2011 OKLAHOMA DEPARTMENT OF TRANSPORTATION HERBICIDE PROGRAM REPORT

Annual Report For Federal FY 2011
ODOT SPR Item Number 2156

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MODERN METRIC CONVERSION FACTORS*

APPROXIMATE CONVERSIONS TO SI UNITS				
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY**	**TO FIND**	**SYMBOL**
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
A	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

MODERN METRIC CONVERSION FACTORS*

APPROXIMATE CONVERSIONS FROM SI UNITS				
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY**	**TO FIND**	**SYMBOL**
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	A
km^2	square kilometers	0.386	square miles	mi^2
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

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1.0 INTRODUCTION

The Oklahoma Department of Transportation (ODOT) uses an Integrated Roadside Vegetation Management (IRVM) program for providing effective and aesthetically pleasing vegetation along the travel corridor. Properly vegetated roadsides minimize soil erosion and protect the paved surface. IRVM includes selection, establishment and management of well adapted plant species as well as use of an integrated mowing and chemical weed control program. Proper mowing and herbicide use favor the selected desirable species and hinder nuisance and noxious weed species.

An ODOT Herbicide program survey was conducted in 2011. The purpose of the annual ODOT herbicide program survey was to document herbicide use trends as well as the successes, failures and challenges of the chemical weed control program. Information from the survey and this subsequent annual report is useful in providing recommendations for improvement of future weed control and vegetation management efforts. This report can also help in identifying emerging weed problems and possible needs for future education as well as weed control research.

1.1 OBJECTIVES

The objectives of the 2011 ODOT Herbicide Program Survey were to document the herbicide treatments used, treatment use rates, weeds targeted, application timings, acreages treated, weed control performance achieved and to make suggestions for improvements, if needed, to each maintenance unit and Division.

1.2 BACKGROUND

In that each field division makes herbicide application decisions independent of other field divisions; we attempted to minimize comparisons among divisions in this report. We attempted to document the progress of each field division on its own merit, considering the unique management goals within each division.

We are aware that each field Division's herbicide program may have special considerations that are unknown to the authors of this report. If there is disagreement by Division personnel concerning our comments or recommendations, we ask that we have the opportunity to review those comments and respond, making adjustments if appropriate. We encourage suggestions as to how this report can be made more informative and useful to ODOT.

We would like to thank all those individuals for their participation in this year's survey. Without the survey data they supplied and subsequent meetings with each field Division's leaders, this report would not reflect the entire ODOT herbicide program effort.

2.0 METHODS

ODOT county and interstate facilities were supplied by email a four page herbicide program survey form (Appendix A) early in the 2011 herbicide application

season. County superintendents or their appointees were asked to complete all questions on the document in reference to the year 2011 and return hard copies of the survey by August 31, 2011 to the OSU RVM program.

Questions on the first page of the survey included: whether the facility had used any nighttime or weekend herbicide application events; the number of personnel involved with a typical herbicide mixing/loading event; the number of personnel participating in a typical herbicide application event; the typical frequency of sprayer application calibration; the administrative rank of the individual making the spray application execution decisions; the administrative rank of the individual making the herbicide product selection choice and product use rate decisions; the number of landowner informal herbicide complaints/concerns fielded by the facility during the year; the number of formal complaints filed by landowners with the Oklahoma Dept of Ag, Food & Forestry in 2011 for off-target herbicide injury allegedly caused by ODOT; the number of formal noxious weed complaints filed against the facility; specific weed problems not being satisfactorily controlled by the facility's current herbicide program, how many lane miles sprayed per county and how many miles of cable-barrier were in place in each county.

Page two through four of the survey included a herbicide product use survey that included product choice, product use rate, target weed group, first and last dates of herbicide application, number of tank loads applied, acres treated per tank load, total acres treated with each product and the overall performance level (good, fair, poor) achieved with each herbicide product used. In 2011, superintendants (including spray lead-person or those responsible for herbicide program assessment in county maintenance units) were asked to give their herbicide treatments a "percent control" rating. It is felt that superintendants should be comfortable with consulting herbicide labels to determine which weed species will be controlled and suppressed by that specific treatment and treatment rate. A list of weeds that the herbicide will control (at specific rates) is listed on all herbicide labels. In 2011 the survey requested that the following rating scale be used for herbicide control of the label listed weed species. In 2011 a rating of "Good" meant 80 – 100% control, "Fair" meant 70 – 79% control and "Poor" meant a rating of 0 - 69% control of the weed species listed on the herbicide or combination of tank mix herbicide labels. If "Fair" or "Poor" was assigned to a treatment, additional information was requested to help identify specific weeds that were not being controlled satisfactorily. This information will further help the OSU RVM Program personnel investigate treatment performance leading to additional recommendations to remedy problems.

Herbicides utilized by ODOT and recommended by OSU-RVM are expected to control the weeds listed as being "controlled" on their labels as opposed to simply suppressing their growth. It is important for applicators to note any failures of an herbicide treatment to control species that are listed as being controlled on the herbicide labels. Failures may be an indication of herbicide resistance or specific adjustments that may need to be initiated to achieve expected or improved weed control.

Results were summarized by division and county unit. Data was then presented in tabular form for each division as well as for a state-wide summary. Comments and recommendations were made for each division to assist division personnel in solving challenges that became apparent after reviewing this year's herbicide surveys and

following discussion at fall division meetings. OSU RVM staff met with personnel from all eight field divisions in fall of 2011.

In an attempt to facilitate a better understanding of herbicides and their active ingredients, we often listed both the product trade name and the common name of the active ingredients in our discussions. For instance Roundup Pro Concentrate®, Honcho Plus®, and Ranger Pro® are trade names of products that contain the herbicide active ingredient that has the common name of glyphosate. Each Field Division's Summary Table will reference the specific product brand name used by the division. In the supportive text we list both the brand name and common name upon first reference in each chapter. The reader is referred to Table 1a for both trade and common names of herbicides utilized by ODOT as well as adjuvant names and manufacturers in Table 1b.

Table 1a. Herbicide active ingredient common names, brand names, and manufacturers on the September 1 2011 ODOT Approved Herbicide and Adjuvant List (AHAL).

Product Type	Active Ingredient(s) Common name	Brand Name	Manufacturer/ Distributor
herbicide	aminocyclopyrachlor/chlorsulfuron	Perspective®	Dupont
herbicide	aminocyclopyrachlor/metsulfuron	Streamline®	Dupont
herbicide	aminopyralid	Milestone VM®	Dow AgroSciences
herbicide	clopyralid	Transline®	Dow AgroSciences
herbicide	dicamba	Banvel®	Arysta
herbicide	dicamba/diflufenzopyr	Overdrive®	BASF
herbicide	diglycolamine salt of dicamba	Vanquish®	Syngenta/Nufarm
herbicide	diuron	Diuron 80 WDG®	Loveland Industries
herbicide	fluroxypyr	Vista®	Dow AgroSciences
herbicide	fosamine	Krenite S®	Dupont
herbicide	glyphosate	Mirage®	UAP-Loveland Products
	glyphosate	Mirage Plus®	UAP-Loveland Products
herbicide	glyphosate	Ranger Pro®	Monsanto
herbicide	glyphosate	Roundup Pro Concentrate®	Monsanto
herbicide	glyphosate (aquatic)	AquaMaster®	Monsanto
	glyphosate (aquatic)	AquaStar®	Albaugh
herbicide	glyphosate/2,4-D	Landmaster® BW	Albaugh
herbicide	imazapic	Plateau®	BASF
herbicide	imazapyr	Arsenal	BASF
	imazapyr	Imazapyr 2 SL®	Veg. Mgmt., LLC
herbicide	imazapyr (aquatic)	Habitat®	BASF
herbicide	imazapyr/diuron	Sahara®	BASF
herbicide	metsulfuron methyl	MSM E-Pro®	Etigra
	metsulfuron methyl	Escort XP®	Dupont
	metsulfuron methyl	Metsulfuron methyl	Veg. Mgmt., LLC
herbicide	nicosulfuron/metsulfuron	Pastora®	Dupont
herbicide	MSMA	MSMA 6.0 Plus®	Drexel
	MSMA	Weed-Hoe 108®	Albaugh
	MSMA	Target 6 Plus®	Luxemborg Panol
herbicide	picloram	Tordon K®	Dow AgroSciences
herbicide	sulfometuron	SFM E-Pro®	Etigra
	sulfometuron	Oust XP®	Dupont
	sulfometuron	SFM 75®	Veg. Mgmt., LLC
herbicide	sulfometuron/metsulfuron	Oust Extra®	Dupont
herbicide	sulfosulfuron	Outrider®	Monsanto
herbicide	triclopyr amine	Garlon 3A®	Dow AgroSciences
	triclopyr amine	Triclopyr 3A®	Microflo
herbicide	triclopyr ester	Garlon 4®	Dow AgroSciences
	triclopyr ester	Garlon 4 Ultra®	Dow AgroSciences
herbicide	triclopyr ester	Pathfinder II (RTU)®	Dow AgroSciences

Table 1b. Adjuvant types, brand names, and manufacturers on the September 1, 2011 ODOT Approved Herbicide and Adjuvant List (AHAL).

Product Type	Brand Name	Manufacturer/ Distributor
liquid Non-ionic surfactant (adjuvant)	SurfKing®	Estes
	Red River 90®	Red River Specialties
	Timberland 90®	UAP
	AD-Spray 80®	Helena
liquid non-ionic surfactant aquatic (adjuvant)	Aqua King®	Estes
	Red River 90®	Red River Specialties
	Timberland 90®	UAP
	Induce®	Helena
liquid drift control (adjuvant)	Control™	Garrco
	Corral® Poly	Winfield Solutions
	ChemTrol®	UAP
	Pointblank WM®	Helena
dry ammonium sulfate (adjuvant)	Royal AMS®	Estes
	APF AMS®	Estes
dry ammonium sulfate w/drift control (adjuvant)	Array®	Estes
	Dry Poly Wet®	Red River Specialties
	StrikeZone PPS®	Helena

3.0 SURVEY OF DIVISION ONE HERBICIDE PROGRAMS

3.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 of 10 maintenance facilities in Division One responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division One headquarters on November 3, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division One herbicide usage is summarized in Table 2a and 2b. The winter annual weed control program in Division One (Table 2a) continued with a glyphosate/2,4-D herbicide (either Landmaster® BW or Campaign®) + AMS broadcast treatment. Treatment rates with these two products ranged from 2 pints per acre to 3 pints per acre. The 3 pints per acre rate was used to increase the amount of glyphosate and 2,4-D being delivered to target species. Increased rates were recommended to help control more annual grasses and to increase control of broadleaf weeds, specifically annual sowthistle (*Sonchus oleraceus*). Winter annual weed control results were rated as good from this 3 pt per acre treatment rate. The counties reporting use of the 2 pint per acre rate were Adair and McIntosh and they rated control as good. All other units used the 3 pint per acre rate.

Division One's summer weed control program (Table 2b) consisted mainly of treatments of glyphosate (Roundup Pro Conc.®) + sulfometuron (Oust XP®) at varying rates or applications of Roundup Pro Conc.® and Oust Extra® (combination of sulfometuron + metsulfuron-methyl). Oust Extra® treatments provided a wider spectrum of broadleaf weed control compared to Oust XP® (sulfometuron alone). Recommendations from OSU-RVM personnel at the 2010 Division One herbicide program meetings were that when an Oust Extra® treatment was used in 2011 that it be at 1.5 oz per acre for broadcast application treatment. Application rates of Oust Extra® varied from 1 oz to 1.5 oz per acre in 2011. It is not known why some yards used only the 1 oz per acre rate of Oust Extra®. Division One maintenance administrators had stipulated use of the 1.5 oz use rate prior to the actual 2011 spray season. Haskell, Okmulgee, Sequoyah, Checotah I-40 and Sallisaw I-40 units supplemented Roundup Pro Conc® + Oust Extra® tank mixes with an additional 0.25 oz rate of Escort XP® for increased broadleaf weed control.

3.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and division herbicide meeting comments indicate that Division One has been satisfied with the overall goal of their broadcast herbicide applications. Introduction of increased winter weed control glyphosate and 2,4-D rates have appeared to address control of annual sow thistle. We recommend that all units in Division One utilize the 3 pt per acre rate of Landmaster BW to provide the added level of control for winter annual weed control. While an application of Monsanto Campaign® was reported, this was left over product and should be the last instance of Campaign® herbicide use. Next season's applications should indicate a 100 percent conversion to the use of Landmaster® BW by Division One maintenance units. We have asked that

maintenance units increase their efforts to make initial applications at the beginning of recommended treatment windows as opposed to targeting initial applications towards the end of recommended treatment windows. There have been instances of bermudagrass injury due to winter weed control applications being made on bermudagrass that has broken dormancy earlier than expected.

Those county units or interstate units moving to the use of Oust Extra® for summer johnsongrass and broadleaf weed control generally expressed favorable results. However, several county maintenance units singled out specific summer annuals and perennials that are becoming more problematic. Pigweed (*Amaranthus* spp.) and sericea lespedeza (*Lespedeza cuneata*) were mentioned specifically in survey results. The continued application of Oust Extra® at the recommended rate (1.5 oz Oust Extra®) plus the addition of more metsulfuron-methyl through adding Escort XP® at 0.5 oz per acre should help reduce the sericea lespedeza and most species of pigweed. It is important to note that Division One's inadvertent use of 1 oz per acre of Oust Extra® (at 56.25% a.i. sulfometuron and 15.0% metsulfuron-methyl) only provides a 0.15 oz active ingredient rate of metsulfuron-methyl and a 0.56 oz rate of sulfometuron. These rates are well below the minimum active ingredient rate of metsulfuron-methyl recommended by the OSU-RVM program when these products are applied as a tank mix. The recommended active ingredient rates by OSU are 0.30 oz of metsulfuron-methyl (equivalent to 0.5 oz of DuPont Escort XP®, a.i. 60%) and 0.75 oz of sulfometuron (equivalent to 1.0 oz of DuPont Oust XP®, a.i. 75%). To reduce the risk of development of weed populations with resistance to Escort XP®, the OSU-RVM program is recommending Division One maintenance units make broadcast summer application utilizing 1.5 oz Oust Extra® + 13-19 oz Roundup Pro Conc.® + 0.5 oz Escort XP® per acre. In the meeting held November 3, 2011, Division One maintenance administrators agreed that contract Escort XP® prices were low enough to implement this recommendation on a division-wide basis.

Division One is gaining an additional 10 miles of cable-barrier positioned 10-14 feet from the hard road surface along highway shoulders. Maintenance managers are looking at maintaining these areas as bare-ground. This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of prodiamine, which is not considered a "bare-ground" treatment, was discussed with maintenance administrators in 2010 for the cable barrier foot-print areas where bermudagrass cover was deemed desirable. Bermudagrass was allowed to invade and persist in these foot print areas in order to mitigate erosion issues associated with cable-barrier placement in ditch bottoms. Newly researched bare-ground combinations (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011) have shown promise. The use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. The OSU RVM Team does not believe that season-long control of most weeds is achievable from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional high rates of Roundup Pro Conc.® may be used in late August for follow-up weed control with no risk of drift from herbicides volatilizing and moving off of ODOT easement. Post-emergent, broadcast treatments with phenoxy herbicides or other

volatile herbicides may be deemed too high of risk for late summer applications unless very stringent precautions regarding use are taken (see *2010 Herbicide Program Report*, December 2010).

We recommend that Division One continue with their summer broadcast program for controlling johnsongrass (*Sorghum halepense*) utilizing tank mixes of Roundup Pro Conc.® (glyphosate) + Oust Extra® (1.5 oz per acre) + Escort XP® (0.5 oz per acre) as an additional component for broadleaf weed control. This broadcast treatment will continue to provide johnsongrass control and should also provide good to excellent control of many broadleaf weeds including the burgeoning pigweed population in the safety-zone.

Table 2a. Summary of Division One Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Adair 192 LM 1.0 MCB	Landmaster® BW + AMS[4] - (G)	3 pt+5.33 lb	360	60 A 25 GPA	03-21-11 03-23-11	02-25 03-31
	Campaign® + AMS - (F)	2 pt+ 5.33 lb	150	60 A 25 GPA	03-23-11 03-24-11	02-25 03-31
Cherokee 324 LM	Landmaster® BW + AMS - (G)	3 pt+5.9 lb	507.2	60 A 25 GPA	03-30-11 04-01-11	02-25 03-31
Haskell 229 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	600	60 A 25 GPA	03-23-11 03-28-11	02-25 03-31
McIntosh 228 LM 10 MCB	Landmaster® BW + AMS - (G)	2 pt+3.4 lb	704	60 A 25 GPA	03-24-11 03-30-11	02-25 03-31
Muskogee 569 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	720	60 A 25 GPA	03-15-11 03-31-11	02-25 03-31
Okmulgee 313 LM 13 MCB	Landmaster® BW + AMS - (G)	3 pt+ 5.33 lb	707	38A 40GPA	03-24-11 04-07-11	02-25 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problem*.

Table 2a. (Continued) Summary of Division One Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Sequoyah 283 LM	Landmaster® BW + AMS[4] - (G)	3 pt+4.2 lb	582	60 A 25 GPA	03-16-11 03-24-11	02-25 03-31
Wagoner 291 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	420	60 A 25 GPA	03-23-11 03-31-11	02-25 03-31
Checotah I-40 210 LM 4 MCB	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	579.5	60 A 25 GPA	03-23-11 03-31-11	02-25 03-31
Sallisaw I-40 208 LM 26.5 MCB	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	528	60 A 25 GPA	03-21-11 03-29-11	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			5857.7			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problem*.

Table 2b. Summary of Division One Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Adair 196 LM 0.75 MCB	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1.5 oz	540	60 A 25 GPA	06-02-11 06-06-11	05-10 06-15
Cherokee 324 LM	Roundup Pro Conc® + Oust Extra®	16 oz+1 oz	487.6	60 A 25 GPA	06-01-11 06-06-11	05-10 06-15
	Roundup Pro Conc® + Oust XP® - (G)	16 oz+1 oz	130.1	60 A 25 GPA	06-06-11 06-07-11	05-10 06-15
	Garlon® 4+ oil carrier (cut stump	4:1 ratio	Not stated	Spot treatment	07-11-11 07-20-11	Year round
Haskell 229 LM	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1 oz	420	60 A 25 GPA	06-02-11 06-14-11	05-10 06-15
	Roundup Pro Conc® + Oust Extra® + Escort XP®- (G)	13 oz+1 oz+ 0.25 oz	120	60 A 25 GPA	06-01-11 06-01-11	05-10 06-15
	Garlon® 4+ oil carrier (cut stump)	4:1 ratio	10	Spot treatment	12-01-10 02-31-11	Year round
McIntosh 228 LM 10 MCB	Roundup Pro Conc® + Oust XP® - (G)	13 oz+1 oz	350	60 A 25 GPA	06-07-11 06-09-11	05-10 06-15
Muskogee 569LM	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1.5 oz	390	60A 25 GPA	05-16-11 06-07-11	05-10 06-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 2b. (Continued) Summary of Division One Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Okmulgee 313 LM 13 MCB	Roundup Pro Conc® + Oust Extra® - (G) (+ musk thistle)	13 oz+1.5 oz	288	50 A 30 GPA	06-01-11 06-09-11	05-10 06-15
	Roundup Pro Conc® + Oust Extra® + Escort XP®- (G) (+-musk thistle)	13 oz+1 oz+ 0.25 oz	224	50 A 30 GPA	06-01-11 06-09-11	05-10 06-15
Sequoyah 283 LM	Roundup Pro Conc® + Oust Extra® + Escort XP®- (G)	13 oz+1 oz+ 0.25 oz	582	60 A 25 GPA	06-06-11 06-09-11	05-10 06-15
Wagoner 289 LM	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1 oz	420	60 A 25 GPA	06-01-11 06-22-11	05-10 06-15
	Garlon® 4+ oil carrier (cut stump)	4:1 ratio	Not stated	Spot treatment		Year round
Checotah I-40 210 LM 4 MCB	Roundup Pro Conc® + Oust Extra® + Escort XP®- (G)	13 oz+1 oz+ 0.25 oz	244	60A 25 GPA	06-02-11 06-10-11	05-10 06-15
Sallisaw I-40 208 LM 26.5 MCB	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1 oz+ 0.25 oz	496	60A 25 GPA	06-14-11 06-23-11	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			4701.7 0 0			Division Total Treated Acres[7] 10,559.4

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division One, from Tables 2a and 2b.

4.0 SURVEY OF DIVISION TWO HERBICIDE PROGRAMS

4.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 of 10 maintenance facilities in Division Two responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Two headquarters on Tuesday, October 18, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Two herbicide usage is summarized in Table 3a and 3b. The winter annual weed control program in Division Two (Table 3a) continued with a glyphosate/2,4-D + AMS broadcast treatment or the glyphosate/2,4-D + AMS paired with the addition of 4 oz. Milestone VM®. The treatment rate was 2-3 pints per acre of the glyphosate/2,4-D combination (either Campaign® or Landmaster® BW). Choctaw, Latimer and Le Flore counties used the 3 pint per acre rate with good results. The 3 pints per acre rate was used to increase the amount of glyphosate and 2,4-D being delivered to target species. Increased rates were recommended to help control more annual grasses and to increase control of broadleaf weeds. All other counties, using the 2-2.5 pint per acre rate (with the exception of Pushmataha County) rated their weed control as good. Pushmataha County rated winter annual weed control with the 2 pint rate as fair due to the superintendants observations of reduced control from drought effect upon herbicide uptake by weedy species. Division Two is in the process of using up stocks of Campaign® herbicide and this should be the last year that Campaign® is used.

Division Two's summer weed control program (Table 3b) was severely affected by drought conditions and several counties either suspended entire summer broadcast application regimens or partially suspended summer broadcast applications. Those maintenance units that did make summer broadcast applications utilized treatments consisting mainly of glyphosate (Roundup Pro Conc.® or Ranger Pro®) + sulfometuron (Oust XP®) or Oust Extra® (combination of sulfometuron + metsulfuron-methyl). Oust Extra® treatments provided a wider spectrum of broadleaf weed control compared to Oust XP® (sulfometuron alone). Some counties made selected broadcast applications of glyphosate (Roundup Pro Conc.® or Ranger Pro®) + Outrider® (sulfosulfuron) at varying rates. Outrider® is a sulfonyl-urea herbicide that is less phytotoxic to bermudagrass and therefore, more forgiving if application rates deviate slightly from recommended rates. Spot treatments with aquatic formulations of glyphosate were used sporadically as were bare ground treatments utilizing glyphosate and brush control treatments using triclopyr (Garlon 4 Ultra®).

In response to survey question #9 (Appendix A) regarding acknowledgment of informal complaint/concerns, Atoka County, Bryan County, McCurtain County and Pushmataha County indicated they had received contact from concerned citizens requesting "no spray" zones in and around their properties. There were no formal application complaints pursued through ODAFF regulatory offices.

4.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and division herbicide meeting comments indicate that Division Two has generally been satisfied with the overall results of their broadcast herbicide applications. Due to good control ratings with Landmaster® BW at the 2-3 pint per acre rate, OSU-RVM personnel recommended continued use and suggested all county maintenance units utilize the 3 pint rate. Division Two maintenance administrators were receptive to the recommendation to increase the Landmaster BW® rate to 3 pints/acre instead of the low-end 2 pint/acre rate. This should provide additional level of control for winter annual weed control. Increasing the Landmaster BW® rate will increase the amount of glyphosate and 2,4-D being delivered to target species. This results in a relatively low additional cost of approximately $1.30/acre. We strongly recommend that Division Two maintenance units be aware of the need to make Landmaster® BW applications as a dormant bermudagrass application. Otherwise there may be injury to bermudagrass which will delay the time to full green-up and weakening the desirable perennial grass.

The drought conditions that involved most if not all of Division Two (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklahoma_south-central_u.s, Nov. 30, 2011) maintenance units had significant effects on rainfall needed for summer weed control broadcast herbicide application (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s , Nov. 30, 2011). The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments with foliar and soil-residual herbicides. The OSU-RVM Program supported decisions made by ODOT Maintenance Divisions to suspend or abbreviate broadcast summer treatments. The Division Two decisions were made after joint consultations between the maintenance headquarters and the specific county maintenance unit's supervisors. Table 3b shows the counties that made decisions to suspend or abbreviate summer broadcast treatments. Some of those counties that suspended summer broadcast treatments took that opportunity to increase treatments of nuisance aquatic vegetation and also targeted increased chemical brush control treatment. Overall, cumulative total of acres treated for 2011 were 37.2 percent lower than cumulative totals for 2010 (2010 ODOT Herbicide Program Report, December 30, 2010, p. 13-15). The majority of the acreage reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

OSU-RVM is continuing to recommend the use of Oust Extra® (sulfometuron + metsulfuron) as an alternative to Oust XP® when ODOT needs increased levels of broadleaf weed control. Use of Oust Extra® (premix of sulfometuron and metsulfuron-methyl) has provided an increased spectrum of broadleaf weed control in Division Two. Selected maintenance units in Division Two used this product at the application rate of 1.5 oz product per acre and were pleased with the weed control efficacy. Use of Oust Extra® will only increase the weed control treatment cost per acre by approximately $1.47. We recommend that Division Two utilize an Oust Extra® program for controlling johnsongrass (*Sorghum halepense*) and other broadleaf weeds. The use of Oust Extra® by Division Two will also provide benefits of controlling bahiagrass (*Paspalum notatum*) that is commonly found in southeastern Oklahoma. Division Two maintenance

administrators indicated that the use of Oust XP® during 2011 was the result of county maintenance units using up product carry-over from 2010.

Switchgrass (*Panicum virgatum*) continues to be mentioned by county maintenance supervisors as a specific weed problem that is not being adequately controlled by current broadcast applications. Unfortunately, current recommended summer broadcast treatments for johnsongrass (*Sorghum halepense*) do not control this roadside invader. While recommended treatments for johnsongrass are effective, they actually reduce competition surrounding switchgrass and allow it to proliferate. Current recommendations for herbicide wiper applications of high rates of glyphosate (that are effective) can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011. Wiper applications are recommended to be made in a two perpendicular directions to encourage treatment effect. There must be adequate height differential between weed target and desired grass to insure only switchgrass gets the treatment while direct exposure to bermudagrass is avoided. If bermudagrass is accidentally wiped, the treatment will result in severe growth suppression or death of the desirable species. OSU-RVM has identified the GrassWorks™ (source http://weedproblems.com/, Nov. 30, 2011) weed wiper 14 foot unit and 24 foot unit as a potential resource to help address treatment of switchgrass infestations more efficiently. A demonstration of this technology was held October 3, 2011 at the ODOT headquarters in Oklahoma City. This was part of an ongoing effort to acquaint ODOT maintenance administrators with the potential benefits of acquisition of similar units for vegetation management in Oklahoma.

Division Two indicated they have 12.07 miles of cable-barrier within their division with an additional 8 miles being proposed for addition in 2012. This area or “footprint” surrounding the cable barrier is susceptible to multiple weed invasions. Division Two maintenance administrators indicated they wish to maintain these areas as bare-ground. OSU-RVM has identified several promising treatments (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011). This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. It is not known if actual season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional treatments of Roundup Pro Conc.® may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement. Post-emergent, broadcast treatments with phenoxy herbicides (example Vanquish®) or other volatile herbicides are deemed very risky for late summer applications unless substantial precautions regarding use are taken (OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011).

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Table 3a. Summary of Division Two Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Atoka 200 LM	Landmaster® BW + Milestone VM® + AMS[4] - (G)	2 pt+4 oz+5.1 lb	330	66 A 30 GPA	03-02-11 03-25-11	02-15 03-20
	Landmaster® BW +AMS - (G)	2 pt +5.1 lb	264	66 A 30 GPA	03-11-11 03-16-11	02-15 03-20
Bryan 474.3 LM 4.07 MCB	Landmaster® BW +AMS - (G)	2 pt+5 lb	1332	66 A 30 GPA	03-01-11 03-16-11	02-15 03-20
Choctaw 686 LM	Landmaster® BW + Milestone VM® - (G)	3 pt+ 4 oz	650	50 A 25 GPA	03-01-11 04-01-11	02-15 03-20
Latimer 190 LM	Landmaster® BW +AMS - (G)	3 pt+5.0 lb	840	80 A 20 GPA	03-11-11 04-01-11	02-15 03-31
Le Flore 510 LM	Landmaster BW® + AMS- (G)	3 pt+5.1 lb	500	50 A 40 GPA	02-25-11 03-18-11	02-15 03-31
McCurtain 568.8 LM	Campaign®+MilestoneVM® +AMS (G)	2 pt+4 oz+4.6 lb	1067.2	66.7 A 30 GPA	03-10-11 03-24-11	02-15 03-20
	Roundup Pro Conc.®+Krenite® +MilestoneVM® - (G)	1.2 pt+1.2 pt +4 oz	66.7	66.7 A 30 GPA	03-13-11 03-13-11	02-15 03-20
Marshall 105 LM	Landmaster® BW +AMS - (G)	2 pt+3.4 lb	450	75 A 20 GPA	02-18-11 03-15-11	02-15 03-31
Pittsburg 520 LM 8 MCB	Campaign®+AMS (G)	2 pt+3.2 lb	1800	100 A 20 GPA	02-22-11 03-18-11	02-15 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problem*.

Table 3a. (Continued) Summary of Division Two Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Pushmataha 351 LM	Landmaster® BW +AMS - (F)	2 pt+5.1 lb	750	50A 40 GPA	03-15-11 04-01-11	02-15 03-31
Le Flore/Push 320 LM	Landmaster® BW +AMS - (G)	2.5 pt+7.6 lb	580	40 A 40 GPA	03-15-11 03-31-11	02-15 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8629.9			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problem*.

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Table 3b. Summary of Division Two Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Atoka 200 LM	Roundup Pro Conc® + Oust XP®- (G)	16 oz + 1 oz	300	66 A 25 GPA	04-28-11 05-16-11	04-20 05-31
Bryan 474.3 LM 4.07 MCB	Roundup Pro Conc®+Outrider®+Oust XP®- (G)	17 oz+1.2 oz + 0.18 oz	732.6	66 A 30 GPA	04-14-11 05-16-11	04-20 06-30
	Roundup Pro Conc® - (bare ground) - (G)	2%	20	66 A 25 GPA	05-12-10 05-13-10	04-25 09-15
Choctaw 686 LM	Summer broadcast suspended due to drought		0			
Latimer 247.3 LM	Most summer broadcast suspended due to drought		0			
	Ranger Pro®+Oust XP® - (G)	22 oz + 1 oz	80	80 A 20 GPA	05-16-11 05-17-11	04-20 05-31
	Garlon 4 Ultra® - (G)	4:1 ratio	Not reported	Spot treatment	Year round	Year round
Le Flore 500 LM	Roundup Pro Conc®+Outrider® - (G)	19 oz+1.33 oz	400	50 A 40 GPA	04-05-11 05-05-11	04-20 06-30
	Ranger Pro®+Outrider® - (G)	24 oz+1.0 oz	450	50 A 40 GPA	05-06-11 06-13-11	04-20 06-30
	Garlon 4 Ultra® - (G)	4:1 ratio	12.5	Spot treatment	Year round	Year round
	Aquastar (aquatic) – (G)	2.5 qt	100	Spot treatment	06-14-11 06-15-11	05-15 08-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 3b. (Continued) Summary of Division Two Herbicide Survey Results For Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Performance Good (G), Fair (F) or Poor (P)[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
McCurtain 530.9 LM	Summer broadcast suspended due to drought		0			
	Roundup Pro Conc.® (bare ground)- (G)	12 oz	66.7	Spot treatment	09-20-10 09-23-10	Growing Season
	AquaStar® (aquatic) -(G)	2.4 pt	66.7	Spot treatment	06-10-11 06-13-11	04-20 06-30
	Garlon 4® (brush) -(G)	3 pt	276.8	Spot treatment	09-28-10 08-03-11	Year round
Marshall 207 LM	Summer broadcast suspended due to drought		0			
	Ranger Pro® (bareground) -(G)	2%	20	Spot treatment	05-17-11 05-18-11	04-25 09-15
Pittsburg 584 LM 6 MCB	Summer broadcast suspended due to drought		0			
Pushmataha 351 LM	Most summer broadcast suspended due to drought		0			
	Roundup Pro Conc® + Outrider® - (F)	19 oz+1.1 oz	120	60A 30GPA	05-30-11 06-10-11	04-20 06-30

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 3b. (Continued) Summary of Division Two Herbicide Survey Results For Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Performance Good (G), Fair (F) or Poor (P)[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Le Flore/Push 325 LM	Roundup Pro Conc ® + Oust Extra® +Garlon 4 Ultra®- (G)	16 oz+1.2 oz+16 oz	740	40A 40GPA	06-01-11 07-05-11	04-20 06-15
	Aquaneat® (aquatic) - (G)	2%	25	Spot treatment	05-04-11 05-06-11	05-15 08-31
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC TOTAL ACRES TREATED FOR BRUSH			2822.6 106.7 191.7 289.3			Division Total Treated Acres[7] 12040.2

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division One, from Tables 3a and 3b.

5.0 SURVEY OF DIVISION THREE HERBICIDE PROGRAMS

5.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 12 of 12 maintenance facilities in Division Three responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Three headquarters on October 19, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Three herbicide usage is summarized in Table 4a and 4b. The winter annual weed control program in Division Three (Table 4a) continued with a glyphosate/2,4-D + AMS broadcast treatment. The treatment rate was 2 pints/Acre with varying rates of ammonium sulfate (AMS). While Landmaster BW® rates were consistent, AMS additions varied from low to medium concentrations (label recommendations are from 8 pounds to 20 pounds/100 gallons of water). The OSU-RVM recommended rate is 5.1 pounds of AMS/acre (equivalent to 17 pounds AMS/100 gallons of water) when using a 30 GPA carrier rate. Winter annual weed control results were rated as good by all of the 12 maintenance units.

Division Three's summer broadcast weed control program (Table 4b) consisted mainly of treatments of Roundup Pro Concentrate® and Outrider® (sulfosulfuron). Outrider®, like Oust XP®), is a sulfonyl-urea herbicide, but it is less phytotoxic to bermudagrass at normal use rates and is therefore more forgiving if application rates deviate slightly from the recommended rates. Division Three has had past experience with roadside injury above acceptable levels when using sulfometuron (Oust XP®). However, when recommended rates are applied, OSU-RVM research has found injury levels from Oust XP® within acceptable limits.

Additional miscellaneous applications included glyphosate for bare-ground situations.

5.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

The survey results and division herbicide meeting comments indicate that Division Three has been satisfied with the overall results of their broadcast herbicide applications. However, in Division Three, there have been reports of increased populations of sowthistle (*Sonchus oleraceus*). Pontotoc County has contacted the OSU-RVM Program regarding this winter weed species. To address the possible need for increased winter weed control, OSU-RVM has recommended increasing the Landmaster BW® rate to 3 pints/acre rate in 2012 for those counties experiencing this issue. This should provide an additional level of control for winter annual weed control. Increasing the Landmaster BW® rate will increase the amount of glyphosate and 2,4-D being delivered to target species with relatively low additional cost, approximately $1.30/acre. Some Division Three maintenance units were using less than recommended rate of AMS in spray tank mixes. OSU-RVM recommended rate is 5.1 pounds of AMS/acre (equivalent to 17 pounds AMS/100 gallons of water) when using a 30 GPA carrier rate. Those maintenance units' under-utilizing AMS should raise their

AMS rates to 5.1 pounds/Acre if using a 30 GPA carrier rate. There continues to be a few treatments being applied after the recommended shut-off date. As a reminder, if treatments are applied later than recommended they may cause unacceptable injury to bermudagrass if spring green-up is too far along. If Landmaster BW® rates are increased to 3 pt/acre, it is even more important that the bermudagrass be completely dormant in order to minimize the risk of bermudagrass injury.

The drought conditions that involved most if not all of Division Three (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklahoma_south-central_u.s, Nov. 30, 2011) maintenance units had significant effects on rainfall needed for summer weed control broadcast herbicide application (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s , Nov. 30, 2011). The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments with soil-residual herbicides. The OSU-RVM Program supported decisions made by ODOT Maintenance Divisions to suspend or abbreviate broadcast summer treatments. The Division Three decisions were made after joint consultations between the maintenance headquarters and the specific county maintenance unit's supervisors. Table 4b shows the counties that made decisions to suspend or abbreviate summer broadcast treatments. The overall, cumulative total of acres treated for 2011 was 25.2 percent lower than the cumulative total for 2010 (2010 ODOT Herbicide Program Report, December 30, 2010, p. 19-21). The majority of the acreage treatment reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

Division Three survey respondents also indicated that there were non-specific summer broadleaf weed problems being experienced in safety-zones. To address this issue, OSU-RVM is recommending that ODOT consider adding a third component, metsulfuron (Escort XP®) into the tank mix of glyphosate and sulfosulfuron (Outrider®). Additions of Escort XP® should provide an increased spectrum of broadleaf weed control in Division Three. The cost to apply the recommended 0.5 oz/Acre rate should only add an additional $1.93/Acre.

Switchgrass (*Panicum virgatum*) continues to be a problem in Division Three. Hughes, Lincoln, Pontotoc and Seminole County maintenance units listed this roadside grassy weed as not being controlled with broadcast summer treatments. Unfortunately, current recommended summer broadcast treatments for johnsongrass (*Sorghum halepense*) do not control this roadside invader. While recommended treatments for johnsongrass are effective, they actually reduce competition surrounding switchgrass and allow it to proliferate. Current recommendations for herbicide wiper applications of high rates of glyphosate (that are effective) can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011. Wiper applications are recommended to be made in a two perpendicular directions to encourage treatment effect. There must be adequate height differential between weed target and desired grass to insure only switchgrass gets the treatment while direct exposure to bermudagrass is avoided. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species. OSU-RVM has identified the GrassWorks™ (source http://weedproblems.com/, Nov. 30, 2011) weed wiper 14 foot unit and 24 foot unit as a potential resource to help address treatment of switchgrass infestations more efficiently. A demonstration of this technology was held October 3,

2011 at the ODOT headquarters in Oklahoma City. This was part of an ongoing effort to acquaint ODOT maintenance administrators with the potential benefits of acquisition of similar units for vegetation management in Oklahoma. Timely mowing in conjunction with wiping effort is also important to achieve acceptable control levels of switchgrass.

Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the Amaranth or pigweed family. They continue to be reported as severe problems in Garvin County and other Division Three maintenance areas. Of the two related species, Palmer amaranth is more difficult to control and herbicide resistance has been documented. OSU-RVM is in the process of exploring control options for this specific weed problem and will continue to work with ODOT divisions regarding control options. Division Three was receptive to the possible use of prodiamine as a pre-emergent applied treatment, on targeted areas for the suppression of pigweeds in heavily infested safety-zones and on some back-slopes in Garvin County and McClain County. The OSU-RVM Program supports the application of 1.5 lbs (Prodiamine 65 WDG®) per acre on these special sites. Safety-zones in these two counties would also receive a separate application of Landmaster BW® in February – March as well. This prodiamine application was suggested around areas of "phenoxy and benzoic acid type herbicide" sensitive summer crops. In such areas the potential for herbicide particle drift due to elevated wind speed or temperature inversions as well as volatility during high air temperature periods may render post-emergent applications unfeasible. Post-emergent, broadcast treatments with benzoic acid herbicides (example Vanquish®, diglycolamine salt of dicamba) or other volatile herbicides are deemed risky for summer applications unless substantial precautions regarding use are taken (OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011). Use of glyphosate herbicide through wiper-bar applications can also be useful in controlling certain weed species in such areas with no risk to adjacent crops.

In those situations where adjacent crop injury is not a distinct possibility, and weather conditions are favorable, OSU-RVM research has identified post-emergent applications of Vanquish® 8 fl oz + Overdrive® 4 oz /acre as an highly effective broadleaf weed control treatments for control of Palmer amaranth (see *Final Report Concerning 2004 – 2006 Evaluations of New Herbicide Formulations For Potential Integration Into Existing ODOT Roadside Vegetation Management Programs*, September, 2006).

Division Three indicated they have 32 miles of cable-barrier within their division with an additional 28 miles being proposed for addition in 2012. This area or "footprint" surrounding the cable barrier is susceptible to invasion by multiple weed species. Division Three maintenance administrators indicated they wish to maintain these areas as bare-ground. OSU-RVM has identified several promising treatments (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs,* December 2011). This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of 3.0 oz OustXP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. It is not known if satisfactory season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional treatments of Roundup Pro

Conc.® may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement.

Table 4a. Summary of Division Three Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Coal 215 LM	Landmaster® BW + AMS[4] - (G)	2 pt+3.7 lb	632	50A 30 GPA	3-15-11 4-12-11	02-25 03-31
Garvin 372 LM	Landmaster® BW + AMS - (G)	2 pt+5 lb	554.7	46.2 A 30 GPA	3-15-11 3-25-11	02-15 03-31
Hughes 203.6 LM	Landmaster® BW + AMS - (G)	2 pt+2.5 lb	748	49 A 30 GPA	3-25-11 4-13-11	02-25 03-31
Johnson 306.9 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	884.8	50 A 30 GPA	4-05-11 4-13-11	03-10 04-15
Lincoln 428 LM	Landmaster® BW + AMS - (G)	2 pt+3.8 lb	1041.9	50 A 30 GPA	3-15-11 3-25-11	02-25 03-31
McClain 309 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	748.2	50 A 30 GPA	3-11-11 3-24-11	02-25 03-31
Okfuskee 215 LM	Landmaster® BW + AMS - (G)	2 pt+3.4 lb	600	50 A 30 GPA	3-10-11 3-15-11	02-25 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating by ODOT unit. [4]AMS= Dry Ammonium Sulfate (adjuvant).
[5]Recommended treatment window, OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 4a. (Continued) Summary of Division Three Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Pontotoc 344 LM	Landmaster® BW+AMS - (G)	2 pt+5.1 lb	804.6	50 A 30 GPA	03-12-11 03-31-11	02-25 03-31
Pottawatomie 340 LM	Landmaster® BW+AMS - (G)	2 pt+2.9 lb	1011.2	50 A 30 GPA	03-10-11 03-23-11	02-25 03-31
Seminole 404 LM	Landmaster® BW+AMS - (G)	2 pt+5.1 lb	900	50 A 30 GPA	03-15-11 03-23-11	02-25 03-31
Purcell I-35 367.5 LM 22.6 MCB	Landmaster® BW+AMS - (G)	2 pt+5.1 lb	713.6	50 A 30 GPA	03-10-11 04-12-11	02-25 03-31
Shawnee I-40 120 LM 10 MCB	Landmaster® BW+AMS - (G)	2 pt+4.3 lb	342	38 A 30 GPA	3-19-11 (ending date not reported)	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8981			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 4b. Summary of Division Three Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Coal 215 LM	Suspended due to drought conditions		0			
Garvin 372 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	895.1	49.7 A 30 GPA	6-01-11 6-08-11	04-20 07-30
Hughes 203.6 LM	Roundup Pro Conc®+Outrider® - (G)	20 oz+1 oz	546.5	49 A 30 GPA	6-15-11 6-23-11	05-10 06-15
Johnson 306.9 LM	Suspended due to drought conditions		0			
Lincoln 428 LM	Roundup Pro Conc®+Outrider® (G)	16 oz+1 oz	356.5	50 A 30 GPA	6-06-11 6-10-11	05-10 06-30
McClain 309 LM	Suspended due to drought conditions		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 4b. (Continued) Summary of Division Three Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Okfuskee 215 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	450	50 A 30 GPA	06-06-11 06-23-11	05-10 06-30
Pontotoc 344 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	598	50 A 30 GPA	06-06-11 06-15-11	05-10 06-30
Pottawatomie 340 LM	Suspended due to drought conditions		0			
Seminole 404 LM	Roundup Pro Conc®+Outrider® - (G)	12.8 oz+1 oz	900	50 A 30 GPA	06-09-11 06-17-11	05-10 06-30
	Roundup Pro Conc® - (bareground) - (G)	2%	Not reported	Spot treatment	06-14-11 06-16-11	04-25 09-15
Purcell I-35 367.5 LM 22.6 MCB	Suspended due to drought conditions		0			
Shawnee I-40 120 LM 10 MCB	Suspended due to drought conditions		0			
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			3746.1 0 0			Division Total Treated Acres[7] 12727.1

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Three, from Tables 4a and 4b.

6.0 SURVEY OF DIVISION FOUR HERBICIDE PROGRAMS

6.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 9 of 9 maintenance facilities in Division Four responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Four headquarters on October 14, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and the meeting.

Division Four herbicide usage is summarized in Table 5a and 5b. The winter annual weed control program in Division Four (Table 5a) generally consisted of a glyphosate/2,4-D (Landmaster BW®) + aminopyralid (Milestone VM®) + AMS (ammonium sulfate) broadcast treatment. The treatment rate most often used was 2 pints Landmaster BW® + 4 oz Milestone VM®/A (Payne County used Milestone VM® at 2 oz/A) with varying rates of AMS. OSU-RVM supports the use of 4 oz/A Milestone VM® and discourages use of less than this rate. OSU-RVM recommended AMS rate is 5.1 pounds of AMS/A (equivalent to 17 pounds AMS/100 gallons of water) when a 30 GPA carrier rate is used. Noble County used higher rates of Landmaster BW® but still within labeled rates. All maintenance units rated control as good. Most maintenance units applied this treatment within recommended application windows except Payne County.

The Division Four summer broadcast weed control program (Table 5b) consisted mainly of treatments of Roundup Pro Concentrate® (glyphosate) or Ranger Pro® (glyphosate) and Oust XP® (sulfometuron). Grant County used Ranger Pro® + Outrider® (sulfosulfuron). Outrider®, like Oust XP®, is a sulfonyl-urea herbicide but is less phytotoxic to bermudagrass at normal use rates and therefore is more forgiving than Oust XP® if application rates deviate from recommended rates. Grant County has had past experience with roadside injury above acceptable levels when using sulfometuron (Oust XP®). However, when recommended rates of Oust XP® are applied, OSU-RVM research has found injury levels within acceptable limits. Grant County rated Ranger Pro® + Outrider® control as fair. This “fair” rating is attributed to less than favorable environmental condition brought on by extreme drought that impeded the performance of the herbicide application. Grant County was the test area for demonstration and observation of the herbicide combination, Ranger Pro® + Outrider® + Perspective® (aminocyclopyrachlor + chlorsulfuron), targeting johnsongrass (*Sorghum halepense*) and pigweeds(*Amaranthus species*). This treatment was rated as “fair” and some less than expected performance may be linked to drought conditions. Kay County and Noble County used Ranger Pro® + Oust XP® and rated their control as fair also. This “fair” performance may also be attributed to herbicide interference due to drought conditions.

Additional miscellaneous applications made for musk thistle control and bare ground situations are shown in Table 5b. Specific weed problems that were reported as not being controlled to the desired performance expectations included pigweeds (*Amaranthus species*), switchgrass (*Panicum virgatum*) and johnsongrass (*Sorghum halepense*).

6.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Comments contained in survey results and division herbicide meetings indicate that Division Four has been generally satisfied with the overall goal of their broadcast herbicide applications. We would recommend that Division Four continue with the winter weed control broadcast application of Landmaster BW® and Milestone VM® since the reported results were satisfactory. Of special note is the application of this treatment by Tonkawa I-35 maintenance unit at the tail-end of the acceptable application window (damage observed by OSU-RVM personnel, May 4, 2011). This application was also made to a measured 13 foot wide (OSU-RVM personnel and Div. 4 maintenance administrator, October 14, 2011) strip of the safety-zone. Not only was this treatment possibly applied to bermudagrass that had broken dormancy, the application pattern suggests a 2X application rate if using a Boombuster 437-R tip, and attempting to spray a 25-27 foot pattern. In a subsequent meeting with the I-35 Tonkawa maintenance unit superintendant (October 14, 2011), it was re-emphasized that the Landmaster BW® product should only be used as a dormant bermudagrass application and that extra care should be taken to maintain the correct spray pattern width to achieve the correct application rate. If Landmaster BW® is applied to these injured areas, the application window should be narrowed to coincide with application beginning February 25 and ending March 9. ODOT field staff should scout target areas each year to insure that bermudagrass has not greened up prior to the application despite our providing expected safe target windows of application. The constricted application window should prevent exposure of non-dormant bermudagrass to Landmaster BW® herbicide. Those areas that were severely damaged may need to undergo re-establishment procedures to speed bermudagrass coverage of areas having a low percentage of bermudagrass cover. Additionally, those areas may be candidates for reduced phytotoxic herbicide applications for summer weed control. Use of pre-emergent herbicides and post-emergent herbicides that have very low injury potential to bermudagrass should be considered. Suggested products for this specific purpose include Outrider® or MSMA for johnsongrass control. These areas cannot tolerate any summer glyphosate application as this will stunt the remaining bermudagrass and further delay stand recovery.

The drought conditions that involved most if not all of Division Four (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklahoma_south-central_u.s, Nov. 30, 2011) maintenance units had significant effects on rainfall needed for summer weed control broadcast herbicide application (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s , Nov. 30, 2011). The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments. The OSU-RVM Program supported decisions made by ODOT Maintenance Divisions to suspend or abbreviate broadcast summer treatments. The Division Four decisions were made after joint consultations between the maintenance headquarters and the specific county maintenance unit's supervisors. Table 5b shows the counties that made decisions to suspend or abbreviate summer broadcast treatments. Some of those counties that suspended summer broadcast treatments utilized time for spot treatments and site-specific vegetation control options. Overall, cumulative total of acres treated for 2011 were 12.6 percent lower than cumulative

totals for 2010 (2010 ODOT Herbicide Program Report, December 30, 2010, p. 23-26). The majority of the acreage reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

Division 4 maintenance administrators were encouraged to explore the use of Oust Extra®, a combination of Oust XP® (sulfometuron) and Escort XP® (metsulfuron-methyl). The application of Oust Extra® at the recommended rate (1.5 oz Oust Extra®) plus the addition of more metsulfuron-methyl through adding Escort XP® at 0.5 oz per acre should help reduce most species of pigweed and many miscellaneous broadleaf weeds. The OSU-RVM program is recommending Division Four maintenance units make broadcast summer applications utilizing 1.5 oz Oust Extra® + 13-19 oz Roundup Pro Conc.®(or generic equivalent) + 0.5 oz Escort XP® per acre. In the meeting held October 14, 2011, Division Four maintenance administrators agreed that contract Oust Extra® and Escort XP® prices were low enough to implement this recommendation in those maintenance units currently using Oust XP®. It was suggested that Grant County add Escort XP® (1.0 oz/A) to their summer treatments of tank mixed Ranger Pro® + Outrider®.

Division Four maintenance units in Noble County, Kingfisher County and Canadian County reported additional difficulty with switchgrass (*Panicum virgatum)*. Unfortunately, current recommended summer broadcast treatments for johnsongrass (*Sorghum halepense*) do not control this roadside invader. While recommended treatments for johnsongrass are effective, they actually reduce competition surrounding switchgrass and allow it to proliferate. Current recommendations for herbicide wiper applications of high rates of glyphosate (that are effective) can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011. Wiper applications are recommended to be made in a two perpendicular directions to encourage treatment effect. There must be adequate height differential between weed target and desired grass to insure only switchgrass gets the treatment while direct exposure to bermudagrass is avoided. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species. OSU-RVM has identified the GrassWorks™ (source http://weedproblems.com/, Nov. 30, 2011) weed wiper 14 foot unit and 24 foot unit as a potential resource to help address treatment of switchgrass infestations more efficiently. A demonstration of this technology was held October 3, 2011 at the ODOT headquarters in Oklahoma City. This was part of an ongoing effort to acquaint ODOT maintenance administrators with the potential benefits of acquisition of similar units for vegetation management in Oklahoma. Timely mowing in conjunction with any wiping effort is also important to achieve acceptable control levels of switchgrass.

Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species of summer annual broadleaf weed species that continue to show increased populations along roadsides. They were reported as severe problems in Grant County and other maintenance units in Division Four (Canadian County, Kingfisher County, Payne County, I-35 Guthrie, and I-35 Tonkawa). Of the two related species, Palmer amaranth is more difficult to control and herbicide resistance has been documented in Oklahoma. The OSU-RVM Program is in the process of exploring control options for this specific weed problem and will continue to work with ODOT divisions regarding control options. Currently, the diglycolamine salt of dicamba (Vanquish®) will control most

broadleaf weeds including some pigweeds and is recommended in OSU publication, E-958. OSU-RVM research (*Final Report Concerning 2004 – 2006 Evaluations of New Herbicide Formulations For Potential Integration Into Existing ODOT Roadside Vegetation Management Programs*) identified post-emergent applications of Vanquish® 8 fl oz + Overdrive® 4 oz /acre would be a highly effective broadleaf weed control treatment including control of Palmer amaranth. Post-emergent, broadcast treatments with hormone type herbicides (example Vanquish®, diglycolamine salt of dicamba) or other volatile herbicides are deemed risky for summer applications unless substantial precautions regarding use are taken (OSU publication, E-958, Suggested Herbicides for Roadside Weed Problems, September 2011). A new herbicide, aminocyclopyrachlor (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs,* December 2011), may have application in Division Four for suppression of Palmer amaranth and control of other pigweed species. As of this writing, ODOT was working with OK DCS (Oklahoma Department of Central Services) to include Perspective® (aminocyclopyrachlor + chlorsulfuron) as an addendum item to the 2012 herbicide contract. Perspective® in combination with other herbicides has shown promise for ODOT use as a low-volatility summer post-emergent application for pigweed control.

Transline® was used for spot treatment of musk thistle and miscellaneous broadleaf weeds in Grant, Kay and Kingfisher Counties (Table 5b). The counties using Transline® are reminded that the application rate is 6 – 10 ounces per acre. While application methods were not specified (backpack or broadcast), adherence to rates within the recommended rates are highly advised.

Division Four indicated they have 150 miles of cable-barrier within their division with an additional 50 miles being proposed for addition in 2012. This area or “footprint” surrounding the cable barrier is susceptible to multiple weed invasions. Division Four maintenance administrators indicated they wish to maintain these areas as bare-ground. OSU-RVM has identified several promising treatments (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs,* December 2011). This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. In the cable barrier footprint, the use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy and broadleaf weeds, including pigweeds. This treatment should be confined to the cable-barrier footprint only. It is not known if 100% season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional treatments of Roundup Pro Conc.® (or generic equivalent) may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement. In the event Division Four would desire bermudagrass cover under cable-barriers to prevent erosion, the application of prodiamine (Prodiamine 65 WDG®) made in an application window of December – January would help provide control of early germinating kochia and later germinating summer annuals including pigweeds. The application rate of 2.3 lbs of actual product per acre per year in a 20 to 40 gallon per acre carrier rate, is the recommended from OSU-RVM. This treatment, if made singly without other herbicide tank components, can be made without the addition of drift

control additives (ODOT Policy Directive No. D-504-1, effective date 01-31-2011). If Prodiamine 65 WDG® is made in a tank mix with Landmaster BW® or any other post-emergent herbicide, it must contain a drift control additive such as Garrco, Control™. Prodiamine is not compatible with Agrisolutions Corral® Poly, sold by Winfield Solutions.

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Table 5a. Summary of Division Four Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Garfield 324 LM	Landmaster® BW + Milestone VM® + AMS[4] - (G)	2 pt+4 oz + not reported	1082.5	43.3 A 30 GPA	03-12-11 03-25-11	02-25 04-15
Grant 304 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +4.7 lb	879.4	43.3 A 30 GPA	03-21-11 04-01-11	02-25 04-15
Kay 380 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +4 lb	822.7	43.3 A 30 GPA	03-13-11 03-31-11	02-25 03-31
Kingfisher 255 LM + Canadian LM (not reported)	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +4 lb	1802	43.3 A 30 GPA	03-09-11 03-18-11	02-25 03-31
Logan 330.7 LM	Landmaster® BW + Milestone VM® + AMS - (F)	2 pt+4 oz +5.1 lb	866	43.3 A 30 GPA	03-10-11 03-18-11	02-25 03-31
Noble 277.9 LM	Landmaster® BW + Milestone VM® - + AMS - (G)	4 pt+4 oz +5.1 lb	692.8	43.3 A 30 GPA	03-15-11 03-24-11	02-25 03-31
Payne 340 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+2 oz +4.7 lb	817	43.3 A 30 GPA	03-12-11 04-01-11	02-25 03-31
Guthrie I-35 188 LM 30 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2pt+4 oz +5.1lb	519.6	43.3 A 30 GPA	03-15-11 03-24-11	02-25 03-31
Tonkawa I-35 84 LM 30 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+ 4 oz + 4.6 lb	649.5	43.3 A 30 GPA	03-23-11 03-28-11	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8131.5			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 5b. Summary of Division Four Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Garfield 324 LM	Roundup Pro Conc® + Oust XP® - (spot treatment of johnsongrass) - (F)	16 oz+1 oz	216.5	43.3 A 30 GPA	05-26-11 06-22-11	04-10 06-30
	Summer broadcast suspended due to drought		0			
Grant 304 LM	Ranger Pro® + Outrider® - (F)	19 oz+1.3 oz	862.9	43.3 A 30 GPA	06-11-11 06-13-11	04-20 08-15
	Ranger Pro® + Outrider® + Perspective® - (F)	19 oz+1.3 oz+4.75 oz	38.0	43.3 A 30 GPA	06-06-11 06-06-11	04-20 08-15
	Transline® + Surfactant - (Musk thistle) – (G)	25.6 oz+12.8 oz	12.5	Spot treatment	05-10-11 05-12-11	03-01 05-10
	Arsenal® + Ranger Pro® + surf - (bare ground) - (F)	2 qts+1 gal +0.5 qt	0.5	Spot treatment	06-09-11 06-30-11	05-01 09-15
Kay 380 LM	Ranger Pro® + Oust XP® - (F)	19 oz+1 oz	606.2	43.3 A 30 GPA	05-31-11 06-23-11	05-10 06-15
	Transline® + Surfactant – (Musk thistle) – (G)	12 oz	0.75	Spot treatment	05-09-11 05-11-11	03-01 05-10
Kingfisher 255 LM + Canadian LM (not reported)	Summer broadcast suspended due to drought		0			
	Arsenal®+ Krovar® + Surfactant – (bare ground) - (G)	.6 gal+12 lb+16 oz	36	Spot treatment	03-31-11 8-04-11	05-10 09-15
	Transline® + Surfactant - (Musk thistle) – (G)	6.5 oz	1	Spot treatment	05-03-10 05-03-10	03-01 05-10

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 5b. (Continued) Summary of Division Four Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Logan 330.7 LM	Summer broadcast suspended due to drought		0			05-01 06-15
Noble 277.9 LM	Ranger Pro® + Oust XP® - (F)	19 oz+1 oz	779.4	43.3 A 30 GPA	05-31-11 06-15-11	05-10 06-15
Payne 340 LM	Summer broadcast suspended due to drought		0			
	Transline® (Musk thistle) - (G)	2 oz	Not stated	Spot treatment	05-16-11 05-17-11	03-01 05-10
	Ranger Pro + Oust XP (Bare ground) - (G)	3.84 gal + 16 oz	Not stated	Spot treatment	Not reported	05-10 09-15
Guthrie I-35 188 LM 30 MCB	Summer broadcast suspended due to drought		0			
Tonkawa I-35 84 LM 30 MCB	Ranger Pro® + Oust XP® - (G)	18 oz+1.1oz	562.9	43.3 30 GPA	05-31-11 06-03-11	05-10 06-15
	Ranger Pro® (Bare ground) - (G)	2.5 gal	10	Spot treatment	08-01-11 08-05-11	05-10 09-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			3065.9 46.5 0			Division Total Treated Acres[7] 11243.9

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Four, from Tables 5a and 5b.

7.0 SURVEY OF DIVISION FIVE HERBICIDE PROGRAMS

7.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 13 of 13 maintenance facilities in Division Five responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Five headquarters on October 25, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Five herbicide usage is summarized in Table 6a and 6b. The winter annual weed control program in Division Five (Table 6a) generally consisted of a glyphosate/2,4-D (Landmaster BW® or Campaign®) + AMS (ammonium sulfate) broadcast treatment or a Campaign®/Landmaster BW®+ aminopyralid (Milestone VM®) + AMS (ammonium sulfate) broadcast treatment. Treatment rates were mostly 2.4 – 2.5 pints Landmaster BW® (or Campaign®) +/- 4 oz Milestone VM®/A with varying rates of AMS. Hydro I-40 East reported using 3.0 pints of Landmaster BW® + 4.0 oz Milestone VM®. Division Five has opted to use low rates of AMS (equivalent to 7.75 – 8.75 lbs/100 gal water). OSU-RVM recommended AMS rate is 5.1 pounds of AMS/A (equivalent to 17 pounds AMS/100 gallons of water/30GPA). All maintenance units rate control as “good”. All maintenance units applied this treatment within recommended application windows. Elk City I-40 maintenance unit was the test site for cable-barrier treatments with prodiamine with limited success (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, Annual Report, December 2011).

Division Five’s summer broadcast weed control program (Table 6b) consisted mainly of treatments of Roundup Pro Concentrate® (glyphosate) + Oust XP® (sulfometuron), Roundup Pro Concentrate® + Oust Extra® (sulfometuron + metsulfuron-methyl), MSMA alone or in combination with other herbicides. All summer weed control broadcast applications were rated as “good”. Additional miscellaneous applications included applications for cable barrier weed control and bare ground situations with multiple combinations of various herbicides.

Specific weed problems that were reported as not being controlled to expectations included pigweed species (*Amaranthus species*), kochia (*Kochia scoparia*), switchgrass (*Panicum virgatum*), johnsongrass (*Sorghum halepense*) and sunflower (*Helianthus species*).

7.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and Division herbicide meeting comments indicate that Division Five has been generally satisfied with the overall achievement goals of their broadcast herbicide applications. We would recommend that Division Five continue with the winter weed control broadcast application of Landmaster BW® and Milestone VM® as the reported results were satisfactory. Campaign® (Monsanto Company) stocks should be completely used up and replaced in all Division 5 maintenance units in 2012. Where applicable, we recommend Division Five continue the use of Milestone VM® as an additional component in the winter weed control tank mix for pre-emergent broadleaf

weed control. Some county maintenance units used Milestone VM® as an extra herbicide component of the winter weed control tank mix. Those that did benefited from timely late-March to early-April rains, resulting in 4 – 5 months of selective pre-emergent broadleaf weed control. Unfortunately, Milestone VM® does not provide pre-emergent control of kochia or pigweed.

The drought conditions that involved most if not all of Division Five (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklahoma_south-central_u.s, Nov. 30, 2011) maintenance units had significant effects on rainfall needed for summer weed control broadcast herbicide application (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s , Nov. 30, 2011). The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments. The OSU-RVM Program supported decisions made by ODOT Maintenance Divisions to suspend or abbreviate broadcast summer treatments. The Division Five decisions were made after joint consultations between the maintenance headquarters and the specific county maintenance unit's supervisors. Table 6b shows the counties that made decisions to suspend or abbreviate summer broadcast treatments. Some of those counties that suspended summer broadcast treatments spot treatments and site-specific vegetation control options. Overall, the cumulative total of acres treated for 2011 were 31.6 percent lower than cumulative totals for 2010 (*2010 ODOT Herbicide Program Report*, December 30, 2010). The majority of the acreage reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

For summer weed control broadcast applications in Division Five counties where previously Oust XP® was utilized, we continue to recommend they utilize DuPont's blended product Oust Extra® (ingredients sulfometuron and metsulfuron). Division Five maintenance administrators indicated some maintenance units were in the process of expending existing stocks of Oust XP® and would switch to Oust Extra® in 2012. The Oust Extra® applied at 1.5 oz/A should deliver enough metsulfuron to provide a widened spectrum of miscellaneous broadleaf weed control (see label, http://www.cdms.net/LDat/ld6BP006.pdf January, 2012). This rate will also provide a phytotoxicity safety level that Division Five administrators want. Use of Oust Extra® at 1.5 oz/A will only increase the cost per acre by approximately $1.47. We recommend that Division Five modify their summer broadcast treatment to utilize an Oust Extra® program for controlling johnsongrass and other labeled broadleaf weeds. Those maintenance units already applying Milestone VM® as a tank mix component in their winter annual weed control treatment should consider staying with Oust XP® as the metsulfuron provided by the Oust Extra® may not provide additional annual broadleaf weed control.

Division Five personnel continue to report additional difficulty with pigweed. Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They were reported as severe problems in other maintenance units in several ODOT Maintenance Divisions. Of the two related species, Palmer amaranth is more difficult to control. The OSU-RVM is in the process of exploring control options (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011) for this specific weed problem and will continue to work with ODOT divisions regarding control options. A new

herbicide, aminocyclopyrachlor may have application in Division Five for suppression of Palmer amaranth and control of other pigweed species. As of this writing, ODOT was working with the Oklahoma Department of Central Services to include Perspective® (aminocyclopyrachlor + chlorsulfuron) as an addendum item to the 2012 herbicide contract. Perspective® in combination with other herbicides has shown promise for ODOT use as a low-volatility summer post-emergent application for pigweed control.

Cable-barrier cross-over prevention systems in Division Five are particularly prone to infestation by these *Amaranthus* weed species. Division Five maintenance administrators acknowledged approximately 87 miles of cable-barrier within their area of responsibility. Division Five maintenance administrators indicated they wish to maintain these areas as bare-ground. OSU-RVM has identified several promising treatments (see *Evaluation Of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011). This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 25 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. This treatment should be confined to the cable-barrier footprint only. It is not known if complete season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February or early March treatment, additional treatments of Roundup Pro Conc.® (or generic equivalent) may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement.

As indicated in earlier text, the herbicide prodiamine was used as an experimental Division Five cable-barrier treatment in 2011 with limited success. This was discussed in the *2011 OSU-RVM report Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*.

Tillman County reported additional difficulty with switchgrass (*Panicum virgatum)*. Unfortunately, current recommended summer broadcast treatments for johnsongrass (*Sorghum halepense*) while controlling johnsongrass do not control switchgrass. These treatments allow switchgrass to proliferate. Current recommendations for herbicide wiper applications using glyphosate (that are effective) can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2011. Wiper applications are recommended to be made in two perpendicular directions to encourage treatment effect. There must be adequate height differential between weed target and desired grass to insure only switchgrass gets the treatment while direct exposure to bermudagrass is avoided. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species. OSU-RVM has identified the GrassWorks™ (http://weedproblems.com/, Nov. 30, 2011) weed wiper 14 foot unit and 24 foot unit as a potential resource to help address treatment of switchgrass infestations more efficiently. A demonstration of this technology was held October 3, 2011 at the ODOT headquarters in Oklahoma City. This was part of an ongoing effort to acquaint ODOT maintenance administrators with the potential benefits of acquisition of similar units for vegetation management in Oklahoma. Timely mowing in conjunction with any wiping effort is also important to achieve acceptable control levels of switchgrass.

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Table 6a. Summary of Division Five Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment --- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load --- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Beckham 310 LM	Campaign® + Milestone VM® + AMS[4] - (G)	2.4 pt+4.8 oz+9.5 lb	986	49.15 A 40 GPA	03-15-11 03-28-11	02-25 04-15
Blaine 350 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.2 lb	357.5	32.5 A 40 GPA	03-09-11 04-01-11	02-25 04-15
	Landmaster® BW + AMS - (G)	2.5 pt+3.2 lb	568.75	32.5 A 40 GPA	03-09-11 04-01-11	02-25 04-15
Custer 306 LM	Landmaster® BW + AMS - (G)	2.5 pt+3.1 lb	715	32.5 A 40 GPA	03-02-11 03-28-11	02-25 04-15
Dewey 277 LM	Landmaster® BW + AMS - (G)	2.5 pt+3.14lb	715	32.5 A 40 GPA	03-03-11 03-28-11	02-25 04-15
Greer 242 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.2 lb	600	32.5 A 40 GPA	03-09-11 04-05-11	02-25 04-15
Harmon 205 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.4 pt+4 oz+3.4 lb	607.5	40.5 A 40 GPA	03-15-11 03-31-11	02-25 04-15
Jackson 303 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.4 lb	810	40.5 A 40 GPA	03-12-11 04-01-11	02-25 04-15
Kiowa 405.9 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.2 lb	920	40 A 40 GPA	03-10-11 03-31-11	02-25 04-15
Roger Mills 300 LM	Landmaster® BW + AMS - (G)	2.4 pt	771.5	42 A 40 GPA	03-14-11 03-25-11	02-25 04-15
Tillman 298 LM	Campaign® + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.4 lb	736.1	50 A 40 GPA	03-09-11 03-15-11	02-25 04-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 6a. (Continued) Summary of Division Five Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Washita 350 LM	Campaign® + AMS - (G)	2.5 pt+3.4 lb	455	32.5 A 40 GPA	03-21-11 03-31-11	02-25 04-15
	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.4 lb	877.5	32.5 A 40 GPA	03-21-11 03-31-11	02-25 04-15
Elk City I-40 W 292.2 LM 30 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.5 lb	1118	43 A 40 GPA	03-04-11 03-24-11	02-25 04-15
	Prodiamine 65WDG® (cable barrier) (F)	2.3 lbs	43	43 A 40 GPA	02-17-11 02-17-11	02-25 03-01
Hydro I-40 E 315 LM 50 MCB	Landmaster BW® + Milestone VM® + AMS - (G)	3.0 pt+4 oz+3.4 lb	975	32.5 A 40 GPA	03-05-11 03-28-11	02-25 04-15
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			11255.85			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 6b. Summary of Division Five Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Beckham 310 LM	MSMA – (sandbur)(G)	1.25 qt	413	48 A 40 GPA	06-06-11 06-09-11	05-10 07-15
	Summer broadcast suspended due to drought		0			
Blaine 350 LM	Roundup Pro Conc® + Oust XP - (G)	12 oz+0.7 oz	325	32.5 A 40 GPA	05-03-11 06-02-11	05-01 06-15
	Roundup Pro Conc® + OustExtra® - (G)	12 oz+2 oz	195	32.5 A 40 GPA	06-09-11 06-20-11	05-01 06-15
	MSMA - (G)	2 qt	130	32.5 A 40 GPA	04-28-11 05-03-11	05-10 07-15
	MSMA + Roundup Pro Conc® (G)	2 qt+12 oz	65	32.5 A 40 GPA	06-23-11 07-05-11	05-10 07-15
	Aquastar® (aquatic) - (G)	1%	15	Aquatic spot treatment	04-05-11 07-12-11	05-01 09-15
	Arsenal® + Roundup Pro Conc® (bare ground) - (G)	1 oz+1 oz/100 gal	10	Spot treatment Patchen shoulder crack/edge treatment	05-30-11 06-08-11	05-10 09-15
	Arsenal® + Roundup Pro Conc® + Oust XP® (bare ground) - (G)	1 gal+3 gal+12 oz/100 gal	50	Patchen shoulder crack/edge treatment	05-26-11 05-27-11	05-10 09-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 6b. (Continued) Summary of Division Five Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Blaine(continued)	Vanquish®(G)	23 oz	65	32.5 A 40 GPA	04-28-11 06-03-11	03-15 06-30
	Vanquish® + Roundup Pro Conc® - (G)	23 oz+12 oz	97.5	32.5 A 40 GPA	06-01-11 06-04-11	03-15 06-30
	Vanquish® + MSMA - (G)	23 oz+2 qt	260	32.5 A 40 GPA	06-22-11 07-06-11	03-15 06-30
Custer 306 LM	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® + OustExtra® - (G)	9.8 oz+1.5 oz	227.5	32.5A 40 GPA	05-18-11 06-05-11	05-01 06-15
	MSMA + OustExtra® - (G)	1.5 qt+2 oz	260	32.5A 40 GPA	06-22-11 07-06-11	05-10 07-15
	Roundup Pro Conc® + OustExtra® + Vanquish®-(G)	9.8 oz+1.5 oz+1.8 qt	162	32.5A 40 GPA	05-16-11 05-17-11	05-01 06-15
Dewey 277 LM	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® (bare ground) - (G)	20 oz	32.5	32.5A 40 GPA	06-01-10 06-24-10	05-01 09-15
	Roundup Pro Conc® + Banvel® + Pendulum® (bare ground) - (G)	1.3 qt+3.3 oz+13.3 oz	6	Spot treatment	03-15-11 03-23-11	03-15 04-07
	Roundup Pro Conc® + Pendulum® (bare ground) - (G)	2%+2 pt	8	Spot treatment	07-01-11 07-19-11	05-01 09-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*

Table 6b. (Continued) Summary of Division Five Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Greer 242 LM	Roundup Pro Conc® + Oust XP® - (G)	12 oz+0.5 oz	240	32.5A 40 GPA	06-01-11 06-07-11	05-10 06-15
	MSMA - (G)	2 qt	243	32.5A 40 GPA	06-09-11 06-30-11	05-10 07-15
Harmon 205 LM	Summer broadcast suspended due to drought conditions		0			
	MSMA - (G)	2 qt	243	40.5A 40 GPA	06-09-11 06-30-11	05-10 07-15
Jackson 303 LM	Summer broadcast partially suspended due to drought conditions					
	Roundup Pro Conc® + OustExtra® - (G)	10 oz+1.58 oz	486	40.5A 40 GPA	06-05-11 06-15-11	05-10 06-15
Kiowa 405.9 LM	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® + Oust XP - (G)	10 oz+0.5 oz	80	40A 40 GPA	05-26-11 05-31-11	05-10 06-15
	Roundup Pro Conc® + Milestone VM® - (G)	1%+4.27 oz	7.5	Spot treatment	04-01-11 04-05-11	02-25 04-15
	Roundup Pro Conc® (bare ground)- (G)	2%	12.5	Spot treatment	07-18-11 08-08-11	05-01 09-15
Roger Mills 300 LM	Summer broadcast suspended due to drought conditions		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 6b. (Continued) Summary of Division Five Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Roger Mills(continued)	Arsenal® + Roundup Pro Conc® (bare ground)- (G)	2%+1%	20	Spot treatment	05-19-11 not reported	05-10 07-30
Tillman 298 LM	Summer broadcast suspended due to drought conditions		0			
Washita 337 LM	Summer broadcast suspended due to drought conditions		0			
	MSMA - (G)	2 qt	32.5	32.5A 40 GPA	07-11-11 07-11-11	05-10 07-15
Elk City I-40 W 292.2 LM 30 MCB	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® (bare ground) - (G)	2%	43	Spot treatment	06-10-11 06-28-11	05-1 09-15
Hydro I-40 E 315 LM 50 MCB	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® + Oust XP - (G)	10 oz+0.5 oz	148	32.5A 40 GPA	05-17-11 06-02-11	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			3680 182 15			Division Total Treated Acres[7] 15132.85

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Five, from Tables 6a and 6b.

8.0 SURVEY OF DIVISION SIX HERBICIDE PROGRAMS

8.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 9 of 9 maintenance facilities in Division Six responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Six headquarters on October 25, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Six was devoid of cable barrier crossover prevention systems at the time of this writing. However, weed species identified as problematic are also those noted in cable barrier systems in other ODOT divisions.

Division Six herbicide usage is summarized in Table 7a and 7b. The winter annual weed control program in Division Six (Table 7a) consisted of a glyphosate alone application at or near a 1.0 quart/A rate. All maintenance units reported not using any AMS in their winter weed control applications. Due to the relatively inexpensive price of AMS ($0.96/A), we recommend every maintenance unit add AMS to all winter weed control applications involving glyphosate. All maintenance units rated weed control as "good." Division Six maintenance units varied in making broadcast applications within recommended application windows. Due to extreme drought conditions and the suspension or elimination of the summer weed control program multiple summer weed species were mentioned but, were not the result of herbicidal failure.

Specific weeds mentioned were pigweed species (*Amaranthus species*), kochia (*Kochia scoparia*), johnsongrass (*Sorghum halepense*) and field sandbur (*Cenchrus species*). If normal rainfall patterns would return in 2012 and replace extreme drought conditions, summer treatments would resume.

8.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and division herbicide meeting comments indicate that Division Six has been generally satisfied with the overall achievements of their broadcast herbicide applications for winter weed control (Table 7a). This application of the 32 oz/A rate of glyphosate has been effective for Division Six, however we recommend that Division Six return to the use of Landmaster BW® (glyphosate + 2, 4-D) at a 2 – 3 pint/A rate. Later applications of the 32 oz glyphosate/A use rate can injure bermudagrass that may have broken dormancy earlier than expected. The 32 oz/A rate is recommended as a remediation treatment for rights-of-way that are infested with annual ryegrass (synonym Italian ryegrass) [*Lolium perenne ssp. multiflorum* synonymous with Lolium multiflorum]. OSU-RVM publication, E-958 (*Suggested Herbicides for Roadside Weed Problems*, September 2011) specifically indicates this type of treatment has special and specific caveats for its usage. Division Six maintenance administrators indicated they would support a return to Landmaster BW® (+/- Milestone VM®) winter annual weed control program in 2012.

Extreme summer drought conditions were exhibited in all locations of Division Six areas where maintenance expectations involve vegetation management (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklah

oma_south-central_u.s, Nov. 30, 2011). All maintenance units lacked adequate rainfall needed for summer weed control broadcast herbicide application (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s , Nov. 30, 2011). The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments. The OSU-RVM Program supported the suspension or abbreviation of broadcast summer treatments. Maintenance unit supervisors implemented the suspension decision made by the Division Engineer and Division Maintenance Manager. Only Alfalfa County was allowed to make limited broadcast applications before total suspension of summer programs was implemented. Table 7b shows the counties that suspended or abbreviated summer broadcast treatments. Some of those counties utilized the time savings for spot treatments and site-specific vegetation control options. The cumulative total of acres treated for 2011 were 41.8 percent lower than cumulative totals for 2010 (see *2010 ODOT Herbicide Program Report*, December 2010). The majority of the acreage reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

For future summer weed control broadcast applications in Division Six, we continue to recommend use of DuPont's product Oust Extra®. This is a blend of sulfometuron (Oust XP®) and metsulfuron (Escort XP®). The Oust Extra® applied at 1.5 oz/A should deliver the same amount of sulfometuron as Oust XP® at a 1.0 oz/A rate and deliver enough metsulfuron (Escort XP®) to give good control of johnsongrass. This treatment will also widen the spectrum of various broadleaf weeds being controlled (see label http://www.cdms.net/LDat/ld6BP006.pdf, January 2012). Use of Oust Extra® will only increase cost per acre by approximately $1.47 when compared to an Oust XP® (1.0 oz/A) application. We recommend that Division Six use an Oust Extra® program for controlling the combination of johnsongrass (*Sorghum halepense*) with other labeled broadleaf weeds. Those maintenance units that may use Milestone VM® (aminopyralid) as a tank mix component in their winter annual weed control treatment do not need the additional metsulfuron in Oust Extra®. In those areas where field sandbur continues to persist, continued use of Plateau® + moderate rates of glyphosate (0.38 lb. a.i./A) should provide an acceptable reduction in sandbur prevalence along with acceptable johnsongrass control.

Division Six personnel reported additional difficulty with pigweed. Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They have been reported as a severe problem in other maintenance units in several ODOT Maintenance Divisions. Of the two related species, Palmer amaranth is more difficult to control and herbicide resistance has been documented. The OSU-RVM program is continuing the process of exploring pigweed control options (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011). A new herbicide, aminocyclopyrachlor, may have application in Division Six for suppression of Palmer amaranth and control of other pigweed species. Demonstration areas were treated with this new active ingredient in Alfalfa County. As of this writing, ODOT was working with the Oklahoma Department of Central Services to include Perspective® (aminocyclopyrachlor + chlorsulfuron) as an addendum item to the 2012 herbicide contract. Perspective® in combination with other herbicides has shown promise for ODOT use as a low-volatility summer post-emergent application for pigweed control.

Vanquish® (diglycolamine salt of dicamba) will control most broadleaf weeds including some pigweeds and is recommended in OSU publication E-958. OSU-RVM research identified post-emergent applications of Vanquish® 8 fl oz + Overdrive® 4 oz /A would be a highly effective broadleaf weed control treatment including control of Palmer amaranth (see *Final Report Concerning 2004 – 2006 Evaluations of New Herbicide Formulations For Potential Integration Into Existing ODOT Roadside Vegetation Management Programs*). Extreme caution is advised when using Vanquish® for summer weed control around sensitive agricultural crops. High summer temperatures increase the risk of Vanquish® drift due to increased volatility with increasing temperature. Future research regarding more efficacious control of pigweed species is being explored.

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Table 7a. Summary of Division Six Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Alfalfa 297 LM	MadDog® - (G)	32 oz	750	55 A 30 GPA	3-10-11 3-30-11	03-05 04-05
Beaver 352 LM	MadDog® - (G)	27.8 oz	1151.4	55 A 30 GPA	3-23-11 4-18-11	03-05 04-05
Cimarron 414 LM	Honcho Plus® - (G)	32 oz	600	43 A 30 GPA	4-05-11 4-12-11	03-05 04-05
	MadDog® - (G)	32 oz	214	43 A 30 GPA	4-12-11 4-17-11	03-05 04-05
Ellis 184 LM	Honcho Plus® - (G)	32 oz	263	50 A 30 GPA	3-23-11 3-27-11	02-25 04-15
	MadDog® - (G)	32 oz	749.7	50 A 30 GPA	3-27-11 4-08-11	02-20 04-05
Harper 314 LM	MadDog® - (G)	32 oz	834.7	57 A 30 GPA	3-18-11 4-01-11	03-05 04-05
Major 334 LM	Honcho Plus® - (G)	32 oz	350	50 A 30 GPA	3-15-11 3-25-11	03-05 04-05
	MadDog® - (G)	32 oz	550	50 A 30 GPA	3-25-11 4-01-11	03-05 04-05
Texas 500 LM	MadDog® - (G)	32 oz	1550	50 A 30 GPA	3-23-11 ?	03-05 04-05
Woods 275 LM	Honcho Plus® - (G)	32 oz	500	50 A 30 GPA	3-15-11 4-07-11	03-05 04-05
	MadDog® - (G)	32 oz	50	50 A 30 GPA	3-15-11 3-15-11	03-05 04-05
Woodward 354 LM	MadDog® - (G)	32 oz	994.8	48 A 30 GPA	3-11-11 4-13-11	02-20 04-05
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8557.6			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 7a. (Continued) Summary of Division Six Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Texas 500 LM	MadDog® - (G)	32 oz	1550	50 A 30 GPA	3-23-11 ?	03-05 04-05
Woods 275 LM	Honcho Plus® - (G)	32 oz	500	50 A 30 GPA	3-15-11 4-07-11	03-05 04-05
	MadDog® - (G)	32 oz	50	50 A 30 GPA	3-15-11 3-15-11	03-05 04-05
Woodward 354 LM	MadDog® - (G)	32 oz	994.8	48 A 30 GPA	3-11-11 4-13-11	02-20 04-05
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8557.6			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 7b. Summary of Division Six Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Alfalfa 297 LM	Roundup Pro Conc® + Oust Extra® - (G)	13 oz+1.5 oz	50	50 A 30 GPA	6-10-11 6-10-11	05-20 06-30
	Honcho Plus® + Oust Extra® - (G)	16 oz+1.5 oz	350	50 A 30 GPA	6-10-11 6-28-11	05-20 06-30
	Honcho Plus® + Oust Extra® + Perspective® - (G)	16 oz+1.5 oz+4.75 oz	34	50 A 30 GPA	6-22-11 6-22-11	05-20 06-30
Beaver 352 LM	Summer broadcast suspended due to drought conditions		0			
Cimarron 414 LM	Summer broadcast suspended due to drought conditions		0			
	Roundup Pro Conc® + Arsenal® - (G)	2%+1%	6	Spot treatment	5-16-11 6-28-11	05-20 09-15
Ellis 184 LM	Summer broadcast suspended due to drought conditions		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80–100, Fair=70– 79, Poor=0-69. [5]Recommended treatment window, OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Six, from Table 6a and 6b.

Table 7b. (Continued) Summary of Division Six Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Performance Good (G), Fair (F) or Poor (P)[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Harper 314 LM	Summer broadcast suspended due to drought conditions		0			
Major 334 LM	Summer broadcast suspended due to drought conditions		0			
	Banvel® (Musk thistle) - (G)	1 qt	3	Spot treatment	5-06-11 6-01-11	02-25 08-10
Texas 500 LM	Summer broadcast suspended due to drought conditions		0			
	MadDog® (G)	2%	150	Spot treatment	4-20-11 5-05-11	05-20 06-30
	MadDog® + Arsenal® - (G)	2%+1%	125	Spot treatment	7-28-11 8-03-11	05-20 08-15
Woods 275 LM	Summer broadcast suspended due to drought conditions		0			
Woodward 354 LM	Summer broadcast suspended due to drought conditions		0			
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			437 275 0			Division Total Treated Acres[7] 9269.6

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80–100, Fair=70– 79, Poor=0-69. [5]Recommended treatment window, OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Six, from Table 7a and 7b.

9.0 SURVEY OF DIVISION SEVEN HERBICIDE PROGRAMS

9.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 of 10 maintenance facilities in Division Seven responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Seven headquarters on October 27, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Seven herbicide usage is summarized in Table 8a and 8b. The winter annual weed control program in Division Seven (Table 8a) generally consisted of a glyphosate + 2,4-D (Landmaster BW® or Campaign®) + AMS (ammonium sulfate) broadcast treatment or a Campaign®/Landmaster BW®+ aminopyralid (Milestone VM®) + AMS (ammonium sulfate) broadcast treatment. Treatment rates were mostly 2 pints Landmaster BW®/Landmaster BW® +/- 4 oz Milestone VM®/A with varying rates of AMS. The OSU-RVM recommended AMS rate is 5.1 pounds of AMS/A (equivalent to 17 pounds AMS/100 gallons of water/30GPA). Campaign® or Landmaster BW® rates were between 2 pts/A and 2.5 pts/A. All maintenance units rated control as “good”. Most maintenance units applied this treatment within recommended application windows. However, Ardmore Interstate and Caddo County reported application outside of recommended treatment windows. Those exceeding treatment windows may experience bermudagrass injury from the glyphosate component of this treatment applied to bermudagrass beginning to break dormancy. Caddo County reported applications for winter weed control into May which is an extremely late application.

Division Seven’s summer broadcast weed control program (Table 8b) consisted mainly of treatments of glyphosate (Roundup Pro Concentrate® or Ranger Pro®) + sulfosulfuron (Outrider®, a sulfonyl-urea herbicide that is less phytotoxic to bermudagrass and therefore, more forgiving if application rates deviate from recommended rates), or Ranger Pro® + imazapic (Plateau®).

Specific weed problems that were reported as not being controlled to expectations included pigweed species (*Amaranthus species*), and johnsongrass (*Sorghum halepense*). Personal observations from OSU-RVM personnel support reports that pigweed species (*Amaranthus species*) are presenting control issues in Division Seven cable barrier cross-over prevention systems.

9.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and division herbicide meeting comments indicate that Division Seven has been generally satisfied with the overall achievements of their broadcast herbicide applications. We would recommend that Division Seven continue with the winter weed control broadcast application of Landmaster BW® and Milestone VM® as the reported results were satisfactory. Campaign® will no longer be available as Monsanto Company has discontinued their product. Future applications for winter weed control should reflect the use of Landmaster BW® instead of Campaign®. Where applicable, we recommend Division Seven continue the use of Milestone VM® as an

additional component in the winter weed control tank mix for preemergent broadleaf weed control. However, Milestone VM® does not provide preemergent control of kochia or pigweed.

The drought conditions that involved most if not all of Division Seven (http://climate.ok.gov/index.php/climate/map/map_of_oklahoma_climate_divisions/oklahoma_south-central_u.s, Nov. 30, 2011) maintenance units had significant effects on rainfall needed for summer weed control broadcast herbicide applications. The lack of rainfall warranted suspension or abbreviation of summer broadcast treatments. The OSU-RVM Program supported decisions made by ODOT Maintenance Divisions to suspend or abbreviate broadcast summer treatments. The Division Seven decisions were made after joint consultations between the maintenance headquarters and the specific county maintenance unit's supervisors. Table 8b shows the counties that made decisions to suspend or abbreviate summer broadcast treatments. Some of those counties that suspended summer broadcast treatments utilized time for spot treatments and site-specific vegetation control options. Overall, cumulative total of acres treated for 2011 were 32.5 percent lower than cumulative totals for 2010 (see *2010 ODOT Herbicide Program Report*, December 30, 2010). The majority of the acreage reduction is attributable to suspension or abbreviation of summer weed control broadcast herbicide applications.

For summer weed control broadcast applications in Division Seven, OSU-RVM continues to recommend the use of Plateau® and Outrider® combined with glyphosate for summer johnsongrass control. Observations of broadleaf weed infestation in and along cable barrier cross-over systems were noted (OSU-RVM personnel personal observations, 2010). Division Seven indicated they have 35 - 40 miles of cable-barrier within their division with 12 more miles under establishment at the time of this writing.

Division Seven personnel continue to report additional difficulty with pigweed in other locations as well. Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They were reported as severe problems in other maintenance units in several ODOT Maintenance Divisions. Of the two related species, Palmer amaranth is more difficult to control and herbicide resistance has been documented in Oklahoma. The OSU-RVM program is in the process of exploring control options for this specific weed problem. These efforts are discussed in *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011. We will continue to work with ODOT divisions regarding control options. A new herbicide, aminocyclopyrachlor may have application in Division Seven for suppression of Palmer amaranth and control of other pigweed species. As of this writing, ODOT was working with OK DCS (Oklahoma Department of Central Services) to include Perspective® (aminocyclopyrachlor + chlorsulfuron) as an addendum item to the 2012 herbicide contract. Perspective® in combination with other herbicides has shown promise for ODOT use as a low-volatility summer post-emergent application for pigweed control. Currently, diglycolamine salt of dicamba (Vanquish®) will control most broadleaf weeds including some pigweeds and is recommended in OSU publication, E-958. Extreme caution is advised when using Vanquish® for summer weed control around sensitive agricultural crops. High summer temperatures exacerbate the problem of Vanquish® drift due to increased volatility at these times

Cable-barrier cross-over prevention systems in Division Seven are particularly prone to infestation by these weed species. Division Seven maintenance administrators indicated they wish to maintain these areas as bare-ground, but in some areas bermudagrass coverage would be desired to prevent foot-print erosion. OSU-RVM has identified several promising treatments for bare-ground (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs*, December 2011). This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. This treatment will likely not provide successful control of perennial grass species (common bermudagrass, switchgrass, silver bluestem) if total bare-ground is desired. This treatment should be confined to the cable-barrier footprint only. It is not known if true season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional treatments of Roundup Pro Conc.® (or generic equivalent) may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement.

In the event Division Seven would desire bermudagrass cover under cable-barriers to prevent erosion, the application of prodiamine (Prodiamine 65 WDG®) made in an application window of December – January would help provide control of early germinating kochia and later germinating summer annuals including pigweeds. The application rate of 2.3 lbs of actual product per acre per year in a 20 to 40 gallon per acre carrier rate, is the recommendation from the OSU-RVM program. This treatment, if made singly without other herbicide tank components, can be made without the addition of drift control additives (ODOT Policy Directive No. D-504-1, effective date 01-31-2011). If Prodiamine 65 WDG® is made in a tank mix with Landmaster BW® or any other post-emergent herbicide, it must contain a drift control additive such as Garrco, Control™. Prodiamine is not compatible with Agrisolutions Corral® Poly.

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Table 8a. Summary of Division Seven Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Caddo 530 LM	Landmaster® BW + Milestone VM® + AMS[4] - (G)	2 pt+4 oz +4.25 lb	1260	60 A 30 GPA	03-15-11 05-02-11	02-25 03-31
Carter 480 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz +5.1 lb	840	60 A 30 GPA	03-01-11 03-16-11	02-15 03-20
Comanche 500 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +5.1 lb	1300	50 A 30 GPA	03-01-11 03-16-11	02-15 03-31
Cotton 302.9LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +5.1 lb	750	50 A 30 GPA	03-01-11 03-19-11	02-15 03-20
Grady 488 LM	Campaign® + AMS - (G)	2 pt++3.4 lb	1190	70 A 25 GPA	03-01-11 03-23-11	02-25 03-31
Jefferson 250 LM	Campaign® + Milestone VM® + AMS - (G)	2 pt+4 oz +3.4 lb	768	70 A 25 GPA	03-01-11 03-23-11	02-15 03-20
Love 390 LM	Landmaster® BW + AMS - (G)	2 pt+2.7 lb	770	70 A 25 GPA	02-14-11 03-10-11	02-15 03-20
Murray 183 LM	Landmaster® BW + AMS - (G)	2 pt+ 4.25 lb	490	49 A 30 GPA	03-01-11 03-11-11	02-15 03-31
Stephens 200 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +3.4 lb	175	70 A 25 GPA	03-15-11 03-24-11	02-15 03-31
	Landmaster® BW + AMS - (G)	2 pt+ +3.4 lb	490	70 A 25 GPA	03-15-11 03-24-11	02-15 03-31
Ardmore Interstate 250 LM 25 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz +5.1 lb	600	60 A 30 GPA	03-10-11 04-01-11	02-15 03-20
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8633			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 8b. Summary of Division Seven Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Caddo 530 LM	Summer broadcast treatments suspended due to drought conditions		0			
Carter 480 LM	Summer broadcast treatments suspended due to drought conditions		0			
Comanche 500 LM	Partial summer broadcast treatment suspension due to drought conditions		0			
	Roundup Pro® + Plateau® - (G)	13 oz+4 oz	450	50 A 30 GPA	05-12-11 05-26-11	04-20 06-15
	Transline® + surfactant (musk thistle) - (G)	6 oz+1 qt	1	Spot treatment 100 GPA	04-12-11 05-26-11	03-01 05-31
Cotton 265 LM	Summer broadcast treatments suspended due to drought conditions		0			
	Roundup Pro Conc® + Oust XP® (bare ground) - (G)	2 qt+4 oz	12	Spot treatment 100 GPA	06-27-11 06-29-11	05-01 09-01
Grady 488 LM	Summer broadcast treatments suspended due to drought conditions		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 8b. (Continued) Summary of Division Seven Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Jefferson 250 LM	Summer broadcast treatments suspended due to drought conditions		0			
	Overdrive® + surfactant (musk thistle)- (G)	2 oz	1	Spot treatment 100 GPA	04-14-11 04-27-11	04-25 09-15
	Garlon 4® + oil (brush) - (G)	1 gal	3	Spot treatment 100 GPA	04-14-11 04-14-11	Year round
Love 390 LM	Summer broadcast treatments suspended due to drought conditions		0			
	Roundup Pro Conc®	48 oz	Not reported	Spot treatment	04-01-10 06-15-10	04-25 09-15
	Garlon 4® + oil	3:1	5	Spot treatment	04-01-11 On going	Year round
Murray 183 LM	Summer broadcast treatments suspended due to drought conditions		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems.*

Table 8b.(Continued) Summary of Division Seven Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100% Fair (F) 70-79% or Poor (P) 0-69%[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Stephens 200 LM	Ranger Pro® + Outrider® - (G)	13 oz+1 oz	280	70 A 25 GPA	06-03-11 06-06-11	04-20 06-30
	Roundup Pro Conc® (bare ground) - (G)	2%	36	Spot treatment	05-10-11 05-12-11	Growing season
Ardmore Interstate 250 LM 25 MCB	Summer broadcast treatments suspended due to drought conditions		0			
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			740 48 0			Division Total Treated Acres[7] 9421

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Seven, from Tables 8a and 8b.

10.0 SURVEY OF DIVISION EIGHT HERBICIDE PROGRAMS

10.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 of 11 maintenance facilities in Division Eight responded to the survey this year. In response to survey questions 1-13 no apparent concerns arose. A meeting was held at Division Eight headquarters on October 17, 2011 to solicit comments and opinions from division administrative personnel and county superintendents. The following observations and comments are made based on the surveys and meeting.

Division Eight herbicide usage is summarized in Table 9a and 9b. The winter annual weed control program in Division Eight (Table 9a) generally consisted of a glyphosate/2,4-D (Landmaster® BW®) + AMS (ammonium sulfate) broadcast treatment. Treatment rates were mostly 2 pints/A Landmaster® + 5.1 lbs of AMS. The OSU-RVM recommended AMS rate is 5.1 pounds/A of AMS (equivalent to 17 pounds AMS/100 gallons of water) when using a 30 GPA carrier rate. Landmaster® BW rates were mostly 2 pts/A with Rogers County reporting a 3 pt/A use rate. Out of the eleven county maintenance units reporting, only Rogers County reported control as “Fair”. All others reported winter weed control as “Good”. Rogers County reported applications for winter weed control eight weeks past the ending treatment date recommended by OSU-RVM recommendations. Pawnee County utilized Landmaster® BW (3.3 pts/A) + Banvel® (dicamba, 2 oz/A) + Prodiamine 65WDG® (prodiamine, 2.3 lbs/A) + AMS for an experimental cable-barrier preemergent and winter weed control application on selected lengths of rights-of-way easement.

Division Eight’s summer broadcast weed control program (Table 9b) consisted mainly of treatments of glyphosate (Roundup Pro Concentrate® or Ranger Pro®) + sulfometuron (Oust XP®) or glyphosate + Oust Extra® (sulfometuron + metsulfuron). Most summer weed control broadcast applications were rated as “Good”, however, Nowata County maintenance unit rated glyphosate (Ranger Pro®) + Oust XP® control as “Poor”. Washington County also rated Ranger Pro® + Oust Extra® as “Poor”. Lowering the glyphosate use rate during summer should only be undertaken if injury to common bermudagrass has been exceeding the acceptable phytotoxicity level. Otherwise, glyphosate rates in the moderate range of 0.6 - 0.75 lbs a.i./A should be used. Moderate rates of Ranger Pro® (0.6 – 0.75 lbs glyphosate a.i./A) are equivalent to 19.2 – 24 oz/A of Ranger Pro®/A, respectively. Low-end rates of glyphosate (13 – 15 oz/A Ranger Pro®) were used and contribute to lower control levels. OSU publication E-958, *Suggested Maintenance Practices for Roadside Weed and Brush Problems*, September 2011, recommends 16 – 24 oz/A of products such as Ranger Pro® (4 lbs a.i. glyphosate/gallon) when combined with Oust XP® or Oust Extra® for summer broadcast weed control. However, in Division Eight, growing conditions are highly favorable for weeds and necessitate higher glyphosate rates. Additional miscellaneous applications included applications for cable barrier weed control and bare ground situations with multiple combinations of various herbicides.

Specific weed problems that were reported as not being controlled to expectations included johnsongrass (*Sorghum halepense*) and Illinois bundleflower (*Desmanthus illinoensis*).

10.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Both survey results and division herbicide meeting comments indicate that Division Eight has been experiencing “Good” to “Fair” control of winter annual weeds with 2-3 pt/A broadcast rates of Landmaster® BW. In meetings with Division Eight maintenance administrators, increased rates of Landmaster® BW up to 3 pt/A were recommended. Treatment rates were increased from 2 pints per acre to 3 pints per acre to increase the amount of glyphosate and 2,4-D being delivered to target species. Increased rates were recommended to help control more annual grasses and to increase control of broadleaf weeds, specifically early germinating kochia and annual sowthistle as well. No reports of sow thistle problems were voiced in the 2010-2011 herbicide survey results. Only Rogers County reported “Fair” results with their Landmaster® BW application. While a 3 pt/A rate was used, resulting expectations may have been unreasonable due to the late application of this treatment by Rogers County. This late application targeted weeds that were more mature reducing herbicide effectiveness. Those applications were reported to be outside of the recommended treatment window by as much as eight weeks late. OSU-RVM strongly encourages Rogers County to make this application within recommended treatment windows and expects that desired control levels will be more acceptable while also reducing injury to common bermudagrass. Several other maintenance units reported winter annual weed control broadcast applications were made 1 - 2 weeks past the recommended application window as well. We strongly recommend that Division Eight maintenance units be aware of the need to make Landmaster® BW applications as a dormant bermudagrass application to avoid delaying green-up and weakening desirable species stands. Due to earlier than expected warm temperature responses from bermudagrass rights-of-ways, managers are encouraged to prepare for the need for possible Landmaster® BW applications up to 3-6 days earlier than normally expected. This recommendation counts on the monitoring capabilities of maintenance unit supervisors to recognize the need for application to only 100% dormant bermudagrass.

For summer weed control broadcast applications in Division Eight, those counties having previously used Oust XP®, we continue to recommend they utilize DuPont’s blended product Oust Extra®. Oust Extra® is a blend of sulfometuron (Oust XP®) and metsulfuron (Escort XP®) herbicides. Oust Extra® applied at 1.5 oz/A should deliver the same amount of sulfometuron as Oust XP® used at 1.0 oz/A and deliver a small amount of metsulfuron. To increase the amount of metsulfuron to levels where “good” control of Illinois bundleflower will be achieved (along with other miscellaneous broadleaf weeds), we recommend the addition of 0.5 oz/A of Escort XP® (metsulfuron) to the 1.5 oz/A Oust Extra® + glyphosate treatment. Use of Oust Extra® only adds an additional $1.47/A when compared to use of Oust XP® and 0.5 oz/A Escort XP® adds an additional $1.93/A. This treatment is intended to be combined with a glyphosate source. In Division Eight, the use of minimum glyphosate rates in the summer should only be used if common bermudagrass injury exceeds acceptable levels. Otherwise, glyphosate rates in the moderate range of 0.6 - 0.75 lbs a.i./A should be used. Moderate rates of Ranger Pro® (0.6 – 0.75 lbs glyphosate a.i./A) are equivalent to 19.2 – 24oz/A of Ranger Pro®/A, respectively.

We would strongly encourage maintenance units to make this application as a component of a minimum basic vegetation management program. Additionally, the counties reporting a missed opportunity for summer weed control treatments are also encouraged to make their applications to insure seasonal summer weed control and reduced mowing frequencies. The summer weed control application with 1.5 oz/A of Oust Extra® + 0.5 oz/A, Escort XP® + glyphosate should control Illinois bundleflower, other miscellaneous broadleaf weeds and provide johnsongrass (*Sorghum halepense*) control.

Divisional meetings with maintenance administrators included discussion of cable barrier cross-over systems in Division Eight. Survey results indicate approximately 86 miles of cable barrier in existence at the time of this writing. This area or "footprint" surrounding the cable barrier is susceptible to multiple weed invasions. As mentioned earlier, Division Eight experimented with cable-barrier treatments for preemergent weed control and winter weed control in the "foot-print" areas. The results of this trial are reported in the OSU-RVM report, *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs,* December 2011. Division Eight maintenance administrators indicated they may repeat the same preemergent application treatments in selected areas in 2012. Division Eight maintenance administrators indicated they may wish to maintain some of these "foot-print" areas as bare-ground. OSU-RVM has identified several promising treatments for bare-ground. This will minimize the need for mowers and maintenance crews to operate in this confined area where they have possible exposure to high speed traffic. The use of 3.0 oz Oust XP® + 8.0 oz Perspective® + 32 oz Roundup Pro Conc.® per acre should allow improved season-long control of annual grassy weeds and broadleaf weeds, including pigweeds. This treatment will not likely control perennial grass species such as common bermudagrass, switchgrass, and silver bluestem. This treatment should be confined to the cable-barrier footprint only. It is not known if true season-long control is an achievable goal from a single herbicide tank-mix application. If there are weeds that break through this late February treatment, additional treatments of Roundup Pro Conc.® (or generic equivalent) may be used in late July-August for follow-up weed control with low risk of herbicides volatilizing and moving off of the ODOT easement.

Additional cable-barrier research planned by OSU-RVM for 2012 will be shared with ODOT as information is gleaned from pending trials.

Table 9a. Summary of Division Eight Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Craig 320 LM	Landmaster® BW + AMS[4] - (G)[4]	2.5 pt+3.4 lb	550	50 A 30 GPA	04-07-11 04-16-11	02-25 03-31
Creek 350 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	800	50 A 30 GPA	03-17-11 03-31-11	02-25 03-31
Delaware 380 LM 6 MCB	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	650	50 A 30 GPA	03-15-11 03-23-11	02-25 03-31
Mayes 394 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	550	50 A 30 GPA	03-24-11 04-14-11	02-25 03-31
Nowata 248 LM	Landmaster® BW + AMS - (G)	2.1 pt+5.05 lb	550	50 A 30 GPA	04-07-11 04-13-11	02-25 03-31
Osage 426 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	878	50 A 30 GPA	03-02-11 04-05-11	02-25 03-31
Ottawa 275 LM 11 MCB	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	506	50 A 30 GPA	03-24-11 03-28-11	02-25 03-31
Pawnee 350 LM 9 MCB	Landmaster® BW + AMS - (G)	1.5 pt+5.1 lb	750	50 A 30 GPA	03-07-11 03-28-11	02-25 03-31
	Landmaster® BW + Banvel® + Prodiamine 65WDG® + AMS – (cable-barrier) - (F)	3.3 pt+2 oz+2.3 lb+5.1 lb	40	50 A 30 GPA	03-02-11 03-02-11	02-25 03-31
Rogers 466 LM	Landmaster® BW + AMS - (F)	3 pt+4 lb	750	50 A 30 GPA	04-07-11 06-01-11	02-25 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 9a.(Continued) Summary of Division Eight Herbicide Survey Results for Winter Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Winter Annual Treatment ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[3]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window[5], Beginning to Ending (mm-dd)
Tulsa Not reported LM 60 MCB	None reported		0			
Washington 281 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	700	50 A 30 GPA	03-16-11 04-06-11	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			6724			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 9b. Summary of Division Eight Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Craig 320 LM	Roundup Pro Conc® + OustXP® - (G)	13 oz+1 oz	600	50 A 30 GPA	06-15-11 06-30-11	05-10 06-15
Creek 350 LM	Roundup Pro Conc® + Oust XP® - (G)	13 oz+1 oz	600	50 A 30 GPA	06-12-11 06-28-11	05-10 06-15
Delaware 380 LM	Roundup Pro Conc® + Oust XP® - (G)	13 oz+1 oz	650	50 A 30 GPA	06-05-11 06-09-11	05-10 07-30
Mayes 412 LM	Ranger Pro® + Oust XP®- (G)	16 oz + 1 oz	675	50 A 30 GPA	05-16-11 06-06-11	05-10 07-30
Nowata 248 LM	Ranger Pro® + Oust XP®- (P)	13 oz+1.2 oz	500	50 A 30 GPA	5-21-10 6-01-10	05-10 07-30
Osage 426 LM	Ranger Pro® + Oust XP®- (G)	19 oz + 1 oz	873	50 A 30 GPA	06-22-11 07-11-11	05-10 07-30
	Ranger Pro® + Oust Extra® + Escort XP® - (G)	19 oz + 1.5 oz + 0.5 oz	96	50 A 30 GPA	07-05-11 07-06-11	05-10 07-30
Ottawa 275 LM	Roundup Pro Conc® + Oust Extra® - (G)	25.6 oz+1.6 oz	506	50 A 30 GPA	06-01-11 06-02-11	05-10 07-30
Pawnee 350 LM	None reported		0			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

Table 9b.(Continued) Summary of Division Eight Herbicide Survey Results for Johnsongrass, & Other Weed Control.

County/Interstate Unit, Lane Miles (LM)[1] & Miles of Cable Barrier Treated (MCB)[2]	Johnsongrass, Broadleaf & Other Treatments[3] ---------- Percent control Good (G) 80-100 Fair (F) 70-79 or Poor (P) 0-69[4]	Treatment Amount per Acre	Treated Acres	Acres (A) per Tank Load ---------- Carrier Rate in Gallons per Acre (GPA)	Actual Treatment Window, Beginning to Ending (mm-dd-yy)	E-958 Recommended Treatment Window Beginning - Ending[5] (mm-dd)
Rogers 466 LM	Roundup Pro Conc® (bare ground) - (G)	13 oz	Not reported	Spot treatment	06-07-11 07-08-11	05-01 09-01
Tulsa Not reported LM 60 MCB	None reported		0			
Washington 281 LM	Ranger Pro® + Oust Extra® - (P)	15 oz+1.5 oz	600	50 A 30 GPA	06-04-11 06-22-11	05-10 06-15
	Ranger Pro® + Oust Extra® + Escort XP® - (F)	15 oz+1.5 oz+0.16 oz	100	50 A 30 GPA	06-03-11 06-04-11	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			5200 0 0			Division Total Treated Acres[7] 11924

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Percent control rating given to treatment by ODOT unit for control of the weed species listed on the herbicide or combined tank mix herbicide labels, Good=80-100, Fair=70-79, Poor=0-69. [5]Recommended treatment window is from OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.[6]Total treated acreage for Johnsongrass as well as other individual treatments. [7]Cumulative total of all acres treated for weeds in Division Eight, from Tables 9a and 9b.

11.0 STATEWIDE SUMMARY OF ODOT HERBICIDE PROGRAM RESULTS

Broadcast herbicide spray applications for weed control by ODOT maintenance divisions continued to be somewhat constrained in 2011. This was due to limited availability of funds as well as to severe drought in certain areas of Oklahoma. The per-acre mowing costs in 2011 were approximately $15 – $46, similar to costs experienced in 2010 (see *2010 ODOT Herbicide Program Report*, December 2010). With limited maintenance budgets ODOT vegetation managers continued to manage roadside vegetation in a cost cutting mode.

Fuel costs are predicted to increase (http://gasbuddy.com/gb_retail_price_chart.aspx, verified March 2, 2012), with the possibility of summer 2012 fuel costs being nearly twice that of the summer 2011 fuel costs (http://money.cnn.com/2010/12/27/markets/oil_commodities/index.htm, verified March 2, 2012). A continuing effort was underway in 2011 to reduce mowing frequency by utilizing a cheaper vegetation control method involving herbicide application, which in turn reduces mowing frequency. By saving on mowing Oklahoma's taxpayer's money can be invested in more needy areas of Oklahoma's highway system. The OSU-RVM Program estimates that an integrated roadside vegetation maintenance program of herbicides and mowing can eliminate two to four mowing cycles per year over that of a "mowing only" program for the clear zone. This can result in a substantial savings for ODOT.

Weather in 2011 was unprecedented, as drought conditions prevailed over most of Oklahoma from October, 2010 to October, 2011 (http://climate.ok.gov/index.php/drought/last_365_days/oklahoma_south-central_u.s, verified February 22, 2012). While drought was a dominant factor and its effects limited normal summer weed control options, wind continued to affect implementation of herbicide programs.

In ongoing efforts to help ODOT herbicide applicators make timely herbicide treatment applications in 2012, OSU-RVM personnel continued to emphasize options available to ODOT. Two of those options included making night-time and weekend applications in order to utilize possible low-wind conditions. Table 10 shows the response of county/Interstate units regarding the use of non-traditional herbicide application opportunities.

Table 10. Nighttime and weekend herbicide spraying by ODOT Field Divisions in 2010 and 2011.

		Do you make nighttime herbicide applications?	
ODOT Field Division	Number of surveys (crews) 2011	% Yes 2011	% Yes 2010
1	10	30	90
2	10	20	10
3	12	75	50
4	10	100	100
5	13	77	85
6	9	100	100
7	10	70	70
8	10	80	45
	ODOT average	69	69
		Do you make weekend herbicide applications?	
ODOT Field Division	Number of surveys (crews) 2011	% Yes 2011	% Yes 2010
1	10	10	0
2	10	10	10
3	12	50	36
4	10	90	67
5	13	85	92
6	9	89	100
7	10	60	60
8	10	70	50
	ODOT average	58	52

In 2010, 69% of respondents answered “yes” when asked about using non-tradition application times (weekends and evenings). In 2011 69% answered “yes”. While the percentage “yes” response was relatively unchanged, Divisions 2, 3 and 8 showed increases in the “yes” response indicating more nighttime spraying in those divisions. It is assumed variations within divisions from year–to-year may be the result of budget constraints or other parameters beyond the scope of this report. Division’s 1, 3, 4 and 8 increased utilization of weekends to complete herbicide applications. Conversations with maintenance superintendents indicate that they favor night time applications due to lower wind speeds, reduced highway traffic loads, increased motorist visibility of the herbicide application truck (due to safety strobe lights) and increased spray application pattern visibility (due to pattern illumination). We encourage all divisions to consider the viability of night time and weekend herbicide applications since additional suitable wind speed conditions may present themselves during these times. With the new 2012 ODOT 30 foot no-spray buffer zone guidelines it will be important that spray crews know where all of their “blue-line” areas are located as they will not be as evident if spraying at night.

The 2011 ODOT herbicide treatments, target weeds and total acres treated with specific herbicide combinations are summarized in Table 11. The cornerstones in ODOT’s post-emergent weed control programs continue to be the application of a basic

Table 11. Summary of 2011 ODOT herbicide treatments, target weeds and total acres treated with specific herbicide or herbicide combinations in Oklahoma.

Herbicide Treatment	Target Weed	Divisions Using Treatment(s)	Total Acreage Treated Per Treatment
glyphosate +/- 2,4-D +/- AMS +/- Others	winter annual weeds	1, 2, 3, 5, 7, 8	34203.95
glyphosate +/- 2,4-D +/- aminopyralid +/- AMS +/- Others	winter annual weeds (including musk and scotch thistle)	2, 4, 5, 7	23859.3
glyphosate (alone)+ AMS	winter annual weeds	6	8557.6
prodiamine +/- 2,4-D +/- glyphosate +/- dicamba +/- AMS	Preemergent broadleaf weeds, winter annual weeds and early germinating summer weeds	5, 8	83
glyphosate + sulfometuron	johnsongrass and summer annual weeds	1, 2, 4, 5, 8	7716.1
glyphosate + sulfosulfuron + aminocyclopyrachlor	johnsongrass, summer annual weeds and broadleaf weeds	4	38
glyphosate + sulfometuron + metsulfuron-methyl + aminocyclopyrachlor	johnsongrass, summer annual weeds and broadleaf weeds	6	34
glyphosate + sulfometuron+ metsulfuron-methyl	johnsongrass, summer annual weeds and broadleaf weeds	1, 5, 6, 8	6822.1
glyphosate + sulfosulfuron + sulfometuron	johnsongrass and summer annual weeds	2	732.6
glyphosate + sulfosulfuron	johnsongrass and summer annual weeds	1, 2, 3, 4, 7	6209
glyphosate + sulfosulfuron+ metsulfuron-methyl +/- triclopyr +/- dicamba	johnsongrass, summer annual weeds and broadleaf weeds	2, 5	902
glyphosate + imazapic	johnsongrass and summer annual weeds	7	450
MSMA +/- sulfometuron, sulfosulfuron, imazapic, dicamba	johnsongrass and summer annual weeds	5	1646

Table 11. (Continued) Summary of 2011 ODOT herbicide treatments, target weeds and total acres treated with specific herbicide or herbicide combinations in Oklahoma.

Herbicide Treatment	Target Weed	Divisions Using Treatment(s)	Total Acreage Treated Per Treatment
glyphosate +/- dicamba, aminopyralid, sulfometuron, pendimethalin bromacil/diuron glyphosate + imazapyr glyphosate + imazapyr+ 2,4-D glyphosate + imazapyr + sulfometuron glyphosate + diuron	johnsongrass and summer annual weeds total vegetation control bare ground sign-posts guardrails shoulders, cracks	2, 4, 5, 6	321.7
triclopyr ester + diglycolamine salt of dicamba + glyphosate	general broadleaf weed control	5	168
dicamba, dicamba/diflufenzopyr +/- Others	musk thistle	6, 7	4
clopyralid +/- Others	musk thistle	4, 6	40
triclopyr ester	basal bark or cut stump brush control	1, 2, 6	302
glyphosate (aquatic)	aquatic vegetation control	2, 5	206
Cumulative Total Acres Treated With Specific Treatments or Treatment Combinations			92295.35

winter annual weed control treatment and summer johnsongrass control and summer broadleaf weed control treatment effort.

Winter weed control efforts were lead by the application of glyphosate + 2, 4-D (unused remaining stocks of Campaign® or Landmaster® BW) + AMS (34203.95 acres). This is a 2896.45 acre increase (9.3%) when compared to the 2010 level of 31307.5 acres. As in 2010, applications of glyphosate + 2,4-D + aminopyralid (Milestone VM®) + AMS were the second largest acreage treated (23,859.3 acres), reflecting an increase (3.0%) over 2010 acres treated by 685.3 acres. Use of glyphosate alone (ODOT Division 6) accounted for applications to 8557.6 acres. This was an increase of 3406.1 acres (66%) over the 2010 Division Six acres treated with glyphosate alone. During 2011 divisional herbicide program meetings, OSU-RVM personnel emphasized the continued need for winter annual weed control programs in all eight divisions. This emphasis was placed on the use of a post-emergent broadleaf application of 2 – 3 pts/A of Landmaster® BW + AMS to control both emerged winter annual grasses and a complex of emerged winter annual broadleaf weeds. Recommendations were made to Division Six maintenance administrators to switch from applications of 32 fl oz/A of generic glyphosate (4 lb a.i./A), expressly applied for annual ryegrass control, to an alternative winter weed control program containing 2 – 3 pt/A Landmaster® BW/A + AMS.

Divisions 2, 4, 5, and 7 utilized glyphosate +/- 2, 4-D (Landmaster® BW) + AMS in combination with aminopyralid (Milestone VM®). Additions of Milestone VM® can provide extended preemergent control of summer broadleaf weeds, many times into the 4 to 5 month time frame. Application of Milestone VM® during the spring can take advantage of rainfall necessary to activate herbicides with residual soil activity. Summer application of soil residual herbicide may not be effective due to drought and lack of rainfall. Lack of rainfall will preclude activation of summer applications of soil residual herbicides. As long as budgets will allow, we encourage the continued use of Milestone VM® to provide additional summer broadleaf weed control. The February 2012 cost of a Milestone VM® herbicide addition to the tank mix will add an additional $9.07 per acre to treatment costs. Milestone VM® has performed well for ODOT however; most pigweed or amaranth species, such as Palmer amaranth (*Amaranthus palmeri*), and kochia (*Kochia scoparia*) are not controlled by pre-emergent applications of this herbicide.

OSU-RVM Program has had encouraging suppression results on Palmer amaranth and control of kochia with the use of the new herbicide from DuPont Co, Inc. containing aminocyclopyrachlor. The product utilized and presented to the right-of-way user is sold under the trade name Perspective®. In a 2011 Perspective® Demonstration effort, conducted by Division Six/Alfalfa County, Perspective® at 4.75 oz./A combined with Honcho® Plus at 16 fl. oz./A + Oust Extra® at 1.5 oz./A provided very good control of Palmer amaranth, field bindweed, kochia, and other broadleaf weeds for at least 3 months. Estimated Perspective® product costs will be $20 – 22/A for a broadcast application of 4.75 oz. product/Acre. Contracted prices may be lower than this estimate. However, even at this cost/Acre, there are sections of ODOT roadsides with severe Palmer amaranth and kochia infestations that could benefit greatly from judicious use of this new herbicide.

Summer weed control efforts varied from division-to-division depending upon goals and budget constraints. The majority of acres treated with summer broadcast applications of herbicides continue to primarily target control of johnsongrass (*Sorghum halepense*). While johnsongrass is the primary target, additional weed complexes contribute to vegetation managers' concerns. Any vegetation growth exceeding 12 inches in height will soon trigger a mowing cycle for maintenance of the "clear zone" or "safety zone." State-wide concerns regarding musk thistle (*Cardus nutans*), a legislatively designated Oklahoma Noxious Weed, has resulted in focused efforts by ODOT to manage musk thistle with an integrated pest management (IPM) approach using herbicides, mechanical control and biological control to comply with ODAFF regulatory enforcement. Applications of Landmaster® + Milestone VM® were made to 23,859.3 acres of ODOT managed safety zones and were very effective for musk thistle control and help ODOT to comply with the Oklahoma Noxious Weed Law standards.

MSMA (monosodium methanearsonate) has been utilized by ODOT for johnsongrass control in the past. However, the US EPA has not allowed MSMA manufactures to re-register MSMA for future use on highway rights-of-way. Under the current product registration phase-out, MSMA products still labeled for application to roadsides can be legally purchased for roadside use through the end of 2012 with all legal applications being allowed until the end of Dec 31 2013. ODOT RVM managers will be unable to use MSMA following Dec 31, 2013. Oust XP®, Oust Extra®, Plateau®, Pastora® and Outrider® are examples of herbicidal options available to ODOT divisions currently using MSMA (Division 5, 2011) for johnsongrass control.

ODOT continues to expand the highly successful installation of cable-barrier crossover prevention system. While the system has reduced fatalities on Oklahoma highways, it has presented additional maintenance challenges to vegetation managers. ODOT divisions with goals of bare-ground in the cable-barrier foot print, face considerable weed pressure because weed species take advantage of the absence of bermudagrass completion and the lack of a bermudagrass canopy to reduce weed seed germination. In an effort to assist managers in the short term, OSU-RVM obtained a variance to the ODOT drift control policy. The variance is for the application of prodiamine (Prodiamine 65 WDG) to the foot print of the cable-barrier with no drift control additive. Use of Prodiamine 65 WDG at the 2.3 lbs of product per acre (1.5 lbs active ingredient/A, prodiamine) per year was made to assist in the pre-emergent control of numerous broadleaf and grassy weeds. This application was recommended in December – January. Rainfall is required for the product to be activated and for it to properly control weeds. The drought conditions experienced in 2011 severely affected the efficacy of Prodiamine herbicide; it appears to have not been activated properly as sufficient rainfall was lacking.

Some maintenance divisions wish to maintain bare-ground in the cable barrier footprint rather than allow common bermudagrass to vegetate the footprint. Due to the desire for some divisions to maintain bare ground in the footprint, we initiated research on products for this purpose in 2011 (see *Evaluation of New And Generic Herbicides For ODOT Roadside Vegetation Management Programs,* December 2011). Findings of that research initiative are hoped to provide suitable options for long-term residual bare-ground treatments to weed species invading the foot-print of cable-barriers. One goal of this research is to identify treatments that do not require late-summer glyphosate

applications to address annual weed “escapes” from the initial foot-print application. However, we do not feel that such a goal is realistic based on our prior experience in working with long-term residual bare–ground herbicides in sensitive environments where herbicides with reduced runoff and leaching potential must be used.

Among several cable barrier designs, most current cable-barrier installations are 10-12 feet from the hard, paved surface on the highway shoulder. Additional glyphosate treatments have been required during the growing season (May- September) if bare ground was the objective. ODOT divisions’ applying any herbicide in the cable-barrier foot print area should be aware that vertical cable support structures can interfere with herbicide placement. This gap in uniform herbicide coverage caused by support structure (posts and cables) intercepting the spray pattern is often referred to as “shadowing”. Shadowing results in there being untreated areas. Weed seed can germinate and survive in these areas, avoiding having been controlled by treatments of both pre-emergent and postemergent herbicides. Directing spray applications from directly over the post-tops or applying the application from both sides of the cable barrier can reduce or eliminate non-treated areas. The OSU-RVM research program will continue to examine this specific maintenance issue and advise ODOT concerning updates and possible, new maintenance approaches.

Annual trends in the amount of acres maintained through the use of integrated roadside vegetation management involving the application of broadcast treatment herbicides are depicted in Table 12. Cumulative total acres-treated with broadcast applied herbicidal applications in 2011 (87,805.95 acres) was 20.4% less than totals recorded in 2010 (110,360.25 acres). This acreage reduction was due to suspension or abbreviation of summer broadcast applications in those divisions affected by drought. Those divisions were 1 (11.5% reduction), 2 (35.2% reduction), 3 (25.2% reduction), 4 (27.7% reduction), 5 (33.7% reduction), and 7 (32.9% reduction). Divisions 6 and 8 showed increased acres treated by 2.7% and 25.7% respectively. Division 6 increases were due to increased use of broadcast treatments of glyphosate for winter weed control as little to no summer program was initiated. Division 8 increases were due to slight increases in acres treated for winter weed control and Division 8 was not affected by drought conditions, allowing increases of acres treated for summer johnsongrass and broadleaf weed control. OSU-RVM Program supported the suspension or abbreviation of the summer weed control programs in those maintenance divisions affected by the historic drought conditions of 2011.

Vegetation management is ever changing. Future challenges can include new weed species, familiar species expanding their range, species that may have developed herbicidal resistance, constant federal and state regulation changes and continuing budget management issues. Additional variation of invasive weed species may also result from the need for importation of hay to augment Oklahoma forage production. Drought conditions in 2011 resulted in movement of hay from neighboring states and other more widely dispersed hay production areas. This distribution of hay from other states may result in the introduction of weed species that are different from the normally encountered species that are currently being targeted by ODOT vegetation managers. Integrated Roadside Vegetation Management (IRVM) remains an effective strategy for ODOT to utilize in order to provide a safe, efficient and aesthetically pleasing system of

travel corridors that Oklahomans have come to expect through an interaction of research, training and consultation.

Table 12. Comparison of herbicide acreages treated in 2008, 2009, 2010 and 2011 for the more common broadcast treatments and total acres treated by Division.

		Herbicide Treatments							
Div.#	Year(Y)	glyphosate +/- 2,4-D +/- AMS (winter annual weed control)	glyphosate +/- 2,4-D +/- aminopyralid +/- AMS (winter annual weed control)	glyphosate +/- sulfometuron (johnsongrass control)	glyphosate + sulfometuron + metsulfuron-methyl (Johnsongrass and broadleaf control)	glyphosate + sulfosulfuron (johnsongrass control)	glyphosate + Imazapic +/- 2,4-D (johnsongrass control)	MSMA +/- sulfometuron/ sulfosulfuron (johnsongrass control)	Total Acres Treated with Selected Herbicide Applications
1	Y2008	5369	60	6469	0	0	0	0	11898
	Y2009	6086	0	3850	0	0	0	0	9936
	Y2010	5910.3	0	3100	2907	0	0	0	11917.3
	Y2011	5857.7	0	480.1	4211.6	0	0	0	10549.4
2	Y2008	5861	0	712	0	6040	0	748	13361
	Y2009	6632	0	5141	0	2791	0	1252	15816
	Y2010	7467.6	0	3476	0	4431.8	0	1080	16455.4
	Y2011	6516	2047.2	380	740	970	0	0	10653.2
3	Y2008	6891	0	0	0	6367	0	0	13258
	Y2009	8294	0	0	0	4996	0	0	13290
	Y2010	8904.1	0	0	0	8115.05	0	0	17019.15
	Y2011	8981	0	0	0	8115.05	0	0	17096.05
4	Y2008	1775	4773	3811	0	1807	0	4	12170
	Y2009	0	7761	5917	0	0	0	2	13680
	Y2010	0	5823.2	6988.3	0	831	0	0	13642.5
	Y2011	0	8131.5	862.9	0	862.9	0	0	9857.3
5	Y2008	7736	4444	8417	0	0	0	2624	23221
	Y2009	4040	6151	9238	0	0	0	2699	22128
	Y2010	1664	10046	6454	0	75	0	2590.6	20829.6
	Y2011	3225.25	7987.6	793	162	0	0	1646.5	13814.35
6	Y2008	0	8037	380	0	0	0	90	8507
	Y2009	0	0	0	0	0	7506	100	7606
	Y2010	182.7	49.4	6013.7	0	0	603.3	250	7099.1
	Y2011	0	8557.6	0	400	0	0	0	8957.6
7	Y2008	6497	1560	0	0	427	0	4353	12837
	Y2009	1107	7121	0	0	3572	0	3698	15498
	Y2010	1478	7255.4	0	0	568	2290	2355	13946.4
	Y2011	2940	5693	0	0	280	450	0	9363

Table 12. (Continued) Comparison of herbicide acreages treated in 2008, 2009 and 2010 for the more common broadcast treatments and total acres treated by Division.

		Herbicide Treatments							
Div.#	**Year(Y)**	**glyphosate +/- 2,4-D +/- AMS (winter annual weed control)**	**glyphosate +/- 2,4-D +/- aminopyralid +/- AMS (winter annual weed control)**	**glyphosate +/- sulfometuron (johnsongrass control)**	**glyphosate + sulfometuron + metsulfuron-methyl (Johnsongrass and broadleaf control)**	**glyphosate + sulfosulfuron (johnsongrass control)**	**glyphosate + Imazapic +/- 2,4-D (johnsongrass control)**	**MSMA +/- sulfometuron/ sulfosulfuron (johnsongrass control)**	**Total Acres Treated with Selected Herbicide Applications**
8	Y2008	0	0	0	0	0	0	0	0
	Y2009	6324	0	4852	0	1250	0	0	12426.00
	Y2010	5700.8	0	1500	450	1800	0	0	9450.80
	Y2011	6684	0	3898	1302	0	0	0	11884.00
All Divisions	Y2008	34129	18874	19789	0	14641	0	7819	95252.00
	Y2009	32483	21033	28998	0	12609	7506	7751	110380.00
	Y2010	31001.9	23174	25551.9	3357	16031.1	2893.5	6275.6	110360.25
	Y2011	34203.95	32416.9	6414	6815.6	5859	450	1646.5	87805.95

APPENDIX A

2011 ODOT/OSU HERBICIDE PROGRAM SURVEY

2010/2011 Herbicide Survey Instructions

Greetings from the OSU-RVM Program,

Item #7 of our joint project with ODOT requires the production, dissemination and compilation of information from the **Annual ODOT Herbicide Program Survey and Report**

There are **7 pages in the attached survey that we are requesting you complete and return to your division headquarters on or before August 31, 2011**. Herbicide usage reporting should include use dates from August 31, 2010 – August 31, 2011 **Extra herbicide use pages can be submitted if herbicides or herbicide combinations used in your county unit are not listed (see blank usage table).**

In addition to questions asked last year, this year we are asking superintendants (including spray leadman or those responsible for herbicide program assessment in your unit) to give your treatments a **"percent control" rating.**

At this point, superintendants should be comfortable with consulting herbicide labels to determine which weed species will be controlled by that specific treatment and treatment rate. A list of weeds that the herbicide will control (at specific rates) is listed on all herbicide labels.

This year on the survey we are requesting that the following rating scale be used for herbicide control of the label listed weed species.

"Good": 80 – 100% control of the weed species listed on the herbicide or combination of tank mix herbicide labels.

"Fair" 70 – 79% control of the weed species listed on the herbicide or combination of tank mix herbicide labels. If "Fair" is assigned to a treatment, add information to page 6.

"Poor" 0-69% control of the weed species listed on the herbicide or combination of tank mix herbicide labels. If "Poor" is assigned to a treatment, add information to page 6.

Herbicides utilized by ODOT and recommended by OSU-RVM are expected to control the weeds listed on their labels. It is important to note any failures of an herbicide treatment to control listed species. Failures may be an indication of herbicide resistance or specific adjustments that may need to be initiated to achieve expected or improved weed control.

Thank you for your involvement in ODOT's herbicide program and your time expended on this survey.

2010/2011 ODOT/OSU Herbicide Program Survey (7 pages, attach extras as needed)
Please return to your Division Headquarters on or before Aug. 31, 2011. Then forward to Craig Evans.
ODOT Division: _____ County/Interstate Maintenance Facility: _____
Superintendent: _____Person completing survey_____
Spray crew leadman _____

1. Do you make nighttime herbicide applications? ___ **Yes** ___ **No**
2. Do you make weekend herbicide applications? ___ **Yes** ___ **No**
3. Was an application record filled out for each herbicide application? ____ **Yes** ____ **No**
4. How many personnel do you use when mixing and loading herbicides into spray trucks?
   Always 1 _____ 1 or 2 _____
   Always at least 2 _____ 3 or more _____
5. How many personnel do you use on a spray truck when applications are being made?
   Always 1 _____ 1 or 2 _____
   Always at least 2 _____ 3 or more _____
6. How often is the herbicide spray truck calibrated?
   Once each year _____ once for each different herbicide treatment _____
   Once a week _____ once a day _____ other: _____
7. Who decides on whether to spray on a day-to-day basis?
   Division personnel _____ superintendent _____ TMW I or II _____
8. Who decides on what herbicides and rates are applied at your maintenance facility?
   Div. personnel _____ superintendent _____
   TMW I or II _____other: _____
9. How many, if any, informal landowner complaints/concerns (phone calls, personal visits, etc…) did you have this year as a result of your herbicide program?

_____

10. How many, if any, formal complaints were filed against your herbicide program through the Okla. Dept. of Agriculture, Food, and Forestry? (Example: off-target drift complaints or noxious weed complaints) If yes, please include a brief description of complaint(s).

_____

11. Please name any specific weed problems that you have along your roadsides that are not being controlled by your current herbicide program?

_____

12 How many lane miles do you spray in your county?

_____

13. How many miles of Cable Barrier are in your county?

_____

Division _____County Maintenance Unit_____

Summary of August 31, 2010 - August 31, 2011 Herbicide Applications

(Please fill in the data for every block as precisely as possible, if you do not know acreage please estimate)

Herbicide Treatment if (+ or -) is listed for combinations, please indicate if that herbicide was used or not. If generic glyphosate was used please list trade name.	**Herbicide product/Acre**	**Carrier Rate Gallons/Acre**	**Number of Loads**	**Acres /Load**	**Total Acres**	**Target Weed(s)**	**Date Started**	**Date Ended**	**Overall Control of labeled weed species** Good: 80-100% Fair: 70-79% Poor: 0-69% If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.		
Example: *Landmaster BW® + AMS*	*2 pts. + 3.4 lbs.*	*30 GPA*	*15*	*43.3*	*649.5*	*brome, cheat, hairy vetch*	*3-15-02*	*4-7-02*	***Good***	**Fair**	**Poor**
									100-80%	**79-70%**	**69% or less**
									x		
Landmaster BW® + AMS (+ or - Milestone®)						*winter annuals (Preemergent summer broadleaf)*					
Campaign® + AMS (+ or - Milestone)						*winter annuals (Preemergent summer broadleaf*					
Roundup Pro Conc.® + AMS (+ or - Milestone)®						*winter annuals (Preemergent summer broadleaf*					

If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.

Division _____County Maintenance Unit_____

Summary of August 31, 2010 - August 31, 2011 Herbicide Applications

(Please fill in the data for every block as precisely as possible, if you do not know acreage please estimate)

Herbicide Treatment If generic forms were used please list trade name.	**Herbicide product/Acre**	**Carrier Rate Gallons/Acre**	**Number of Loads**	**Acres /Load**	**Total Acres**	**Target Weed(s)**	**Date Started**	**Date Ended**	**Overall Control of labeled weed species**		
									Good	**Fair**	**Poor**
									100 - 80 %	**79-70%**	**69% or less**
Roundup Pro Conc.® + Oust® XP						*johnsongrass*					
Roundup Pro Conc.® + Oust ® Extra						*Johnsongrass /broadleaf weeds*					
Roundup Pro Conc.® + Outrider®						*johnsongrass*					
Roundup Pro Conc.® + Plateau®						*Johnsongrass*					
MSMA						*johnsongrass*					

If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.

Division _____County Maintenance Unit_____

Summary of August 31, 2010 - August 31, 2011 Herbicide Applications

(Please fill in the data for every block as precisely as possible, if you do not know acreage please estimate)

Herbicide Treatment If generic forms were used please list trade name.	**Herbicide product/Acre**	**Carrier Rate Gallons/Acre**	**Number of Loads**	**Acres /Load**	**Total Acres**	**Target Weed(s)**	**Date Started**	**Date Ended**	**Overall Control of labeled weed species**		
									Good	**Fair**	**Poor**
									100 - 80 %	**79-70%**	**69% or less**
Roundup Pro Conc.® (alone)						*johnsongrass or bareground*					
Diuron 80 WDG ® + surfactant						*annual weeds*					
Aquastar® (aquatic) + surf.						*aquatic*					
Habitat ®(aquatic) + surfactant						*aquatic*					
Arsenal® + surfactant						*bareground*					

If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.

Division _____County Maintenance Unit_____

Summary of August 31, 2010 - August 31, 2011 Herbicide Applications

(Please fill in the data for every block as precisely as possible, if you do not know acreage please estimate)

Herbicide Treatment If generic forms were used please list trade name.	**Herbicide product/Acre**	**Carrier Rate Gallons/Acre**	**Number of Loads**	**Acres /Load**	**Total Acres**	**Target Weed(s)**	**Date Started**	**Date Ended**	**Overall Control of labeled weed species**		
									Good	**Fair**	**Poor**
									100 - 80 %	**79-70%**	**69% or less**
Vanquish® + surfactant						*broadleaf weed*					
Transline ® + surfactant						*musk thistle*					
Overdrive® + surfactant						*broadleaf weed*					
Tordon K® + Garlon 4®						*brush*					
Garlon 4® + oil carrier (basal or cut stump)						*brush*					

If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.

****** Please include any additional treatment comments on an attached page ******

Division _____County Maintenance Unit_____

Please fill out this table for herbicide treatments (august 31, 2010 – August 31, 2011) receiving "Poor' (0-69%) or "Fair (70-79%) control ratings and list the labeled weeds they failed to control satisfactorily.

Herbicide treatment or treatment combinations	Herbicide (s) application rate (product/A)	List weeds off of the herbicide label(s) that were not controlled satisfactorily.

Thank you for all of your roadside vegetation management efforts this year

Division _____County Maintenance Unit_____

Additional Comments (difficulties encountered, suggestions, ect...)

Please complete the survey and return to your division headquarters <u>on or before August 31, 2011.</u>

Divisions please forward this survey to:

Craig Evans

OSU-RVM Program Training Lead

OSU Dept. of Hort & LA

358 Ag Hall

Stillwater, OK 74078

Herbicide Treatment If generic forms were used please list trade name.	**Herbicide product/Acre**	**Carrier Rate Gallons/Acre**	**Number of Loads**	**Acres /Load**	**Total Acres**	**Target Weed(s)**	**Date Started**	**Date Ended**	**Overall Control of labeled weed species**		
									Good	**Fair**	**Poor**
									100 - 80 %	**79-70%**	**69% or less**

If treatment(s) control rating is less than "good", list weeds off of the herbicide(s) label that were not controlled satisfactorily on page 6.