2009 ODOT HERBICIDE PROGRAM REPORT

Annual Report For FY 2009
ODOT SPR Item Number 2156

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METRIC CONVERSION PAGE

SI (METRIC) CONVERSION FACTORS

Approximate Conversions to SI Units					*Approximate Conversions from SI Units*				
Symbol	When you know	Multiply by	To Find	Symbol	Symbol	When you know	Multiply by	To Find	Symbol
		LENGTH					LENGTH		
in	**inches**	**25.40**	**millimeters**	**Mm**	**mm**	**millimeters**	**0.0394**	**inches**	**in**
ft	**feet**	**0.3048**	**meters**	**M**	**M**	**meters**	**3.281**	**feet**	**ft**
yd	**yards**	**0.9144**	**meters**	**M**	**M**	**meters**	**1.094**	**yards**	**yds**
mi	**miles**	**1.609**	**kilometers**	**Km**	**km**	**kilometers**	**0.6214**	**miles**	**mi**
		AREA					AREA		
in^2	**square inches**	**645.2**	**square millimeters**	**Mm^2**	**mm^2**	**square millimeters**	**0.00155**	**square inches**	**in^2**
ft^2	**square feet**	**0.0929**	**square meters**	**m^2**	**M^2**	**square meters**	**10.764**	**square feet**	**ft^2**
yd^2	**square yards**	**0.8361**	**square meters**	**m^2**	**M^2**	**square meters**	**1.196**	**square yards**	**yd^2**
ac	**acres**	**0.4047**	**hectacres**	**Ha**	**ha**	**hectacres**	**2.471**	**acres**	**ac**
mi^2	**square miles**	**2.590**	**square kilometers**	**Km^2**	**Km^2**	**square kilometers**	**0.3861**	**square miles**	**mi^2**
		VOLUME					VOLUME		
fl oz	**fluid ounces**	**29.57**	**milliliters**	**mL**	**mL**	**milliliters**	**0.0338**	**fluid ounces**	**fl oz**
gal	**gallon**	**3.785**	**liters**	**L**	**L**	**liters**	**0.2642**	**gallon**	**gal**
ft^3	**cubic feet**	**0.0283**	**cubic meters**	**m^3**	**M^3**	**cubic meters**	**35.315**	**cubic feet**	**ft^3**
yd^3	**cubic yards**	**0.7645**	**cubic meters**	**m^3**	**M^3**	**cubic meters**	**1.308**	**cubic yards**	**yd^3**
		MASS					MASS		
oz	**ounces**	**28.35**	**grams**	**G**	**G**	**grams**	**0.0353**	**ounces**	**oz**
lb	**pounds**	**0.4536**	**kilograms**	**Kg**	**kg**	**kilograms**	**2.205**	**pounds**	**lb**
T	**short tons (2000 lb)**	**0.907**	**megagrams**	**Mg**	**Mg**	**megagrams**	**1.1023**	**short tons (2000 lb)**	**T**
		TEMPERATURE (exact)					TEMPERATURE (exact)		
°F	**degrees Fahrenheit**	**(°F-32)/1.8**	**degrees Celsius**	**°C**	**°C**	**degrees Fahrenheit**	**9/5(°C)+32**	**degrees Celsius**	**°F**
		FORCE and PRESSURE or STRESS					FORCE and PRESSURE or STRESS		
lbf	**poundforce**	**4.448**	**Newtons**	**N**	**N**	**Newtons**	**0.2248**	**poundforce**	**lbf**
lbf/in^2	**poundforce per square inch**	**6.895**	**kilopascals**	**kPa**	**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 Vegetation Management (IVM) program to provide aesthetically pleasing and erosion resistant vegetation in the safety zone of the roadside right of way. In its initial stage, the IVM program consists of selection of the proper vegetation to install followed by suitable establishment techniques. The mature phase of the IVM program involves integrating mowing and herbicide use to maintain the vegetation as well as suppress problematic weeds.

The purpose of the annual ODOT herbicide program survey was to document herbicide use trends as well as the successes, failures and challenges of ODOT's chemical weed control component of its IVM program in 2009. The information gained each year in the survey and subsequent annual report is useful in providing recommendations for improvement of future weed control and vegetation management efforts. Additional, this survey can help in identifying potential emerging weed problems and documenting possible needs for future weed control research.

1.1 OBJECTIVES

The objectives of the 2009 ODOT Herbicide Program Survey included documenting the herbicide treatments used, weeds targeted, period of application, treatment use rates, acreages treated and weed control performance achieved as well as the administrator responsible for key herbicide program decision making.

1.2 BACKGROUND

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

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

In an attempt to simplify the text of this report, most references to herbicides treatments were made by using the common name of the active ingredient (example: glyphosate) in the herbicide product rather than the product's brand name or trade name (example Roundup Pro Concentrate, Honcho Plus, or Mirage). When common names are unfamiliar to the reader, the reader should refer to Tables 1a and 1b for the corresponding brand name. Each Field Division's Summary Table (Tables 2 - 9) will reference the herbicide's common name, also followed by specific brand names used by the division in parenthesis.

We would like to thank the divisions for their participation in this year's survey. Without the survey data and meetings held at each field division, this report would not reflect the entire ODOT herbicide program effort.

2.0 METHODS

ODOT county and interstate facilities were supplied by email a two page herbicide program survey form (Appendix A) in advance of the 2009 herbicide application season. Superintendents or their appointees were asked to complete all questions on the document in reference to the year 2009 and return hard copies of the survey by August 31, 2009 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 2009 for off-target herbicide injury allegedly caused by ODOT; the number of formal noxious weed complaints filed against the facility; and any specific weed problems not being satisfactorily controlled by the facility's current herbicide program.

Page two 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 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 seven of eight field divisions in fall of 2009. The timeline for completion of this report resulted in Division 5 personnel being contacted by phone rather than in a one on one division meeting as per the other seven field divisions.

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	Microflo
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	Honcho	Monsanto
	Glyphosate	Honcho Plus	Monsanto
	Glyphosate	Mirage	UAP-Loveland Products
	Glyphosate	Mirage Plus	UAP-Loveland Products
	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 out of 10 maintenance facilities in Division One responded to the survey this year. In response to survey questions 1-11 no apparent concerns arose. A meeting was held at Division One headquarters on October 20, 2009 to solicit comments and opinions from division administrative personnel and a few county superintendents. The following observations and comments are made based on the surveys and meeting.

Division One herbicide usage is summarized in Table 2. The winter annual weed control program in Division One continued with a glyphosate/2,4-D + AMS broadcast treatment. Winter annual weed control results were good from these treatments as both recommended application rates and most treatment timings of application were met. Division One's summer weed control program consisted mainly of treatments of glyphosate (Roundup Pro Conc.) + sulfometuron (Oust XP) at varying rates. Glyphosate rates varied significantly from 8-16 oz. prod./A combined with sulfometuron at 1 oz. prod./A. Results from these treatments were very good but we would recommend closing the range of glyphosate rates used. Triclopyr ester herbicide was used as a cut-stump and foliar treatment to control brush with good success.

3.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

From both the survey and division comments, it appears Division One had a successful 2009 roadside weed control program. However Division One personnel did express concern over some specific broadleaf weeds that were escaping their summer glyphosate + Oust XP treatment and infesting along roadside shoulders.

The two principal broadcast treatments made by Division One in 2009 produced good control of targeted weeds and were very cost efficient. The glyphosate/2,4-D + AMS (winter weed control treatment) followed by glyphosate + sulfometuron (summer weed control treatment) were the most cost efficient herbicide programs that will provide good weed control results for the major roadside weeds. Division One has experienced moderate to poor control of sowthistle (*Sonchus oleraceus*) from the current Campaign broadleaf weed control treatment. Two treatment change options were discussed with Division personnel during the fall of 2009 that will result in increased herbicide rates so as to increase sowthistle control in 2010. Option1 was to simply increase Campaign rates, which would increase both the amount of glyphosate and 2,4-D in the treatment. Option 2 consisted of continuing to use the same rate of Campaign (2 pts./A) + AMS, but adding Weedar (2,4-D) at a rate of 1 pt./A to increase the amount of 2,4-D being applied. It is primarily the 2,4-D that will give ODOT the increase in sowthistle control along with increased control of other broadleaf type weeds. Option 2 is slightly less expensive than Option 1, but additional herbicide will have to be purchased, handled, and mixed. We would like to encourage Division One to continue with these programs and continue to watch treatment timings closely to maximize their weed control results.

We recommend that Division One continue with their summer glyphosate + Oust XP program for controlling johnsongrass (*Sorghum halepense*) and other weeds. In 2010 there should be a generic glyphosate (Ranger Pro) available for use that should help reduce the costs of this particular treatment. We visited briefly at the October meeting about the herbicide Oust Extra as being a replacement for Oust XP in some of the tank loads. The Oust Extra product is

a mixture of both sulfometuron and metsulfuron and will provide johnsongrass control and when used at 1.5 oz./A should also provide for good to excellent control of many broadleaf weeds (Illinois bundleflower [*Desmanthus illinoensis*], field bindweed [*Convolvulus arvensis*], asters [*Aster species*], common [*Ambrosia artemisiifolia*] and western ragweed [*Ambrosia psilostachya*], horseweed or marestail [*Conyza canadensis*], sericea lespedeza [*Lespedeza cuneata*], and others). Switching to the Oust Extra product would increase treatments costs by $1.65/A over existing Oust XP treatment costs.

Table 2. Summary of Division One Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)[2]
glyphosate/2,4-D (Campaign) + AMS	32 oz + 4.3 lb (8) ??? (2)	winter annuals	3-2-09	4-8-09	6,086	good (10) fair (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	8 oz + 1 oz (1) 16 oz + 1 oz (3) 12 oz + 1 oz (2) 11 oz + 1 oz (1) 16 oz + 0.8 oz (1)	johnsongrass	5-28-09	7-21-09	3,850	good (8)
triclopyr ester (Garlon 4)	handgun spray-to-wet (1)	brush foliar	7-3-09	7-31-09	-----	good (1)
triclopyr ester (Garlon 4) + oil carrier	25% solution (1)	brush cut-stump	12-1-08	2-1-09	30	fair (1)

[1]Total number of responses to survey: 10 of 10 surveyed.
[2]Numbers in parentheses refer to the number of county or interstate facilities that characterized the the overall success of the treatment with that particular performance rating. Responses may tally to be more or less than the total number of facilities that were surveyed as a facility may not have marked a performance rating or they may have chosen to mark more than a single performance rating . A '???' indicates that information was not provided for the production of this report.

4.0 SURVEY OF DIVISION TWO HERBICIDE PROGRAMS

4.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 out of 10 maintenance facilities in Division Two responded to the survey this year (Table 3). In response to survey questions 1-11 two concerns became apparent. In response to survey question 5 which asked “How many personnel do you use on a spray truck when applications are being made”, the response was that most yards use 1 or 2 personnel. Due to the safety aspects of a slow moving truck driving along roadside shoulders and the importance of making accurate herbicide applications it is critical to have two personnel on a spray truck. Each of the two personnel has multiple duties that are critical to the efficiency of the spray program and putting all of these duties on a single person is not advisable. OSU recommendations are to have two certified ODOT personnel in each spray truck during all applications. Also, in response to survey question 6 which asked “How often is the herbicide spray truck calibrated”, the response was that 6 of 10 facilities only calibrated their spray rigs once per year. The minimum OSU recommendations are to calibrate all broadcast spray rigs once before each broadcast spray treatment. For most ODOT facilities that means a calibration procedure should be performed immediately prior to the application of the winter annual weed control treatment (glyphosate/2,4-D + AMS) and again, immediately prior to the summer weed control treatments (glyphosate or MSMA + sulfometuron or sulfosulfuron). The completed calibration forms would then become a part of the permanent record for the subsequent herbicide applications. Both of these items were discussed in detail with Division Two Maintenance Personnel the at the Division Two headquarters on October 19, 2009. During that meeting, we solicited comments and opinions from division administrative personnel. The following observations and comments are made based on the surveys and the information garnered at the October 19th meeting.

Division Two herbicide usage is summarized in Table 2. Division Two applied glyphosate/2,4-D + AMS over most division roadsides to control winter annual weeds. Weed control results were very good from these treatments since recommended application rates were used. However, some applications were made outside of the optimum window of application timing. As far as timing of applications, 6 of 8 facilities were applying the glyphosate/2,4-D treatment 3-4 weeks later than recommended. Treatments applied later than recommended may cause unacceptable and undesirable injury to bermudagrass (*Cynodon dactylon*). This may result in delayed greenup. Delaying the greenup of bermudagrass will allow for summer annual weeds to germinate earlier and get off to a fast start because the bermudagrass is temporarily stunted. Also, continued late applications of glyphosate/2,4-D + AMS year after year will likely thin bermudagrass stands. Division Two used several different herbicide treatments to provide successful summer johnsongrass control. Treatments of glyphosate + sulfometuron or sulfosulfuron accounted for most of the acreage. One of the counties incorporated Garlon 4, at 1 pt. prod./Acre into this summer treatment to help successfully control sericea lespedeza, sumac (*Rhus species*), and locust. MSMA treatments were also used this past year to provide good control of johnsongrass. Glyphosate treatments were also used for total vegetation control for signs and guardrails with success. Triclopyr ester treatments were applied as a broadcast foliar treatment and as a cut-stump treatment with good success in controlling brush. Glyphosate (aquatic) was also used successfully to control aquatic weeds on 250 acres of aquatic sites.

4.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

We would like to encourage Division Two personnel to continue with their current glyphosate/2,4-D (Campaign) + AMS spray program to control winter annual weeds. As discussed in the October 19 meeting, ODOT personnel will continue to contend with windy spray conditions as our principal spray seasons, March and June, are “windy months.” One of the items discussed at the meeting was to maximize the number of days that are available to ODOT spray personnel during the recommended treatment window. From the 2009 survey it was found that Division Two spray crews do not utilize the options of spraying during nighttime hours or on weekends when additional opportunities for reduced windspeed might be present. In the past these options were not approved. However, after consideration of the possible benefits of utilizing these alternative spray timings Division Two crews may have the option to utilize these times. As can be found in Table 10 (Chapter 11) of this report, many field divisions currently utilize nighttime and weekend spraying to find lower wind conditions, lower traffic levels. Additionally, many personnel feel their slow-moving spray truck is more visible during nighttime hours. Extra caution should be used for any crews attempting nighttime spraying for the first time. It is very important that applicators know where all of the sensitive areas are in their maintenance area as they will not be as visible at night. A flood light mounted near the spray nozzle(s) can make the spray pattern very visible during nighttime applications.

We would like to encourage Division Two to continue their current summer weed control program efforts. Most summer applications in 2009 included mixtures of glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP). These treatments provided good control of johnsongrass during a record breaking wet year. Next year costs for this treatment can be lowered by using the Ranger Pro glyphosate product at a rate of 16 fl. oz./A instead of the Roundup Pro Concentrate product. Another alternative summer treatment was discussed for those roadsides that have problems with bahiagrass as well as johnsongrass. On those roadsides that have bahiagrass problems, Division Two could use the product Oust Extra (sulfometuron + metsulfuron) at 1.5 oz. prod./A mixed with glyphosate instead of using Oust XP (sulfometuron) at 1 oz. prod./A. This new treatment of glyphosate + Oust Extra should provide the same level of johnsongrass control but will now also provide good control of bahiagrass and many broadleaf weeds. The additional cost of this treatment over that of Oust XP alone will be approximately $1.65/A.

We applaud Div. Maintenance Eng. Brian Taylor for his progressive attitude towards vegetation management problems in Division Two. In 2009 Mr. Taylor was responsible for putting together a new Kawasaki Mule sprayer/wiper applicator. The four-wheel drive diesel spray unit is attached with both a Speidel wiping bar and a twelve volt spray system. It can be easily adapted to accommodate many other useful spray booms and bars. This is a low volume unit that can be easily kept busy spot treating thistle, wiping wide rights-of-way, treating sensitive areas, treating aquatic sites, and treating cable barrier systems as well as many other miscellaneous roadside sites. We look forward to highlighting Brian’s new spray rig at upcoming 2010 ODOT CEU Workshops.

Table 3. Summary of Division Two Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate/2,4-D (Campaign) + AMS	32 oz + 6.8 lb (2) 32 oz + 17 lb/100 gal (3) 32 oz + 3.4 lb (1) ??? (3)	winter annual weeds	2-20-09	5-21-09	6,632	good (8) fair (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	1.2 pt + 0.96 oz (2) 1 pt + 0.96 oz (2) ??? (1)	johnsongrass	4-15-09	8-10-09	4,271	good (5)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP) + triclopyr ester (Garlon 4)	16 oz + 1 oz + 16 oz (1)	johnsongrass brush	5-14-09	7-14-09	840	good (1)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider)	17 oz + 1.2 oz (1) ??? (2)	johnsongrass	5-28-09	7-1-09	2,192	good (2)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP) + sulfosulfuron (Outrider)	17 oz + 0.18 oz + 1.2 oz (1)	johnsongrass	6-1-09	7-22-09	599	good (1)
MSMA (MSMA)	0.5 gal (2) ??? (1)	johnsongrass	5-1-09	8-15-09	1,100	good (3)
MSMA (MSMA) + sulfosulfuron (Outrider)	0.5 gal + 1 oz (1)	johnsongrass	5-28-09	6-24-09	152	good (1)
glyphosate (Roundup Pro Concentrate) (spot spraying)	1 pt (1) ??? (1)	johnsongrass total vegetation control	3-18-09	8-25-09	480	good (2)
triclopyr ester (Garlon 4 Ultra)	0.5 gal (1) 3 pt (1)	Brush	4-1-09	9-1-09	450	good (2)
triclopyr ester (Garlan 4 Ultra) + oil carrier (cut stump/basal)	??? (3)	brush stump treatment	1-1-09	12-31-09	----	good (3)
glyphosate, aquatic (AquaNeat)	4 pt (1) ??? (1)	aquatic weeds	4-27-09	5-27-09	250	good (2)

[1]Total number of responses to survey: 9 of 10 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

5.0 SURVEY OF DIVISION FOUR HERBICIDE PROGRAMS

5.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 11 out of 11 maintenance facilities in Division Three responded to the survey this year. In response to survey questions 1-11 no apparent concerns arose. A meeting was held at Division Three headquarters on November 18, 2009 to solicit comments and opinions from division administrative personnel. The following observations and comments are made based on the surveys and meeting. Division Three herbicide usage is summarized in Table 4. Division Three continued with its traditional glyphosate/2,4-D + AMS to control winter annual weeds. Survey results show good weed control from these treatments as both application rates and treatment timings were met. As in the past there continues to be a few treatments being applied after the recommended shut-off date. But considering last spring's windy conditions, spray windows were met very well. As a reminder, if treatments of this nature are applied later than recommended they may cause unacceptable injury to bermudagrass if spring green-up is too far along. Most Division Three roadsides continue to receive a summer glyphosate + sulfosulfuron treatment which produced good johnsongrass control results. Division Three continued with glyphosate + sulfosulfuron rates of application that had been used in previous years (1 pt. + 1 oz.), as well as taking advantage of the wide spray window (May-July) for this specific johnsongrass control treatment.

5.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Division Three continues to have a very consistent herbicide program. We would like to encourage Division Three to continue with their current herbicide program efforts with continued caution. Division Three has been in a very similar herbicide program for at least 6 consecutive years. While the weed control results remain good, it has now been documented that a release of broadleaf weeds and silver bluestem (*Bothriochloa saccharoides*) has occurred. Continued increases in pigweed (*Amaranthus species*), sericea lespedeza, and silver bluestem are anticipated to be slow but eventually will need to be addressed if they reach densities that create sight distance hazards or require increased mowing frequency. In order to control these weeds a change in one or more summer weed control treatment herbicides will be required. Incorporation of metsulfuron methyl into the summer herbicide program will likely address some of the summer broadleaf weed releases at a lower cost as compared to other alternative products. To control silver bluestem will likely require the use of glyphosate alone at higher rates of application that are currently being used by Division Three personnel. We encourage Division Three to contact OSU personnel to discuss details if they are interested in altering some of their summer herbicide treatments to address specific weed problems.

Table 4. Summary of Division Three Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate/2,4-D (Campaign) + AMS	2 pt + 3.4 lb (6) 2 pt + 5.1 lb (4) 2 pt + 17 lb/100 gal (1)	winter annual weeds	3-16-09	4-14-09	7,779+	good (10) fair (1)
glyphosate (Roundup Pro Concentrate) + AMS	2 pt + 3.0 lb (1)	winter annual weeds	4-3-09	4-15-09	515	good (1)
glyphosate (Honcho Plus) + sulfosulfuron (Outrider)	1 pt + 1 oz (1) 3.3 pt + 1 oz (1)	johnsongrass	4-2-09	7-20-09	534	good (2)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider)	1 pt + 1 oz (6) 2 pt + 1 oz (1) 0.8 pt + 1 oz (1)	johnsongrass	6-12-09	7-15-09	4,462	good (7) ??? (1)
glyphosate (Honcho Plus, Roundup Pro Concentrate) (handgun)	2% solution (2) ??? (1)	total vegetation control encroachment	3-18-09	7-1-09	47	good (3)

[1]Total number of responses to survey: 11 of 11 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

6.0 SURVEY OF DIVISION FOUR HERBICIDE PROGRAMS

6.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 out of 10 maintenance facilities in Division Four responded to the survey this year. In response to survey questions no concerns arose. On September 12, 2009 a Division Four Herbicide Program meeting was held at the division headquarters. The comments and recommendations in this report are based on the surveys and meeting.

Division Four herbicide usage is summarized in Table 4. Division Four primarily used glyphosate + aminopyralid + AMS treatments to control winter annual weeds in 2009. As in the past Divisions Four selected this particular treatment to control annual ryegrass, one of the more difficult to control winter annual weeds. While this treatment has been successful at controlling winter annual weeds it has also posed a problem for a few of the Division Four spray crews. This treatment involves using higher rates of glyphosate to control the annual ryegrass than those glyphosate rates traditionally used in the Campaign recommendation. With this higher rate of glyphosate comes the necessity to apply the treatment to completely dormant roadsides so as to prevent damaging common bermudagrass. This past year approximately 1/3 of the glyphosate + aminopyralid + AMS treatments were applied after the breaking of winter dormancy by bermudagrass. This late application resulted in varying degrees of bermudagrass damage and delayed additional green-up. This damage was thinning of bermudagrass stands and promotion of summer annual weed encroachment. This late application should be prevented if at all possible by moving the treatment dates earlier into the year. The broadleaf weed control achieved from the addition of aminopyralid to the winter annual weed control treatments resulted in good broadleaf weed control for the third straight year. However, aminopyralid is still not providing control for those counties that are suffering from palmer amaranth (*Amaranthus palmeri*) and kochia (*Kochia scoparia*) infestations. In 2009 Division Four used primarily glyphosate + sulfometuron to control johnsongrass and other summer weeds. Overall johnsongrass control results were good as both treatment rates and timings were met by most facilities. Division Four personnel used clopyralid to successfully spot & broadcast treat for musk thistle (*Carduus nutans*). A variety of treatments were used to provide total vegetation control around guardrails, signs, and road edges. Most treatments were comprised of mixtures of glyphosate, imazapyr, sulfometuron, bromacil, aminopyralid, and/or imazapyr/diuron. Total vegetation control results were good for most of these treatments as rate and timings were met. A few division four crews used triclopyr ester, applied as a basal bark or foliar handgun treatment, to control brush with success. Imazapyr (aquatic label) was also used to successfully control aquatic weeds.

6.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

We encourage Division Four to continue with their current herbicide program efforts as personnel and budgeting allow. We would like to caution Division Four personnel that if they continue the use of glyphosate herbicide at 1 qt./A + AMS to control winter annual ryegrass and other weeds, these applications must be made to completely dormant bermudagrass roadsides. If some crews are unable to hit the required treatment windows, we would suggest returning back to the old Campaign treatment at 2 pts./A + AMS. The old Campaign treatment had slightly less than one-half of the amount of glyphosate per acre than the current 1 qt./A rate. When late Campaign + AMS treatments were applied to bermudagrass that was already at 20% greenup

(in late March to early April) it produced only slight injury. The current treatment of glyphosate at 1 qt./A does not have this window of safety and should be applied to completely dormant bermudagrass only. This means an earlier application start date for many facilities. From the survey questions it appears that all Division Four crews were taking advantage of both nighttime and weekend spray times to try to achieve treatments within the recommended windows (Table 5 and 10.)

We encourage Division Four to continue the same summer weed control programs in the 2010 spray season. Continuing to use the glyphosate + sulfometuron (Oust XP) treatments for summer weed control will stretch maintenance budgets.

Table 5. Summary of Division Four Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate (Roundup Pro Concentrate) + aminopyralid (Milestone VM) + AMS	25 oz + 4 oz + 4.7 lb (4) 32 oz + 4 oz (1) 32 oz + 4 oz + 4.7 lb (1) 25 oz + 4 oz + 5.1 lb (2) ???(2)	winter annuals musk thistle	3-9-09	4-10-09	7,761	good (10)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	22.2 oz + 1.1 oz (1) 16 oz + 1 oz (3) 15 oz + 0.9 oz (1) 11.8 oz + 1.3 oz (1) 12 oz + 0.75 oz (1) ??? (1)	johnsongrass	5-1-09	6-12-09	5,657	good (7) fair (2) poor (1)
glyphosate (Roundup Pro Concentrate)	1 pt (1)	johnsongrass	5-28-09	5-29-09	260	good (1)
MSMA (MSMA)	2 pt (1)	johnsongrass	5-26-09	6-4-09	2	fair (1)
imazapyr (Imazapyr 2SL, Arsenal) + surfactant (handgun)	1 gal + 1 gal (1) 6 oz/1 gal water (1)	total vegetation control	4-20-09	7-28-09	40	good (1) poor (1)
imazapyr (Imazapyr 2SL) + glyphosate (Roundup Pro Concentrate) + aminopyralid (Milestone VM) + surfactant (handgun)	2 qt + 1 gal + 2.5 oz + 0.5 qt/100 gal (1)	total vegetation control	4-14-09	5-27-09	11.4	good (1)
bromacil/diuron (Krovar) + glyphosate (Roundup Pro Concentrate) + imazapyr (Imazapyr 2SL)	9 lb + 4 qt + 4 pt/100 gal (1)	total vegetation control	4-20-09	4-23-09	---	good (1)
clopyralid (Transline) + surfactant (handgun)	50 oz + 7 oz (1) 3 oz (1) ??? (1)	musk thistle	5-26-09	6-22-09	27+	good (3)
triclopyr ester (Garlon 4) + oil carrier (handgun)	2 qt + oil carrier (1)	brush	2-19-09	2-19-09	---	good (1)
triclopyr ester (Garlon 4)	6 qt (1)	brush	5-26-09	5-26-09	---	good (1)
imazapyr, aquatic (Habitat) + surfactant (handgun)	0.5 gal + 0.5 gal (1)	aquatic	6-17-09	6-19-09	---	good (1)

[1]Total number of responses to survey: 9 of 9 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

7.0 SURVEY OF DIVISION FIVE HERBICIDE PROGRAMS

7.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 13 out of 13 maintenance facilities in Division Five responded to the survey this year. In response to survey questions 1-11 no apparent concerns arose. Due to inclement weather, the December 8, 2009 Division Five Herbicide Program meeting was cancelled. To solicit comments and opinions from division administrative personnel in lieu of the cancelled meeting a phone conference was held on December 9, 2009. Comments and recommendations in this report are based on the surveys and the phone conference.

Division Five herbicide usage is summarized in Tables 6. Division Five treated about one-half of their roadside safety zones with glyphosate + 2,4-D (Campaign) + AMS to control winter annual weeds with good success. The other one-half received the same treatment but with the addition of aminopyralid (Milestone VM) which also produced good weed control results. While the addition of aminopyralid is producing good preemergence control of many summer annual broadleaf weeds, the survey documented that it was not providing acceptable control of kochia and pigweeds. Winter annual weed control results were good; recommended treatment application rates are being met along with most treatment application timings. Treatments are being applied within the approximate 30 day window of application. However, due to the consistent 10-14 day late start, final treatments are being made 10-14 days later than recommended. One of the reasons Division Five spray crews were able to apply their winter annual weed control treatments within the 30 day window is their willingness to utilize both nighttime and weekend hours. This year's survey shows that 85% of Division Five crews utilize nighttime hours to spray along with 77% utilizing weekends (Table 10). Having the administrative support to utilize nighttime and weekend hours, and the willingness of spray crews to work these hours, can make a big difference in whether one sprays in good conditions or windy conditions. The summer johnsongrass control treatments used this year continue to be glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP) (80% of roadsides) and MSMA (20% of roadsides). Both of these treatments continue to provide good control of targeted johnsongrass and other roadside weeds as most recommended treatment application rates and application timings were met. Treatments of Transline and Campaign were utilized to provide good control of the state noxious weed musk thistle. Several treatment combinations including combinations of imazapyr (Arsenal), glyphosate (Roundup Pro Concentrate), diuron (Karmex), and sulfometuron (Oust XP) were used with good success in providing total vegetation control. Glyphosate (Roundup Pro Concentrate) was also used at a 1:1 ration with water to provide good brush control using a cut stump treatment. Successful aquatic weed control was provided by using treatments of glyphosate aquatic (Aquastar) + surfactant.

7.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Division Five continues to produce and maintain a good consistent weed control program to address weed problems along roadsides in the southwest part of the state. We would like to encourage the continued proactive approach that Division Five Maintenance personnel have with regards to their herbicide program. We recommend continuing with the current basic winter annual weed control and summer johnsongrass control treatments. As discussed earlier in this report the current basic treatments used by Division Five should provide overall good weed control of targeted weeds, however, weeds that continue to escape these

treatments will require a change in herbicide active ingredients. Concerning increased problems with kochia and pigweeds, we are hopeful that aminocyclopyrachlor (DPX-MAT28), an experimental herbicide, will be labeled and commercially available in the future. Federal labeling of this product is expected in late 2010. Until this product becomes commercially available to ODOT, it will be necessary for ODOT to cautiously control kochia and pigweed problems with postemergence sprays of dicamba (Vanquish). Division Five personnel should be especially wary of dicamba use around cotton and other sensitive crops since the dicamba used in late spring and summer may volatilize, move off-target, and damage these crops.

Recently Division Five has inquired about using GPS technologies to track and document herbicide treatments. We encourage Division Five personnel as well as all field divisions to refer to the *2009 Annual Herbicide and Equipment Technologies Report* for information concerning a recent study conducted in Mississippi. That work evaluated various GPS mapping technologies. The results from the Mississippi work are summarized in the report along with implementation recommendations. Once GPS mapping technology and OSU RVM recommendations have been evaluated on a trial basis, and if shown to provide benefits, other ODOT Divisions may wish to consider incorporating this technology into their own Division for mapping the specific location of herbicide applications.

Table 6. Summary of Division Five Herbicide Survey Results[1] (Continued on next page).

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
pendimethalin (Pendulum) + glyphosate (Roundup Pro Concentrate) + dicamba (Banvel)	1.3 qt + 13 oz + 13 oz (1)	winter annual weeds preemergence summer annual weeds	3-18-09	3-18-09	6	good (1)
glyphosate/2,4-D (Campaign)	44 oz (1)	winter annuals	3-12-09	4-11-09	863	good (1) ??? (1)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM)	40 oz + 4 oz (1) 48 oz + 4 oz (1)	winter annuals summer broadleaf weeds	3-12-09	4-8-09	1,850	good (2) fair (1)
glyphosate/2,4-D (Campaign) + AMS	39-40 oz + 3.1 lb (2) ??? (2)	winter annuals	3-9-09	4-1-09	3,177	good (3) fair (1)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM) + AMS	38 oz + 4 oz + 3 lb (2) 32 oz + 4 oz + 3.4 lb (1) 40 oz + 4 oz + 3.1 lb (3) 48 oz + 4 oz + 3.4 lb (1)	winter annuals summer broadleaf weeds	3-10-09	4-8-09	4,301+	good (6) fair (1) poor (1)
glyphosate (Roundup Pro Concentrate)	12 oz (1)	johnsongrass	5-26-09	5-26-09	16	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	10 oz + 0.25 oz (1) 10 oz + 0.7 oz (1) 20 oz + 0.5 oz (1) 10 oz + 0.5 oz (6) 10 oz + 4 oz (1) 12 oz + 0.5 oz (1) ??? (1)	johnsongrass	5-10-09	7-7-09	8,539+	good (8) fair (4) ??? (1)
glyphosate (Roundup Pro Concentrate) + diglycolamine salt of dicamba (Vanquish) + sulfometuron (Oust XP)	10 oz + 16 oz + 0.5 (1)	johnsongrass kochia broadleaf weeds	5-27-09	6-9-09	699	good (1)
MSMA	2 qt (4) 1 pt (1)	johnsongrass	5-28-09	8-5-09	1,183	good (4) fair (1)
MSMA + AMS	1.8 qt + 3.1 lb (1)	johnsongrass	5-26-09	6-1-09	786	good (1)

[1]Total number of responses to survey: 13 of 13 surveyed.

[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

Table 6. Summary of Division Five Herbicide Survey Results[1] (Continued from previous page).

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
MSMA + sulfometuron (Oust XP)	1.4 qt + 1 oz (1)	johnsongrass	5-26-09	6-1-09	383	good (1)
MSMA + diglycolamine salt of dicamba (Vanquish)	2 qt + 2 oz (1)	johnsongrass	6-1-09	7-1-09	347	good (1)
Clopyralid (Transline) + surfactant (handgun)	??? (1)	musk thistle	3-1-09	5-30-09	---	good (1)
glyphosate/2,4-D (Campaign) + surfactant (handgun)	2.5 gal + 0.5 gal/100 gal (1)	musk thistle	3-9-09	5-8-09	---	good (1)
diglycolamine salt of dicamba (Vanquish) + surfactant	0.5 gal	broadleaf weeds	6-5-09	6-9-09	86	good (1)
imazapyr (Arsenal) + diuron (Karmex)	5 pt + 3 lb (1)	total vegetation control aquatic	6-22-09	7-1-09	35	good (1)
imazapyr (Arsenal) + glyphosate (Roundup)	1.5 oz + 0.2 oz (1)	total vegetation control	6-24-09	6-30-09	10	poor (1)
imazapyr (Imazapyr 25L) + glyphosate (Roundup Pro Concentrate)+ sulfometuron (Oust XP)	1.1 pt + 3.4 pt + 2.3 oz (1)	total vegetation control	6-15-09	7-6-09	84	good (1)
imazapyr + glyphosate (Roundup Pro Concentrate) + diuron	9 oz + 23 oz + 2.9 lb (1)	total vegetation control	6-2-09	6-17-09	56	good (1)
imazapyr/diuron (Sahara) + surfactant	10 ob + 1 qt/100 gal (1)	total vegetation control	---	---	75	good (1)
glyphosate (Roundup) + sulfometuron (Oust XP)	10 oz + 0.5 oz	---	---	---	25	good (1)
glyphosate (Roundup Pro Concentrate	1:1 ratio water:herbicide	cut stump treatment	2-20-09	---	---	good (1) ??? (1)
glyphosate (Aquastar) (aquatic) + surfactant	3 qt (1) 1% solution + 1% solution (1) ??? (1)	total vegetation control	6-15-09	6-23-09	40	good (3)

[1]Total number of responses to survey: 13 of 13 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

8.0 SURVEY OF DIVISION SIX HERBICIDE PROGRAMS

8.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 9 out of 9 maintenance facilities in Division Six responded to the survey this year. In response to survey questions 1-11 only a single concern arose. With regards to question 5, as to how many personnel are used on a spray truck during applications, seven out of nine responses said they use 1 or 2 personnel. We realize that crew sizes, especially in Division Six, may sometimes be limited and putting two personnel on a spray truck may be difficult. Please remember that there are several critical tasks being accomplished at any given moment on a spray truck and in the opinion of OSU it takes a minimum of two personnel to safely and adequately address all of these tasks. We recommend that a spray truck should have two personnel on board during all applications. One person should be responsible for driving, truck speed and watching traffic, and the other person responsible for administering the spray application as well as observing its pattern. A meeting was held at Division Six headquarters on September 9, 2009 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report are based on the surveys and meeting.

Division Six herbicide usage is summarized in Table 7. Division Six did not apply a broadcast winter annual weed control treatment during the 2009 season. Division Six did however apply glyphosate + imazapic (Plateau) as a broadcast summer johnsongrass control treatment across most of the division. This treatment was specifically chosen as it provides both johnsongrass control as well as sandbur control and it is more economical due to a recent decrease in the cost of Plateau herbicide. Overall the results from this treatment were good with 9 crew responding with control being “good,” 2 responses as “fair,” and 1 response as “poor” results. OSU personnel had an opportunity to look at several Division Six roadsides that had been treated with the glyphosate + imazapic treatment. We also felt that most of the treated areas looked good. This is the only current OSU recommendation that has shown the ability to provide any residual sandbur and crabgrass control following the summer treatment timing. Dicamba was used to successfully control musk thistle in early summer. Also, glyphosate + imazapyr or glyphosate alone was applied to produce total vegetation control on roadside shoulders with good success.

8.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Division Six has struggled for several years at finding the necessary funds to provide for both a broadcast winter annual weed control and a broadcast summer johnsongrass control treatment. We understand the division knows the benefits that each of these unique treatments bring to those charged with managing roadside vegetation. As we understand the 2009/2010 funding levels may remain somewhat level. If so, we suggest Division personnel try the following program for 2010. We recommend a broadcast spray of Landmaster BW at 2 pts./A + AMS 15-17 lb./100 gallon water followed by a summer broadcast application of generic glyphosate at 1 pt./A + Oust XP 0.75 oz./A. The total herbicide costs for both of these treatments would be around $10/A. This past summer the total cost of the glyphosate + imazapic (Plateau) treatment was also around $10/A. We feel that most of Division Six roadways can significantly benefit from both the winter annual weed control and summer johnsongrass control treatments. These treatments may not address all of the weed problems along Division Six roadsides, however, we feel they should provide the greatest amount of vegetation management possible. This would

reduce mowing frequency and provide for aesthetically pleasing roadsides without increasing treatment costs.

Table 7. Summary of Division Six Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate (Roundup Pro Concentrate) + imazapic (Plateau)	10 oz + 4 oz (6) ??? (1)	johnsongrass sandburs annual weeds	5-26-09	7-17-09	5,493	good (6) fair (1) poor (1)
glyphosate (Honcho) + imazapic (Plateau)	16 oz + 4 oz (4)	johnsongrass sandburs	5-18-09	6-30-09	2,013	good (3) fair (1)
MSMA (MSMA)	0.5 gal (1)	johnsongrass	7-14-09	7-17-09	100	good (1)
Dicamba (Banvel)	8 oz (1)	broadleaf weeds	6-23-09	6-23-09	57	good (1)
glyphosate (Roundup Pro Concentrate) + imazapyr (Arsenal)	1.5% + 1% solution (1) 38.5 oz + 19 oz (1)	total vegetation control cracks/seams spot treatment	6-3-09	8-17-09	113	good (2)
glyphosate (Roundup Pro Concentrate)	38.5 oz (1)	total vegetation control spot treatment	7-27-09	7-27-09	33	good (1)
glyphosate (Honcho)	2 oz (1) 0.7 gal (1)	total vegetation control	6-30-09	7-31-09	90	good (2)

[1]Total number of responses to survey: 9 of 9 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

9.0 SURVEY OF DIVISION SEVEN HERBICIDE PROGRAMS

9.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 out of 10 maintenance facilities in Division Seven responded to the survey this year. In response to survey questions 1-11 only a single concern arose. With regards to question 5, as to how many personnel are used on a spray truck during applications, seven out of nine responses said they use 1 or 2 personnel. We realize that crew sizes may sometimes be limited and putting two personnel on a spray truck may be difficult. Please remember that there are several critical tasks being accomplished at any given moment on a spray truck and in the opinion of OSU a minimum of two personnel are required to safely and adequately address all of these tasks. We recommend that a spray truck should have two personnel on board during all applications, with one person responsible for driving, truck speed and watching traffic, and the other person administering the spray application as well as observing its pattern. A meeting was held at Division Seven headquarters on September 16, 2009 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report will be based on the surveys and meeting.

Division Seven herbicide usage is summarized in Table 8. This year Division Seven applied glyphosate/2,4-D + aminopyralid + AMS to most of their roadsides to control winter annual weeds. The remaining roadsides received glyphosate/2,4-D + AMS treatments without aminopyralid. Weed control results were good as treatment rates were met by most facilities as well as most application dates. A few Division Seven applications were being applied 2-3 weeks later than recommended.

Division Seven continues to use MSMA + sulfosulfuron to control johnsongrass and summer annual weeds with good success. Application rates were good and because of the wide window of application, treatments started in late May and continued through late July. This wide window of application is one of the benefits of this treatment combination. Good weed control results can be achieved even at the later dates within this window with little to no increase in bermudagrass injury. Division Seven also utilized johnsongrass control treatments of glyphosate + sulfosulfuron and sulfosulfuron alone on about one-half of the division. The glyphosate + sulfosulfuron treatments produced good results with only fair results from sulfosulfuron by itself. Clopyralid and dicamba/diflufenzopyr herbicide was used to control musk thistle successfully this past year. Diglycolamine salt of dicamba (Vanquish) was successfully used to control broadleaf weeds. Glyphosate (aquatic) was used with fair success to control cattails. A triclopyr ester + oil carrier treatment was used to provide good brush control. Treatments of glyphosate + sulfometuron, imazapyr + glyphosate, and imazapyr + glyphosate were all used on shoulders, slope walls, encroachment, and guardrails to control all vegetation with a good to fair results. Treatment rates and timings were met for most of these treatment combinations.

9.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

We would like to encourage Division Seven to continue with their glyphosate/2,4-D (Campaign) + aminopyralid + AMS winter annual weed control treatment and the summer MSMA + sulfosulfuron (Outrider) johnsongrass control treatment in 2010. Between these two treatments, they should continue to take care of most of the weed problems found along Division Seven roadsides whether they are grassy or broadleaf weeds having annual or

perennial life cycles. Since the EPA is in the process of phasing out the use of MSMA (final legal roadside use date of Dec. 31, 2013) Division Seven may want to continue to phase in the alternative treatment of glyphosate + sulfosulfuron. As experienced in 2009 when phasing out one treatment and resorting to another there will need to be clear concise communication as to the change in tank mix calculations. We encourage ODOT applicators to call us if they ever have a question as to developing new tank mixtures.

We would like to credit Division Seven personnel as being the first field division to recognize that a viable vegetation alternative to bare ground underneath cable barrier systems may be to maintain a good stand of common bermudagrass. OSU has recognized this as a viable goal for years and encourages all ODOT personnel whom are managing cable barriers on sloped center medians to consider maintaining bermudagrass to prevent soil erosion. Managing this vegetation requires a combination of both mowing and selective weed control.

Table 8. Summary of Division Seven Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate/2,4-D (Campaign) + AMS	2 pt + 5.1 lb (1) 2 pt + 3.4 lb (1)	winter annuals	2-20-09	4-8-09	1,107	good (2)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM) + A MS	32 oz + 4 oz + 5.1 lb (6) 38 oz + 4 oz + 5.1 lb (2)	winter annuals summer preemergence	2-13-09	4-20-09	6,587	good (6) fair (2)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM)	52 oz + 5.9 oz (1)	winter annuals	3-14-09	4-8-09	534	good (1)
glyphosate (Roundup Pro Concentrate)	24 oz (1)	johnsongrass	4-3-09	4-7-09	12	good (1)
sulfosulfuron (Outrider)	1.2 oz (1) ??? (1)	johnsongrass	7-13-09	7-23-09	1,289	fair (2)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider)	13 oz + 1 oz (2) 12 oz + 1 oz (1) 15 oz + 1 oz (1)	johnsongrass	5-9-09	7-7-09	2,271	good (4)
MSMA (MSMA) + sulfosulfuron (Outrider)	2 qt + 1 oz (1) 2.3 qt + 1.3 oz (2) 2.1 qt + 1.3 oz (2) 2.1 qt + 1.0 oz (1)	johnsongrass	5-5-09	7-25-09	3,698	good (6)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	24 oz + 6 oz (1) 64 oz + 1 oz (1)	johnsongrass total vegetation control spot spraying	5-19-09	7-16-09	19	good (2)
imazapyr (Arsenal) + sulfometuron (Oust XP) (handgun)	4 pt + 4 oz (1) 1 oz/gal + Oust (1)	total vegetation control	5-26-09	7-17-09	30+	good (2) poor (1)
imazapyr (Arsenal) + glyphosate (Roundup Pro Concentrate) (handgun)	1 qt + 1.5 gal/50 gal (1) 2 qt + 3 gal/100 gal (1)	total vegetation control	6-8-09	6-19-09	8	good (2)
diglycolamine salt of dicamba (Vanquish) + surfactant (handgun)	2 pt + 2 pt/100 gal (1)	broadleaf weeds	3-31-07	4-7-09	1.5	good (1)
dicamba/diflufenzopyr (Overdrive)	2 oz + 0.2% v/v (1)	musk thistle	3-25-09	3-31-09	0.5	good (1)
clopyralid (Transline) + surfactant (handgun)	6 oz + ??? (1) 6 oz + 0.25% (1) 1 oz + 1 oz/1 gal (1)	musk thistle	3-25-09	5-15-09	61.2	good (3)
triclopyr ester (Garlon 4) + oil (handgun)	20% solution (3)	Brush	3-20-09	7-3-09	7	good (3)
glyphosate (Aquastar) (aquatic) (handgun)	2 pt	Cattails	5-5-09	5-6-09	20	good (1)

[1]Total number of responses to survey: 10 of 10 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A '???' indicates that information was not provided for the production of this report.

10.0 SURVEY OF DIVISION EIGHT HERBICIDE PROGRAMS

10.1 HERBICIDE PROGRAM SURVEY RESULTS

A total of 10 out of 10 maintenance facilities in Division Eight responded to the survey this year. In response to survey questions 1-11 only a single concern arose. In response to survey question number 5 as to how often the spray truck is calibrated, 3 of the 10 responses said they calibrated once per year. We recommend that the minimum sprayer calibration frequency be a calibration immediately prior to each broadcast spray program. An example of this minimum recommended frequency is to calibrate immediately prior to the first of the winter annual weed control treatments and calibrate again, immediately prior to the summer johnsongrass control treatment. Completing a proper sprayer calibration procedure takes less than one hour and assures that the equipment is functioning properly prior to starting the actual seasonal spray treatments. If the sprayer is not functioning properly the early calibration procedure will uncover sprayer problems that will require subsequent repair. A meeting was held at Division Eight headquarters on September 15, 2009 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report will be based on the surveys and the September 15th meeting.

Division Eight herbicide usage is summarized in Table 9. Division Eight's broadcast herbicide program for 2009 consisted mainly of a late winter/early spring application of glyphosate/2,4-D + AMS. Overall the weed control results were good from these applications with both recommended treatment rates and timings being met. Glyphosate + sulfometuron treatments were used by most of Division Eight during 2009 to successfully control johnsongrass. Treatment rates were appropriate, however, approximately 75% of the treatments were made in late June, July, and early August. Rainy weather and windy conditions can easily delay herbicide applications. If Division Eight continues with the glyphosate + sulfometuron treatment they will need to apply the treatment between May 15 - June 15 in the future. This will maximize the johnsongrass control and minimize any common bermudagrass injury from this specific treatment. Division Eight also used glyphosate + sulfosulfuron in two counties so as to provide successful johnsongrass control. Division Eight successfully controlled musk thistle in one county with clopyralid while other counties did not report any musk thistle control efforts.

10.2 COMMENTS AND RECOMMENDATIONS FROM OSU PERSONNEL

Division Eight was able to return this year to both a winter annual weed control program and summer johnsongrass control program. Hopefully Division Eight personnel were able to see the benefits from both of these treatments as they drove their highways and began their mowing efforts. We would encourage Division Eight to stay with these treatments as they appear to be providing good results. We would like to encourage those spray crews that use both treatments to calibrate their spray trucks prior to each of these spray treatments and to document this by filling out a calibration form. It was mentioned that a few counties are having problems with Illinois bundleflower, a summer perennial broadleaf weed. The current glyphosate + sulfometuron treatment will usually only provide temporary suppression of Illinois bundleflower. However, adding metsulfuron methyl to the tank mix treatment will provide good control of not only the Illinois bundleflower but other summer broadleaf weeds. There are two ways to get the metsulfuron methyl into the treatment. One can simply add 0.5 oz. prod./A of metsulfuron (Escort XP) to the existing glyphosate + sulfometuron (Oust XP) treatment or one can use Oust Extra instead of Oust XP. Oust Extra is a packaged preblended mixture of sulfometuron (Oust) and metsulfuron (Escort).

Oust Extra should be used at a rate of 1.5 oz. prod./A to give the necessary rate for both johnsongrass and Illinois bundleflower control when tank mixed with glyphosate. One can save $0.50 - $0.75/A if the products are mixed separately as opposed to using the pre-mix product. We need to remind ODOT maintenance crews to please document all musk thistle control efforts regardless of how small of area was treated. The Oklahoma Department of Agriculture, Food, and Forestry has increased Noxious Weed Law enforcement efforts. If a complaint is filed against ODOT it will be important for ODOT to demonstrate the presence of an existing musk thistle control program. Division Eight is substantially infested with musk thistle, more so than any of the other field divisions. Consequently this division is at the forefront of the musk thistle war. The Campaign + AMS herbicide treatment qualifies as a musk thistle control effort. This treatment should also be reflected in ODOT spray records as being targeted for musk thistle.

Table 9. Summary of Division 8 Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed/Site	Date Started	Date Ended	Total Acreages Treated	Overall Success (good, fair, poor)
glyphosate/2,4-D (Campaign) + AMS	2 pt + 17 lb/100 gal (4) 2 pt + 5.1 lb (3) 2 pt + 3.4 lb (1) 34 oz + 5 lb (1) 2 pt + 9 lb/100 gal (1)	winter annuals	2-18-09	4-16-09	6,324	good (9) fair (1)
glyphosate (Roundup Pro) + sulfometuron (Oust XP)	16 oz + 1 oz (2) 25 oz + 1.2 oz (1) 19 oz + 1 oz (1) 13 oz + 1 oz (2) 16.6 oz + 1 oz (1)	johnsongrass	5-10-09	8-5-09	4,102	good (6) fair (1) poor (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	13 oz + 2 oz (1)	johnsongrass	6-17-09	6-26-09	750	good (1)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider)	13 oz + 0.8 oz (1) 19.2 oz + 1.2 (1)	johnsongrass ragweed	6-25-09	7-27-09	1,250	good (2)
glyphosate (Roundup Pro Concentrate) (handgun)	2% solution (1)	total vegetation control	6-21-09	6-21-09	5	good (1)
glyphosate (Roundup Pro) + imazapyr (Arsenal) (handgun)	0.16% solution + 0.4% solution (1)	total vegetation control	6-20-09	7-20-09	12	good (1)
clopyralid (Transline)	1 oz/10 gal (1)	musk thistle	5-10-09	5-20-09	---	good (1)

[1]Total number of responses to survey: 10 of 10 surveyed.
[2]Numbers in parenthesis refer to the number of county/interstate facilities. A ??? indicates that information was not provided in time for the production of this report.

11.0 STATEWIDE SUMMARY OF ODOT HERBICIDE PROGRAM RESULTS

For the second straight year much of Oklahoma has received either near or above average rainfall and moderate temperatures throughout the spring and summer growing seasons (excluding the panhandle which continued to show below average rainfall). The abundance of mid to late summer rainfall, along with current trends of mowing reductions, are producing both desirable and undesirable roadside vegetation growth. We have witnessed a resurgence of native grasses as well as a number of new weedy species showing up along Oklahoma roadsides. As a point of future reference we may want to designate 2009 as "The Year of the Pigweed" as ODOT had more documented problems with pigweed species than ever before. Given our weather in 2009, increased pigweed as well as other vegetation trends can be explained. In the following paragraphs an attempt will be made to shed some light on the changes in roadside plant composition and how they relate to current ODOT divisional herbicide programs.

In 2009 most ODOT field divisions treated equivalent or increased acreages with broadcast winter annual weed control and summer johnsongrass control treatments (Table 11) when compared to 2008. Approximately 53,876 acres were treated in 2009 to control winter annual weeds with 21,033 acres of this amount providing for preemergence summer broadleaf weed control via the inclusion of Milestone VM. About 49,358 acres were treated to control summer johnsongrass and other weeds in 2009. By far most of these treatments were applied using recommended rates of application. To a lesser degree, recommended treatment timings were met. Overall the various broadcast treatments chosen by each of the field divisions continued to provide good weed control results. By controlling the major target weed species the divisional herbicide programs should be providing a safe and aesthetically pleasing roadside when integrated with a reasonable mowing program. The current trend of mowing reductions, where a rural roadside receives 2-3 mowing cycles per year as opposed to 4 or 5 mowing cycles, should continue to place a higher level of importance on a good annual herbicide program. After all, it will be the herbicide component of the roadside vegetation management program that will be expected to pick up the slack if mowing cycles remain as they are.

February through April of 2009 started ODOT's herbicide year off with a great deal of challenges. It's hard to believe it but this Feb./April spray season seemed to have more problems with high winds that most years. Sustained high winds and/or rainy weather resulted in our receiving well above the average number of phone calls from ODOT personnel across the state. Applicators were concerned about missing their recommended spray windows because of unsuitable weather conditions. While applicators know there is nothing that can be done about windy or rainy spray conditions they should also know there are strategies that can be used to make decision making as easy as possible. First, the weather cannot be changed so the applicator should not worry about doing so. Second, applicators should take advantage of the entire recommended spray window. Even if applicators think the OSU recommended treatment timings are too early it is important to not that recommendations were developed through research trials and these early dates of application have been tested and will provide for good results. Third, applicators should take advantage of the internet to help monitor weather conditions, especially forecasted wind and rain conditions. ODOT personnel have received training on how to use the internet, especially the Mesonet AgWeather Forecast web site <http://agweather.mesonet.org/index.php/data/section/forecast> and the "Hourly Weather Graph" option available from that site. And lastly, this year we surveyed ODOT crews and found that 56% and 50% of the crews utilized nighttime and weekend hours, respectively, to spray in

both lower wind conditions and/or safer conditions (Table 10.). Generally speaking one will find lower wind speeds during nighttime hours and with the support of administration and the correct equipment set-up, nighttime applications are a good option. However, if applicators are attempting nighttime spraying, every applicator should know where all of the sensitive areas are located as they will not be as visible during the nighttime application. Applicators should also be prepared to answer questions from the public as to why they are spraying at night.

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

		Do you make nighttime herbicide applications?		
ODOT Field Division	**Number of surveys (crews)**	**Yes**	**No**	**% Yes**
1	10	0	10	0
2	10	0	10	0
3	12	5	7	42
4	10	10	0	100
5	13	11	2	85
6	9	9	0	100
7	10	7	3	70
8	10	5	5	50
			ODOT Average = %56	
		Do you make weekend herbicide applications?		
		Yes	**No**	**% Yes**
1	10	0	10	0
2	10	0	10	0
3	12	3	9	25
4	10	10	0	100
5	13	10	3	77
6	9	9	0	100
7	10	4	6	40
8	10	6	4	60
			ODOT Average = %50	

How did the above average rainfall affect one's roadside vegetation this spring and summer? There were no doubt several times this year that ODOT herbicide spray crews from southeast Oklahoma would have been more than happy to send some of their rain up to the panhandle. For those that received the higher rainfall this year, the extra rain should have promoted the emergence and growth of many of our native grass species. This was very evident on backslopes where some native grass stands had declined due to droughty conditions in 2005 and 2006 as well as high mowing frequencies from earlier this decade. The increase in native grasses should be a benefit to ODOT by healing of some of the damaged backslopes and reducing future slope erosion.

In summer of 2009 we noted what appeared to be a large increase in 'King Ranch' (*Bothriochloa ischaemum* var. *songarica*) and 'Plains' (*Bothriochloa ischaemum*) old world bluestem species along many roadsides. This was perhaps due to both increased rainfall and mowing reductions during the past two years. With respect to King Ranch and Plains bluestem, beauty is in the eye of the beholder as to whether or not they are desirable or undesirable roadside grasses. The Oklahoma Invasive Plant Council has listed the old world bluestem species and its various components as Problem/Invasive species in Oklahoma (http://www.ok-invasive-plant-council.org/species.html). The old world bluestem species are well adapted to roadside conditions but when growing under higher rainfall they produce a seedhead that can easily reach 24-36 inches in height. Under more average rainfall, seedhead heights would be 18-24 inches. The seedhead height can be a problem as far as sight-distance or aesthetic issues. Regardless these bluestems are on the increase along Oklahoma roadsides. We do not believe there are effective, selective chemical control measures for control of the old world bluestem species on roadsides so mowing remains as a means of suppressing the height of seedheads.

Pigweed was the most common broadleaf weed problem listed by ODOT crews in the 2009 herbicide survey. In Oklahoma several pigweed species are present. To mention just a few; smooth pigweed (*Amaranthus hybridus*], redroot pigweed (*Amaranthus retroflexus*], spiny pigweed (*Amaranthus spinosus*], tumble pigweed (*Amaranthus albus*], Palmer amaranth (*Amaranthus palmeri*], and waterhemp (*Amaranthus rudis*). All of these annual weeds are from the pigweed Genus, which is a biological group of plants that are even more closely related than the biological group commonly called a "Family." As these species are genetically very similar, it is very common to find more than one of these species growing together along a roadside and the plants can cross pollinate making interspecific (between species) hybrid pigweeds. In visiting with OSU weed scientists, along with our chemical industry personnel, the most common of the pigweeds in Oklahoma is Palmer amaranth. This species also happens to be more difficult to control than some of the other pigweeds. It is also a prime candidate for developing herbicide resistance to several of our herbicides. There are several areas of Oklahoma that have particularly bad problems with pigweeds, but during the last two years many ODOT personnel have experienced pigweed populations where they had not in the past. This may be due in part to increases in rainfall but for ODOT much of this is perhaps due to the fact that there are no current herbicide recommendations to ODOT that are completely effective in controlling pigweed species.

The best of the current OSU recommendations for the postemergence control of pigweed species is to apply Overdrive herbicide at a minimum of 4 oz. product/Acre plus a non-ionic surfactant to pigweeds 4-8 inches tall (late May or early June). However, some of the worst pigweed problem areas are located immediately adjacent to broadleaf agricultural crops like alfalfa, soybeans, or peanuts. Using an herbicide like Overdrive, which can volatilize after the application and move off target, can be risky. There is no current good pigweed control treatment that doesn't have some kind of risk associated with its use. However, an herbicide currently being developed from Dupont (aminocyclopyrachlor) holds some promise. This product will be discussed later in this section.

Healthy stands of crabgrass were common place in Oklahoma in 2009. Crabgrass is usually not a big problem along roadsides that receive an early summer treatment that includes either glyphosate or MSMA. These early summer (May/June) post–emergent treatments generally control young crabgrass plants and under normal rainfall late germinating crabgrass doesn't usually reinfest roadsides to any great extent. Because of the opportunistic nature of this summer annual weed, if several inches of mid to late summer rain occurs additional

crabgrass seed can germinate resulting in a second and third flush of new plants. These plants can reach 18-24 inches in height by late summer and be very competitive with common bermudagrass. Most of the current johnsongrass control recommendations provide the initial post-emergent control of crabgrass. However, treatments that include Oust XP or Outrider will not provide any control for crabgrass that germinates in mid to late summer. If someone had the foresight to know that we would have above average rainfall in mid to late summer there would be a distinct advantage to using the current recommended treatment of glyphosate + Plateau. This treatment is the only recommended treatment that provides for both initial and residual (preemergence) control of both crabgrass and sandbur for 90-120 days following application.

As mentioned earlier, aminocyclopyrachlor is a new experimental herbicide from Dupont that is currently under development. Currently the US EPA label is expected on this herbicide sometime during the fall of 2010. Aminocyclopyrachlor will be a dry herbicide formulation that will be blended with metsulfuron methyl (Escort XP) and should be a beneficial herbicide in ODOT herbicide programs. Research from OSU shows that aminocyclopyrachlor will provide both preemergence (short to moderate residual) and postemergence control of several problem broadleaf and grassy weed species. Data shows good control of kochia with preemergence applications and good control of Palmer amaranth and musk thistle with postemergence applications. Aminocyclopyrachlor has a very safe toxicity profile and should have no serious problems with vapor drift (volatility). Currently we do not have any information as to what the treatment costs will be for this herbicide.

MSMA, currently in a voluntary EPA cancellation process, continues to have specific uses removed from its label over the next few years. Under current cancellation guidelines all MSMA products can be legally purchased for roadside use through the end of 2012 with all legal applications being finalized by the end of 2013. While unlikely, there is a chance EPA could change the current roadside use guidelines during the next few years allowing continued use along roadsides. The MSMA issue will be monitored closely by OSU in 2010 and beyond.

For the past several years nearly all ODOT field divisions have been installing and maintaining cable barrier systems along the state highway system. While not currently an official ODOT/OSU Roadside Management Project item, OSU personnel have been monitoring cable barrier system installations and subsequent vegetation/erosion issues. We have visited with each of the field divisions about the cable barrier maintenance challenges and would like to ask a favor of ODOT crews in 2010. We would like to ask all ODOT crews that have cable barrier maintenance responsibilities, both cable barrier maintenance and vegetation/erosion maintenance under the cable barrier, to document specific problems they have during 2010. These observations should be included in their Herbicide Program Survey in 2010. These items should include erosion problems, specific weed problems, herbicide application problems, cable barrier design/location problems, and any other issues that create problems. It would be of benefit to document these items so they can individually be monitored more closely in the future.

New yearly herbicide contract prices, which are normally available by October 1, were delayed through the fall and were not available as of press time. This was due to an unanticipated DCS contract extension and errors in the development of the contract specifications. Because of this delay, and deadlines for this annual report, it will not be possible to discuss specific changes to herbicide treatment costs for 2010. We can however speculate on the changes we expect to see based on conversations with herbicide manufacturers, and distributors as well as known changes to the AHAL. Due to the fact that Campaign herbicide will no longer be available, it will be replaced by the product Landmaster BW (manufactured by

Albaugh). Landmaster BW is a generic equivalent product to Campaign and ODOT should use it in exactly the same manner as they have been using Campaign herbicide. Speculatively speaking, we have been informed that Roundup Pro Concentrate will drop in price slightly for 2010. We are uncertain if this will also cause a drop in price for the generic glyphosate source Ranger Pro.

There should be a contract award in 2010 for an AHAL-approved MSMA. The MSMA product on the new contract should either be Target 6 Plus or Weed Hoe 108. Either herbicide should perform well for ODOT. The costs for all MSMA products continue to increase as production decreases due to increased EPA restrictions on MSMA use.

Table 11. Summary of 2009 ODOT herbicide treatments, target weeds and total acres treated with herbicides in Oklahoma.

Herbicide Treatment	Target Weed	Divisions Using Treatment(s)	Total Acreage Treated
glyphosate +/- 2,4-D +/- AMS +/- Others	winter annual weeds	1, 2, 3, 5, 7, 8	32,483
glyphosate +/- 2,4-D +/- aminopyralid +/- AMS +/- Others	winter annual weeds (including musk and scotch thistle)	4, 5,7	21,033
glyphosate + sulfometuron	johnsongrass and summer annual weeds	1, 2, 4, 5, 8	28,998
glyphosate + sulfosulfuron	johnsongrass and summer annual weeds	2, 3, 7, 8	12,609
glyphosate + imazapic	johnsongrass and summer annual weeds	6	7,506
MSMA +/- sulfometuron, sulfosulfuron, imazapic	johnsongrass and summer annual weeds	2, 4, 5, 6, 7	7,751
glyphosate (alone) bromacil/diuron glyphosate + imazapyr 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	1,189
bromacil bromacil/diuron	total vegetation control	4	----
triclopyr ester diglycolamine salt of dicamba	general broadleaf weed control	5, 6, 7	144.5
dicamba/diflufenzopyr +/- Others	musk thistle	7	0.5
clopyralid +/- Others	musk thistle	4, 5, 7, 8	88.2
triclopyr ester + diesel	basal bark or cut stump brush control	1, 2, 7	37
Glyphosate	cut stump brush control	5	----
picloram + triclopyr ester	foliar brush control		0
triclopyr ester or amine	foliar brush control	1, 2, 4	487
imazapyr (aquatic)	aquatic vegetation control	4	----
glyphosate (aquatic)	aquatic vegetation control	2, 5, 7	310
triclopyr amine	aquatic vegetation control		0
Other		5	6
Total			**112,642.2**

Table 12. Comparison of herbicide acreages treated in 2006, 2007, 2008 and 2009 for the more common broadcast treatments and total acres treated by division.

ODOT Field Division	Year	Herbicide Treatments						Total Acres Treated with Selected Herbicide Applications
		glyphosate +/- 2,4-D +/- AMS (winter annual weed control)	glyphosate +/- 2,4-D +/- aminopyralid +/- AMS (winter annual weed control)	glyphosate + sulfometuron (johnsongrass control)	glyphosate + sulfosulfuron (johnsongrass control)	glyphosate + imazapic (johnsongrass control)	MSMA +/- sulfometuron/ sulfosulfuron (johnsongrass control)	
1	2006	1,561	0	3,639	2,287	0	0	7,487
	2007	5,574	0	540	5,547	0	0	11,661
	2008	5,369	60	6,469	0	0	0	11,898
	2009	6,086	0	3,850	0	0	0	9,936
2	2006	0	0	2,901	0	0	1,299	4,200
	2007	8,486	0	1,899	8,818	0	1,687	20,890
	2008	5,861	0	712	6,040	0	748	13,361
	2009	6,632	0	5,141	2,791	0	1,252	15,816
3	2006	660	0	0	2,713	0	0	3,373
	2007	5,901	2,484	0	6,090	0	0	14,475
	2008	6,891	0	0	6,367	0	0	13,258
	2009	8,294	0	0	4,996	0	0	13,290
4	2006	688	0	5,977	0	0	0	6,665
	2007	4,894	6,438	2,095	4,634	0	43	18,104
	2008	1,775	4,773	3,811	1,807	0	4	12,170
	2009	0	7,761	5,917	0	0	2	13,680
5	2006	0	0	7,700	0	0	2,010	9,710
	2007	6,392	5,485	9,236	0	0	1,684	22,797
	2008	7,736	4,444	8,417	0	0	2,624	23,221
	2009	4,040	6,151	9,238	0	0	2,699	22,128
6	2006	0	0	6,054+	0	0	0	6,054
	2007	0	7,237	0	0	0	1,401	8,638
	2008	0	8,037	380	0	0	90	8,507
	2009	0	0	0	0	7,506	100	7,606
7	2006	534	0	0	0	0	3,489	4,023
	2007	0	8,563	0	0	0	7,893	16,456
	2008	6,497	1,560	0	427	0	4,353	12,837
	2009	1,107	7,121	0	3,572	0	3,698	15,498
8	2006	5,309	0	1,700	3,275	0	0	10,284
	2007	3,125	4,225	100	5,817	0	0	13,267
	2008	---	---	---	---	---	---	---
	2009	6,324	0	4,852	1,250	0	0	12,426
All Divisions	2006	8,752	0	27,971	8,275	0	6,798	51,796
	2007	34,372	34,432	13,870	30,906	0	12,708	126,288
	2008	34,129	18,874	19,789	14,641	0	7,819	95,252
	2009	32,483	21,033	28,998	12,609	7,506	7,751	110,380

APPENDIX A

2009 ODOT/OSU HERBICIDE PROGRAM SURVEY

2009 ODOT/OSU Herbicide Program Survey (2 pages)

Please return to your Division Headquarters on or before Aug. 31, 2009. Then forward to Doug Montgomery.

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?

_____

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Summary of 2008/2009 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		
								Good	Fair	Poor
Example: Campaign + AMS	***2 pts. + 3.4 lbs.***	***brome, cheat, hairy vetch***	***3-15-02***	***4-7-02***	***15***	***43.3***	***649.5***	***xxx***		
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.