2010 ODOT HERBICIDE PROGRAM REPORT

Annual Report For FY 2010
ODOT SPR Item Number 2156

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METRIC CONVERSION PAGE

SI (METRIC) CONVERSION FACTORS

Approximate Conversions to SI Units

Symbol	When you know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	25.40	millimeters	Mm
ft	feet	0.3048	meters	M
yd	yards	0.9144	meters	M
mi	miles	1.609	kilometers	Km
		AREA		
in^2	square inches	645.2	square millimeters	Mm^2
ft^2	square feet	0.0929	square meters	m^2
yd^2	square yards	0.8361	square meters	m^2
ac	acres	0.4047	hectacres	Ha
mi^2	square miles	2.590	square kilometers	Km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallon	3.785	liters	L
ft^3	cubic feet	0.0283	cubic meters	m^3
yd^3	cubic yards	0.7645	cubic meters	m^3
		MASS		
oz	ounces	28.35	grams	G
lb	pounds	0.4536	kilograms	Kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		TEMPERATURE (exact)		
°F	degrees Fahrenheit	(°F-32)/1.8	degrees Celsius	°C
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.448	Newtons	N
lbf/in^2	poundforce per square inch	6.895	kilopascals	kPa

Approximate Conversions from SI Units

Symbol	When you know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.0394	inches	in
M	meters	3.281	feet	ft
M	meters	1.094	yards	yds
km	kilometers	0.6214	miles	mi
		AREA		
mm^2	square millimeters	0.00155	square inches	in^2
M^2	square meters	10.764	square feet	ft^2
M^2	square meters	1.196	square yards	yd^2
ha	hectacres	2.471	acres	ac
Km^2	square kilometers	0.3861	square miles	mi^2
		VOLUME		
mL	milliliters	0.0338	fluid ounces	fl oz
L	liters	0.2642	gallon	gal
M^3	cubic meters	35.315	cubic feet	ft^3
M^3	cubic meters	1.308	cubic yards	yd^3
		MASS		
G	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.1023	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	degrees Fahrenheit	9/5(°C)+32	degrees Celsius	°F
		FORCE and PRESSURE or STRESS		
N	Newtons	0.2248	poundforce	lbf
kPa	kilopascals	0.1450	poundforce per square inch	lbf/in^2

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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 2010. 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 efforts. 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 weed control research.

1.1 OBJECTIVES

The objectives of the 2010 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.

The *2010 Herbicide Program Report* differs from past reports in that partitioning of Divisions into county/interstate maintenance units is more specific. This was done in an attempt to supply managers with more detailed information and assist in more specific decision- making. Information compilation is a dynamic process and the OSU RVM program strives to provide report information in useable formats that best serve ODOT vegetation managers.

We are aware that each field Division's herbicide program may have special considerations 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.

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®, or 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 Tables 1a and 1b for both trade and common names of herbicides utilized by 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 and 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) in advance of the 2010 herbicide application season. County superintendents or their appointees were asked to complete all questions on the document in reference to the year 2010 and return hard copies of the survey by August 31, 2010 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 2010 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.

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 2010.

Table 1a. Herbicide active ingredient common names, brand names, and manufacturers on the August 2009 ODOT Approved Herbicide and Adjuvant List (AHAL).

Product Type	Active Ingredient(s) Common name	Brand Name	Manufacturer/ Distributor
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	Campaign®	Monsanto
	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	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 August 2009 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)	Detain II®	Estes
	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 September 10, 2010 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 + AMS broadcast treatment. Treatment rate 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 annual sowthistle (*Sonchus oleraceus*). Winter annual weed control results were rated as good from this 3 pt/A treatment 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 Concentrate® and OustExtra® (combination of sulfometuron + metsulfuron-methyl). OustExtra® treatments provided a wider spectrum of broadleaf weed control compared to OustXP® (sulfometuron alone). Recommendations from OSU-RVM personnel at the 2009 Division One herbicide program meetings were that a 1.5 oz OustExtra® rate be used for 2010 OustExtra® broadcast application treatments. Application rates of OustExtra® varied from 1 oz to 1.5 oz. Speculation as to the use of low rates indicated that Division One personnel may have used the 1 oz use rate of OustXP® and did not make the recommended rate increase regarding OustExtra®.

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 outcome 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 utilizes the 3pt/A rate of LandMaster BW to provide the added level of control for winter annual weed control

Those county units or interstate units moving to the use of OustExtra® 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.), sericea lespedeza (*Lespedeza cuneata*) and wild garlic (*Allium* spp.) were mentioned specifically in survey results. The continued application of OustExtra® at the recommended rate should help reduce the prevalence of wild garlic and sericea lespedeza. The control of pigweed is more daunting. Palmer amaranth (*Amaranthus palmeri*) is a species within the pigweed family. It is more difficult to control and herbicide resistance has been documented. Currently, 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*, September 30, 2006) identified post-emergent applications of Vanquish® at 8 fl oz + Overdrive® at 4 oz /acre would be a highly effective broadleaf weed control treatment including control of Palmer amaranth. 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. The OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications.

We recommend that Division One continue with their summer glyphosate + OustExtra® program for controlling johnsongrass (*Sorghum halepense*) and other broadleaf weeds. This broadcast treatment will continue to provide johnsongrass control and when used at a 1.5 oz/A rate, should also provide good to excellent control of many broadleaf weeds. Implementing the OustExtra® program will increase treatments costs by $1.47/A over existing Oust XP® treatment costs at current state contract pricing.

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 --- Performance Good (G), Fair (F) or Poor (P)[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 196 LM 0.75 MCB	Landmaster® BW + AMS[4] - (G)	3 pt+4.2 lb	510	60 A 25 GPA	3-15-10 3-17-10	02-25 03-31
Cherokee 324 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	487	60 A 25 GPA	3-15-10 3-17-10	02-25 03-31
Haskell 229 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	480	60 A 25 GPA	3-15-10 3-17-10	02-25 03-31
	Campaign® + AMS - (G)	2 pt+4.2 lb	120	60 A 25 GPA	3-15-10 3-15-10	02-25 03-31
McIntosh 228 LM 10 MCB	Landmaster® BW + AMS - (G)	2 pt+3.4 lb	704	60 A 25 GPA	3-15-10 3-29-10	02-25 03-31
Muskogee 527.5 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	600	60 A 25 GPA	3-15-10 3-18-10	02-25 03-31
	Campaign® + AMS - (F)	2 pt+4.2 lb	108	60 A 25 GPA	3-12-10 3-12-10	02-25 03-31
Okmulgee 312 LM 5.97 MCB	Landmaster® BW + AMS - (F)	3 pt+5.33 lb	514.4	38A 40GPA	3-24-10 4-14-10	02-25 03-31
	Campaign® + AMS - (G)	3 pt+5.33 lb	126.9	38A 40GPA	3-19-10 3-23-10	02-25 03-31

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

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 ---------- Performance Good (G), Fair (F) or Poor (P)[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	700	60 A 25 GPA	3-15-10 3-18-10	02-25 03-31
Wagoner 289 LM	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	360	60 A 25 GPA	3-18-10 3-19-10	02-25 03-31
	Campaign® + AMS - (F)	2 pt+3.75 lb	60	60 A 25 GPA	3-26-10 3-26-10	02-25 03-31
Checotah I-40 200 LM 4 MCB	Landmaster® BW + AMS - (G)	3 pt+4.2 lb	360	60 A 25 GPA	3-15-10 3-26-10	02-25 03-31
	Campaign® + AMS - (G)	2 pt+4.2 lb	240	60 A 25 GPA	3-15-10 3-26-10	02-25 03-31
Sallisaw I-40 166 LM 15.75 MCB	Campaign® + AMS - (G)	2 pt+4.2 lb	540	60 A 25 GPA	3-18-10 3-19-10	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			5910.3			

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

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] ---------- 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[7] Beginning - Ending[5] (mm-dd)
Adair 196 LM 0.75 MCB	Roundup Pro Conc® + OustExtra® - (G)	13 oz+1.5 oz	480	60 A 25 GPA	5-26-10 6-09-10	05-10 06-15
Cherokee 324 LM	Roundup Pro Conc® + OustExtra® - (G)	11.2 oz+1.3 oz	450.4	60 A 25 GPA	6-08-10 6-15 -10	05-10 06-15
Haskell 229 LM	Roundup Pro Conc® + OustXP® - (F)	13 oz+1 oz	600	60 A 25 GPA	6-02-10 6-16-10	05-10 06-15
McIntosh 228 LM 10 MCB	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	660	60 A 25 GPA	5-14-10 5-26-10	05-10 6-15
Muskogee 527.5 LM	Roundup Pro Conc® + OustXP® - (G)	13 oz+1 oz	60	60 A 25 GPA	5-21-10 5-21-10	05-10 06-15
	Roundup Pro Conc® + OustExtra® - (G)	13 oz+1.5 oz	600	60A 25 GPA	5-24-10 6-01-10	05-10 06-15
Okmulgee 312 LM 5.97 MCB	Roundup Pro Conc® + OustExtra® - (G)	13 oz+1.5 oz	768.6	38 A 40 GPA	5-24-10 6-23-10	05-10 06-15
Sequoyah 283 LM	Roundup Pro Conc® + OustXP® - (G)	13 oz+1 oz	700	60 A 25 GPA	6-01-10 6-17-10	05-10 06-15
Wagoner 289 LM	Roundup Pro Conc® + OustXP® - (G)	13 oz+1 oz	420	60 A 25 GPA	6-04-10 6-22-10	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]Performance rating given to treatment by ODOT unit. [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 Two, from table 2a and 2b.

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] ---------- 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[7] Beginning - Ending[5] (mm-dd)
Checotah I-40 200 LM 4 MCB	Roundup Pro Conc® + OustXP® - (G)	13-16 oz+1 oz	660	60A 25 GPA	5-21-10 6-02-10	05-10 06-15
Sallisaw I-40 166 LM 15.75 MCB	Roundup Pro Conc® + OustExtra® - (G)	13 oz+1 oz	608	60A 25 GPA	5-28-10 6-03-10	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			6007 0 0			Division Total Treated Acres[7] 11917.3

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses.
[4]Performance rating given to treatment by ODOT unit. [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 Two, from table 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 October 5, 2010 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 + ammonium sulfate (AMS) broadcast treatment. Treatment rates were mostly 2 pints per acre with only Atoka County deviating from the 2 pint rate. Winter annual weed control results were rated as good by 8 of the 10 counties. Latimer County and LeFlore County rated control as fair. The reason for achieving only a "fair" performance rating is not easily resolved. It is not known if a switch in product use during the treatment season played a roll or not. Division Two is in the process of using up stocks of Campaign® herbicide. Some county/maintenance units had already switched to the replacement for Campaign, Landmaster® BW.

Division Two's summer weed control program (Table 3b) consisted mainly of treatments of glyphosate (Roundup Pro Concentrate® or Ranger Pro®) + sulfometuron (Oust XP®) at varying rates or applications of Roundup Pro Concentrate®/Ranger Pro® and Outrider® (sulfosulfuron). Outrider®, while being a sulfonyl-urea family herbicide like sulfometuron, is less phytotoxic to bermudagrass. Pittsburg County experienced severe phytotoxicity to roadsides when high labeled rates of Roundup Pro Concentrate® were used in conjunction with excessive, higher than recommended OustXP® rates (personal conversation with OSU-RVM personnel and Division 2 maintenance administrators, May 25, 2010). This is an example of the need to be acutely aware of the need for accuracy and recommended rate adherence.

Spot weed control treatments with aquatic formulations of glyphosate were used sporadically in the Division as were bareground treatments utilizing various combinations of glyphosate, triclopyr and sulfometuron.

In response to survey question #9 (Appendix A) regarding acknowledgment of informal complaint/concerns, Atoka County and Pushmataha County indicated they had received contact from concerned citizen that did not pursue complaints 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 achievements of their broadcast herbicide applications. However, with perceived increased seasonal spring precipitation that has resulted in more vigorous winter weed growth, Division Two maintenance administrators were receptive to the recommendation to increase the Landmaster® BW rate from 2 to 3 pints/acre. This change should provide additional control of winter annual weeds. Increasing the Landmaster® BW rate will increase the amount of glyphosate and 2,4-D being delivered to target species with 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 to avoid delaying green-up and weakening desirable species stands. Some now-retired maintenance managers who had worked with applications of atrazine (principally a pre-emergent herbicide with some post emergent activity by root uptake) had difficulty in switching to an exclusively post-emergent program using Landmaster® BW as

their winter annual weed control application. This is believed to have been due to the practice of applying the Campaign® or Landmaster® BW as if they were a pre-emergent product application, which they are not. The Landmaster® BW application should be referred to as a dormant bermudagrass, post-emergent application for winter annual weeds and not a pre-emergent program.

Division Two survey respondents also indicated that there were broadleaf weed problems being experienced after the summer broadcast applications of glyphosate and sulfometuron (Oust XP®). To address this issue, OSU-RVM is recommending the use of OustExtra®, which is a pre-mix of sulfometuron + metsulfuron. The metsulfuron a.i. is that found in the product Escort®. Thus, for this specific problem OustExtra® should be used to replace Oust XP® and thus improved broadleaf weed control. The application rate for OustExtra® is 1.5 oz product per acre. Selected maintenance units in Division One used this product and treatment rate in 2010 and were pleased with the weed control efficacy. Use of OustExtra® will only increase cost per acre by approximately $1.47. We recommend that Division Two modify their summer broadcast treatment to utilize an OustExtra® program for controlling johnsongrass (*Sorghum halepense*) and other broadleaf weeds.

A specific weed problem identified was switchgrass (*Panicum virgatum*). Unfortunately, current recommended summer broadcast treatments for johnsongrass do not control switchgrass. Current recommendations for switchgrass control are herbicide wiper applications in two perpendicular directions using high rates of glyphosate in combination with more frequent mowing. These recommendations can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2010. Wiper applications must be made in two-directions. There should be adequate height differential between the switchgrass and the bermudagrass to insure only switchgrass gets the wiper treatment. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species.

Division Two indicated they have 12.07 miles of cable-barrier within their division. The cable barrier “footprint” is susceptible to invasion by several weed species. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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 (Not reported) LM	Campaign®+AMS[3] - (G)	0.5 pt+5.3 lb	990	66 A 25 GPA	03-11-10 04-09-10	02-15 03-20
Bryan 474.3 LM 4.07 MCB	Landmaster® BW +AMS - (G)	2 pt+5 lb	1731.6	66 A 25 GPA	03-17-10 06-17-10	02-15 03-20
Choctaw 344 LM	Campaign®+AMS - (G)	2 pt+5 lb	896	64 A 25 GPA	03-18-10 04-12-10	02-15 03-20
Latimer 247.3 LM	Landmaster® BW +AMS - (F)	2 pt+3.5 lb	880	80 A 20 GPA	03-15-10 03-29-10	02-15 03-31
Le Flore	Campaign®+AMS - (G)	2 pt+5.1 lb	300	50 A 30 GPA	030-3-10 030-8-10	02-15 03-31
McCurtain 530.9 LM	Landmaster® BW +AMS - (G)	2 pt+6 lb	400	50 A 30 GPA	03-23-10 04-15-10	02-15 03-20
	Campaign®+AMS - (G)	2 pt+6 lb	400	50 A 30 GPA	03-10-10 03-18-10	02-15 03-20
Marshall 207 LM	Landmaster® BW +AMS - (G)	2 pt+3.4 lb	450	75 A 25 GPA	03-17-10 03-29-10	02-15 03-31
Pittsburg 520 LM 8 MCB	None reported		0			
Pushmataha 351 LM	Campaign®+AMS - (G)	2 pt+5.1 lb	780	60A 25 GPA	03-15-10 04-01-10	02-15 03-31
Le Flore/Push 320 LM	Landmaster® BW +AMS - (F)	2.5 pt+7.6 lb	640	40 A 30 GPA	04-05-10 04-20-10	02-15 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			7467.6			

[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 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] ---------- 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)
Atoka (not reported) LM	Roundup Pro Conc® - (G)	16 oz	577.8	66 A 25 GPA	03-11-10 04-09-10	04-20 05-31
Bryan 474.3 LM 4.07 MCB	Roundup Pro Conc® + Outrider - (G)	17 oz+1.2 oz	1531.8	66 A 25 GPA	06-21-10 07-30-10	04-20 06-30
	Roundup Pro Conc® - (bareground) - (G)	2%	20	66 A 25 GPA	05-12-10 05-13-10	04-25 09-15
Choctaw 344 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	576	64 A 25 GPA	05-18-10 07-08-10	04-20 05-31
Latimer 247.3 LM	MSMA - (G)	64o z	180	80 A 20 GPA	07-21-10 08-30-10	04-15 08-15
	Aquastar® (aquatic) - (G)	2%	60	Spot treatment	07-14-10 07-16-10	05-15 08-31
	Ranger Pro® + Garlon 4 Ultra® + OustXP® - (G)	16 oz+2 pt+1 oz	160	Spot treatment	06-01-10 06-02-10	03-15 06-31
	Ranger Pro - (bareground) (G)	2%	1.5	Spot treatment	06-15-10 06-18-10	04-15 09-15
Le Flore 500 LM	Roundup Pro Conc®+Outrider® - (G)	19 oz+1.33 oz	550	50 A 30 GPA	05-03-10 07-22-10	04-20 06-30
McCurtain 530.9 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1.2 oz	150	50 A	05-04-10 05-05-10	04-20 06-30
	Ranger Pro ®+Outrider® - (G)	16 oz+1.2 oz	1300	30 GPA	05-18-10 08-13-10	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]Performance rating given to treatment by ODOT unit. [5] Recommended treatment window, 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)
Marshall 207 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	493.75	75A 25GPA	05-03-10 05-26-10	04-20 05-31
	Roundup Pro Conc® (bareground) - (G)	2%	33.3	Spot treatment	04-08-10 06-18-10	04-25 09-15
Pittsburg 520 LM 8 MCB	Roundup Pro Conc® + OustXP® - (G)	19 oz+1 oz	300	60A 25GPA	05-26-10 05-27-10	04-20 06-15
	Ranger Pro® + OustXP® - (G)	19 oz+1 oz	1800	60A 25GPA	05-4-10 05-26-10	04-20 06-15
Pushmataha 351 LM	Roundup Pro Conc® + Outrider® - (G)	19 oz+1.3 oz	900	60A 25GPA	04-15-10 05-15-10	04-20 06-30
	MSMA - (G)	64 oz	900	60A 25GPA	07-15-10 08-15-10	04-15 07-30
Le Flore/Push 320 LM	Ranger Pro® + OustXP® - (G)	16 oz+1.33 oz	800	40A 30GPA	06-04-10 06-29-10	04-20 06-15
	Aquaneat® (aquatic) - (G)	2%	40	Spot treatment	05-03-10 05-4-10	05-15 08-31
	Garlon 4 Ultra®	64 oz	40	Spot treatment	08-01-10 08-10-10	Year round
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			10259.35 54.8 100			Division Total Treated Acres[7] 17881.75

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. Conc = Concentrate. [4]Performance rating given to treatment by ODOT unit. [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 Two, from table 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 5, 2010 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. Treatment rate was 2 pints/Acre with varying rates of ammonium sulfate (AMS). While Campaign and Landmaster BW® rates were consistent, AMS rates varied from low to medium rates (label recommended rates are from 8 pounds to 20 pounds/100 gallons of water). 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 9 of the 12 maintenance units. Hughes, Johnson, and Shawnee Intestate units reported efficacy as fair while all others rated efficacy as good. Division Three is in the process of using up stocks of Campaign® herbicide and some county/maintenance units had already switched to the replacement for Campaign®, Landmaster BW®.

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 application of glyphosate for bareground 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, as in other Divisions (1,2,3,4 and 7), perceived increased seasonal spring precipitation resulted in more vigorous winter weed growth and some reduction in observed efficacy of winter annual weed control. While low end rates may be implicated in reduced control, 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. To address the possible reduced control of low end Landmaster BW® rates (2 pints/Acre), OSU-RVM has recommended increasing the rate to 3 pints/acre rate in 2011. 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. 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

Division Three survey respondents also indicated that there were non-specific broadleaf weed problems being experienced after the summer broadcast applications of glyphosate and sulfosulfuron (Outrider®). 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. If Division Three were to move back to the use of sulfometuron, Dupont blends sulfometuron and metsulfuron in their product called OustExtra® that is being used successfully in other divisions. This decision is entirely the prevue of Division Three maintenance managers and their desire to achieve goals with minimal bermudagrass injury.

Switchgrass (*Panicum virgatum*) continues to be a problem in Division Three. Hughes, Johnson, Lincoln and Pontotoc maintenance units listed this roadside grassy weed as not being controlled with broadcast summer treatments. Unfortunately, current recommended summer broadcast treatments for johnsongrass do not control switchgrass. Current recommendations for herbicide wiper applications of high rates of glyphosate can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2010. Wiper applications must be made in a two-direction method to encourage treatment effect and there must be adequate height differential to insure only switchgrass gets the treatment while direct bermudagrass exposure is avoided. Timely mowing in conjunction with wiping effort is also important to achieve acceptable control levels of switchgrass. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species.

Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They are 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. Currently, 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*, September 30, 2006) 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.

Observations of broadleaf weed infestation in and along cable barrier systems was noted. Division Three indicated they have 27 miles of cable-barrier within their division. This area or “footprint” surrounding the cable barrier is susceptible to multiple weed invasions. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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	Campaign® + AMS[4] - (G)	2 pt+3.7 lb	619.3	47.6 A 30 GPA	4-07-10 4-15-10	02-25 03-31
Garvin 372 LM	Landmaster® BW + AMS - (G)	2 pt+5 lb	792.6	49.5 A 30 GPA	3-26-10 4-08-10	02-15 03-31
Hughes 267 LM	Landmaster® BW + AMS - (F)	2 pt+2.5 lb	735	49 A 30 GPA	3-15-10 4-12-10	02-25 03-31
Johnson (Not reported) LM	Landmaster® BW + AMS - (F)	2 pt+3.1 lb	831.2	50 A 30 GPA	3-17-10 4-14-10	03-10 04-15
Lincoln 428 LM	Campaign® + AMS - (G)	2 pt+5.1 lb	950	50 A 30 GPA	3-26-10 4-16-10	02-25 03-31
McClain 309 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	751	50 A 30 GPA	3-29-10 4-09-10	02-25 03-31
Okfuskee 215 LM	Landmaster® BW + AMS - (G)	2 pt+3.4 lb	600	50 A 30 GPA	3-17-10 4-08-10	02-25 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment 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 ---------- Performance Good (G), Fair (F) or Poor (P)[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 (Not reported) LM	Campaign®+AMS[4] - (G)	2 pt+5.1 lb	704.6	50 A 30 GPA	3-18-10 4-14-10	02-25 03-31
Pottawatomie 340 LM	Landmaster® BW+AMS - (G)	2 pt+2.9 lb	1013	50 A 30 GPA	3-29-10 4-13-10	02-25 03-31
Seminole 338 LM	Landmaster® BW+AMS - (G)	2 pt+5.1 lb	900	50 A 30 GPA	3-17-10 4-08-10	02-25 03-31
Purcell I-35 216 LM 17 MCB	Landmaster® BW+AMS - (G)	2 pt+5.1 lb	602.4	50 A 30 GPA	3-18-10 4-09-10	02-25 03-31
Shawnee I-40 120 LM 10 MCB	Landmaster® BW+AMS - (F)	2 pt+4.3 lb	405	34 A 40 GPA	3-29-10 4-13-10	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8904.1			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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] ---------- 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)
Coal 215 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	577.8	47.6 A 30 GPA[4]	6-07-10 8-02-10	04-20 08-15
Garvin 372 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	1037.2	49.5 A 30 GPA	6-08-10 7-28 -10	04-20 08-15
	Roundup Pro Conc® - (bareground) - (G)	1%	7.25	Spot treatment	5-04-10 7-29-10	04-25 09-15
Hughes 267 LM	Roundup Pro Conc®+Outrider® - (G)	13 oz+1 oz	728.3	49 A 30 GPA	5-18-10 7-08-10	05-10 06-15
Johnson (Not reported) LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	800.9	50 A 30 GPA	6-09-10 6-24-10	04-20 06-30
Lincoln 428 LM	Roundup Pro Conc®+Outrider® (G)	16 oz+1 oz	715.9	50 A 30 GPA	6-21-10 6-25-10	05-10 06-30
McClain 309 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	490.3	50 A 30 GPA	7-15-10 7-29-10	05-10 06-30
	Honcho® - (bareground) - (G)	2%	38.8	Spot treatment	4-27-10 7-29-10	04-25 09-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit. [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 Three, from table 4a and 4b

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] ---------- 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)
Okfuskee 215 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	565.7	50 A 30 GPA	6-16-10 6-24-10	05-10 06-30
Pontotoc (Not reported) LM	Roundup Pro Conc®+Outrider® - (F)	13 oz+1 oz	420	50 A 30 GPA	6-29-10 7-23-10	05-10 06-30
Pottawatomie 340 LM	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	976.1	50 A 30 GPA	6-01-10 6-29-10	05-10 06-30
Seminole 338 LM	Roundup Pro Conc®+Outrider® - (G)	12.8 oz+1 oz	900	50 A 30 GPA	6-16-10 6-23-10	05-10 06-30
	Roundup Pro Conc® - (bareground) - (G)	2%	4.4	Spot treatment	6-16-10 6-25-10	04-25 09-15
Purcell I-35 216 LM 17 MCB	Roundup Pro Conc®+Outrider® - (G)	16 oz+1 oz	548.4	50 A 30 GPA	6-14-10 6-24-10	05-10 06-30
Shawnee I-40 120 LM 10 MCB	Roundup Pro Conc®+Outrider® - (G)	32 oz+1 oz	304	34 A 40 GPA	6-21-10 6-29-10	05-10 06-30
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			8064.6 50.45 0			Division Total Treated Acres[7] 17019.15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit. [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 Three, from table 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 8, 2010 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. Treatment rate was mostly 2 pints Landmaster BW® + 4 oz Milestone VM®/A with varying rates of AMS. 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 Logan County, Noble County and Guthrie I-35 Interstate maintenance units. Payne County did not report use of a winter annual weed control broadcast application.

The Division Four summer broadcast weed control program (Table 5b) consisted mainly of treatments of Roundup Pro Concentrate® (glyphosate) and Oust XP® (sulfometuron) or Roundup Pro Concentrate® + Outrider® (sulfosulfuron). Grant County utilized Roundup Pro Concentrate® + Outrider®. 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 are applied, OSU-RVM research has found injury levels within acceptable limits. Grant County rated control with this herbicide combination as fair. This rating may be due to a reported use rate of 0.6 oz/A. rate well below the 1.33 oz/A rate recommended by OSU-RVM personnel. Kay County used Roundup Pro Concentrate® + Oust XP® and rated their control as fair also.

Additional miscellaneous applications made for musk thistle control and bareground 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.

For summer weed control broadcast applications in Division Four in those counties satisfied with weed control provided by Oust XP® and glyphosate; these treatments/rates should continue as this is an economical application. However, Grant County and Kay County seem to have more difficulty with johnsongrass control. In the 2010 summer weed control spray season, Grant County switched to the use of Outrider® in an attempt to circumvent high levels of bermudagrass injury from use of Oust XP®. While the switch to Outrider® will lower

phytotoxicity from the use of a “softer” sulfonyl-urea herbicide, continued use rates of Roundup Pro Concentrate® at 16 oz/A may also continue to contribute to bermudagrass stand thinning if application windows are not strictly observed. We suggest that the Grant County maintenance unit utilize the high-end labeled rate of Outrider®, 1.33oz/A (the reported 2010 season rate utilized was 0.6oz/A), and possibly lower the Roundup Pro Concentrate® rate to 14 oz/A. The increased Outrider® rate should yield better johnsongrass control while lessening dependence on the high-end Roundup Pro Concentrate® rate. Kay County should benefit by switching from the use of Oust XP® to the use of Outrider® at 1.33 oz/A for their summer broadcast johnsongrass control application. While Outrider® is more expensive ($15.41/A versus $2.30/A for Oust XP®) to use, it provides excellent johnsongrass control with reduced injury potential on bermudagrass. This should allow both Grant County and Kay County to enjoy improved bermudagrass health in the clear zones while heightening johnsongrass control in these zones.

Division Four personnel reported additional difficulty with pigweed and switchgrass. Unfortunately, current recommended summer broadcast treatments for johnsongrass do not control switchgrass. Current effective recommendations for herbicide wiper applications of high rates of glyphosate can be found in the OSU publication, E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2010. Wiper applications must be made in a two-direction method to encourage treatment effect and there must be adequate height differential to insure that only switchgrass gets the treatment. Successful switchgrass control also involves timely mowing in conjunction with wiping efforts. If bermudagrass is accidentally wiped, the treatment will result in death of the desirable species.

Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They were reported as severe problems in Grant County and other maintenance units in Division Four. 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.

Observations of broadleaf weed infestation in and along cable barrier systems was noted. Division Four indicated they have 32 miles of cable-barrier within their division with more miles under construction at this time. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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 323.3 LM	Landmaster® BW + Milestone VM® + AMS[4] - (G)	2 pt+4 oz + not reported	1125.8	43.3 A 30 GPA	3-29-10 4-18-10	02-25 04-15
Grant 304 LM	Landmaster® BW + Milestone VM® + AMS - (G)	1.84 pt+4 oz +4.7 lb	779.4	43.3 A 30 GPA	3-16-10 3-26-10	02-25 04-15
	Campaign®+ Milestone VM® + AMS - (G)	1.84 pt+4 oz +4.7 lb	129.9	43.3 A 30 GPA	3-15-10 3-15-10	02-25 04-15
Kay 358.5 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +4 lb	866.6	43.3 A 30 GPA	3-16-10 4-19-10	02-25 03-31
Kingfisher 223.6 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +4 lb	1035.2	43.3 A 30 GPA	3-16-10 3-19-10	02-25 03-31
Logan 288.2 LM	Landmaster® BW + Milestone VM® + AMS - (G)	4 pt+4 oz +5.1 lb	799.5	53.3 A 30 GPA	4-17-10 6-09-10	02-25 03-31
Noble 277.9 LM	Landmaster® BW + Milestone VM® - + AMS - (G)	4pt+4oz +5.1lb	606.2	43.3 A 30 GPA	3-15-10 4-07-10	02-25 03-31
	Roundup Pro Conc® + Milestone VM® - + AMS - (G)	25oz+4oz +5.1lb	736.1	43.3 A 30 GPA	3-17-10 4-08-10	02-20 03-25
Payne 300 LM	Not reported		0			

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

Table 5a. (Continued) 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 ---------- Performance Good (G), Fair (F) or Poor (P)[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)
Guthrie I-35 200 LM 7 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2pt+4oz +5.1lb	519.6	43.3 A 30 GPA	2-10-10 4-10-10	02-25 03-31
Tonkawa I-35 170 LM 25 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	Not reported	390	43.3 A 30 GPA	3-15-10 3-17-10	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			6988.3			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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] ---------- 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)
Garfield 323.3 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	909.3	43.3 A 30 GPA	5-26-10 6-16-10	04-10 06-30
Grant 304 LM	Roundup Pro Conc® + Outrider® - (F)	16 oz+.6 oz	831	43.3 A 30 GPA	6-08-10 7-28-10	04-20 08-15
	Transline® + Surfactant - (Musk thistle) – (G)	50 oz+7 oz	.8	43.3 A 30 GPA	4-26-10 5-05-10	03-01 05-10
	Roundup Pro Conc® - (bare ground) - (G)	2%	23.2	Spot treatment	7-21-10 7-27-10	05-01 09-15
	Imazapyr 2 SL + Roundup Pro Conc® + surf - (bare ground) - (G)	2 qts+1 gal +1 qt	4	Spot treatment	6-01-10 6-28-10	05-01 09-15
Kay 358.5 LM	Roundup Pro Conc® + OustXP® - (F)	16 oz+1 oz	882.7	43.3 A 30 GPA	5-27-10 6-23-10	05-10 06-15
	Transline® + Surfactant – (Musk thistle) – (G)	50 oz	1.5	Spot treatment	5-05-10 6-03-10	03-01 05-10
Kingfisher 223.6 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	43.3	43.3 A 30 GPA	6-24-10 6-24-10	05-01 06-15
	Arsenal®+Roundup Pro Conc® + Krovar® + Surfactant – (bare ground) - (G)	.6 gal+1 gal +6 lb+16 oz	10	Patchen sprayer	7-01-10	05-10 09-15
	Transline® + Surfactant - (Musk thistle) – (G)	65 oz	1	Spot treatment	5-03-10 5-03-10	03-01 05-10
Logan 288.2 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	799.5	53.3 A 30 GPA	4-17-10 6-09-10	05-01 06-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit. [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 Four, from table 5a and 5b.

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] ---------- 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)
Noble 277.9 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	692.8	43.3 A 30 GPA	5-18-10 6-22-10	05-10 06-15
	Arsenal® + OustXP® + Surfactant – (bare ground) – (G)	1 gal+8 oz +2 gal	1.5	Spot treatment	6-01-10 8-02-10	05-10 09-15
Payne 300 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	731	43.3 A 30 GPA	5-11-10 5-28-10	05-10 06-15
Guthrie I-35 200 LM 7 MCB	Roundup Pro Conc® + OustXP® - (F)	16 oz+1 oz	519.6	43.3 A 30 GPA	4-17-10 6-22-10	05-10 06-15
Tonkawa I-35 170 LM 25 MCB	Roundup Pro Conc® + OustXP® - (G)	Not reported	430	43.3 30 GPA	5-18-10 5-27-10	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			5842.5 38.7 0			Division Total Treated Acres[7] 12869.5

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit. [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 Four, from table 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 19, 2010 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®) + ammonium sulfate (AMS) broadcast treatment or a Campaign®/Landmaster® BW+ Milestone VM® (aminopyralid) + AMS broadcast treatment. Treatment rates were mostly 2 pints/A Landmaster® BW or Campaign® +/- 4 oz/A Milestone VM® with varying rates of AMS. 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. Campaign® or Landmaster® BW rates were between 2 pts/A and 3 pts/A. All maintenance units rated control as good except the Elk City I-40 unit rated control as fair. Fair control may be partially attributed to lower than recommended AMS rates. Most maintenance units applied this treatment within recommended application windows.

The Division Five summer broadcast weed control program (Table 6b) consisted mainly of treatments of Roundup Pro Concentrate® (glyphosate) + Oust XP® (sulfometuron). A Roundup Pro Concentrate® + Outrider® (sulfosulfuron) treatment provides less potential for bermudagrass injury. Outrider®, like Oust XP®, is a sulfonyl-urea herbicide, but it is less phytotoxic to bermudagrass at normal use rates and therefore more forgiving if application rates deviate slightly from recommended rates. Most summer weed control broadcast applications were rated as good except from the Harmon County maintenance unit who rated control as fair. Utilization of glyphosate rates below the label recommended rates were used and this factor may have contributed to reduced weed control efficacy.

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*), and crabgrass (*Digitaria species*).

7.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Comments from survey results and division herbicide meetings indicate that Division Five has been generally satisfied with the overall achievements 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® since the reported results were satisfactory. Campaign® will no longer be available as Monsanto Company has discontinued manufacture of their Campaign® herbicide product. Future post-emergent winter weed control applications will be with Landmaster® BW instead of Campaign®. 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. However, Milestone VM® does not provide pre-emergent control of kochia or pigweed.

For summer weed control broadcast applications in Division Five counties where previously Oust XP® was utilized, we recommend they utilize DuPont's blended product Oust

Extra®. Oust Extra® is a blend of sulfometuron and metsulfuron. The Oust Extra® applied at 1.0 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 December, 2010). This rate will also provide a phytotoxicity safety level that Division Five administrators want. Use of OustExtra® will only increase the cost per acre by approximately $0.98. We recommend that Division Five modify their summer broadcast treatment to utilize an OustExtra® 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 do not need the additional metsulfuron in Oust Extra®.

Division Five personnel reported 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 and herbicide resistance has been documented in Oklahoma. The 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. Currently, the diglycolamine salt of dicamba (Vanquish®) will control most broadleaf weeds including some pigweeds and it 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.

Division Five experienced a complaint against the division for spray drift injury when the I-40 East maintenance unit sprayed Vanquish® along/within the “foot print” area of cable barrier adjacent to a pumpkin famer. The situation is currently under review by the Oklahoma Dept of Agriculture, Food & Forestry.. Extreme caution is advised when using Vanquish® for summer weed control around sensitive agricultural crops. High summer temperatures have the potential to exacerbate the problem of Vanquish® drift due to increased volatility at those times.

Observations of broadleaf weed infestation in and along cable barrier systems were noted. Division Five indicated that they have 71 miles of cable-barrier within their division with more miles under establishment. This area or “footprint” surrounding the cable barrier is susceptible to invasion by multiple weeds. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications..

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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 - (G)	2 pt+4.8 oz+9.5 lb	933.9	49.15 A 40 GPA	3-10-10 3-23-10	02-25 04-15
Blaine 350 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.2 lb	682.5	32.5 A 40 GPA	3-16-10 4-08-10	02-25 04-15
	Landmaster® BW + AMS - (G)	2.5 pt+3.2 lb	292.5	32.5 A 40 GPA	3-16-10 4-08-10	02-25 04-15
Custer 306 LM	Landmaster® BW + AMS - (G)	2.5 pt+3.1 lb	682.5	32.5 A 40 GPA	3-29-10 4-21-10	02-25 04-15
	Campaign® + AMS – (G)	2.5 pt+3.1 lb	32.5	32.5 A 40 GPA	3-29-10 3-29-10	02-25 04-15
Dewey 277 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz+3.14 lb	333	32.5 A 40 GPA	3-16-10 4-08-10	02-25 04-15
	Landmaster® BW + AMS - (G)	2 pt+3.14lb	333	32.5 A 40 GPA	3-16-10 4-08-10	02-25 04-15
Greer 242 LM	Landmaster® BW + Milestone VM® + AMS - (G)	Not reported	440	32.5 A 40 GPA	3-23-10 4-09-10	02-25 04-15
	Campaign® + Milestone VM® + AMS - (G)	Not reported	120	32.5 A 40 GPA	3-17-10 3-24-10	02-25 04-15
Harmon 205 LM	Landmaster® BW + Milestone VM® + AMS - (G)	3 pt+4 oz+3.4 lb	445.5	40.5 A 40 GPA	3-30-10 4-12-10	02-25 04-15
	Campaign® + Milestone VM® + AMS - (G)	3 pt+4 oz+3.4 lb	243	40.5 A 40 GPA	3-23-10 3-30-10	02-20 03-25

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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 ---------- Performance Good (G), Fair (F) or Poor (P)[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)
Jackson 303 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.4 lb	526.5	40.5 A 40 GPA	3-29-10 4-18-10	02-25 04-15
	Campaign® + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.4 lb	283	40.5 A 40 GPA	3-23-10 3-29-10 4-04-10 4-08-10	02-25 04-15
Kiowa 405.9 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5 pt+4 oz+3.2 lb	872.5	40 A 40 GPA	3-16-10 4-09-10	02-25 04-15
	Landmaster® BW + AMS - (G)	2.5 pt+3.2lb	40	40 A 40 GPA	3-16-10 3-16-10	02-25 04-15
Roger Mills 300 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2.5pt+4oz+3.2lb	728.6	42 A 40 GPA	3-11-10 3-25-10	02-25 04-15
Tillman Not reported LM	Campaign® + Milestone VM® + AMS - (G)	2.5pt+4oz+3.4lb	925	50 A 40 GPA	3-16-10 3-19-10	02-25 04-15
Washita 337 LM	Campaign® + AMS - (G)	2.5pt+3.4lb	227.5	32.5 A 40 GPA	3-16-10 3-17-10	02-25 04-15
	Landmaster® BW + Milestone VM® + AMS - (G)	2.5pt+4oz+3.4lb	1365	32.5 A 40 GPA	3-17-10 4-02-10	02-25 04-15
Elk City I-40 E 305.9 LM 28 MCB	Landmaster® BW + Milestone VM® + AMS - (F)	3pt+4oz+3.5lb	1075	43 A 40 GPA	3-16-10 4-08-10	02-25 04-15
	Campaign®+Pendulum® - (?)	2pt+1.4qt	56	Spot treatment	3-16-10 4-08-10	02-25 04-15
Hydro I-35 W 320 LM 43 MCB	Campaign® + Milestone VM® + AMS - (G)	3.0pt+4oz+3.4 lb	1072.5	32.5 A 40 GPA	2-20-10 4-15-10	02-25 04-15
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			11710			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating by ODOT unit, an (?) = no response.[4]AMS= Dry Ammonium Sulfate. [5]Recommended window, 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] ---------- 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)
Beckham 310 LM	MSMA - (G)	2 qt	920.60	49.15 A 40 GPA	6-29-10 7-09-10	05-10 07-15
	Roundup Pro Conc® + Arsenal® + OustXP® (Bare ground) - (G)	18 oz+8 oz+0.75 oz	248	Spot treatment	7-09-10 8-13-10	05-10 09-15
	Roundup Pro Conc® + OustXP® (bare ground) - (G)	2%+1 oz	176	Spot treatment	7-09-10 8-13-10	05-01 09-01
Blaine 350 LM	Roundup Pro Conc® + OustXP - (G)	12 oz+0.7 oz	975	32.5 A 40 GPA	5-08-10 6-12-10	05-01 06-15
	MSMA+OustXP - (G)	2 qt+0.5 oz	325	32.5 A 40 GPA	5-20-10 7-21-10	05-10 07-15
	Roundup Pro Conc® + Arsenal® (Bare ground) - (F)	2%	10	Spot treatment	5-04-10 5-11-10	05-01 09-15
	Aquastar® (aquatic) - (F)	2%	10	Aquatic spot treatment	5-20-10 7-20-10	05-01 09-15
	Arsenal® + Roundup Pro Conc® + OustXP® (bare ground) - (G)	1 gal+3 gal+12 oz/100 gal	145	Patchen shoulder crack/edge treatment	6-20-10 7-12-10	05-10 09-15
	Vanquish® + MSMA - (G)	12 oz+2 qt	260	32.5 A 40 GPA	6-29-10 7-20-10	03-15 06-30

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Five, from table 6a and 6b.

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] ---------- 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)
Custer 306 LM	Roundup Pro Conc® + OustXP® - (G)	9.8 oz+0.5 oz	780	32.5A 40 GPA	7-13-10 7-15-10	05-01 06-15
	MSMA + OustXP® - (G)	1.5 qt+1.0 oz	292.5	32.5A 40 GPA	7-13-10 7-15-10 8-16-10 8-18-10	05-10 07-15
	Roundup Pro Conc® + Arsenal® + Sahara® + OustXP® (bare ground) - (F)	92 oz+180 oz+64 oz+6.4 oz	30	Spot treatment	4-26-10 4-27-10 6-21-10 6-21-10	05-10 09-15
Dewey 277 LM	Roundup Pro Conc® + Vanquish® + OustXP® - (G)	10 oz+16 oz+0.5 oz	698.75	32.5A 40 GPA	6-09-10 7-06-10	05-01 06-15
	Roundup Pro Conc® (bare ground) - (G)	3%	45.5	32.5A 40 GPA	6-01-10 6-24-10	05-01 09-15
	Habitat® (Aquatic) - (F)	1%	0.12	Aquatic spot treatment	6-30-10 6-30-10	05-01 07-01
	Roundup Pro Conc® + Arsenal® + Pendulum® (bare ground) - (G)	1%+0.5%+2 pt	10	Spot treatment	5-11-10 5-27-10	05-01 09-15
Greer 242 LM	Roundup Pro Conc® + OustXP® - (G)	Not reported	160	32.5A 40 GPA	5-27-10 5-27-10	05-10 06-15
	MSMA - (G)	Not reported	40	32.5A 40 GPA	5-27-10 5-27-10	05-10 07-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Five, from table 6a and 6b.

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] ---------- 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)
Harmon 205 LM	Roundup Pro Conc® + OustXP® - (F)	12 oz+0.5 oz	Not reported	40.5A 40 GPA	5-25-10 6-14-10	05-10 06-15
	MSMA - (F)	2 pt	Not reported	40.5A 40 GPA	8-01-10 9-30-10	05-10 07-15
	Roundup Pro Conc® +Arsenal® + Surfactant (bare ground) - (F)	2%+2%	Not reported	Spot treatment	3-18-10 4-12-10	05-01 09-15
Jackson 303 LM	Roundup Pro Conc® + OustXP® - (G)	10 oz+0.5 oz	891	40.5A 40 GPA	5-25-10 6-24-10	05-10 06-15
	Roundup Pro Conc® + Arsenal® + Surfactant (bare ground) - (G)	2%+1%	5	40.5A 40 GPA	6-29-10 7-30-10	05-01 09-15
Kiowa 405.9 LM	Roundup Pro Conc® + OustXP - (G)	10 oz+0.5 oz	920	40A 40 GPA	5-26-10 6-14-10	05-10 06-15
	MSMA – (?)	1.5 t	200	40A 40 GPA	6-30-10 7-13-10	05-10 07-15
Roger Mills 300 LM	Roundup Pro Conc® + OustXP® - (G)	10 oz+0.5 oz	825	42A 40 GPA	5-26-10 6-14-10	05-10 06-15
	Roundup Pro Conc® + Outrider® - (G)	10 oz+0.5 oz	75	Spot treatment	7-06-10 7-12-10	05-10 07-30
	MSMA + Vanquish® - (G)	2 qt+16 oz	37.5	Spot treatment	6-15-10 6-15-10	05-10 07-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Five, from table 6a and 6b.

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] ---------- 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)
Tillman Not reported LM	MSMA – (?)	2 qt	450	50A 40 GPA	5-17-10 6-4-10	05-10 07-15
	Roundup Pro Conc® + Imazapyr 2SL + Surfactant (bare ground) - (G)	2%+2.3 oz+1%+	63	Spot treatment	6-22-10 6-25-10	05-01 09-15
Washita 337 LM	Roundup Pro Conc® + OustXP® - (G)	12 oz+0.5 oz	910	32.5A 40 GPA	5-20-10 6-02-10	05-10 06-15
	MSMA - (G)	0.77 qt	65	32.5A 40 GPA	7-01-10 7-02-10	05-10 07-15
Elk City I-40 E 305.9 LM 28 MCB	Roundup Pro Conc® + OustXP® - (G)	10 oz+0.7 oz	817	43A 40 GPA	6-1-10 6-28-10	05-10 06-15
	Roundup Pro Conc® + Imazapyr 2SL + Surfactant (bare ground) - (G)	Not reported	12	Spot treatment	6-29-10 6-29-10	05-1 09-15
Hydro I-35 W 320 LM 43 MCB	Vanquish® - (G)	1 pt	20	Spot treatment	3-01-10 7-20-10	03-15 06-30
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			9717.85 699 0.12			Division Total Treated Acres[7] 22126.97

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Five, from table 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 19, 2010 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 made a concerted effort to engage in a "house cleaning" endeavor to reduce or eliminate inventory of older herbicides. The best way to do that was to use them as they are labeled for weed control in Division Six. Division Six is 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) generally consisted of a glyphosate + 2,4-D (Campaign®) + AMS(ammonium sulfate) broadcast treatment, or a Campaign® + aminopyralid (Milestone VM®) + AMS(ammonium sulfate) broadcast treatment or a glyphosate (Honcho Plus®/Roundup Pro Concentrate®) + Milestone VM® + AMS treatment or a glyphosate(Honcho Plus®) +/- AMS treatment. Treatment rates were mostly 3-4 pints/A Campaign® +/- 4 oz Milestone VM®/A with varying rates of AMS. 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. Some maintenance units did not report using any AMS in some winter weed control applications. Due to the relatively cheap price of AMS ($0.96/A), every maintenance unit is recommended to make this addition to all winter weed control applications involving glyphosate. All maintenance units rated control as good except the Harper County unit which rated control as fair. Fair control may be partially attributed to use of the lowest recommended glyphosate rates. Division Six maintenance units varied in making broadcast applications within recommended application windows.

Specific weed problems that were reported as not being controlled to expectations included pigweed species (*Amaranthus species*), kochia (*Kochia scoparia*), johnsongrass (*Sorghum halepense*) and field sandbur (*Cenchrus species*). It was noted in divisional meetings that complexes of miscellaneous broadleaf weeds were becoming more noticeable.

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. We would recommend that Division Six continue with the winter weed control broadcast application of glyphosate + 2,4-D (Landmaster® BW). Due to marketing decisions by Monsanto Company, Campaign® will no longer be available and future survey data should indicate the Division Six movement to Landmaster® BW. During meetings with Division Six maintenance administrators recommendations were made by OSU that Landmaster® BW be applied at a rate of 3 pts/A alone + AMS or in combination with Milestone VM® (4 oz/A) + AMS. Unfortunately, pre-emergent applications of Milestone VM® often do not provide adequate control of kochia and some pigweed species. However Milestone VM® does control a wide spectrum of other broadleaf weeds (see label http://www.cdms.net/LDat/ld7I2022.pdf, November 2010) and should continue to be applied where budgets will allow. Alfalfa County and Major County maintenance units used excessively high rates of Roundup Pro Conc® during

winter weed control applications. Both county units also applied their treatments outside of preferred treatment windows. These two maintenance units should strive to adhere to recommendations contained in OSU publication, E-958. Roundup Pro Conc® should not exceed 25 fluid ounces of product per acre.

For summer weed control broadcast applications in Division Six, those counties having previously used Oust XP® (Division Six has been comfortable with high-end sulfometuron applications and is satisfied with maintenance units making this broadcast rate application), we recommend they utilize DuPont's blended product Oust Extra® that 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® and deliver enough metsulfuron (Escort XP®) to give good control of johnsongrass while also increasing and widening the spectrum of miscellaneous broadleaf weed control (see label http://www.cdms.net/LDat/ld6BP006.pdf, November 2010). Use of OustExtra® will only increase cost per acre by approximately $1.47. We recommend that Division Six modify their summer broadcast treatment to utilize an OustExtra® program for controlling johnsongrass (*Sorghum halepense*) and other labeled broadleaf weeds. Those maintenance units already applying Milestone VM® 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 should provide an acceptable reduction in sandbur prevalence along with acceptable johnsongrass control. Use of Outrider® was limited due to cost, $11.59/A, however results were rated as good. In those maintenance units where johnsongrass control is difficult and injury levels are of a major concern, high-end rates (1.33oz/A) of Outrider® and low-end rates of glyphosate, should provide excellent johnsongrass control with little bermudagrass injury.

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 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, 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. 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. Future research regarding more efficacious control of pigweed species is being explored and will be shared with Division Six as results are generated.

Division Six is to be commended for undertaking "periodic house cleaning" regarding instruction to maintenance units to thoroughly inventor pesticide storage facilities for older herbicide products. This practice is encouraged to help minimize possession of older products and to utilize products before contents become less stable or become degraded by overly excessive storage periods.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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	Roundup Pro Conc® + Milestone VM® + AMS[4] - (G)	30.72 oz+4 oz +4 lb	700	50 A 30 GPA	4-02-10 4-13-10	03-05 04-05
Beaver 352 LM	Honcho Plus® - (G)	30 oz	1155	55 A 30 GPA	4-03-10 4-22-10	03-50 04-50
Cimarron 389.6 LM	Honcho Plus® + Milestone VM® + AMS - (G)	32 oz+4 oz+ 4.7 lb	516	43 A 30 GPA	3-30-10 4-07-10	03-05 04-05
	Honcho Plus® + AMS - (G)	32 oz+4.7 lb	425.3	43 A 30 GPA	4-08-10 4-26-10	03-05 04-50
Ellis 184 LM	Campaign® + Milestone VM® - (G)	4 pt+8 oz	49.4	50 A 30 GPA	4-08-10 4-08-10	02-25 04-15
	Honcho Plus® - (G)	64 oz	862.6	50 A 30 GPA	4-08-10 4-27-10	02-20 04-05
Harper 314 LM	Honcho Plus® - (G)	64 oz	684	57 A 30 GPA	3-30-10 4-17-10	03-05 04-05
	Honcho Plus® + Milestone VM® + AMS - (F)	16 oz+4 oz +4 lb	120	57 A 30 GPA	4-08-10	03-05 04-05
	Campaign® + AMS - (G)	4pt+4 lb	36	57 A 30 GPA	4-05-10	03-10 04-15
Major 312 LM	Roundup Pro Conc® + Milestone VM® + AMS - (G)	32 oz+4 oz +4 lb	850	50 A 30 GPA	4-07-10 4-13-10	02-20 03-05

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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 ---------- Performance Good (G), Fair (F) or Poor (P)[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	Campaign® - (G)	3.75 qt	50	50 A 30 GPA	4-07-10 4-07-10	03-10 04-15
	Honcho Plus® + Milestone VM® - (G)	32 oz+4 oz	50	50 A 30 GPA	4-08-10 4-08-10	03-05 04-05
	Honcho Plus® - (G)	32 oz	1300	50 A 30 GPA	4-08-10 4-27-10	03-05 04-05
	Honcho Plus® - (G)	16 oz	25	Spot treatment	4-27-10 4-27-10	03-05 04-05
Woods 275 LM	Honcho Plus® + Milestone VM® + AMS - (G)	32 oz+4 oz +4 lb	200	50 A 30 GPA	4-08-10 4-08-10	03-05 04-05
	Roundup Pro Conc® + Milestone VM® + AMS - (G)	20 oz+4 oz+ 4 lb	200	50 A 30 GPA	3-23-10 4-08-10	03-05 04-05
	Honcho Plus® + AMS - (G)	32 oz+4 lb	300	50 A 30 GPA	4-12-10 4-20-10	03-05 04-05
Woodward 344 LM	Campaign® - (G)	4 pt	96.7	48 A 30 GPA	3-25-10 3-31-10	02-25 04-15
	Honcho Plus® - (?)	32 oz	399.2	48 A 30 GPA	4-20-10 4-27-10	02-20 04-05
	Honcho Plus® + Milestone VM® - (G)	32 oz+4 oz	537.8	48 A 30 GPA	4-02-10 4-20-10	02-20 04-05
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8557			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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] ---------- 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)
Alfalfa 297 LM	None reported		0			
Beaver 352 LM	Roundup Pro Conc® + OustXP® - (G)	9.6 oz+0.9 oz	385	55 A 30 GPA[4]	6-3-10 6-6-10	05-20 06-30
	Honcho Plus® + OustXP®	15.6 oz+0.9 oz	385	55 A 30 GPA	6-3-10 6-6-10	05-20 06-30
Cimarron 389.6 LM	Honcho Plus® + OustXP® + AMS - (G)	16 oz+1 oz +4.7 lb	645	43 A 30 GPA	6-10-10 6-18-10	05-20 06-30
	Honcho Plus® + Outrider® - (G)	16 oz+1 oz	344	43 A 30 GPA	6-19-10 6-26-10	05-20 08-15
	Honcho Plus® + Plateau® - (G)	16 oz+4 oz	16	43 A 30 GPA	6-28-10 6-28-10	05-20 06-30
	Honcho Plus® + Plateau® (bare ground) - (F)	32 oz+8 oz	42.9	Spot treatment	6-29-10 7-7-10	05-20 09-15
Ellis 184 LM	Honcho Plus® - (G)	Rate not reported	862.6	50 A 30 GPA	6-3-10 6-29-10	05-10 08-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

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	Honcho Plus® + Outrider® - (G)	16 oz+1 oz	171	57 A 30 GPA	5-25-10 5-27-10	05-20 08-15
	Honcho Plus® + Oasis®(F)	16 oz+4 oz	114	57 A 30 GPA	5-27-10 5-28-10	05-20 06-15
	Honcho Plus® + OustXP® - (G)	16 oz+1 oz	513	57 A 30 GPA	6-02-10 6-06-10	05-20 06-30
	Honcho Plus® + Arsenal® (bare ground) - (G)	2%+1%	23	Spot treatment	7-20-10 7-29-10	05-20 09-15
	Honcho Plus® + Arsena® + Oasis® (bare ground) - (G)	2%+1%+.3%	47	Spot treatment	8-04-10 8-11-10	05-20 09-15
Major 312 LM	Honcho Plus® + Outrider® - (G)	16 oz+0.8 oz	1050	50 A 30 GPA	6-02-10 6-30-10	05-10 08-15
	Banvel® + Surfactant (Musk thistle) - (G)	1 qt+1 qt	3	Spot treatment	5-12-10 6-15-10	02-25 08-10
Texas 500 LM	Overdrive® + OustXP® + Honcho Plus® - (G)	4 oz+1 oz +16 oz	250	50 A 30 GPA	6-03-10 6-11-10	05-20 06-30
	Honcho Plus® + OustXP® - (G)	16 oz+1 oz	775	50 A 30 GPA	6-14-10 6-30-10	05-20 06-30
	MSMA 6 Plus® - (G)	2 qt	250	50 A 30 GPA	6-28-10 6-29-10	05-20 08-15

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, OSU pub. E-958, *Suggested Herbicides for Roadside Weed Problems*.

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)
Woods 275 LM	Honcho Plus® + OustXP® - (G)	16 oz+1 oz	500	50 A 30 GPA	6-01-10 6-15-10	05-20 06-30
Woodward 344 LM	Honcho Plus® + OustXP® (?)	16 oz+1 oz	529.7	48 A 30 GPA	6-15-10 6-25-10	05-10 06-30
	Honcho Plus® + Oasis® - (G)	16 oz+4 oz	473.3	48 A 30 GPA	6-02-10 6-15-10	05-10 06-30
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			7309.5 70 0			15936.5

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 November 9, 2010 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/A Milestone VM® with varying rates of AMS. OSU-RVM recommended AMS rate is 5.1 pounds of AMS/A (equivalent to 17 pounds AMS/100 gallons of water) when using a 30 GPA carrier rate. Campaign® or Landmaster® BW rates were between 2 pts/A and 2.5 pts/A. Jefferson County included dicamba + diflufenzopyr (Overdrive®) in their winter weed control broadcast application to specifically target musk thistle (*Cardus* nutans) and increase control results. All maintenance units rate control as good. Most maintenance units applied this treatment within recommended application windows. Those exceeding treatment windows may experience bermudagrass injury from the glyphosate component of this treatment applied to bermudagrass beginning to break dormancy.

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®). MSMA was utilized in several maintenance units at a 2 qt/A rate. Most 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 silver bluestem, also called silver beardgrass, (*Bothriochloa saccharoides*) Personal observations from OSU-RVM personnel noted pigweed species (*Amaranthus species*) 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 achievement goals 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 will 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 pre-emergent broadleaf weed control. However, Milestone VM® does not provide pre-emergent control of kochia or pigweed.

For summer weed control broadcast applications in Division Seven, emphasis has been historically placed on summer applications of MSMA for johnsongrass control. All Division Seven maintenance units indicated on survey results that they were aware that MSMA use would come to an end December 31, 2013. This is due to EPA regulatory efforts to end roadside uses of MSMA. While MSMA is available and economical, Division Seven can continue to purchase MSMA through December 31, 2012. All stocks of MSMA must be expended by December 31, 2013. In place of MSMA, Division Seven has already been using two herbicides, Plateau® and Outrider® combined with glyphosate for summer johnsongrass control. Division Seven is encouraged to continue evaluation of these combinations for johnsongrass control in their division.

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 25 miles of cable-barrier within their division with more miles under establishment at the time of this writing. Pigweed (*Amaranthus species*) and Palmer amaranth (*Amaranthus palmeri*) are species within the pigweed family. They have been reported to be 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. 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. Currently, diglycolamine salt of dicamba (Vanquish®) will control most broadleaf weeds including some pigweeds and is recommended in OSU publication, E-958. Division. 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. 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.

This area or “footprint” surrounding the cable barrier is susceptible to invasion by multiple weeds. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the “foot print” area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications.

Division Seven personnel reported additional difficulty with silver bluestem and big bluestem. OSU publication E-958, *Suggested Herbicides for Roadside Weed Problems*, September 2010, contains recommendations for the control of silver bluestem with glyphosate that are an option for Division Seven. However, there is no room for error with this application and 30-45 days of visible phytotoxicity will need to be tolerated on bermudagrass rights-of-way. Maintenance units in Division Seven are encouraged to discuss this treatment option with divisional maintenance administrators before making this application.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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	3-17-10 4-15-10	02-25 04-31
	Campaign® + AMS - (G)	2 pt+4.25 lb	120	60 A 30 GPA	3-16-10 3-16-10	02-25 04-31
Carter 480 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +5.1 lb	840	60 A 30 GPA	3-11-10 4-8-10	02-15 03-20
Comanche 500 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +3.4 lb	1200	50 A 30 GPA	3-22-10 3-31-10	02-15 03-31
Cotton 265 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +5.1 lb	750	50 A 30 GPA	3-11-10 3-16-10	02-15 03-20
Grady 488 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4 oz +3.4 lb	1120	70 A 25 GPA	3-16-10 4-08-10	02-25 03-31
Jefferson 220 LM	Campaign® + Milestone VM® + Overdrive® + AMS - (G)	2.5 pt+4 oz +4 oz 3.4 lb	785.4	70 A 25 GPA	3-11-10 3-18-10	02-15 03-20
Love 390 LM	Landmaster® BW + AMS - (G)	2 pt+2.7 lb	770	70 A 25 GPA	3-12-10 3-26-10	02-15 03-20
Murray 183 LM	Landmaster® BW + AMS - (G)	2 pt+ 4.25 lb	588	49 A 30 GPA	3-27-10 4-08-10	02-15 03-31
Stephens 200 LM	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4oz +3.4 lb	700	70 A 25 GPA	3-17-10 3-23-10	02-15 03-31
Ardmore Interstate 250 LM 25 MCB	Landmaster® BW + Milestone VM® + AMS - (G)	2 pt+4o z +3.4 lb	600	60 A 30 GPA	3-12-10 4-12-10	02-15 03-20
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			8733.4			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating by ODOT, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate. [5]Recommended treatment window, 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] ---------- 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)
Caddo 530 LM	MSMA + Outrider® - (G)	2 qt+1 oz	1150	60 A 30 GPA	6-09-10 6-29-10	05-10 07-30
	MSMA - (G)	2 qt	150	60 A 30 GPA	7-09-10 8-13-10	05-10 09-15
Carter 480 LM	MSMA + Outrider® - (G)	2 qt+1.33 oz	840	60 A 30 GPA	6-15-10 7-01-10	04-15 07-30
Comanche 500 LM	Roundup Pro® + Plateau® - (G)	13 oz+4 oz	1000	50 A 30 GPA	6-07-10 6-17-10	04-20 06-15
Cotton 265 LM	Roundup Pro® + Plateau® - (G)	14 oz+4 oz	750	50 A 30 GPA	6-09-10 7-19-10	04-20 05-31
Grady 488 LM	Roundup Pro® + Plateau® - (G)	12 oz+4 oz	540	70 A 25 GPA	6-22-10 6-30-10	03-20 06-15
Jefferson 220 LM	Roundup Pro® + Outrider® - (G)	15 oz+1.3 oz	78	70 A 25 GPA	5-27-10 5-27-10	04-20 06-30
	Roundup Pro Conc® + OustXP® (bare ground) - (G)	32 oz+2 oz	6	Spot treatment	5-26-10 6-8-10	04-25 09-15
	Garlon 4® + oil – (?)	Not reported	1	Spot treatment	1-14-10 1-21-10	Year round
Love 390 LM	MSMA - (G)	2 qt	210	70 A 25 GPA	8-21-10 ?	04-15 07-30
	Arsenal® + Surfactant (bare ground) - (G)	2 oz/ gal	Not reported	Spot treatment	4-1-10 6-15-10	04-25 09-15
	Garlon 4® + oil	3:1	Not reported	Spot treatment	10-17-10 3-29-10	Year round

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Seven, from table 8a and 8b.

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] ---------- 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)
Murray 183 LM	Roundup Pro® + Outrider® - (G)	32 oz+1 oz	490	49 A 30 GPA	5-21-10 6-03-10	04-20 07-30
Stephens 200 LM	MSMA - (G)	2 qt	5	70 A 25 GPA	7-06-10 7-06-10	04-15 07-30
	Roundup Pro Conc® (bare ground) - (G)	2%	12	Spot treatment	6-16-10 6-17-10	Growing season
	Garlon 4® + oil – (?)	Not reported	5	Spot treatment	3-22-10 6-26-10	Year round
Ardmore Interstate 250 LM 25 MCB	Not reported		0			
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			5219 18 0			Division Total Treated Acres[7] 13970.4

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Seven, from table 8a and 8b.

10.0 SURVEY OF DIVISION EIGHT HERBICIDE PROGRAMS

10.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 11 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 19, 2010 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 or Campaign®) + AMS (ammonium sulfate) broadcast treatment. Treatment rates were mostly 2 pints/A Landmaster® BW/Campaign® + varying rates 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. Campaign® or Landmaster® BW rates were mostly 2 pts/A with Craig County reporting a 3 pt/A use rate. Four of eleven county maintenance units reported winter weed control as fair. Most counties reporting fair control were using the 2 pt/A rate of Landmaster® BW or Campaign® with the exception of Craig County that used a 3 pt/A rate of Landmaster® BW with a medium rate of AMS, 4.2 lbs/A.

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 + sulfosulfuron (Outrider®, a sulfonyl-urea herbicide that is less phytotoxic to bermudagrass and therefore, more forgiving if application rates deviate from recommended rates). Most summer weed control broadcast applications were rated as good except Nowata County maintenance unit who rated glyphosate (Ranger Pro®) + Outrider® control as fair. Low-end rates of glyphosate were used and may contribute to lower control levels. 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 sow thistle (*Sonchus oleraceus*) 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 pt/A broadcast rates of Landmaster® BW or Campaign®. In meetings with Division Eight maintenance administrators, increased rates of Landmaster® BW up to 3 pt/A were recommended. Campaign® will no longer be available as Monsanto Company has discontinued their product. Future applications for winter weed control will reflect the use of Landmaster® BW instead of Campaign®. 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. Moving to the 3 pt/A rate will only add $1.37/A (2 pt/A cost is $2.73). For those county maintenance units experiencing significant broadleaf weed problems that originate after the winter annual weed control application of Landmaster® BW, addition of 4 oz/A of aminopyralid (Milestone VM®) will provide a wide spectrum, pre-emergent control option that can be tank-mixed with Landmaster® BW + AMS. Some of these winter annual weed control broadcast applications were 2-3 weeks past the recommended application window. 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.

For summer weed control broadcast applications in Division Eight, those counties having previously used Oust XP®, we recommend they utilize DuPont's blended product Oust Extra® that 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® used at 1.0oz/A and deliver enough metsulfuron (Escort XP®) to give good control of Illinois bundleflower. This rate of Oust Extra® will also widen the spectrum of miscellaneous broadleaf weed control. Use of Oust Extra® only adds an additional $1.47/A when compared to use of Oust XP®

Several other items of note include survey responses indicating some county maintenance units made no winter annual weed control treatment applications. Multiple factors can contribute to the lack of this application however; 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® plus glyphosate should control Illinois bundleflower along with providing johnsongrass (*Sorghum halepense*) control.

Survey results also indicate some county maintenance units (4 of 11 reporting) are only calibrating spray rigs once per season. These maintenance units should be calibrating their spray rigs once before each different herbicide application as a minimum requirement. Spray rig calibration only takes approximately one hour and helps assure accurate herbicide applications as well as identifying areas of mechanical concern allowing follow-up repair and adjustment, if needed.

Divisional meetings with maintenance administrators included discussion of cable barrier cross-over systems in Division Eight. Survey results indicate 63 miles of cable barrier in existence at the time of this writing with more under construction. This area or "footprint" surrounding the cable barrier is susceptible to multiple weed invasions. OSU RVM Program has requested that the ODOT Maintenance Division Headquarters grant a variance to the drift control policy (ODOT Policy No. D-504-1, item III). The variance request has not been granted but is under consideration at this time. The variance requests that applicators be allowed to make a preemergence application of prodiamine on to the "foot print" area in and around cable-barriers without the use of a drift control additive. The purpose of the prodiamine is to suppression or partially control Palmer amaranth and other weed species before they germinate. Until and unless a variance is granted, a drift control additive is required when making broadcast herbicide applications Maintenance administrators indicated at the September 10, 2010 meeting that they intended to utilize prodiamine in a pre-emergent application to their cable barrier foot print areas along a seven mile stretch in Pawnee County as a trial. Division Eight is exploring the possibility of selectively controlling obnoxious grasses and broadleaf weeds to favor bermudagrass development in the foot print to reduce erosion.

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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 ---------- Performance Good (G), Fair (F) or Poor (P)[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[2] + AMS[4] - (F)[4]	3 pt+4.2 lb	600	50 A 30 GPA	4-9-10 4-21-10	02-25 03-31
Creek 350 LM	Landmaster® BW + AMS - (F)	2 pt+5.1 lb	800	50 A 30 GPA	3-16-10 4-09-10	02-25 03-31
Delaware 350 LM	Landmaster® BW + AMS - (F)	2 pt+5.1 lb	650	50 A 30 GPA	4-07-10 4-12-10	02-25 03-31
Mayes 412 LM	None reported		0			
Nowata 233 LM	Landmaster® BW + AMS - (G)	2.1 pt+5.05 lb	250	50 A 30 GPA	3-29-10 4-15-10	02-25 03-31
	Campaign® + AMS - (G)	2.1 pt+5.05 lb	150	50 A 30 GPA	3-26-10 3-29-10	02-25 03-31
Osage 436 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	825	50 A 30 GPA	3-29-10 4-12-10	02-25 03-31
Ottawa 275 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	506	50 A 30 GPA	4-13-10 4-16-10	02-25 03-31
Pawnee 350 LM	Landmaster® BW + AMS - (G)	2 pt+3.4 lb	450	50 A 30 GPA	3-15-10 4-14-10	02-25 03-31
	Campaign® + AMS - (G)	2 pt+3.4 lb	250	50 A 30 GPA	3-11-10 3-12-10	02-25 03-31
Rogers 433 LM 3 MCB	Landmaster® BW + AMS - (F)	2 pt+4 lb	650	50 A 30 GPA	3-29-10 4-19-10	02-25 03-31

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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 ---------- Performance Good (G), Fair (F) or Poor (P)[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 265 LM	Landmaster® BW + AMS - (G)	2 pt+5.1 lb	569.8	50 A 30 GPA	3-29-10 4-15-10	02-25 03-31
Craig 320 LM	Landmaster® BW + AMS - (F)	3 pt+4.2 lb	600	50 A 30 GPA	4-09-10 4-21-10	02-25 03-31
Creek 350 LM	Landmaster® BW + AMS - (F)	2 pt+5.1 lb	800	50 A 30 GPA	3-16-10 4-09-10	02-25 03-31
TOTAL ACRES TREATED FOR WINTER ANNUAL WEEDS			7100.8			

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Performance rating given to treatment by ODOT unit, an (?) indicates no response.[4]AMS= Dry Ammonium Sulfate (adjuvant). [5]Recommended treatment window, 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] ---------- 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)
Craig 320 LM	Roundup Pro Conc® + OustXP® - (G)	16 oz+1 oz	750	50 A 30 GPA	6-23-10 7-06-10	05-10 06-15
Creek 350 LM	Roundup Pro® + OustXP® - (G)	19 oz+1 oz	750	50 A 30 GPA	6-08-10 7-14-10	05-10 06-15
	Imazapyr 2SL + Roundup Pro® (bare ground) - (G)	1%+2%	27	Spot treatment	6-17-10 8-10-10	05-10 09-13
Delaware 350 LM	Roundup Pro® + Outrider® - (G)	16 oz+1 oz	600	50 A 30 GPA	6-28-10 7-01-10	05-10 07-30
Mayes 412 LM	Roundup Pro® + Outrider® - (G)	16 oz. + 1.33 oz	550	50 A 30 GPA	6-29-10 7-7-10	05-10 07-30
Nowata 233 LM	Roundup Pro® + Outrider® - (F)	13 oz+1.2 oz	500	50 A 30 GPA	5-21-10 6-01-10	05-10 07-30
Osage 436 LM	None reported		0			
Ottawa 275 LM	Roundup Pro® + Outrider® - (G)	25.6 oz+1.2 oz	506	50 A 30 GPA	7-06-10 7-20-10	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]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Eight, from table 9a and 9b.

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] ---------- 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)
Rogers 433 LM 3 MCB	Roundup Pro Conc® + Outrider® - (G)	17 oz+1 oz	150	50 A 30 GPA	7-15-10 7-19-10	05-10 07-30
	Roundup Pro Conc® + (bare ground) - (G)	2%	286	Spot treatment	6-01-10 7-23-10	05-01 09-01
	Arsenal® (bare ground) - (G)	1%	2.5	Spot treatment	6-02-10 6-02-10	05-10 09-13
	Transline® (Musk thistle) - (G)	Not reported	17.5	Spot treatment	6-01-10 6-10-10	03-01 05-10
Tulsa Not reported LM 60 MCB	Imazapyr + HonchoPlus® (bare ground) - (G)	1%+2%	32	Spot treatment	5-05-10 5-27-10	05-10 09-13
	Mec Amine-D®(G)	1.3pt	15	Not reported	4-19-10 4-21-10	NA
Washington 265 LM	Roundup Pro® + OustXP® + EscortXP® - (G)	13 oz+1 oz+0.5 oz	450	50 A 30 GPA	5-28-10 6-25-10	05-10 06-15
TOTAL ACRES TREATED FOR JOHNSONGRASS[6] TOTAL ACRES TREATED FOR BAREGROUND TOTAL ACRES TREATED FOR AQUATIC			4315 320.5 0			Division Total Treated Acres[7] 11736.8

[1]LM = Lane miles treated. [2]MCB= Miles of cable barrier treated. [3]Johnsongrass treated unless otherwise stated in parentheses. [4]Performance rating given to treatment by ODOT unit, an (?) indicates no response. [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 Eight, from table 9a and 9b.

11.0 STATEWIDE SUMMARY OF ODOT HERBICIDE PROGRAM RESULTS

Maintenance budgets continue to be somewhat limited and result in a continued need to manage roadside vegetation in the most efficient manner. Examples of cost increases across the state were evident on responses to two questions that maintenance administrators were asked to respond to during 2010 divisional headquarters herbicide program meetings. The first question was, “What was the cheapest mowing cost per acre in your division?” The second question was, “What was the most expensive mowing cost per acre in your division?” Answers to the first question were approximately $15.00 per acre and answers to the second question went as high as $42.00 per acre. Obviously, any efforts that reduce mowing frequency by utilizing a cheaper control method save ODOT and Oklahoma’s taxpayer’s money that can be invested more wisely in Oklahoma’s highway system management. The OSU-RVM Program estimates that an integrated maintenance program featuring herbicidal vegetation management as a key component can eliminate two to four mowing cycles per year in the clear zone. This can result in a substantial savings for ODOT.

Weather plays a major role in the management of Oklahoma’s highway system. Most Oklahomans tend to think of its role as a deterrent to safe travel in situations of snow, ice and flooding. ODOT Maintenance managers responsible for vegetation management have another weather parameter that affects implementation of herbicide programs on rights-of-way and that is the wind. In ongoing efforts to help ODOT herbicide applicators make timely herbicide treatment applications in 2009 OSU-RVM personnel began re-emphasizing options available to ODOT. Two of those options include making night-time and weekend applications in order to utilize possible low-wind conditions and stay within suggested dates of treatment applications (windows) as per OSU publication, *E-958, Suggested Maintenance Practices for Roadside Weed and Brush Problems*. Table 10 shows the response of county/Interstate units regarding the use of non-traditional herbicide application opportunities. The 2009 initial survey results indicated 55.88 percent of respondents utilized nighttime applications (a response of “yes”). In 2010, 68.75 percent of respondents answered “yes”. Of particular note were the trend changes in Division 1 and 2 where there was an increase in nighttime spraying of 90 percent and 10 percent respectively. Table 10 indicates relatively little change in ODOT divisions regarding use of weekends to make herbicide applications.

It is important to note that making herbicide applications into prevailing winds causes a shortening of the spray pattern and if not compensated for by increasing spray truck speed, the shortened pattern leads to an over application of spray rig tank contents. This over application can kill desirable vegetation or lead to thinning of desirable vegetation. Both scenarios’ can lead to increased weed populations. This appears to explain what happened in Central and Eastern ODOT Divisions based on our personal observations in Payne County, Logan County and Kingfisher County during April, 2010. These areas received uncharacteristically high amounts of rainfall in June and July, 2010 according the Mesonet Weather Stations located in those counties (http://climate.mesonet.org/monthly_summary.html, verified 20 December 2010). Observation of summer broadcast herbicide treatment effects (personal conversations with ODOT Superintendants July 7, 2010) suggested that spray applications made

during elevated winds may have shortened spray patterns on roadsides where spray application was into the wind. Spray width patterns on the opposite roadside appeared longer. Spray patterns were indicated by herbicidal effect on treated vegetation within the spray application zone. On roadsides that received a higher than recommended herbicide application rate, subsequent heavy rains stimulated large amounts of secondary flushes of crabgrass growth during June and July. This invasion by crabgrass had a detrimental effect on bermudagrass establishment. This is perhaps because typical summer broadcast treatments with Oust® or Oust extra® have no residual control component affecting crabgrass. While managers may view crabgrass as a more favorable option than no cover at all, crabgrass is an annual plant that dies during the winter and leaves voids in canopy cover. In the spring these voids allow more noxious roadside weeds to establish. Crabgrass also has no rhizomes (underground perennial stems) so when injured or displaced by errant roadside traffic, the void does not reestablish readily, which results in the area being prone to soil erosion.

Table 10. Nighttime and weekend herbicide spraying by ODOT Field Divisions in 2009 and 2010.

		Do you make nighttime herbicide applications?	
ODOT Field Division	Number of surveys (crews) 2010	% Yes 2009	% Yes 2010
1	10	0	90
2	10	0	10
3	12	42	50
4	9	100	100
5	13	85	85
6	9	100	100
7	10	70	70
8	10	50	45
	ODOT average	55.88	68.75
		Do you make weekend herbicide applications?	
ODOT Field Division	Number of surveys (crews) 2010	% Yes 2009	% Yes 2010
1	10	0	0
2	10	0	10
3	12	25	36
4	9	100	67
5	13	77	92
6	9	100	100
7	10	40	60
8	10	60	50
	ODOT average	50.25	51.88

Consultations in those ODOT Divisions that did have heavy infestations of crabgrass included the suggestion that they may need to switch to summer broadcast applications of imazapic (Plateau®). Unlike Oust® or Oust Extra®, Plateau® has both post emergent and residual pre-emergent control characteristics. These characteristics can allow

bermudagrass to re-establish itself in areas where crabgrass has invaded. While nighttime applications and weekend applications widen the opportunity for ODOT herbicide applicators to experience more favorable wind conditions, night time spraying does require applicators to be more aware of sensitive areas. They must also be intimately familiar with their spray routes. In summer 2010 we had conversations with some maintenance unit superintendants that had not previously made night time herbicide applications. These particular superintendents indicated that they now favor night time applications due to lower wind speeds, reduced highway traffic loads, increased motorist visibility of the herbicide application truck (due to the trucks being equipped with safety strobes) and increased spray application pattern visibility (due to the pattern illumination by spray truck lighting). 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.

2010 ODOT herbicide treatments, target weeds and total acres treated with specific herbicide or herbicide combinations are summarized in Table 11. The cornerstones in ODOT's post-emergent weed control programs are the application of the basic 1. winter annual weed control, 2. a summer johnsongrass and 3. summer broadleaf weed control effort.

Winter weed control efforts were lead by the application of glyphosate + 2, 4-D (Campaign® or Landmaster® BW) + AMS (31307.5 acres) followed by applications of glyphosate + 2, 4-D + aminopyralid (Milestone VM®) (23174 acres) + AMS. Smaller winter annual weed control efforts included glyphosate alone and applications of glyphosate + aminopyralid. During 2010 divisional herbicide program meetings, OSU-RVM personnel emphasized implementing 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. Divisions 4, 5, 6 and 7 utilized glyphosate +/- 2, 4-D (Campaign® or Landmaster® BW) + AMS in combination with aminopyralid (Milestone VM®). Additions of Milestone VM® can provide extended pre emergent control of summer broadleaf weeds. As long as budgets will allow, we encourage the use of Milestone VM® to provide additional summer broadleaf weed control. The current (December 2010) cost of a Milestone herbicide addition to the tank mix will add an additional $9.07 per acre. Milestone VM® has performed well for ODOT however; several highly problematic weeds are not controlled well by this herbicide. Some pigweed or amaranth species, such as Palmer amaranth (*Amaranthus palmeri*), and kochia (*Kochia scoparia*) are not controlled by pre-emergent applications of this herbicide. New herbicides from DuPont Co, Inc. (DuPont Crop Protection, Laurel Run Building, Chestnut Run Plaza, Wilmington, DE 19898) containing aminocyclopyrachlor combined with other active ingredients may provide additional herbicidal control for Palmer amaranth and kochia. Cost of these products is pending company commercialization of the product following an anticipated EPA labeling in 2011.

Summer weed control efforts varied from division-to-division depending upon goals and budget constraints. The majority of acres treated with summer broadcast

Table 11. Summary of 2010 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, 6, 7, 8	31449.32
glyphosate +/- 2,4-D +/- aminopyralid +/- AMS +/- Others	winter annual weeds (including musk and scotch thistle)	4, 5, 6, 7	23174.00
glyphosate (alone)+ AMS	winter annual weeds	6	5151.50
glyphosate + aminopyralid + AMS	winter annual weeds and summer broadleaf weeds	4, 6	4342.90
glyphosate + sulfometuron	johnsongrass and summer annual weeds	1, 2, 4, 8	12965.12
glyphosate	johnsongrass and summer annual weeds	2, 6	1440.40
glyphosate + sulfometuron + triclopyr	johnsongrass, summer annual weeds and broadleaf weeds	2	160.00
glyphosate + sulfometuron + diglycolamine salt of dicamba	johnsongrass, summer annual weeds and broadleaf weeds	5	698.80
glyphosate + sulfometuron+ metsulfuron-methyl	johnsongrass, summer annual weeds and broadleaf weeds	1, 8	3357.00
glyphosate + sulfosulfuron	johnsongrass and summer annual weeds	2, 3, 4, 5, 7, 8	15820.85
glyphosate + sulfosulfuron+ metsulfuron-methyl	johnsongrass, summer annual weeds and broadleaf weeds	8	2907.00
glyphosate + imazapic	johnsongrass and summer annual weeds	6, 7	2306.00
glyphosate + imazapic+ 2,4-D	johnsongrass, summer annual weeds and broadleaf weeds	6	587.30
MSMA +/- sulfometuron, sulfosulfuron, imazapic	johnsongrass and summer annual weeds	2, 5, 6, 7	3920.60

Table 11.(Continued) Summary of 2010 ODOT herbicide treatments, target weeds and total acres treated with specific herbicide or herbicide combinations in Oklahoma.

glyphosate (alone) 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, 3, 4, 5, 6, 7, 8	1332.72
triclopyr ester diglycolamine salt of dicamba	general broadleaf weed control	5, 8	35.00
dicamba/diflufenzopyr +/- Others	musk thistle	6	253.00
clopyralid +/- Others	musk thistle	4, 8	312.62
triclopyr ester	basal bark or cut stump brush control	2, 7	46.00
imazapyr (aquatic)	aquatic vegetation control	5	0.12
glyphosate (aquatic)	aquatic vegetation control	2	100.00
Cumulative Total Acres Treated With Specific Treatments or Treatment Combinations			110360.25

applications of herbicides continue to primarily target johnsongrass (*Sorghum halepense*) control. While johnsongrass is the primary target, additional weed complexes contribute to vegetation managers concerns. Any vegetation growth exceeding 12 inches in height should 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.

MSMA (monosodium methanearsonate) has been utilized by ODOT for johnsongrass control for over 30 years. 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 all MSMA products 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. On October 28, 2010 OSU-RVM personnel participated in a national discussion entitled "*The Future of MSMA Turf Uses, Meeting of the Organic Arsenical Products Task Force [OAPTF]*" with Turf Specialists and Weed Scientists. The meeting focused on pending actions regarding use of MSMA on turfgrass areas,

including the impact on right-of-way MSMA use. At the national level, highway rights-of-way use of MSMA is considered minor. Regardless of quantity usage, MSMA has been beneficial in highway vegetation management in Oklahoma. If OAPTF is unsuccessful in attempts to force EPA to allow MSMA an opportunity to participate in the re-registration process, ODOT will need to utilize other herbicides for johnsongrass control. Oust XP® and Outrider® are examples of herbicidal options now either currently being used or are under consideration by ODOT divisions currently using MSMA for weed control. Pastora®, a new herbicide which received registration in 2010, will also be a herbicide option in 2011 for past MSMA uses. While OSU-RVM Program personnel hope for a positive outcome for MSMA re-registration, contingency planning for an alternative treatment will continue to be researched and shared with ODOT. All use sectors should have realistic expectations concerning costs of replacement herbicides for MSMA; the replacements will be more expensive than MSMA.

ODOT has embarked on an ambitious and 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 has requested a specific variance to the ODOT drift control policy. The variance request has not been granted but is under consideration at this time. The specific request is for the application of prodiamine (Prodiamine 65 WDG) to the foot print of the cable-barrier with no drift control additive. Again, to clarify, the waiver is under consideration and it has not been granted. Prodiamine 65 WDG at the 2.3 lbs of product per acre (1.5 lbs active ingredient/A, prodiamine) per year should assist in the control of numerous broadleaf and grassy weeds when applied as a pre-emergent broadcast application in December - January provided that rainfall occurs to activate the product. This application will be for prodiamine applied singly without a tank mix partner herbicide. Applications should be made before February since kochia can germinate during February. Applying prodiamine (a pre-emergent, soil applied herbicide without foliar contact activity) singly allows ODOT to make the application without the potential injury from a contact (post-emergent foliar active) herbicide such as glyphosate. Use of a post-emergent or contact herbicide without drift control additives can injure winter crops and evergreen ornamental plants that exist in urban settings. Prodiamine does not have post-emergent activity. These cable-barrier areas should also receive a Landmaster® BW (glyphosate + 2, 4-D + drift control additive) standard broadcast application if they are within 25 – 28 ft safety-zone spray area. Most current cable-barrier installations are 10-12 feet from the hard, paved surface on the highway shoulder. Additional glyphosate treatments will be required during the growing season (May- September) if bare ground is the objective. This will be necessary to control bermudagrass encroachment in the foot print area. 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 by support structure (posts and cables) is often referred to a "shadowing". Shadowing allows untreated areas where weed seed can germinate avoiding control by treatments of both pre-emergent and contact herbicides.

Directing spray applications from directly over the post-tops or applying the application from both sides of the cable barrier eliminates non-treated area. 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. Herbicidal use in 2010 was nearly identical to the total acreages treated in 2009. This continuation of broadcast treatments to ODOT easements can be attributed to several factors. First, prices of herbicides have fallen considerably. Landmaster® BW, used for winter annual weed control, has fallen in price approximately 43% and, Roundup Pro Concentrate®, a cornerstone for both winter and summer weed control, has fallen 54% when compared to contracted prices in 2008-2009. Summer johnsongrass broadcast herbicides have also fallen in price. Oust XP® has fallen approximately 14% while Oust Extra® has fallen 13%. Two broadcast herbicides that have not followed this trend are Milestone VM®, which has increased by approximately 8% and Outrider® which has increased by approximately 6% compared to 2008-2009 costs per acre. Outrider® and Milestone VM® contain newly patented active ingredients and no generic products can be offered to compete with them. This lack of competition from generic formulators allows original manufactures to price their products at higher costs to users. Both of these products have been used successfully by ODOT vegetation managers for control of specific problematic weeds. We recommend continued use of these products as budgets allow.

Vegetation management is a dynamic, ever changing process. Future challenges can include newly introduced weed species, familiar species expanding their range, older weed species that may have developed herbicidal resistance, constant federal and state regulation changes and continuing budget management issues. 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 2007, 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**
1	Y2007	5574	0	540	0	5547	0	0	11661
	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
2	Y2007	8486	0	1899	0	8818	0	1687	20890
	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
3	Y2007	5901	2484	0	0	6090	0	0	14475
	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
4	Y2007	4894	6438	2095	0	4634	0	43	18104
	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
5	Y2007	6392	5485	9236	0	0	0	1684	22797
	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
6	Y2007	0	7237	0	0	0	0	1401	8638
	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
7	Y2007	0	8563	0	0	0	0	7893	16456
	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

Table 12.(Continued) Comparison of herbicide acreages treated in 2007, 2008, 2009 and 2010 for the more common broadcast treatments and total acres treated by Division.

8	Y2007	3125	4225	100	0	5817	0	0	13267.00
	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
All Divisions	Y2007	34372	34432	13870	0	30906	0	12708	126288.00
	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

APPENDIX A

2010 ODOT/OSU HERBICIDE PROGRAM SURVEY

2010 ODOT/OSU Herbicide Program Survey (4 pages)

Please return to your Division Headquarters on or before Aug. 31, 2010. Then forward to Craig Evans.

ODOT Division: _____County/Interstate Maintenance Facility: _____
Superintendent: _____

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? _____

Summary of 2009/2010 Herbicide Applications

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

Herbicide Treatment	Herbicide product/Acre	Target Weed(s)	Date Started	Date Ended	Number of Loads	Acres/Load	Total Acres	Overall Success		
Example: Campaign + AMS	***2 pts. + 3.4 lbs.***	***brome, cheat, hairy vetch***	***3-15-02***	***4-7-02***	***15***	***43.3***	***649.5***	***Good***	***Fair***	***Poor***
								x		
LandMaster BW + AMS +/-Milestone		*winter annuals*								
Campaign + AMS +/-Milestone		*winter annuals*								
Rndp Pro Conc. + AMS +/-Milestone		*winter annuals*								
Rndp Pro Conc. + Oust XP		*johnsongrass*								
Rndp Pro Conc. + Outrider		*johnsongrass*								
MSMA		*johnsongrass*								
Rndp Pro Conc. (alone)		*johnsongrass or bareground*								
Diuron 80 WDG + surfactant		*annual weeds*								
Aquastar (aquatic) + surf.		*aquatic*								
Habitat (aquatic) + surfactant		*aquatic*								
Arsenal + surfactant		*bareground*								
Vanquish + surfactant		*broadleaf weed*								
Transline + surfactant		*musk thistle*								
Distinct + surfactant		*broadleaf weed*								
Tordon K + Garlon 4		*brush*								
Garlon 4 + oil carrier (basal or cut stump)		*brush*								

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

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