weeds and suppress grass growth behind guardrails (Treatment 23). Detail may be useful in areas where sensitive crops are growing nearby as it is less persistent than other herbicides. A new product first evaluated last year, Esplanade Sure (Treatment 19), is also a herbicide product positioned for use near sensitive sites. Esplanade Sure is a combination of indaziflam and rimsulfuron. Other products from 2020 included Terravue @ 5.7 oz/a, which is the bareground rate (Treatment 17), 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.

Combinations used for fall applications were also included in this year's treatment list. A separate trial was established to evaluate spring and fall timing of bareground applications.

The Grayson weather station reported 1.62 inches of rain May 28 (one day after treatment applications) which helped activate the soil residual herbicide treatments. Species present at application included tall fescue (35 inches with seed heads), orchard grass (36 inches with seedheads), flowering sweet clover (39 inches), flowering white clover (6 inches), sow thistle (24 inches), pepper weed setting seed (16 inches), and flowering buckhorn plantain (21 inches).

Visual assessments of the proportion (%) of bare ground, perennial grasses, annual grasses, marehail, and broadleaf weeds were taken in 2021 on July 29, September 14, and November 1 at 63, 110, and 158 days after treatment (DAT), respectively. Data were analyzed using ARM research management software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

Almost all the treatments with glyphosate plus a residual herbicide (Treatments 2 to 22) had more bareground (33 to 97%) except when applied with Detail (18% bareground) (Treatment 16). Bareground observed with Method + Escort + Plateau (Treatment 23) was not different than the Nontreated Check (Treatment 24) 63 DAT (Tables 2a and 2b) (Figure 2). Some of the treatments with soil active herbicides were in the top grouping with 82 to 100% bareground and almost all of them included indaziflam. These were Sahara (Treatment 2), Perspective + Esplanade (Treatment 5), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Esplanade + Oust Extra (Treatment 15), Plainview SC (which includes indaziflam) (Treatment 18), Viewpoint + Esplanade (Treatment 20), and Esplanade + Polaris AC Complete (Treatment 22).

Treatments, in the top two groups, with the most perennial grass cover (28 to 48%) included treatments without glyphosate (Treatments 23 and 24), plus Roundup ProMax alone (Treatment 1), Terravue, which primarily targets broadleaf plants (Treatment 17), and Detail (Treatment 16). The treatments with the most annual grass cover (18 to 28%) included the same treatments, as well as, Viewpoint (Treatment 7). The most marehail cover (15 to 18%) was observed with the Oust XP (Treatment 4), Cleantraxx alone (Treatment 12), followed by Roundup ProMax alone (Treatment 1). All plots had some broadleaf cover but the greatest (35 to 47%) was with the Esplanade Sure (Treatment 19) and the Untreated Check (Treatment 24) plots. (Tables 2a and 2b)

Later in the season, 110 DAT (Figure 3), the top grouping of treatments with 67 to 88% bareground all included indaziflam as part of the treatment mixture (Tables 3a and 3b). These were Perspective + Esplanade (Treatment 5), Esplanade + Oust (Treatment 9), Streamline + Esplanade + Plateau (Treatment 10), Plainview SC (which includes indaziflam) (Treatment 18), Viewpoint + Esplanade (Treatment 20), and Esplanade + Polaris AC Complete (Treatment 22). Treatments that had a low % bareground (0 to 20%) included Roundup ProMax alone (Treatment 1), those without glyphosate (Treatments 23, and 24), and those with residual herbicides that are less effective at controlling annual grasses (Treatments 11 and 16).

Treatments with the most visible perennial grass cover (13 to 30%) included Perspective + Esplanade (Treatment 5), Streamline + Esplanade + Plateau (Treatment 10), Cleantraxx + Milestone (Treatment 11), and Escort + Esplanade + Method (Treatment 21) (Tables 3a and 3b). Treatments with the most annual grass cover (64 to 85%) were Viewpoint (Treatment 7), Detail (Treatment 16), Terravue (Treatment 17), and Method + Escort + Plateau (Treatment 23). The most marestalk cover (20 to 30%) was with Oust XP (Treatment 4), Cleantraxx by itself (Treatment 12), and Roundup ProMax alone (Treatment 1). The greatest broadleaf cover (47 to 65%) was with the Esplanade Sure (Treatment 19), the Untreated Check (Treatment 24), Roundup alone (Treatment 1), and Method + Esplanade (Treatment 13).

By the end of the season (158 DAT) (Figure 4) there were only three treatments in the top group with 65 to 83% bareground (Tables 4a and 4b). These were Esplanade + Oust XP (Treatment 9), Plainview SC (Treatment 18), and Viewpoint + Esplanade (Treatment 20). Most of the treatments had increased visible perennial grass cover (8 to 33%) compared to 110 DAT. Treatments not in the top group (3 to 7%) included Oust XP (Treatment 4), Viewpoint (Treatment 7), Polaris AC Complete (Treatment 8), Esplanade + Oust XP (Treatment 9), Viewpoint + Esplanade (Treatment 20), and Esplanade + Polaris AC Complete (Treatment 22). The treatments with the most annual grass cover (43 to 60%) included the four from 110 DAT plus Polaris AC Complete (Treatment 8). Treatments with the most marestalk cover (17 to 23 %) included Oust XP (Treatment 4) and Cleantraxx by itself (Treatment 12). Buckhorn plantain growth had 13 to 22% cover on the treatments that included Roundup ProMax alone (Treatment 1), both Cleantraxx treatments (Treatments 11 and 12), Detail (Treatment 16), and the Nontreated Check (Treatment 24). Treatments with the most broadleaf cover (42 to 58%) included Oust XP (Treatment 4), Polaris AC Complete (Treatment 8), Cleantraxx by itself (Treatment 12), Esplanade + AC Polaris Complete (Treatment 22), and the Nontreated Check (Treatment 24).

The vegetation beside the cable barrier at this location provided a good trial on the performance of bare ground herbicides over a season. These trials continue to add to data collected from previous years and provide information for roadside managers.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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)	SOA 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 8 5	QT/A OZ/A FL OZ/A	glyphosate aminocyclopyrachlor + chlorsulfuron indaziflam	1.5 LB AE/A 3.2 OZ + 1.3 OZ/A 1.0 OZ/A	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%

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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)	SOA 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 + florypyrauxifen-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	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Viewpoint	14	OZ/A	aminocyclopyrachlor + imazapyr + metsulfuron	3.2 OZ + 4.4 OZ + 1.0 OZ/A	4 + 2 + 2
	Esplanade	7	FL OZ/A	indaziflam	1.5 OZ/A	29
21	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Escort	0.5	OZ/A	metsulfuron	0.3 OZ/A	2
	Esplanade	5	FL OZ/A	indaziflam	1 OZ/A	29
	Method	9	FL OZ/A	aminocyclopyrachlor	2.25 OZ AE/A	4
22	Rodeo	32	FL OZ/A	glyphosate	1 LB AE/A	9
	Esplanade	5	FL OZ/A	indaziflam	1 OZ/A	29
	AC Polaris Complete	10	FL OZ/A	imazapyr	5 OZ AE/A	2
23	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
24	Nontreated Check					

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

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2a. Results for Cable Barrier Trial 63 DAT¹ (July 29, 2021) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Marestalk	% Broadleaves
				63 DAT				
1	Roundup ProMax	1.3	QT/A	30 ij ²	28 bcd	17 bcde	12 bc	25 bcde
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	85 abcd	4 g	2 gh	2 ef	9 fghi
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	68 cdefg	7 fg	12 cdefg	0 f	13 fghi
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	73 bcdef	0 g	5 fgh	15 ab	20 cdef
5	Roundup ProMax Perspective Esplanade	1.3 8 5	QT/A OZ/A FL OZ/A	87 abc	6 fg	3 gh	0 f	3 ghi
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	68 cdefg	13 efg	2 gh	0 f	5 ghi
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	67 defg	8 fg	22 abc	0 f	2 hi
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	68 cdefg	5 g	9 defgh	5 def	12 fghi
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	90 ab	2 g	0 h	4 def	8 ghi
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	80 abcde	11 efg	7 efgh	0 f	2 hi
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	50 gh	22 cde	15 bcdef	0 f	13 efgh
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	67 defg	5 g	2 gh	18 a	27 bcd

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2b. Results for Cable Barrier Trial 63 DAT¹ (July 29, 2021) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Maretail	% Broadleaves
				63 DAT				
13	Rodeo	32	FL OZ/A	62 efg ²	9 efg	0 h	6 cdef	29 bc
	Method	9	FL OZ/A					
	Esplanade	7	FL OZ/A					
14	Rodeo	32	FL OZ/A	73 bcdef	7 fg	4 fgh	0 f	15 defg
	Esplanade	6	FL OZ/A					
	Milestone VM	7	FL OZ/A					
15	Rodeo	32	FL OZ/A	78 abcde	7 fg	3 gh	4 def	12 fghi
	Esplanade	3.5	FL OZ/A					
	Oust Extra	1.5	OZ/A					
16	Rodeo	32	FL OZ/A	18 ij	33 bc	18 abcd	0 f	32 bc
	Detail	6	FL OZ/A					
17	Rodeo	32	FL OZ/A	33 hi	35 ab	25 ab	0 f	7 ghi
	Terravue	5.7	OZ/A					
18	Rodeo	32	FL OZ/A	94 a	1 g	0 h	0 f	4 ghi
	Plainview SC	64	FL OZ/A					
19	Rodeo	32	FL OZ/A	57 fg	5 g	3 gh	8 cde	35 ab
	Esplanade Sure	6	OZ/A					
20	Rodeo	32	FL OZ/A	97 a	2 g	1 h	0 f	1 i
	Viewpoint	14	OZ/A					
	Esplanade	7	FL OZ/A					
21	Rodeo	32	FL OZ/A	73 bcdef	18 def	6 efgh	0 f	2 hi
	Escort	0.5	OZ/A					
	Esplanade	5	FL OZ/A					
	Method	9	FL OZ/A					
22	Rodeo	32	FL OZ/A	82 abcd	2 g	2 gh	5 def	13 efgh
	Esplanade	5	FL OZ/A					
	AC Polaris Complete	10	FL OZ/A					
23	Method	6	FL OZ/A	22 ij	48 a	28 a	1 f	2 hi
	Escort	0.33	OZ/A					
	Plateau	3	FL OZ/A					
24	Nontreated Check			13 j	33 bc	7 efgh	8 cd	47 a

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 3a. Results for Cable Barrier Trial 110 DAT¹ (September 14, 2021) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Marestalk	% Broadleaves
				110 DAT				
1	Roundup ProMax	1.3	QT/A	8 ij ²	8 bc	33 bcd	20 ab	47 abc
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	58 bcd	7 bc	7 ef	7 cde	23 defg
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	45 cdef	3 c	40 b	0 e	10 fgh
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	28 efghi	2 c	35 bcd	30 a	32 cde
5	Roundup ProMax Perspective Esplanade	1.3 8 5	QT/A OZ/A FL OZ/A	73 ab	13 abc	8 ef	0 e	3 h
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	50 cde	2 c	22 bcdef	0 e	8 fgh
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	28 efghi	0 c	64 a	1 e	1 h
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	22 ghi	3 c	37 bc	12 bcd	27 def
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	77 ab	3 c	5 ef	9 cde	13 efgh
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	67 abc	13 abc	7 ef	0 e	10 fgh
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	20 hij	23 ab	40 b	2 de	17 efgh
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	37 defgh	8 bc	13 cdef	28 a	42 bcd

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 3b. Results for Cable Barrier Trial 110 DAT¹ (September 14, 2021) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Maretail	% Broadleaves
				110 DAT				
13	Rodeo	32	FL OZ/A	27 fghi ²	5 c	3 f	17 bc	65 a
	Method	9	FL OZ/A					
	Esplanade	7	FL OZ/A					
14	Rodeo	32	FL OZ/A	30 efghi	8 bc	28 bcde	0 e	32 cde
	Esplanade	6	FL OZ/A					
	Milestone VM	7	FL OZ/A					
15	Rodeo	32	FL OZ/A	48 cdef	7 bc	22 bcdef	13 bc	23 defg
	Esplanade	3.5	FL OZ/A					
	Oust Extra	1.5	OZ/A					
16	Rodeo	32	FL OZ/A	0 j	7 bc	72 a	0 e	17 efgh
	Detail	6	FL OZ/A					
17	Rodeo Terravue	32 5.7	FL OZ/A OZ/A	10 ij	5 c	80 a	0 e	2 h
18	Rodeo Plainview SC	32 64	FL OZ/A FL OZ/A	82 a	1 c	0 f	2 de	14 efgh
19	Rodeo Esplanade Sure	32 6	FL OZ/A OZ/A	27 fghi	8 bc	12 def	17 bc	53 ab
20	Rodeo	32	FL OZ/A	88 a	4 c	4 f	0 e	4 h
	Viewpoint	14	OZ/A					
	Esplanade	7	FL OZ/A					
21	Rodeo	32	FL OZ/A	42 defg	30 a	20 bcdef	0 e	7 gh
	Escort	0.5	OZ/A					
	Esplanade	5	FL OZ/A					
	Method	9	FL OZ/A					
22	Rodeo	32	FL OZ/A	67 abc	2 c	3 f	17 bc	27 def
	Esplanade	5	FL OZ/A					
	AC Polaris Complete	10	FL OZ/A					
23	Method	6	FL OZ/A	3 j	7 bc	85 a	2 de	2 h
	Escort	0.33	OZ/A					
	Plateau	3	FL OZ/A					
24	Nontreated Check			3 j	8 bc	40 b	10 bcde	50 abc

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 4a. Results for Cable Barrier Trial 158 DAT¹ (November 1, 2021) (Part 1 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Marestail	% Buckhorn Plantain	% Broadleaves
				158 DAT					
1	Roundup ProMax	1.3	QT/A	28 defgh ²	20 abcd	33 bcd	7 bcd	13 abc	33 bcdef
2	Roundup ProMax Sahara	1.3 10	QT/A LB/A	50 cde	8 abcd	15 defg	7 bcd	8 bcd	40 bcde
3	Roundup ProMax Hyvar	1.3 10	QT/A LB/A	30 defgh	20 abcd	28 cde	0 d	3 cd	27 defgh
4	Roundup ProMax Oust XP	1.3 3	QT/A OZ/A	25 efgh	7 bcd	28 cde	17 ab	5 cd	50 ab
5	Roundup ProMax Perspective Esplanade	1.3 8 5	QT/A OZ/A FL OZ/A	53 bcd	27 abcd	7 efg	0 d	2 cd	20 fghij
6	Roundup ProMax Perspective Proclipse	1.3 9 2.3	QT/A OZ/A LB/A	40 cdefg	25 abcd	25 cdef	0 d	3 cd	30 cdefg
7	Roundup ProMax Viewpoint	1.3 18	QT/A OZ/A	22 fgh	7 bcd	60 a	0 d	0 d	17 fghij
8	Roundup ProMax Polaris AC Complete	1.3 2	QT/A PT/A	17 gh	3 d	43 abc	10 bcd	0 d	42 abcde
9	Roundup ProMax Esplanade Oust XP	1.3 3.5 3	QT/A FL OZ/A OZ/A	65 abc	5 cd	5 fg	12 bc	0 d	30 cdefg
10	Roundup ProMax Streamline Esplanade Plateau	1.3 8 5 5	QT/A OZ/A FL OZ/A FL OZ/A	53 bcd	33 a	8 efg	0 d	0 d	8 ij
11	Rodeo Cleantraxx Milestone VM	1.5 3 7	QT/A PT/A FL OZ/A	23 efgh	32 ab	20 defg	2 cd	22 a	28 cdefg
12	Rodeo Cleantraxx	1.5 4.5	QT/A PT/A	30 defgh	12 abcd	7 efg	23 a	22 a	58 a

*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.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 3b. Results for Cable Barrier Trial 158 DAT¹ (November 1, 2021) (Part 2 of 2)

Trt. No.	Product Name*	Rate	Rate Unit	% Bare	% Perennial Grass	% Annual Grass	% Marestalk	% Buckhorn Plantain	% Broadleaves
				158 DAT					
13	Rodeo	32	FL OZ/A	43 cdefg ²	18 abcd	3 fg	8 bcd	0 d	38 bcde
	Method	9	FL OZ/A						
	Esplanade	7	FL OZ/A						
14	Rodeo	32	FL OZ/A	47 cdef	17 abcd	17 defg	0 d	0 d	25 efghi
	Esplanade	6	FL OZ/A						
	Milestone VM	7	FL OZ/A						
15	Rodeo	32	FL OZ/A	50 cde	17 abcd	15 defg	10 bcd	2 cd	27 defgh
	Esplanade	3.5	FL OZ/A						
	Oust Extra	1.5	OZ/A						
16	Rodeo	32	FL OZ/A	5 h	20 abcd	55 ab	0 d	13 abc	25 efghi
	Detail	6	FL OZ/A						
17	Rodeo	32	FL OZ/A	10 h	32 ab	52 ab	0 d	2 cd	7 j
	Terravue	5.7	OZ/A						
18	Rodeo	32	FL OZ/A	78 ab	4 cd	3 fg	0 d	0 d	14 ghij
	Plainview SC	64	FL OZ/A						
19	Rodeo	32	FL OZ/A	50 cde	18 abcd	3 fg	12 bc	2 cd	28 cdefg
	Esplanade Sure	6	OZ/A						
20	Rodeo	32	FL OZ/A	83 a	3 d	5 fg	0 d	0 d	10 hij
	Viewpoint	14	OZ/A						
	Esplanade	7	FL OZ/A						
21	Rodeo	32	FL OZ/A	50 cde	30 abc	10 efg	0 d	3 cd	13 ghij
	Escort	0.5	OZ/A						
	Esplanade	5	FL OZ/A						
	Method	9	FL OZ/A						
22	Rodeo	32	FL OZ/A	48 cdef	6 bcd	2 g	13 b	8 bcd	44 abcd
	Esplanade	5	FL OZ/A						
	AC Polaris Complete	10	FL OZ/A						
23	Method	6	FL OZ/A	5 h	33 a	60 a	0 d	7 bcd	7 j
	Escort	0.33	OZ/A						
	Plateau	3	FL OZ/A						
24	Nontreated Check			3 h	22 abcd	28 cde	8 bcd	18 ab	45 abc

*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 near Morehead, KY on May 27, 2021 (Day of Treatment)



Figure 2: View of Plots in the Cable Barrier Trial on July 29, 2021 (63 Days After Treatment)



Figure 3: View of Plots in the Cable Barrier Trial on September 14, 2021 (110 Days After Treatment)



Figure 4: View of Plots in the Cable Barrier Trial on November 1, 2021 (158 Days After Treatment)



**2020 Johnsongrass Control Trial [Lexington]
(including 2021 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 unapproved 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), 50 (10/15/2020), and 352 (8/13/2021) days after treatment (DAT). Data were analyzed using ARM software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The Fusion labeled rates prior to 2012 for selective control of johnsongrass were 7 to 9 fl oz/A (Treatments 1 and 2). The labeled Fusilade II rates are 16 to 24 fl oz/A (Treatments 3 and 4). The Acclaim Extra label lists 20 fl oz/A per acre to control seedling johnsongrass 12 to 24 inches tall (Treatment 5); 39 fl 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 fl oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider labeled 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 often 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 herbicide options.

Results and Discussion

At the first evaluation 15 DAT the range of control observed was from 22 to 90%, which is early for observing the full expression of symptoms and final control for most treatments (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 in this trial 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%.

By late summer the following season (352 DAT) without any mowing most of the treatments were within the top group with 78 to 92% control (Table 2). Whereas, the remaining herbicide treatments had 53 to 71% control, which included the high rate of Fusion (Treatment 2), both rates of Acclaim Extra (Treatments 5 and 6), and Method + Detail + Plateau (Treatment 15).

The treatments showing aboveground control more quickly may not necessarily be the herbicides that provide the best long-term control.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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				

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2. Herbicide Treatments and % Control 15, 36, 50, and 352 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	15 DAT	36 DAT	50 DAT	352 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	22 c ¹	32 hi	55 e	80 abc
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	23 c	37 ghi	62 de	71 bcd
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	25 bc	32 hi	70 cde	85 abc
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	22 c	53 efgh	70 cde	82 abc
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	42 b	47 fghi	70 cde	53 d
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	42 b	70 bcde	83 abc	57 d
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	22 c	48 efghi	75 bcd	87 ab
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	28 bc	50 efghi	60 de	78 abc
9	Outrider Activator 90	1 0.25	OZ/A % V/V	25 bc	30 i	55 e	93 a
10	MSMA	32	FL OZ/A	83 a	83 abc	87 ab	78 abc
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	90 a	93 a	97 a	87 ab
12	Clearcast MSO	32 1	FL OZ/A % V/V	22 c	52 efghi	65 de	83 abc
13	Plateau MSO	8 1	FL OZ/A % V/V	28 bc	60 def	75 bcd	83 abc
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	33 bc	65 cdef	72 bcd	88 ab
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	67 cd
16	Roundup ProMax	22	FL OZ/A	85 a	90 ab	93 a	91 a
17	Journey MSO	21.3 1	FL OZ/A % V/V	33 bc	77 abcd	82 abc	92 a
18	Nontreated Check			0 d	0 j	0 f	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), 50 DAT (Oct 15, 2020), and 352 DAT (Aug 13, 2021).

2021 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 unapproved 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 8, 2021. The trial contained 19 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 50% flowering plants at time of application. Johnsongrass control was assessed 16 (8/24/2021), 48 (9/25/2021), and 79 (10/26/2021) days after treatment (DAT). Data were analyzed using ARM software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists the treatments, active ingredients and application rates. The Fusion labeled rates prior to 2012 for selective control of johnsongrass were 7 to 9 fl oz/A (Treatments 1 and 2). The labeled Fusilade II rates are 16 to 24 fl oz/A (Treatments 3 and 4). The Acclaim Extra label lists 20 oz/A per acre to control seedling johnsongrass 12 to 24 inches tall (Treatment 5); 39 fl 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 fl oz/A), for improved turfgrass tolerance and to control rhizome johnsongrass 10 to 25 inches tall (Treatment 7). The Outrider labeled rates for selective johnsongrass control in tall fescue turf are 0.75 to 1 oz/A (Treatments 8 and 9). The combination of Outrider and Garlon 4 Ultra (Treatment 10) was added as this treatment was used by NaturChem on the area close to Shelbyville where tolerant johnsongrass was observed. One possibility is the growth regulator herbicide (triclopyr) may have interfered with the activity of the grass herbicide? Treatment 11 was MSMA applied alone and Treatment 12 was MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 13) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 14 will often severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 15) with enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 16) was one suggested to suppress johnsongrass growth, in areas such as behind

guardrails. Roundup ProMax (Treatment 17) and Journey (Treatment 18) are non-selective herbicide options.

Results and Discussion

At the first evaluation 16 DAT the range of control observed was from 13 to 80%, which is early for observing the full expression of symptoms and final control for most treatments (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 75 to 80% control. They included both treatments with MSMA (Treatments 11 and 12), and Roundup ProMax (Treatment 17).

By 48 DAT the range of control was from 20 to 88%. The top treatments (63 to 88% control) included the high rate of Fusilade II (Treatment 4), the high rate of Acclaim Extra (Treatment 6), both rates of Outrider by itself (Treatments 8 and 9), the Outrider + MSMA combination (Treatment 12), Roundup ProMax (Treatment 17), and Journey (Treatment 18). The combination of Outrider and Garlon (Treatment 10) displayed 25% less control than Outrider at 1 oz/a (Treatment 9). MSMA (Treatment 11) had lots of regrowth and a lower control rating.

At the end of the season, 79 DAT, the range of control was from 17 to 92%. The most effective group of treatments (83 to 82% control) included the high rate of Fusilade II (Treatment 4), both rates of Outrider by itself (Treatments 8 and 9), the Outrider + Garlon 4 Ultra combination (Treatment 10), Roundup ProMax (Treatment 17), and Journey (Treatment 18).

The treatments showing aboveground control more quickly may not necessarily be the herbicides that provide the best long-term control.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	AI Rate (per acre)	MOA Group(s)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz	1 + 1
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz	1 + 1
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz	1
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz	1
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz	1
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz	1
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	1 1
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz	2
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz	2
10	Outrider Garlon 4 Ultra Activator 90	1 20 0.25	OZ/A FL OZ/A % V/V	sulfosulfuron triclopyr	0.75 oz 10 oz ae	2 4
11	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz	27
12	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz	2 27
13	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae	2
14	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae	2
15	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae	14 2
16	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	4 14 2
17	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae	9
18	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae	2 + 9
19	Nontreated Check					

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2. Herbicide Treatments and % Control 16, 48, and 79 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	16 DAT	48 DAT	79 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	35 c ¹	45 efg	43 fg
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	27 cde	60 bcde	53 def
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	27 cde	43 efg	52 def
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	25 cdef	63 abcde	87 ab
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	33 c	47 defg	27 gh
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	48 b	77 abc	47 ef
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	25 cdef	55 cdef	63 de
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	18 ef	67 abcde	90 a
9	Outrider Activator 90	1 0.25	OZ/A % V/V	23 cdef	78 abc	83 abc
10	Outrider Garlon 4 Ultra Activator 90	1 20 0.25	OZ/A FL OZ/A % V/V	20 def	52 cdef	83 abc
11	MSMA	32	FL OZ/A	75 a	28 fg	17 hi
12	Outrider MSMA	0.75 32	OZ/A FL OZ/A	80 a	83 ab	68 bcd
13	Clearcast MSO	32 1	FL OZ/A % V/V	20 def	40 efg	67 cd
14	Plateau MSO	8 1	FL OZ/A % V/V	15 ef	48 def	67 cd
15	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	20 def	53 cdef	67 cd
16	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	13 f	20 gh	67 cd
17	Roundup ProMax	22	FL OZ/A	77 a	88 a	92 a
18	Journey MSO	21.3 1	FL OZ/A % V/V	32 cd	73 abcd	92 a
19	Nontreated Check			0 g	0 h	0 i

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 16 DAT (Aug 24, 2021), 48 DAT (Sept 25, 2021), and 79 DAT (Oct 26, 2021).

2020 Fescue Damage Relative to Johnsongrass Control Options (including 2021 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. Fusion herbicide is one of the safer johnsongrass control options to use on tall fescue but is no longer available for use on right-of-way sites due to a labeling change in 2012. The objective of 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

A field study 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 in 2020 on September 10, September 30, October 15, and November 20 at 14, 30, 49, and 85 days after treatment (DAT), respectively. In the spring plots were also assessed for tall fescue stand density (from 0 to 10) on May 10 and June 1, 2021 at 256 and 278 DAT, respectively. Data were analyzed using ARM software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists treatments evaluated, active ingredients and application rates. Prior to 2012 the labeled Fusion rates for selective control of johnsongrass were 7 to 9 fl oz/A (Treatments 1 and 2). The labeled Fusilade II rates were 16 to 24 fl oz/A (Treatments 3 and 4). The Acclaim Extra label indicates 20 fl oz/A per acre to control seedling johnsongrass 12 to 24 inches tall (Treatment 5); 39 fl 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 fl 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 were 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 often severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 14) for enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment

15) was suggested to suppress johnsongrass growth, in areas such as behind guardrails. Roundup ProMax (Treatment 16) and Journey (Treatment 17) are non-selective herbicide options.

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 tall fescue in the application area.

The following spring 256 DAT most of the treatments had tall fescue stand densities similar to the control except for Clearcast (Treatment 12), Roundup ProMax (Treatment 16), and Journey (Treatment 17). At 278 DAT these treatments and Plateau (Treatment 13) remained with lower densities than nontreated control. Therefore, non-selective treatments would not be recommended if tall fescue growth should be maintained within treated areas.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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				

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2. Herbicide Treatments and Tall Fescue 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).

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 3. Herbicide Treatments and Tall Fescue Stand Density (0-10) 256 and 278 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	256 DAT	278 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	7.3 ab ¹	7.2 abc
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	7.2 ab	5.7 abcde
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	7.0 ab	6.8 abc
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	7.8 ab	7.7 ab
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	6.3 abc	6.5 abcd
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	7.3 ab	7.8 ab
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	7.5 ab	6.3 abcde
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	7.2 ab	7.2 abc
9	Outrider Activator 90	1 0.25	OZ/A % V/V	7.3 ab	6.3 abcde
10	MSMA	32	FL OZ/A	7.7 ab	7.5 ab
11	Outrider MSMA	0.75 32	OZ/A FL OZ/A	8.0 a	8.0 a
12	Clearcast MSO	32 1	FL OZ/A % V/V	2.8 d	3.8 de
13	Plateau MSO	8 1	FL OZ/A % V/V	6.5 abc	4.7 cde
14	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	6.7 ab	5.5 abcde
15	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	7.8 ab	6.5 abcd
16	Roundup ProMax	22	FL OZ/A	4.8 c	3.7 e
17	Journey MSO	21.3 1	FL OZ/A % V/V	6.2 bc	5.2 bcde
18	Nontreated Check			7.5 ab	6.7 abc

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 256 DAT (May 10, 2021) and 278 DAT (June 1, 2021).

2021 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. Fusion herbicide is one of the safer johnsongrass control options to use on tall fescue but it is no longer available for use on right-of-way sites due to a labeling change in 2012. The objective of 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

A field study was established August 8, 2021 at Spindletop Research Farm near Lexington, KY on a tall fescue field when the plants were 11 inches high. The trial had 19 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 in 2021 on August 24, September 25, and October 27 at 16, 48, and 80 days after treatment (DAT), respectively. Data were analyzed using ARM software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Table 1 lists treatments evaluated, active ingredients and application rates. Prior to 2012 the labeled Fusion rates for selective control of johnsongrass were 7 to 9 fl oz/A (Treatments 1 and 2). The labeled Fusilade II rates are 16 to 24 fl oz/A (Treatments 3 and 4). The Acclaim Extra label lists 20 fl oz/A per acre to control seedling johnsongrass 12 to 24 inches tall (Treatment 5); 39 fl 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 fl 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 were 0.75 to 1 oz/A (Treatments 8 and 9). The combination of Outrider and Garlon 4 Ultra (Treatment 10) was added as this was used by NaturChem on the area close to Shelbyville where tolerant johnsongrass was observed. One possibility is that the growth regulator herbicide (triclopyr) may have interfered with the activity of the grass herbicide? Treatment 11 was MSMA applied alone and Treatment 12 was MSMA applied in combination with Outrider at 0.75 oz/A. Clearcast (Treatment 13) has an aquatic label and may be used close to waterways. The high rate of Plateau used in Treatment 14 will often severely damage tall fescue. Detail + Plateau was suggested as a combination (Treatment 15) for enhanced control of johnsongrass. The combination of Method + Detail + Plateau (Treatment 16) was suggested to suppress johnsongrass

growth, in areas such as behind guardrails. Roundup ProMax (Treatment 17) and Journey (Treatment 18) are non-selective herbicide options.

Results and Discussion

Some treatments showed good safety on tall fescue with color ratings that were not different from the nontreated check at all three assessments (Table 2). These included both rates of Fusion (Treatments 1 and 2), both rates of Acclaim Extra (Treatments 5 and 6), the Acclaim Extra and Fusilade II combination (Treatment 7), the high rate of Outrider and in combination with Garlon 4 Ultra (Treatments 9 and 10), and MSMA by itself and in combination with Outrider (Treatments 11 and 12). Treatments that showed recover by the end of the season (80 DAT) included the low rate of Fusilade II (Treatment 3), Detail + Plateau (Treatment 15), and Method + Detail + Plateau (Treatment 16). Non-selective treatments that had lower color ratings at all assessments included Clearcast (Treatment 13), Plateau (Treatment 14), Roundup ProMax (Treatment 17), and Journey (Treatment 18). Fescue stand densities will be assessed the following spring.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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

Trt. No.	Product Name	Rate	Rate Unit	Active Ingredient(s)	AI Rate (per acre)	SOA Group(s)
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	1.75 oz + 0.49 oz	1 + 1
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	fluazifop + fenoxaprop	2.25 oz + 0.63 oz	1 + 1
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	fluazifop	4 oz	1
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	fluazifop	6 oz	1
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	fenoxaprop	1.4 oz	1
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	fenoxaprop	2.78 oz	1
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	1 1
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	sulfosulfuron	0.563 oz	2
9	Outrider Activator 90	1 0.25	OZ/A % V/V	sulfosulfuron	0.75 oz	2
10	Outrider Garlon 4 Ultra Activator 90	1 20 0.25	OZ/A FL OZ/A % V/V	sulfosulfuron triclopyr	0.75 oz 10 oz ae	2 4
11	MSMA	32	FL OZ/A	monosodium acid methanearsonate	24 oz	27
12	Outrider MSMA	0.75 32	OZ/A FL OZ/A	sulfosulfuron monosodium acid methanearsonate	0.563 oz 24 oz	2 27
13	Clearcast MSO	32 1	FL OZ/A % V/V	imazamox	4 oz ae	2
14	Plateau MSO	8 1	FL OZ/A % V/V	imazapic	2 oz ae	2
15	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	saflufenacil imazapic	0.36 oz 2 oz ae	14 2
16	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	4 14 2
17	Roundup ProMax	22	FL OZ/A	glyphosate	12.4 oz ae	9
18	Journey MSO	21.3 1	FL OZ/A % V/V	imazapic + glyphosate	2 oz ae + 4 oz ae	2 + 9
19	Nontreated Check					

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2. Herbicide Treatments and Tall Fescue Color (0-9) 16, 48, and 80 Days After Treatment (DAT)²

Trt. No.	Product Name	Rate	Rate Unit	16 DAT	48 DAT	80 DAT
1	Fusion Activator 90	7 0.25	FL OZ/A % V/V	7.5 ab ¹	7.7 abc	7.5 abc
2	Fusion Activator 90	9 0.25	FL OZ/A % V/V	7.8 a	8.0 a	8.0 a
3	Fusilade II Activator 90	16 0.25	FL OZ/A % V/V	6.7 bcd	6.2 cd	6.5 abcde
4	Fusilade II Activator 90	24 0.25	FL OZ/A % V/V	6.7 bcd	6.8 abc	6.0 cdef
5	Acclaim Extra Activator 90	20 0.25	FL OZ/A % V/V	7.9 a	8.0 a	8.0 a
6	Acclaim Extra Activator 90	39 0.25	FL OZ/A % V/V	8.0 a	8.0 a	8.0 a
7	Acclaim Extra Fusilade II COC	7 14 1	FL OZ/A FL OZ/A % V/V	7.0 abc	6.5 abc	6.7 abcd
8	Outrider Activator 90	0.75 0.25	OZ/A % V/V	6.5 bcde	6.7 abc	6.2 bcdef
9	Outrider Activator 90	1 0.25	OZ/A % V/V	7.3 abc	6.7 abc	7.2 abcd
10	Outrider Garlon 4 Ultra Activator 90	1 20 0.25	OZ/A FL OZ/A % V/V	7.2 abc	7.0 abc	7.3 abcd
11	MSMA	32	FL OZ/A	8.0 a	7.8 ab	7.8 ab
12	Outrider MSMA	0.75 32	OZ/A FL OZ/A	7.2 abc	6.8 abc	7.2 abcd
13	Clearcast MSO	32 1	FL OZ/A % V/V	5.5 ef	1.8 g	3.3 g
14	Plateau MSO	8 1	FL OZ/A % V/V	6.3 cde	4.2 ef	4.8 efg
15	Detail Plateau MSO	1 8 1	FL OZ/A FL OZ/A % V/V	6.3 cde	4.7 de	6.3 abcdef
16	Method Detail Plateau MSO	6 1 3 1	FL OZ/A FL OZ/A FL OZ/A % V/V	7.2 abc	6.3 bc	7.7 abc
17	Roundup ProMax	22	FL OZ/A	4.5 f	2.5 g	4.7 fg
18	Journey MSO	21.3 1	FL OZ/A % V/V	5.8 de	3.0 fg	5.7 def
19	Nontreated Check			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 26, 2020. Visual evaluations taken 16 DAT (Aug 24, 2021), 48 DAT (Sept 25, 2021), and 80 DAT (Oct 27, 2021).

2021 Fescue PGR at Spindletop

Tall fescue is a widely adapted species and is cool-season grass commonly grown on roadsides, as well as, in areas of unimproved turf. Frequent mowing is the most common management regime for departments of transportation. Plant Growth Regulators (PGRs) are potential tools to reduce turf grass growth and promote seed head suppression. Furthermore, PGRs can be an effective means to reduce mowing for the first cycle and aid in keeping our roadways safe for travelers. They are normally applied in the early spring and usually only one PGR is applied at a time. Class D PGRs are herbicidal and may cause excessive damage to the turf. The addition of a growth regulator herbicide (Group 4) to the mixture can act as a safener to reduce yellowing (damage) of the turf as well as expanding the spectrum of weeds controlled.

The objectives of this trial were to evaluate options of PGR mixtures and the timing of their application for roadside management.

Materials and Methods

A trial was established in 2021 at Spindletop Research Farm in Lexington KY arranged as a complete block design with 13 PGR treatments and three replications. Plots were 7 ft by 20 ft with running unsprayed checks (3 ft wide) between each of the plots. The treatments were 4 PGR combinations applied at three times in the spring plus an untreated control (Table 1). All four primary treatments consisted of Plateau (imazapic) applied alone or combined with three other treatments that contained Escort (metsulfuron methyl) at each application timing. Method (aminocyclopyrachlor) and Milestone (aminopyralid) were also included in combination with Plateau and Escort in two of the four treatments, as potential safeners. The first application was before any fescue stem extension on April 20 while the second application was when some tillers had emerging seedheads on May 6. The third application was when many of the plants had emerging seedheads on May 19, 2021. The optimum timing for seedhead suppression would often be at the first timing but that may not always be feasible across all the miles of roadway to be treated. Sometimes there could be benefits of later application timings, such as weed control.

All applications were at 25 gallons per acre and included a non-ionic surfactant at 0.25% v/v. The fescue was 12" tall at the first application date on April 20. 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. Tall fescue heading (%) was assessed and canopy heights were measured every two weeks as well. Color, height, and % heading was assessed 8 (4/28/2021), 16 (5/6/2021), 29 (5/19/2021), 42 (6/1/2021), and 56 (6/15/2021) days after first application timing (DAT1). 90 DAT1 (7/19/2021) color and green canopy height was assessed. The brown canopy height (standing brown stems) was measured on that same day 61 days after the third application timing (DAT3). Data were analyzed using ARM software (Gyllings Data Management Solutions, Inc., Brookings, SD) and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results and Discussion

Each application timing are discussed separately to best highlight the observations that were made. The treatments 8 DAT1 with lower green ratings than control were the combinations with the potential safeners (Treatments 3 and 4) which is not what we expected (Table 2). 16 DAT1 the Plateau + Escort

combination (Treatment 2) had the same color as control while we had expected it to have more yellowing. All the treatments were shorter than control 16 DAT1 and had no heading (Table 2). By 29 DAT1 all the treatments were less green than control but Plateau alone (Treatment 1) had more green than Plateau + Escort + Milestone (Treatment 4). All treatments were shorter than control and had little to no heading (Table 3). The same difference in color between Treatments 1 and 4 was observed 42 DAT1 and with all treatments shorter than control and without seedheads. 56 DAT1 all the treatments had recovered color and were the same as control (Table 4). They were all shorter than control and had no seedheads. Later in the season, 90 DAT1, all the treatments had higher green color ratings than the control and were no different in green canopy (grass regrowth) height than control (Table 4).

At the time of the second application (May 6, 2021), 3% tall fescue seed heading was observed in the control plots, and had increased to 80% 13 DAT2 evaluation date (Table 3). The Plateau treatment by itself (Treatment 5) had the same color as control while the other treatments all had lower ratings. All the treatments were shorter than control and had few seedheads. Treatment 5 was less green than control 26 DAT2 but still had a higher rating than the other treatments (Table 3). All the treatments were shorter and had far less seedheads than control. By 40 DAT2 all the color ratings were far less than control (1.8 to 2.7) (Table 4). All the treatments were shorter and had far less seedheads than control. At the last rating 74DAT2 all the plots had the same color rating as the untreated control and the height of the new growth was the same as the control for the Plateau + Escort combination (Treatment 6) (Table 4).

By the time of the third application (May 19, 2021) the control plots had 80% tall fescue heading which had increased to 90% by the time of the 13 DAT3 evaluation (Table 3). The Plateau (Treatment 9) and the Plateau + Escort + Milestone combination (Treatment 12) had the same color rating as control. All the treatments were shorter than control while the combinations with the safeners (Treatments 11 and 12) had the same % heading as control. At 27 DAT3 only the Plateau + Escort + Milestone combination (Treatment 12) had the same color as control (Table 4). All the treatments were shorter than control. The Plateau + Escort (Treatment 10) and the Plateau + Escort + Method (Treatment 11) combinations had the same % heading rating as control. At the last rating all the plots had the same color as control and had the same green canopy height as control (Table 4). The standing brown stem canopy was shorter than control for all the later application treatments.

All treatments resulted in similar height reductions and seedhead suppression within an application timing. The first timing was optimal for seedhead suppression while the second timing stopped further seedhead emergence and growth and would probably be acceptable. However, the third timing would not be recommended if seedhead and growth suppression were the primary objectives.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

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

Trt. No.	Product Name	Rate	Rate Unit	Timing ¹	Active Ingredient(s)	AI Rate (per acre)
1	Plateau	3	FL OZ/A	A	imazapic	0.75 OZ AE/A
2	Plateau Escort	3 0.33	FL OZ/A OZ/A	A	imazapic metsulfuron	0.75 OZ AE/A 0.2 OZ/A
3	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	A	imazapic metsulfuron aminocyclopyrachlor	0.75 OZ AE/A 0.2 OZ/A 1.5 OZ AE/A
4	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	A	imazapic metsulfuron aminopyralid	0.75 OZ AE/A 0.2 OZ/A 1.25 OZ AE/A
5	Plateau	3	FL OZ/A	B	imazapic	0.75 OZ AE/A
6	Plateau Escort	3 0.33	FL OZ/A OZ/A	B	imazapic metsulfuron	0.75 OZ AE/A 0.2 OZ/A
7	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	B	imazapic metsulfuron aminocyclopyrachlor	0.75 OZ AE/A 0.2 OZ/A 1.5 OZ AE/A
8	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	B	imazapic metsulfuron aminopyralid	0.75 OZ AE/A 0.2 OZ/A 1.25 OZ AE/A
9	Plateau	3	FL OZ/A	C	imazapic	0.75 OZ AE/A
10	Plateau Escort	3 0.33	FL OZ/A OZ/A	C	imazapic metsulfuron	0.75 OZ AE/A 0.2 OZ/A
11	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	C	imazapic metsulfuron aminocyclopyrachlor	0.75 OZ AE/A 0.2 OZ/A 1.5 OZ AE/A
12	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	C	imazapic metsulfuron aminopyralid	0.75 OZ AE/A 0.2 OZ/A 1.25 OZ AE/A
13	Untreated Check					

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

¹Timing A: April 20 – before stem extension

Timing B: May 6 – some tillers had emerging seedheads

Timing C: May 19 – many plants had emerging seedheads

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 2. Herbicide Treatments, Turf Color, Tall Fescue Heights and % Heading after First PGR Application

Trt. No.	Product Name	Rate	Rate Unit	Timing	April 28, 2021		May 6, 2021		
					Color (0-9)	Ht (in)	Color (0-9)	Ht (in)	Heading (%)
					8 DAT1 ¹		16 DAT1		
1	Plateau	3	FL OZ/A	A	7.7 ab ²	12	6.8 b	12 b	0 b
2	Plateau Escort	3 0.33	FL OZ/A OZ/A	A	8.0 a	12	7.0 ab	11 b	0 b
3	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	A	7.3 b	12	6.0 b	11 b	0 b
4	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	A	7.3 b	12	6.0 b	11 b	0 b
5	Plateau	3	FL OZ/A	B					
6	Plateau Escort	3 0.33	FL OZ/A OZ/A	B					
7	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	B					
8	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	B					
9	Plateau	3	FL OZ/A	C					
10	Plateau Escort	3 0.33	FL OZ/A OZ/A	C					
11	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	C					
12	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	C					
13	Untreated Check				8.0 a	12	8.0 a	16 a	3 a

¹ DAT1 = Days after first PGR treatment (April 20, 2021)

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

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 3. Herbicide Treatments, Turf Color, Tall Fescue Heights and % Heading after PGR Applications

Trt. No.	Product Name	Rate	Rate Unit	Timing	May 19, 2021			June 1, 2021		
					Color (0-9)	Ht (in)	Heading (%)	Color (0-9)	Ht (in)	Heading (%)
					29 DAT ¹ , 13 DAT ²			42 DAT ¹ , 26 DAT ² , 13 DAT ³		
1	Plateau	3	FL OZ/A	A	4.7 de ⁴	12 c	2 cd	3.8 ef	12 cde	0 c
2	Plateau Escort	3 0.33	FL OZ/A OZ/A	A	3.7 ef	11 c	0 d	3.2 fg	10 e	0 c
3	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	A	3.5 ef	12 c	0 d	2.8 fg	12 de	0 c
4	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	A	3.2 f	11 c	0 d	2.7 g	11 e	0 c
5	Plateau	3	FL OZ/A	B	7.5 ab	16 b	5 bc	5.2 cd	16 cd	10 c
6	Plateau Escort	3 0.33	FL OZ/A OZ/A	B	5.7 cd	16 b	3 cd	3.8 ef	15 cde	7 c
7	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	B	5.5 cd	16 b	7 b	3.7 efg	14 cde	3 c
8	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	B	6.5 bc	16 b	3 cd	4.5 de	17 c	3 c
9	Plateau	3	FL OZ/A	C				7.0 ab	23 b	67 b
10	Plateau Escort	3 0.33	FL OZ/A OZ/A	C				5.7 c	22 b	67 b
11	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	C				6.8 b	27 ab	83 ab
12	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	C				7.0 ab	23 b	77 ab
13	Untreated Check				8.0 a	28 a	80 a	8.0 a	31 a	90 a

¹ DAT1 = Days after first PGR treatment (April 20, 2021)

² DAT2 = Days after second PGR treatment (May 6, 2021)

³ DAT3 = Days after third PGR treatment (May 19, 2021)

⁴ Means within a column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

Table 4. Herbicide Treatments, Turf Color, Tall Fescue Heights and % Heading after PGR Applications

Trt. No.	Product Name	Rate	Rate Unit	Timing	June 15, 2021			July 19, 2021		
					Color (0-9)	Ht (in)	Heading (%)	Color (0-9)	Green Canopy Ht (in)	Brown Canopy Ht (in)
					56 DAT1 ¹ , 40 DAT2 ² , 27 DAT3 ³			90 DAT1, 74 DAT2, 61 DAT3		
1	Plateau	3	FL OZ/A	A	7.7 a ⁴	18 de	0 d	8.2 bc	21 abcd	
2	Plateau Escort	3 0.33	FL OZ/A OZ/A	A	8.0 a	16 de	0 d	8.4 a	21 abc	
3	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	A	8.2 a	15 de	0 d	8.3 ab	20 abcd	
4	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	A	7.9 a	14 e	0 d	8.3 ab	19 bcd	
5	Plateau	3	FL OZ/A	B	2.7 c	16 de	10 d	8.0 cd	18 cd	
6	Plateau Escort	3 0.33	FL OZ/A OZ/A	B	1.8 c	13 e	2 d	8.1 bcd	20 abcd	
7	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	B	2.0 c	13 e	0 d	8.1 cd	17 d	
8	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	B	2.0 c	15 de	7 d	8.0 d	18 cd	
9	Plateau	3	FL OZ/A	C	6.2 b	25 bc	80 bc	8.0 d	23 a	35 b
10	Plateau Escort	3 0.33	FL OZ/A OZ/A	C	5.8 b	26 bc	87 abc	8.0 d	22 ab	33 b
11	Plateau Escort Method	3 0.33 6	FL OZ/A OZ/A FL OZ/A	C	6.2 b	30 b	90 ab	8.0 d	23 a	36 b
12	Plateau Escort Milestone	3 0.33 5	FL OZ/A OZ/A FL OZ/A	C	7.0 ab	20 cd	77 c	8.0 d	23 a	35 b
13	Untreated Check				8.0 a	37 a	93 a	8.0 d	22 ab	43 a

¹ DAT1 = Days after first PGR treatment (April 20, 2021)

² DAT2 = Days after second PGR treatment (May 6, 2021)

³ DAT3 = Days after third PGR treatment (May 19, 2021)

⁴ Means within a column followed by the same letter are not different according to Fisher's LSD at $P < 0.05$.

Figure 1: Overall View of Plots in the Fescue PGR Trial on June 1, 2021

The blue and yellow flags mark the center of the plots. Different heights of the grass canopy were observed.



Figure 2: View of One of the Early Treated Plots in the Fescue PGR Trial on June 1, 2021 (42 Days After Treatment)

The yellow lines mark the edges of the spray pattern with the unsprayed check strips on either side. Note the suppressed growth and lack of seedheads along with damaged (yellow) foliage within the plot. The recovering grasses are putting on new growth.



Figure 3: Control Plot in the Fescue PGR Trial on June 1, 2021
Mixture of tall fescue, orchard grass, and vetch observed.



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), 60 (10/29/2019), and 376 (9/9/2020) 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). The Outrider and Fusilade II plots mowed the same day had 53 to 56% control 376 DAT.

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%	

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	Outrider	Fusilade II	Acclaim Extra	Acclaim + 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	Outrider	Fusilade II	Acclaim Extra	Acclaim + 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	Outrider	Fusilade II	Acclaim Extra	Acclaim + 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 $P < 0.05$.



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 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	Outrider	Fusilade II	Acclaim Extra	Acclaim + 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	Outrider	Fusilade II	Acclaim Extra	Acclaim + 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.

Vegetation Management for Highway Rights of Way Workshop
Tuesday July 20, 2021 at L.D. Brown Ag Expo Center, Bowling Green

Agenda

- 8:30 – 9:00 a.m. Registration (Rm 133-34, L.D. Brown Ag Expo Center, 406 Elrod Rd., Bowling Green, KY 42104)
- 9:00 – 10:00 a.m. Weed garden plus weed ID (Dr. JD Green) plus Bee research & Hemp plots (Dr. Dan Strunk) (Group A, on wagons) & Herbicide Injury Demo plus New Soybean Herbicide Technologies plus pollinator beds (Dr. Joe Omielan) (Group B, walking)
- 10:00 – 11:00 a.m. Weed garden plus weed ID (Dr. JD Green) plus Bee research & Hemp plots (Dr. Dan Strunk) (Group B, on wagons) & Herbicide Injury Demo plus New Soybean Herbicide Technologies plus pollinator beds (Dr. Joe Omielan) (Group A, walking)
- 11:00 – 12:00 p.m. Pollinator plot establishment and maintenance (John Seymour, in classroom) plus Truax drill (in Arena, Sid Brantly)
- 12:00 – 12:45 p.m. Lunch
- 12:45 – 2:00 p.m. Herbicide application and management safety using closed loop systems (Brock Shockley and Steve Gray, in classroom) plus discussion about roadside sprayer essentials (in Arena with D3 sprayer, Wayne Harris)
- 2:00 – 3:00 p.m. Take wagons to slope demo site (hydroseeding and erosion mats for turf renovation) plus Green Climber remote mower demo (Martin Halm) then back to Arena for discussion about Finn HydroSeeder unit (Brad Dawson) (snacks, drinks for trip home)

We need everyone to stay healthy and safe so practice social distancing if needed or wear a mask if uncomfortable.

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

Dr. JD Green will provide information and practice in identifying crops and weeds at the weed garden and Dr. Dan Strunk will talk about his research on bees and hemp. (Cat. 3, 6, 10, 12)

Dr. Joe Omielan will lead the group in an exercise examining herbicide injury symptoms on different crop species as well as talk about new soybean herbicide technologies. We will also visit the pollinator beds and discuss some of the species represented there (Cat. 3, 6, 10, 12)

John Seymour will discuss successful pollinator plot establishment and maintenance. Sid Brantly will have a Truax drill to discuss its features and operation. (General)

Brock Shockley and Steve Gray will discuss herbicide application and management safety using closed loop systems and how to integrate them into your spray programs. Wayne Harris will discuss roadside sprayer essentials with sprayers from D3 as examples. (General)

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report

We will view and discuss the pros and cons of hydroseeding and erosion mats for turf renovation at the slope demo site. Martin Halm will demonstrate the Green Climber remote mower. Brad Dawson will discuss the features and operation of a Finn HydroSeeder unit. (General)

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

Attendance: 84 KYTC, 2 UK, 7 Industry

Breakdown of KYTC attendance: Central Office (6), D1 (3), D2 (6), D3 (40), D4 (4), D5 (3), D6 (4), D7 (4), D8 (7), D9 (1), D11 (6)

Non-Crop and Invasive Vegetation Management Weed Science
2021 Annual Research Report
2021 KYTC Tree Management Workshop
Tuesday September 28, 2021 at Morehead State University Research Farm
(25 MSU Farm Drive, Morehead, KY 40351)

Agenda

- 8:30 – 9:00 a.m. Registration along with coffee and donuts
- 9:00 – 10:00 a.m. Options and Application Techniques for Chemical Control/Management of Roadside Woody Vegetation (Steve Gray from Nutrien)
- 10:00 – 11:00 a.m. How to Recognize Hazardous/Dangerous Trees and What are the Next Steps to Take. (Jesse Hesley from Town Branch Tree Experts)
- 11:00 – 11:30 a.m. Tree Measurement and Contract Administration (Dustin Gumm from D10)
- 11:30 – 12:15 p.m. Chainsaw Maintenance, Safety & Ergonomics (Jacob Trego from Bryan Equipment)
- 12:15 – 1:00 p.m. Lunch
- 1:00 – 1:30 p.m. Demonstration of Tree Assessment (Jesse Hesley) (*please bring your hard hats and other safety gear*)
- 1:30 – 2:00 p.m. Continuation of Jacob's Chainsaw Presentation/Demonstration
- 2:00 – 2:45 p.m. Demonstration of Bucket Truck and Slope Mower (Kristie Gifford and D9 Crew)
- 2:45 – 3:15 p.m. Demonstration of Skytrim (Dustin Gumm and D10 crew)

We need everyone to stay healthy and safe. We ask everyone to follow local health guidance and wear masks for the indoor portion of the workshop. We'll be in the barn where we can space ourselves out and the barn has good ventilation.

Pesticide CEU's for this workshop: 1 general and 1 specific (Categories 6, 10) (approved)

Arborist CEU's: 5.5 CEU's approved

Engineering PDH's: 5 hours approved

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

Attendance: 46 KYTC, 1 UK, 2 Industry

Breakdown of KYTC attendance: Central Office (3), D4 (1), D5 (2), D6 (5), D7 (2), D9 (31), D10 (2)

Topics to be covered in the Workshop

Options and Application Techniques for Chemical Control/Management of Roadside Woody Vegetation (Steve Gray from Nutrien)

- Steve will present information on the pros and cons of different options and application techniques for and examples of how they fit into woody vegetation management.

How to Recognize Hazardous/Dangerous Trees and What are the Next Steps to Take. (Jesse Hesley from Town Branch Tree Experts)

- Jesse will illustrate how to do a visual assessment of hazardous trees and discuss what to do about them. In the afternoon he'll demonstrate how to do an assessment on two trees in the pasture and discuss how to deal with them.

Tree Measurement and Contract Administration (Dustin Gumm from D10)

- Dustin will discuss the proper way to measure trees for removal and how to document and pay the contractor after the task is completed satisfactorily.

Chainsaw Maintenance, Safety & Ergonomics (Jacob Hesley from Bryan Equipment)

- Jacob will discuss the safety features of a saw and proper PPE as well as proper starting and handling and continue this outdoors in the pasture field. He will also bring examples of internal combustion and battery-operated tools from Stihl.

Outdoor Demonstrations and Hands-On Opportunities (*please bring your hard hats and other safety gear plus your chainsaws*):

Demonstration of Tree Assessment (Jesse Hesley)

Demonstration of Bucket Truck and Slope Mower (Kristie Gifford and D9 Crew)

- The crew will demonstrate how the slope mower takes down some brush and what the bucket truck can do when dealing with trees

Demonstration of Skytrim (Dustin Gumm and D10 crew)

- The crew may cut down some limbs for Jacob to demonstrate on

Chainsaw Maintenance, Safety & Ergonomics (Jacob Hesley from Bryan Equipment)

- Jacob will continue this outdoors in the pasture field

Demonstration of doing clean up safely using a chipper and truck (Kristie Gifford and D9 Crew)