2008 Oklahoma Department of Transportation Herbicide Program Report

ANNUAL REPORT

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1.0 Introduction

The purpose of this annual report was to document the successes, failures and challenges of ODOT's chemical weed control program in 2008. In that each field division makes herbicide application decisions independent of other field divisions, we attempted to minimize comparisons among divisions in this report. However, it can be both interesting and useful to document trends in ODOT herbicide programs when similarities and differences in field division programs are surveyed. We attempted to document the progress of each field division on its own merit, considering the different attitudes and unique management goals within each field division. When appropriate, recommendations and comments were made to assist divisions in solving issues that became apparent after reviewing this year's herbicide surveys (Appendix A) and divisional meetings. It was our intent that the comments and criticisms included in this report would be of benefit to each field division's herbicide program. We are aware that each field division, in the development of its herbicide program, will have considerations unknown to Oklahoma State University Roadside Vegetation Management Program personnel. If there is disagreement by any division personnel to comments or recommendations, we ask that we have the opportunity to clarify recommendations.

In the body of this report most references to herbicides will be made by using their common name instead of brand name. An example would be a reference to glyphosate instead of Roundup Pro Concentrate, Honcho Plus, or Mirage. This is an attempt to simplify the text of this report. When referenced common names are unfamiliar to the reader, you may refer to Table 11 for the corresponding brand name. Each Field Division’s Summary Table (Tables 1-8) will reference common name followed by specific brand names used by the division in parenthesis.

Finally, 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 will not reflect the entire ODOT herbicide program effort. We encourage each ODOT maintenance facility to fill out the annual herbicide program survey as accurately and completely as possible so this report can reflect as much of ODOT’s weed control effort as possible. 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.

2.0 Survey of the Division One Herbicide Program

2.1 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 2-12 no apparent concerns arose. A meeting was held at Division One headquarters on September 3, 2008 to solicit comments and opinions from division administrative personnel. The following observations and comments are made based on the surveys and meeting.

Division One herbicide usage is summarized in Table 1. The winter annual weed control program in Division One continued with glyphosate/2,4-D + AMS broadcast treatment. Winter annual weed control results were good from these treatments as both recommended application rates and appropriate treatment timing goals 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. Division One also used glyphosate (alone) to treat sign posts, guardrails, johnsongrass, and other total vegetation control areas with good results. Triclopyr ester was used as a cut-stump and foliar treatment to control brush with good success.

2.2 Comments and Recommendations from OSU Personnel

From both the survey and division comments, it appears Division One had a successful 2008 roadside weed control program. The two main Division One broadcast treatments this year produced good control of targeted weeds and were very cost efficient. The glyphosate/2,4-D + AMS (winter) treatment followed by a treatment of glyphosate + sulfometuron (summer) were the most cost efficient herbicide programs to provide good weed control results for the major roadside weeds. We would like to encourage Division One to continue with these programs and to observe treatment application timings closely so as to maximize weed control results. Comments were made on this years survey forms that sericea lespedeza is becoming more of a problem. Sericea lespedeza will not be controlled with either of the two broadcast treatments currently being used by Division One crews. We would recommend applying metsulfuron methyl (Escort XP) in September to sericea lespedeza infestations using 0.5 oz. prod./A. Include a non-ionic surfactant at a rate of 0.25% V/V (1 qt./100 gal. water). Try to make this application after a rain has promoted some new growth to the sericea plants. Control will be evident during late spring of the following year.

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate/2,4-D (Campaign) + AMS	2 pt + 5.33 lb (1) 2 pt + 4.2 lb (6) ??? (3)	winter annuals	3-6-08	4-22-08	597	5,369	good (9)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM) + AMS	2 pt + 4 oz + 4.2 lb (1)	winter annuals summer annual broadleaf weeds	4-14-08	4-14-08	60	60	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	11 oz + 1 oz (3) 8 oz + 1 oz (1) 16 oz + 1 oz (3) 7 oz + 1 oz (1) ???(2)	johnsongrass broadleaf weeds	5-10-08	6-26-08	647	6,469	good (10)
glyphosate (Roundup Pro Concentrate)	2 pt (1)	johnsongrass bareground	4-14-08	6-6-08	48	48	good (1)
triclopyr ester (Garlon 4) + oil carrier	spray-to-wet (1) 20% solution (1) ??? (1)	brush cut-stump treatment	11-07-07	6-5-08	???	???	good (3)

[1]Total number of responses to survey: 10 of 10.

[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.

3.0 Survey of the Division Two Herbicide Program

3.1 Herbicide Program Survey Results

A total of 8 out of 10 maintenance facilities in Division Two responded to the survey this year. In response to survey questions 2-12 a couple of concerns became apparent. In response to survey question 4 which asked "How many personnel do you use on a spray truck when applications are being made", the response was 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 the shoulders of a single person puts that person in a very difficult position. OSU recommendations are to have two certified ODOT personnel on board of each spray truck during all applications whenever possible. Also, in response to survey question 5 which asked "How often is the herbicide spray truck calibrated", the response was that about one-half of the facilities only calibrated their spray rigs once per year. 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 done before you spray for winter annual weeds (glyphosate/2,4-D + AMS) and 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. Facilities that only calibrate their spray trucks once per year, when they are making the two different broadcast treatments, is a major concern of OSU personnel. A meeting was held at Division Two headquarters on September 4, 2008 to solicit comments and opinions from division administrative personnel. The following observations and comments are made based on the surveys and 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 as recommended application rates were met, however application timings had a few problems. As far as timing of applications, 6 of 8 facilities were applying the glyphosate/2,4-D treatment 2-4 weeks later than is recommended. Treatments applied later than recommended may cause unacceptable injury to bermudagrass. Division Two used three different herbicide treatments to provide successful summer johnsongrass control. Treatments of glyphosate + 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, and locust. Glyphosate + sulfometuron and MSMA treatments were the additional treatments used this past year. Each of these treatments was used to successfully control johnsongrass and other summer weeds as most herbicide rates and timing of applications were met. Glyphosate + sulfometuron treatments were also used for total vegetation control for signs and guardrails with success. Triclopyr ester treatments were broadcast foliar applied with good success in controlling brush.

3.2 Comments and Recommendations from OSU Personnel

This is the second year for Division Two facilities to use the glyphosate/2,4-D + AMS to control winter annual weeds. The weed control results this year appeared to be a little more consistent than last year and we would like to encourage Division Two to continue to make this annual treatment. As per recommendations, and considering Division Two begins spring growth earlier than any other part of the state, please pay particular attention to the February 15 – March 20 treatment timing window.

We would like to encourage Division Two to continue their current summer weed control program efforts. Most summer applications this year included mixtures of glyphosate + sulfosulfuron which provided good control of johnsongrass during another wet year. If johnsongrass remains the main target, hopefully Division Two can continue with glyphosate + sulfosulfuron treatments. However, if summer broadleaf weeds increase in density or budgets become too tight there are less expensive treatments of glyphosate + sulfometuron that can be used.

Interest has been shown by Interim Div. Maintenance Eng. Brian Taylor to increase brush control efforts in Division Two in the future. OSU encourages Division Two to pursue this endeavor and requests that before brush control programs are established, a meeting be held between OSU RVM program personnel, Dow AgroSciences personnel, and appropriate Division Two Maintenance personnel to discuss brush control options. Ideally this meeting would occur in the fall of 2008 or early 2009.

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate/2,4-D (Campaign) + AMS	2 pt + 6.8 lb (2) 2 pt + 4.3 lb (4) 2.5 pt + 7.6 lb (1) ??? (1)	winter annuals broadleaf weeds	2-29-08	4-28-08	733	5,861	good (7) fair (1)
glyphosate (Roundup Pro Concentrate, Credit) + sulfosulfuron (Outrider)	19 oz + 1.3 oz (3) 16 oz + 1.3 oz (4)	johnsongrass dallisgrass broadleaf weeds	5-8-08	7-15-08	800	5,600	good (6) fair (1)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider) + triclopyr (Garlon)	16 oz + 1.3 oz + 16 oz (1)	johnsongrass serecia lespedeza sumac locust	6-10-08	8-27-08	440	440	good (1)
MSMA (MSMA)	2 qt (3)	johnsongrass	7-1-08	8-27-08	249	748	good (2) fair (1)
glyphosate (Credit, Roundup Pro Concentrate)	19 oz (1) 16 oz (1) 24 oz (1) ??? (1)	johnsongrass	6-1-08	9-10-08	192	766	good (1) fair (2) ??? (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	1 gal + 4 lb (1)	johnsongrass guardrail treatment	6-2-08	9-4-08	112	112	good (1)
triclopyr ester (Garlon 4)	4 pt (2)	brush	8-27-07	9-15-08	300	600	good (2)

[1]Total number of responses to survey: 8 of 10.

[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.

4.0 Survey of the Division Three Herbicide Program

4.1 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 2-12 no apparent concerns arose. A meeting was held at Division Three headquarters on September 4, 2008 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 3. 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. There were however a few treatments being applied after the recommended shut-off date. 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 received 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.), however, application timings were later because of a division-wide mowing in May. This is one of the advantages of a glyphosate + sulfosulfuron summer treatment as it is no problem to make these applications later into the summer (June-early August) if roadsides require an early mowing.

4.2 Comments and Recommendations from OSU Personnel

Division Three continued this year with a very consistent herbicide program. We would like to encourage Division Three to continue with their current herbicide program efforts with one word of caution. Division Three has been in a very similar herbicide program for at least 5 consecutive years, while the weed control results remain good overall it has now been documented that a release of broadleaf weeds is occurring. Increases in pigweed, sericea lespedeza, and other broadleaf weeds will be slow but will eventually need to be addressed. To control these weeds will require a change in one or more summer treatment herbicides. Trying to incorporate some metsulfuron methyl into the summer herbicide program would likely address some of the summer broadleaf weed releases at a lower cost compared to other alternative products. We encourage Division Three to contact OSU personnel to discuss the details if they are interested in altering some of their summer herbicide treatments.

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate/2,4-D (Campaign) + AMS	2 pt + 3.6 lb (1) 2 pt + 2.5 lb (1) 2 pt + 5.1 lb (6) 2 pt + 2.9 lb (2) 2 pt + 3.4 lb (1)	winter annuals broadleaf weeds	2-14-08	4-24-08	620	6,819	good (11)
glyphosate (Honcho Plus, Roundup Pro Concentrate)	16 oz + 1 oz (5) 12 oz + 1 oz (1) 13 oz + 1 oz (2) 32 oz + 1 oz (1)	johnsongrass	6-9-08	7-24-08	707	6,367	good (9)
glyphosate (HonchoPlus) glyphosate (Roundup Pro Concentrate)	2% solution (2) 2% solution (1)	johnsongrass total vegetation control	5-2-08	7-29-08	2	40	good (3)
glyphosate, aquatic (AquaNeat) + surfactant	1 gal (1)	brush & weeds guardrail total vegetation control	8-6-08	8-8-08	7.5	7.5	fair (1)

[1]Total number of responses to survey: 11 of 11.

[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 the Division Four Herbicide Program

5.1 Herbicide Program Survey Results

A total of 9 out of 9 maintenance facilities in Division Four responded to the survey this year. In response to survey questions 2-12 no concerns arose. On September 11, 2008 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 this past winter. A couple of facilities used glyphosate/2,4-D + AMS and glyphosate + AMS treatments to provide for winter annual weed control. Approximately 3/4ths of the division used the glyphosate + AMS alone treatments, at a rate of 1 qt. product per acre, to control annual ryegrass with the remainder of the facilities using the alternative treatments. At this glyphosate rate per acre it is critical that this treatment be applied to completely dormant bermudagrass. When bermudagrass begins to break dormancy, this will occur next to the shoulder first, the glyphosate at 1 qt./A applications should be discontinued. Most treatment rates and timings were good, however, two facilities were applying these treatments well after bermudagrass greenup. Complete bermudagrass greenup on these highways was delayed by more than a month and allowed for crabgrass and other summer annuals weeds to infest the damaged bermudagrass. These roadsides eventually healed up by mid summer but they did show a reduction in bermudagrass stand coverage. In 2009 it will be very important that these roadsides are treated while they are completely dormant. The broadleaf weed control achieved from the addition of aminopyralid to the winter annual weed control treatments looked good for the second year. The main broadleaf weeds not controlled by the aminopyralid were palmer amaranth and other pigweeds, and kochia. In 2008 Division Four used both glyphosate + sulfometuron and glyphosate + sulfosulfuron treatments to control johnsongrass and other summer weeds. Overall johnsongrass control results were good as both treatment rates and timings were met for most facilities. We would recommend that Grant Co. personnel reduce their glyphosate (Roundup Pro Conc.) rate from 22 fl. oz./A to a maximum of 19 fl. oz. prod./A to minimize bermudagrass injury. Division Four personnel used clopyralid to spot & broadcast treat musk thistle with success. 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, and/or imazapyr/diuron. Total vegetation control results were good for most of these treatments as rate and timings were met.

5.2 Comments and Recommendations from OSU Personnel

We would encourage Division Four to continue with their current herbicide program efforts as personnel and budgeting allow. We would like to caution Division Four that if they continue to use the treatment of glyphosate at 1 qt./A + AMS to control winter annual ryegrass and other weeds then these applications must be made to completely dormant bermudagrass roadsides. This treatment can continue to provide excellent control of winter weeds but does not have the degree of safety of the old Campaign at 2 pts./A + AMS. The old Campaign treatment had slightly less than one-half the amount of glyphosate per acre than the current Campaign

formulation used at 1 qt./A. When the old formulation Campaign + AMS treatments were applied late to bermudagrass that was already at 20% greenup (in late March to early April) it would produce only slight injury. The current Campaign formulation results in treatment with glyphosate at 1 qt./A and subsequently this treatment does not have the window of safety and it must be applied to completely dormant bermudagrass only. Consequently an earlier start date for these applications must be used by many field facilities. Some ODOT applicators may be concerned that this is too early to spray glyphosate by itself since it will only control the weeds that are up and growing the day of application. We would simply like to ask you to have faith in our suggested windows of application. The annual weeds that are targeted will be controlled even though they will be smaller and more difficult to see at earlier application dates.

We would like to encourage Division Four to continue using the same summer weed control programs in the 2009 spray season. Continuing to use the glyphosate + sulfometuron (Oust XP) treatments will stretch maintenance budgets, while the glyphosate + sulfosulfuron (Outrider) will provide to overall best control of johnsongrass. We would also recommend that Grant County consider, for at least one year, the use of a summer treatment of MSMA at 2 qts. prod./A + Oust at 1 oz. prod./A instead of a glyphosate-based summer treatment. OSU personnel will try and set-up a meeting this winter with Grant County personnel to discuss these specific recommendations and the possibility of their implementation.

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate (Roundup Pro Concentrate) + aminopyralid (Milestone VM) + AMS	32 oz + 4 oz + 4.7 lb (5) 32 oz + 4 oz + 1.4 lb (1) ??? (1)	winter annuals summer annual broadleaf weeds annual ryegrass	3-10-08	4-19-08	682	4,773	good (6) ??? (1)
glyphosate (Roundup Pro Concentrate) + AMS	32 oz + 5.1 oz (1)	winter annuals	3-19-08	4-02-08	779	779	fair (1)
glyphosate/2,4-D (Campaign) + AMS	2 pt + 4.7 lb (1)	winter annuals	3-25-08	3-27-08	996	996	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Outrider)	16 oz + 1 oz (2) 19 oz + 1.33 oz (1) 22 oz + 1.4 oz (1) 15 oz + 1.3 oz (1) ??? (1)	johnsongrass	5-19-08	6-13-08	301	1,807	good (5) fair (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	16 oz + 1 oz (2) 15 oz + 1.1 oz (1) 22 oz + 1.1 oz (1) 12 oz + 0.75 oz (1)	johnsongrass	5-19-08	6-10-08	762	3,811	good (4) fair (1)
clopyralid (Transline) + surfactant	50 oz + 7 oz (1) ???(1)	musk thistle	4-29-08	5-9-08	4.5	9	good (2)
imazapyr (Arsenal) + surfactant	1% solution (1) 4 pt + 1 pt (1) ??? (1)	total vegetation control signs culverts	3-19-08	5-28-08	1.67	50	good (3)
imazapyr (Arsenal, Imazapyr 2E) + glyphosate (Roundup Pro Concentrate, Roundup) +/- surfactant	4 pt + 1 gal + 1 pt (1) 1 gal + 1 gal (1) 22 oz + 43 oz (1)	total vegetation control signs guardrails	4-19-08	7-21-08	18	54	good (3)
imazapyr (Arsenal) + glyphosate (Roundup) + sulfometuron (Oust XP)	1 gal + 2 gal + 8 oz (1)	total vegetation control	4-1-08	8-29-08	2	2	good (1)
imazapyr (Arsenal) + bromacil/diuron (Krovar)	32 oz + 6 lb (1)	total vegetation control	4-21-08	4-29-08	2	2	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	64 oz + 4 oz (1)	total vegetation control	7-1-08	7-16-08	3.5	3.5	good (1)

[1]Total number of responses to survey: 9 of 9.

[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 the Division Five Herbicide Program

6.1 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 2-12 no apparent concerns arose. A meeting was held at Division Five headquarters on September 9, 2008 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report are based on the surveys and meeting.

Division Five herbicide usage is summarized in Tables 5a & 5b. For their 2008 winter annual weed control program, Division Five continued with the division-wide treatment of glyphosate/2,4-D + AMS with approximately 1/3 of the tankloads including aminopyralid. The survey also showed a few applications did not include the addition of AMS. Overall winter annual weed control results were good and seemed to be slightly more consistent with the incorporation of aminopyralid (Milestone VM). Division Five crews used slightly higher than recommended rates of glyphosate/2,4-D + AMS (excluding Tillman County), and appeared to hit treatment timing windows a little better this year with only a small amount of application going out late. Tillman County recorded using glyphosate/2,4-D (Campaign) at 79 fl. oz. prod./A, alone or mixed with aminopyralid (Milestone VM). This rate is quite a bit higher than the recommended high end rate of 64 fl. oz. prod./A when used without AMS.

About 75% of Division Five summer johnsongrass control treatments consisted of glyphosate + sulfometuron alone, or combined with diglycolamine salt of dicamba. The remaining treatments consisted of MSMA alone, or combined with sulfometuron. Overall johnsongrass control was good for about 75% of the applications and fair for the rest. As far as the glyphosate + sulfometuron treatments are concerned the application rates, while low, looked good, but 8 out of 12 facilities using this treatment were making final applications 4-6 weeks past the recommended timings. At the low rate of application this would mean applications were likely being made to larger more mature johnsongrass, this could result in less control. Also, while surveyed johnsongrass control was good, Kiowa County recorded using MSMA alone at 40 fl .oz. prod./A. Minimum recommended MSMA application rate per acre is 48 fl. oz. prod./A.

Bareground guardrail and shoulder treatments used included various combinations of glyphosate, imazapyr, imazapyr/diuron, pendimethalin, and sulfometuron. Good bare-ground control was produced from most of these treatments. A few of the total vegetation control treatments chosen included low herbicide rates for bare-ground treatments and only produced fair results. We encourage ODOT crews that may be trying a new treatment combination for the first time to call OSU personnel to check on treatment combinations, rates, and tank mixture calculations.

6.2 Comments and Recommendations from OSU Personnel

We would like to encourage Division Five personnel to continue with their basic winter annual weed control program of glyphosate/2,4-D + AMS and where budgets allow, adding aminopyralid to this treatment. The addition of aminopyralid herbicide cost's around $8.40/A.

This addition results in controlling many of the summer annual broadleaf weed problems as long as the targeted weeds are not pigweed or kochia. Continuing to use the proper application rates and earlier timings will achieve the best control possible with the selected winter annual weed control treatments. We also encourage Division Five to continue with current summer weed control treatments whether glyphosate or MSMA based. We would recommend application of the glyphosate + sulfometuron treatments as per recommended timings. This will maximize johnsongrass control and as well as minimize injury to bermudagrass. Last year it was discussed with Division Five personnel that some of their personnel were noticing a possible thinning of bermudagrass in some areas. Late applications of glyphosate + sulfometuron can cause this affect. Where ODOT personnel are certain of thinned bermudagrass stands being caused by this treatment we recommend alternative treatments of MSMA or sulfosulfuron (no summer glyphosate). These treatments can provide very good control of johnsongrass and other roadside weeds and have proven to cause little to no injury to bermudagrass roadsides.

We would also like to encourage Division Five to continue to fix each of the spray rigs that continue to have compatibility issues between the truck hydraulic systems and the demands of the sprayer hydraulic motor. The overheating of the hydraulic system continues to compromise the accuracy of herbicide applications. This is due to the spray system pressures not staying constant during application. Correcting this situation will hopefully be a priority for those spray rigs on trucks that are not scheduled for replacement with the new on-demand (load sensing) hydraulic systems.

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate/2,4-D (Campaign)	38 oz (1) 79 oz (1)	winter annuals	3-15-08	4-8-08	760	1,519	good (2)
glyphosate/2,4-D (Campaign) + AMS	39 oz + 3.4 lb (2) 40 oz + 3.2 lb (3) 38 oz + 3.4 lb (1) 49 oz + 3.4 lb (1) 40 oz + 3.8 lb (1) ??? (1)	winter annuals	3-12-08	4-22-08	691	6,217	good (7) fair (3)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM) + AMS	40 oz + 3.7 oz + 3.5 lb (1) 39 oz + 3.9 oz + 3.4 lb (1) 40 oz + 4.0 oz + 3.0 lb (3) 40 oz + 4.0 oz + 3.2 lb (2) 40 oz + 3.8 oz + 3.8 lb (1) 38 oz + 4.0 oz + 3.4 lb (1)	winter annuals summer annual broadleaf weeds	3-12-08	4-31-08	472	4,244	good (8) fair (1)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM)	79 oz + 3.0 oz (1)	winter annuals summer annual broadleaf weeds	3-27-08	4-27-08	200	200	good (1)
glyphosate (Roundup Pro Concentrate, Honcho Plus) + sulfometuron (Oust XP, SFM 75)	9.5 oz + 0.5 oz (1) 12 oz + 0.5 oz (3) 10 oz + 0.5 oz (4) 12 oz + 0.6 oz (1) 10.4 oz + 0.7 oz (1) 17.4 oz + 1.0 oz (1) ??? (1)	johnsongrass broadleaf weeds	5-19-08	7-23-08	715	7,864	good (8) fair (4) ??? (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP) + digloc. dicamba (Vanquish)	10 oz + 0.5 oz + 16 oz (1) 12 oz + 0.6 oz + 24 oz (1)	johnsongrass bindweed broadleaf weeds	5-28-08	6-30-08	277	553	good (2)
MSMA (MSMA)	56 oz (1) 40 oz (1) 64 oz (2)	johnsongrass	5-20-08	8-7-08	459	1,837	good (3) fair (1)
MSMA (MSMA) + sulfometuron (Oust XP)	43 oz + 1 oz (1) 48 oz + 0.5 oz (1) 64 oz + 0.5 oz (1)	johnsongrass	6-1-08	7-31-08	262	787	good (3)
glyphosate (Roundup Pro Concentrate)	12 oz (1)	johnsongrass	3-26-08	3-26-08	16	16	good (1)

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

[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 5b. Summary of Division Five Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
pendimethalin (Pendulum 3.3) + dicamba (Banvel)	1.3 qt + 2 qt (1)	broadleaf weeds sandbur (parks)	4-28-08	4-29-08	6	6	good (1)
glyphosate (Roundup Pro Concentrate) + imazapyr/diuron (Sahara)	1 qt + 5 lb (1) ??? (1)	total vegetation control signs guardrails	-----	-----	-----	-----	??? (2)
glyphosate (Roundup Pro Concentrate, Honcho Plus) + imazapyr (Imazapyr 2SL, Arsenal)	2.4 qt + 2 pt (1) 1.2 qt + 2 pt (1)	total vegetation control shoulder edges signs	7-2-08	7-17-08	-----	35+	good (2)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	16 oz + 0.5 oz (1)	total vegetation control signs bridges	6-25-08	7-20-08	-----	-----	good (1)
glyphosate (Honcho Plus) + sulfometuron (SFM 75) + imazapyr (Arsenal)	0.5 gal + 2.0 oz + 0.75 qt (1)	total vegetation control shoulder edge	6-17-08	6-30-08	60	16	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP) + imazapyr/diuron (Sahara)	3 gal + 12 oz + 10 lb/ 100 gal	total vegetation control	-----	-----	50	50	good (1)
glyphosate (Roundup Pro Concentrate) + imazapyr (Arsenal) + pendimethalin (Pendulum 3.3)	1% solution + 0.5% solution + 2.25 qt (1)	total vegetation control	7-22-08	8-15-08	6	6	good (1)
glyphosate (Roundup Pro Concentrate)	1:1 ratio	cut-stump treatment	3-21-08	5-1-08	-----	-----	good (1)
glyphosate, aquatic (Aquastar) + non-ionic surfactant	1% + 1% (2)	aquatic weeds	6-1-08	6-1-08	10	20	good (1) fair (1)
digloc. of dicamba (Vanquish)	??? (1)	broadleaf weeds	4-1-08	5-1-08	-----	-----	fair (1)

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

[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 the Division Six Herbicide Program

7.1 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 2-12 no apparent concerns arose. A meeting was held at Division Six headquarters on September 10, 2008 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 6. Winter annual ryegrass control treatments of glyphosate + aminopyralid + AMS were applied to most Division Six roadsides. There were a few of these facilities that surveyed they did not use the AMS treatment additive, however their weed control results were good. Hopefully this was just a failure to report the use of AMS as perennial weed control is increased with the addition of AMS. Weed control results were good as both application rates and timings were met for the winter annual and summer broadleaf weed control treatments. It is important to note that all Division Six treatment applications were made to completely dormant bermudagrass as per recommendations. This helps insure little to no bermudagrass green-up delay while still controlling winter annual ryegrass and other weeds. The addition of aminopyralid to the winter annual weed control treatment provided good control of later germinating summer annual broadleaf weeds, however it continues to provide little to no control of kochia and pigweed. Three of Nine Division Six facilities applied summer weed control spot treatments of MSMA alone, or mixed with sulfometuron, to control johnsongrass and various other weeds. Only a small amount of acreage was reported for these spot applications. Dicamba and clopyralid was used to successfully control musk thistle in early summer. Also, glyphosate + imazapyr or sulfometuron was applied to produce total vegetation control on roadside shoulders with good to fair success.

7.2 Comments and Recommendations from OSU Personnel

We would like to encourage Division Six personnel to continue this year's winter annual ryegrass control treatment of glyphosate + aminopyralid + AMS. If Division Six will continue to use glyphosate by itself at the 1 qt. product per acre rate, it is very important to continue to make all applications to completely dormant bermudagrass roadsides. This rate of glyphosate should provide very good control of annual ryegrass, and most other winter annual grasses and broadleaf weeds, which continues to increase in agricultural wheat production areas and along roadsides. From this year's herbicide surveys, and observations from OSU personnel (Alfalfa, Woods, and Major Counties), it appears johnsongrass populations are increasing due to the spot treatment approach taken the past 2-3 years. We would like to encourage Division Six to expand their spot treatments next year to include some broadcast spraying where johnsongrass has re-infested clear zones. There are numerous johnsongrass control treatment options today and we would like to encourage Division Six personnel to contact OSU personnel for specific recommendations.

Table 6. Summary of Division Six Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate (Honcho) + aminopyralid (Milestone VM) + AMS	1 qt + 4 oz + 4 lb (3) 1 qt + 3.8 oz + 4 lb (1)	winter annuals summer annual broadleaf weeds	2-27-08	3-18-08	899	3,597	good (3) fair (1)
glyphosate (Honcho Plus, Honcho) + aminopyralid (Milestone VM)	1 qt + 4 oz (2) 1 qt + 3.8 oz (2) ??? (1)	winter annuals summer annual broadleaf weeds	2-26-08	3-26-08	888	4,440	good (4) ??? (1)
glyphosate (Honcho, Honcho Plus) + sulfometuron (Oust XP, SFM 75)	12 oz + 1 oz (1) ??? (1)	johnsongrass	6-19-08	7-11-08	190	380	fair (1) ??? (1)
MSMA (MSMA)	2 qt (1)	johnsongrass	7-8-08	7-8-08	90	90	good (1)
glyphosate (Honcho) + sulfometuron (Oust XP)	32 oz + 1 oz (1)	total vegetation control shoulder cracks	6-12-08	7-2-08	130	130	good (1) fair (1)
glyphosate (Honcho) + imazapyr (Arsenal)	2.5% solution + 1% solution (1)	total vegetation control	4-29-08	7-15-08	33	33	good (1)
clopyralid (Transline)	1 qt/100 gal (1)	musk thistle	4-11-08	7-11-08	15	15	good (1)
dicamba (Banvel) + surfactant	1 qt (1)	musk thistle	4-12-08	5-29-08	2	2	good (1)

[1]Total number of responses to survey: 9 of 9.

[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 the Division Seven Herbicide Program

8.1 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 2-12 no concerns arose. A meeting was held at Division Seven headquarters on September 9, 2008 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 Tables 7a & 7b. This year Division Seven applied glyphosate/2,4-D + AMS to approximately 75% of their roadsides to control winter annual weeds with the remaining 25% receiving aminopyralid in the tank-mixture to provide summer annual broadleaf weed control. 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 1-2 weeks later than recommended. Murray County reported using an application rate of 52 fl. oz./A, which is much higher that the recommended 32 fl. oz./A. Also, one county added additional glyphosate to the traditional glyphosate/2,4-D + AMS treatment to successfully control annual ryegrass. Additionally, Love County reported their winter annual weed control (including annual ryegrass) treatment consisted of glyphosate/2,4-D at 18 fl. oz./A + Outrider at 1 oz. prod./A. We would like to caution Love County, as both their glyphosate/2,4-D rate was very low and Outrider, which is very expensive, is not recommended for this timing of application. Following the suggested Campaign + glyphosate + AMS recommendation would have been less costly and provided better winter annual weed control.

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 treatment started in late May and continued through mid August. 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. Clopyralid and dicamba/diflu. herbicide was used to control musk thistle successfully this past year. Diglycolamine salt of dicamba (Vanquish) was successfully used to control poison hemlock, however, a 4 pt. prod./A rate was reported and this doubles the recommended highest rate from OSU. 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 alone or mixed with sulfometuron or imazapyr, glyphosate + imazapyr + sulfometuron, and glyphosate/2,4-D + aminopyralid 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.

8.2 Comments and Recommendations from OSU Personnel

We would like to encourage Division Seven to continue with their glyphosate/2,4-D (Campaign) + AMS winter annual weed control treatment and the summer MSMA + sulfosulfuron (Outrider) johnsongrass control treatment in 2009. Between these two treatments, they should 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. We would like to encourage the addition of aminopyralid (Milestone VM) to the winter annual weed control treatments when the budget allows as this has proven to provide very good preemergence and residual control of summer annual broadleaf weeds. If budgets are tight only target those roadsides that historically have problems with summer annual broadleaf weeds like marestail, common ragweed, coreopsis, sunflower, and others (check label for controlled species).

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

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
glyphosate/2,4-D (Campaign)	32 oz (1)	winter annuals	2-12-08	3-31-08	770	770	good (1)
glyphosate/2,4-D (Campaign) + AMS	38 oz + 5.1 lb (2) 32 oz + 5.1 lb (1) 32 oz + 3.5 lb (1) 32 oz + 18.8 lb (1) 52 oz + 5.1 lb (1)	winter annuals henbit curly dock	2-27-08	4-14-08	710	4,257	good (6)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM) + AMS	32 oz + 4 oz + 17 lbs/ 100 gal (1)	winter annuals summer annual broadleaf weeds	3-12-08	4-22-08	1,560	1,560	good (1)
glyphosate/2,4-D (Campaign) + glyphosate (Roundup Pro Concentrate) + AMS	32 oz + 13 oz + 5.1 lb (1)	winter annuals annual ryegrass	3-19-08	3-24-08	700	700	good (1)
glyphosate/2,4-D (Campaign) + sulfosulfuron (Outrider)	18 oz + 1 oz (1)	winter annuals annual ryegrass	3-18-08	4-2-08	770	770	good (1)
MSMA (MSMA) + sulfosulfuron (Outrider)	2 qt + 1.33 oz (4) 2.2 pt + 1.0 oz (1) 1.7 qt + 1.0 oz (1) 2.3 qt + 1.33 oz (2)	johnsongrass crabgrass sandburs broadleaf weeds	5-30-08	8-16-08	544	4,353	good (8)
glyphosate (Roundup Pro Concentrate) + sulfosulfuron (Outrider)	12 oz + 1.1 oz (1)	Johnsongrass	6-30-08	7-18-08	427	427	good (1)
glyphosate (Roundup Pro Concentrate) + sulfometuron (Oust XP)	2 qt + 11 oz (1) 1.5 pt + 4 oz (1) 2 qt + 4 oz (1)	total vegetation control johnsongrass	4-2-08	7-16-08	14	42	good (2) fair (1)
glyphosate (Roundup Pro Concentrate)	1.5 pt (1)	total vegetation control	4-14-08	6-19-08	36	36	good (1)

[1]Total number of responses to survey: 10 of 10.

[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 7b. Summary of Division Seven Herbicide Survey Results[1].

Herbicide Common Name (Trade Name)	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
imazapyr (Arsenal) + sulfometuron (Oust XP) + surfactant	4 pt + 4 oz + 0.5% (1)	total vegetation control	8-5-08	8-6-08	5	5	fair (1)
imazapyr (Arsenal) + surfactant	5 oz + ??? (1)	total vegetation control	4-3-08	8-16-08	-----	-----	good (1)
glyphosate (Roundup Pro Concentrate) + imazapyr (Arsenal)	3% solution + 0.5 solution (1)	total vegetation control	5-21-08	8-7-08	14	14	good (1)
digloc. of dicamba (Vanquish) + surfactant	4 pt + 0.25% 91)	poison hemlock	5-2-08	5-12-08	4	4	fair (1)
dicamba/diflu. (Overdrive) + surfactant	??? (1)	musk thistle	4-23-08	4-24-08	0.5	0.5	good (1)
clopyralid (Transline)	??? (1) 6 oz (1)	musk thistle	4-12-08	4-29-08	22	43	good (2)
glyphosate (Roundup Pro Concentrate) + imazapyr (Arsenal) + sulfometuron (Oust XP)	1 gal + 1 qt + 2 oz (1)	total vegetation control	5-1-08	-----	-----	-----	good (1)
triclopyr ester (Garlon 4) + oil carrier	??? (1)	Brush	7-14-08	7-14-08	10	10	good (1)
glyphosate/2,4-D (Campaign) + aminopyralid (Milestone VM)	4 pt + 4 oz (1)	all vegetation spot spray slopes	5-9-08	5-9-08	2	2	good (1)
glyphosate aquatic (AquaStar) + surfactant	1 gal + 1 gal (1)	cattail (aquatic)	5-20-08	5-20-08	2	2	fair (1)

[1]Total number of responses to survey: 10 of 10.

[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 the Division Eight Herbicide Program

9.1 Herbicide Program Survey Results

Division Eight did not submit any herbicide survey's this year. Numerous attempts were made to solicit the surveys so a record could be made of Division Eight's herbicide efforts for 2008. We would like to encourage Division Eight personnel to participate in future herbicide surveys to prevent data gaps. A meeting was held at Division Eight headquarters on September 3, 2008 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report are based solely on discussions and submissions from the September meeting.

Division Eight's broadcast herbicide program for 2008 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. While there was a desire to have a broadcast summer weed control treatment applied over Division Eight roadsides the division did not have the budget. The 2008 winter ice storm depleted Division Eight funds that were ear-marked for the summer herbicide program. Very little, if any, summer johnsongrass control treatments were applied in Division Eight during the 2008 season. Division Eight continued to spray musk thistles in several counties this past year with an increased effort in Osage County.

9.2 Comments and Recommendations from OSU Personnel

This was obviously a very difficult and frustrating year for Division Eight maintenance personnel with regards to their intended herbicide program efforts. Just like our farming neighbors, trying to manage programs and plan work that is affected so much by weather makes decision making very difficult. We would like to encourage Division Eight to continue with their glyphosate/2,4-D (Campaign) + AMS herbicide program next year as well as either a glyphosate + sulfometuron (Oust XP), sulfosulfuron (Outrider), or Oust Extra (sulfometuron/metsulfuron, see comments on page 26) program to control summer johnsongrass. Over the past several years there have been numerous occasions where a field division has been caught with a limited budget in March or April because of a significant snow or ice event(s) that occurred in December, January, or February. This has always been a difficult decision for division maintenance personnel and one that OSU personnel can assist in very limited ways. We can suggest the following, if at all possible try to purchase annual broadcast herbicide products before the winter season hits, this would help prevent having to deal with the significantly reduced materials budgets as a result of snow, ice, and tree removal programs.

10.0 Statewide Summary of ODOT Herbicide Programs

ODOT roadside vegetation programs ran into both old and new challenges during 2008. The old challenges of fuel prices and reduced materials monies as a result of ice and snow events are still very difficult to manage as were the new challenges of limited manufacturer supplies of certain herbicides. Thankfully not all field divisions experienced the weather and supply problems this year so it was "business as usual" for those more fortunate. This year ODOT treated over 96,000 acres with broadcast and spot applications of herbicides. In the opinion of ODOT personnel most of these applications produced good results. Treated acreage is down from last year's very significant centennial-year effort but higher than 2006 and prior years' efforts. Mainly because of fuel prices, there was less mowing this year in most of the field divisions. The lower levels of mowing actually gave people a chance to see the benefits of a well managed herbicide program as the weed control results were evident for a longer time and were not masked by mowing effects. This years roadside vegetation management programs that consisted of a broadcast winter annual weed control treatment followed by a summer johnsongrass control treatment integrated into 2-3 mowing cycles are very similar to programs of the late 1980's through the mid 1990's. It wasn't until after 1995 (election of Governor Keating) that mowing cycles doubled for most Oklahoma roadsides, making some broadcast herbicide applications questionable with such frequent mowing. This year's roadside vegetation management programs represent an integrated approach that will provide for the biggest benefits to the roadside while still meeting the economic challenges of today.

It has been reported to ODOT in the recent past that the world production of glyphosate herbicides (examples Roundup Pro Concentrate, Honcho, Mirage, Ranger Pro) are below the current world demand for these products. This has created a world-wide shortage of glyphosate herbicides for all markets and has driven up the price of glyphosate herbicides by 77% in a single year. This is very important to ODOT as glyphosate herbicides, or pre-mix products containing glyphosate are the cornerstone for most field division herbicide programs. Field divisions likely spend 20-40% of their annual herbicide budget on glyphosate herbicides or products containing glyphosate. The significant increase in price will make it more difficult in 2009 to budget for the necessary glyphosate products for the summer johnsongrass control treatments as well as the many other uses of glyphosate herbicides. In 2008 there were also several occasions that the supply of glyphosate herbicides made purchases impossible. Hopefully, the issue of supply has been worked out by the manufacturer but the fact still remains that each field division will need to come up with more funds to continue with existing glyphosate programs at 2008 levels. Also, considering the current glyphosate issues, there may be a tendency for field divisions or county personnel to lower glyphosate rates to offset some of the price increase. We would like to warn ODOT personnel that lowering glyphosate rates below those currently being used will result in reducing summer johnsongrass and broadleaf weed control to levels that will more than likely be unacceptable to most ODOT personnel. We encourage ODOT personnel to call OSU personnel with questions as to recommended glyphosate rates for the various glyphosate treatments. On a final more positive note, the price for the glyphosate/2,4-D herbicide (Campaign) will remain the same in 2009 as in 2008 so ODOT field divisions should not have to find additional funds for continuing with this very important winter annual weed control treatment.

At a fall 2007 Oklahoma Vegetation Management Association meeting in was mentioned that the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF) were going to increase enforcement efforts on the Oklahoma Noxious Weed Law in 2008. This law requires all landowners and ODOT to prevent musk thistle, Canada thistle, and scotch thistle from producing seed. ODOT is mentioned by name in this law as being responsible for managing all state highway rights-of-way, Early in 2008 the ODAFF sent out a few violation letters to landowners that had complaints filed on them the previous year. The violation letters required landowner to address their noxious weed problem this year or ODAFF would enforce the Noxious Weed Law control measures. While ODOT did receive two known violation letters in 2008 it did not appear the ODAFF increased enforcement of the Noxious Weed Law to any large extent. This was likely an effort to try and get all landowners to increase their efforts to control the three noxious thistle species and prevent there spread to uninfested areas. ODOT continues to apply annual herbicide broadcast treatments (Feb., March, April applications of Campaign or glyphosate alone) to control winter annual weeds that produce good to moderate control of primarily musk thistle. We encourage ODOT crews, in late April and early May, to treat patches of musk thistle that pop up on back slope areas that are not treated with the earlier broadcast treatments. ODOT crews should always remember to make out good spray records when making broadcast or spot applications for noxious weed control and don't be bashful about telling adjacent landowners of your efforts each year.

Currently ODOT has an herbicide on the DCS statewide herbicide contract called Oust Extra. Oust Extra (a blend of sulfometuron/metsulfuron methyl) is a mixture of two herbicides, Oust XP and Escort XP, that have been recommended and used for years by many ODOT field divisions. The price has dropped on this particular herbicide considerably from a few years ago. Consequently, the cost plus the fact that this product will provide additional broadleaf weed control over existing treatments makes this product one that ODOT should consider more carefully for weed control use. This product would fit very nicely in a summer johnsongrass control treatment where normally glyphosate + sulfometuron (Oust XP) is utilized. Instead, Oust XP would now be replaced with Oust Extra. We recommend using the Oust Extra at a rate of 1.5 dry ounces of product per Acre combined with normal use rates of glyphosate. This treatment would provide good control of johnsongrass. Also, the metsulfuron methyl in the Oust Extra would produce good postemergence control of many summer annual and perennial broadleaf weeds. Using Oust Extra instead of Oust XP would add an additional $1.65/Acre to the herbicide cost, but ODOT would get a large benefit consisting of much better control of field bindweed, sericea lespedeza, Illinois bundleflower, common ragweed, marestail, annual fleabanes, coreopsis, and several other broadleaf weeds. Switching to Oust Extra will produce similar temporary injury to bermudagrass that is normally produced from glyphosate + Oust XP treatments. Those ODOT personnel whom would like more information about Oust Extra should call OSU personnel.

As of the summer of 2009 the OSU Roadside Vegetation Management Project will be completing its second round of ODOT Equipment Calibration and Inspection programs for each of the field division's. During the past six years the Equipment Calibration training has been well received by both field division personnel and county/interstate maintenance personnel as well as the Inspection part of this effort continues to document equipment problems that need to be

corrected. This program has been very productive, but, one area of concern has arisen. OSU personnel have received a few comments (in person and on surveys) where ODOT county/interstate personnel have stated that if OSU is going to come around and do these programs then ODOT personnel do not need to continue to do annual equipment calibration and inspection efforts themselves. We want to reemphasize that these comments are few, but of still great concern. The OSU Equipment Calibration and Inspection Programs are not performed as a replacement for annual in-house ODOT herbicide sprayer calibration efforts. OSU training efforts are performed every third year in each field division and not annually. OSU efforts are performed to train the county/interstate crews so that each year these crews can conduct more accurate equipment calibration and inspection efforts on an annual timely basis on their own. The goal is to keep herbicide application equipment in as good of condition as possible to avoid major equipment problems while making the most accurate herbicide applications to Oklahoma roadsides as possible. We would like to ask each field division to talk to county/interstate supervisors and make sure everyone understands the intent of the OSU Equipment Calibration and Inspection Program effort. As most current ODOT county/interstate crews currently do this, please continue to reinforce the importance of accurate spray equipment calibration and inspection efforts prior to each ODOT broadcast application or following any spray equipment/spray truck maintenance.

For the past couple of years ODOT has been installing cable-barrier systems in seven out of the eight field divisions across the state. Recent ODOT data indicates that the cable-barriers are reducing cross-over collisions and saving lives. With these positive outcomes it is safe to assume that Oklahoma highways will see more cable-barrier systems in the future. The cable-barrier systems have and will create vegetation management challenges for ODOT maintenance personnel. Currently the cable-barriers are being built and installed in a number of ways and depending on the installation the vegetation goals may be different. At recent meetings with the field divisions, personnel were asked “what are their vegetation goals for the area underneath the cable-barrier?” The unanimous response was that everyone wanted no vegetation growing underneath the cable-barriers or in other words “bareground” or “total vegetation control.” With this in mind OSU recently made a specific herbicide recommendation to control and maintain bareground underneath cable-barrier systems taking into consideration the many different installations and environmental concerns. These recommendations are included in the new Oct. 2008 version of the E-958 publication that can be downloaded on-line. The cable-barrier recommendation includes making a broadcast application of glyphosate at 1-5 quarts product per acre (or a 1% - 2% handgun solution) + ammonium sulfate at 17 lbs. of product per acre. Cable-barriers infested with only annual weeds should be treated with the low end rates (1 quart/A) and those infested with annual and perennial weeds should be treated with higher end rates (4-5 quarts/A). This treatment can be safely applied to all cable-barriers as long as water in not standing. This treatment will require 2-3 applications annually to keep a cable-barrier free of all vegetation. Care should be taken to only treat the footprint of the cable-barrier as treating outside the footprint will promote soil erosion along the edges. This recommendation does not include the use of any soil residual herbicides as many cable-barrier installations will be done in ditch bottoms making herbicide movement from runoff water a distinct problem. Since there will be many different types of cable-barrier installations made we encourage each field division to consult with OSU personnel on more specific site recommendations that may be applicable. Also, while most field divisions currently believe they want bareground underneath cable-

barriers they shouldn't completely write off the possibility of maintaining a bermudagrass roadside underneath the cable-barriers. This vegetation management technique will eliminate or minimize the issue of soil erosion and many states use this technique today.

While we are "on time: in delivery of this report to ODOT, by the time this annual report gets circulated throughout ODOT, it may be somewhat late to do any creative budgeting for the 2009 herbicide program season. Consequently, we gave notice of increasing herbicide prices to ODOT in early October 2008. It has already been mentioned about the 77% increase in price of glyphosate (Roundup Pro Concentrate) during 2008. It is also important to mention that ammonium sulfate (an important adjuvant that is mixed with Campaign or glyphosate winter annual weed control treatments) has doubled in price since 2007. This price increased was not unexpected as ammonium sulfate is a product of the petroleum industry and it is common knowledge that all petroleum based products increased in price during 2007/2008. In the past the ammonium sulfate additive cost ODOT about $0.50-0.60/Acre and in 2009 it will take twice the money to buy the same supply that each field division purchased in 2007. The ammonium sulfate, while now $1.10-1.20/Acre, is still an important additive for ODOT treatments and still provides an economical benefit to their herbicide program. Please continue to take advantage of ammonium sulfate and remember if one decides to not use this additive they will need to increase the rate of Campaign by 50-100% to achieve the same level of weed control.

A final situation of concern that is important to mention is that regarding the use of MSMA herbicide. MSMA is an important herbicide for several field divisions that use it on a limited basis. The only MSMA product that is on the ODOT Approved Herbicide and Adjuvant List (AHAL) is the Drexel MSMA 6.0 Plus product. In 2008 no vendor bid this specific formulation. Consequently, there will be no ODOT-approved MSMA product on the DCS statewide contract. Therefore it will be up to each field division to purchase local MSMA formulations as needed. If possible we would request that before any large purchases of non-approved MSMA formulations that ODOT call OSU personnel with the specific MSMA formulation name and manufacturer, so that we can assess the product and situation as best we can. We have been informed that MSMA supplies from all manufacturers may be in short supply in 2009. On a more positive note the herbicide Plateau (imazapic) dropped in price by 22% in 2008. This price reduction now makes the OSU recommendation of glyphosate + Plateau for summer johnsongrass control much more economical. This treatment provides both long-term crabgrass and sandbur control. We encourage any ODOT field division to call OSU personnel if they are interested in considering this summer weed control treatment.

Table 8. Summary of 2008 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, 4, 5, 6, 7	34,057
glyphosate +/- 2,4-D +/- aminopyralid +/- AMS +/- Others	winter annual weeds (including musk and scotch thistle)	1, 4, 5, 6, 7	18,874
glyphosate + sulfometuron	johnsongrass and summer annual weeds	1, 2, 4, 5, 6	19,189
glyphosate + sulfosulfuron	johnsongrass and summer annual weeds	2, 3, 4, 7	14,641
glyphosate + imazapic	johnsongrass and summer annual weeds		0
MSMA +/- sulfometuron, sulfosulfuron, imazapic	johnsongrass and summer annual weeds	2, 5, 6, 7	7,815
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	1, 2, 3, 4, 5, 6, 7	971+
bromacil bromacil/diuron	total vegetation control	4	2
triclopyr ester diglycolamine salt of dicamba	general broadleaf weed control	5, 7	4+
dicamba/diflufenzopyr +/- Others	musk thistle	6, 7	2.5
clopyralid +/- Others	musk thistle	4, 6, 7	67
triclopyr ester + diesel	basal brush control	1, 7	10+
picloram + triclopyr ester	foliar brush control		0
triclopyr ester or amine	foliar brush control	2	600
imazapyr (aquatic)	aquatic vegetation control		0
glyphosate (aquatic)	aquatic vegetation control	5, 7	22
triclopyr amine	aquatic vegetation control		0
other		5	6
Total			96,261

Table 9. Comparison of herbicide acreages treated in 2005, 2006, 2007 and 2008 for the more common broadcast treatments and total acres treated by division.

ODOT Field Division	Year	Herbicide Treatments					Total Acres Treated with Key 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)	MSMA +/- sulfometuron/ sulfosulfuron (johnsongrass control)	
1	2005	5,892	0	64	309	0	6,307
	2006	1,561	0	3,639	2,287	0	7,994
	2007	5,574	0	540	5,547	0	11,661
	2008	5,369	60	6,469	0	0	11,898
2	2005	0	0	6,282	0	650	12,907
	2006	0	0	2,901	0	1,299	4,731
	2007	8,486	0	1,899	8,818	1,687	20,890
	2008	5,861	0	712	6,040	748	13,361
3	2005	7,724	0	0	7,542	0	15,266
	2006	660	0	0	2,713	0	3,373
	2007	5,901	2,484	0	6,090	0	15,198
	2008	6,891	0	0	6,367	0	13,258
4	2005	5,234	0	5,612	0	0	10,846
	2006	688	0	5,977	0	0	6,665
	2007	4,894	6,438	2,095	4,634	43	13,310
	2008	1,775	4,773	3,811	1,807	4	12,170
5	2005	8,775	0	7,317	0	2,444	19,589
	2006	0	0	7,700	0	2,010	9,950
	2007	6,392	5,485	9,236	0	1,684	22,797
	2008	7,736	4,444	8,417	0	2,624	23,221
6	2005	1,450	0	5,481	0	0	7,748
	2006	0	0	6,054+	0	0	6,054
	2007	0	7,237	0	0	1,401	8,638
	2008	0	8,037	380	0	90	8,507
7	2005	7,074	0	0	0	8,126	15,309
	2006	534	0	0	0	3,489	4,023
	2007	0	8,563	0	0	7,893	16,456
	2008	6,497	1,560	0	427	4,353	12,837
8	2005	6,254	0	4,230	0	0	10,584
	2006	5,309	0	1,700	3,275	0	10,285
	2007	3,125	4,225	100	5,817	0	13,267
	2008	---	---	---	---	---	---
All Divisions	2005	42,403	0	28,986	7,851	11,220	91,768
	2006	8,752	0	27,971	8,275	6,798	53,074
	2007	34,372	34,532	13,870	30,906	12,708	127,111
	2008	34,129	18,874	19,789	14,641	7,819	95,252

Table 10. 2008 ODOT Approved Herbicide and Adjuvant List with product type, common name(s), brand names, and manufacturers (January 2008 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
herbicide	Glyphosate	Roundup Pro Concentrate	Monsanto
herbicide	Glyphosate (aquatic)	AquaMaster	Monsanto
	Glyphosate (aquatic)	AquaStar	Albaugh
herbicide	Glyphosate/2,4-D	Campaign	Monsanto
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
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
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

APPENDIX A

2008 ODOT/OSU HERBICIDE PROGRAM SURVEY

2008 ODOT/OSU Herbicide Program Survey (2 pages)

Please return to your Division Headquarters on or before Aug. 22, 2007.
Then forward to Doug Montgomery ASAP.

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

1. How many lane miles of state highway are in your maintenance area? _____
2. Was an application record filled out for each herbicide application? **yes_____ no _____**
3. 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 _____
4. 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 _____
5. How often is the herbicide spray truck calibrated?

   once each year _____ once for each different herbicide treatment _____

   once a week _____ once a day _____ other: _____
6. Who decides on whether to spray on a day-to-day basis?

   division personnel _____ superintendent _____

   TMW I or II _____ other: _____
7. What was the brand name of your glyphosate product that you used this year ?

   Roundup Pro Concentrate ___ Generics (Mirage, Honcho, etc…) _____
8. Who decides on what herbicides and rates are applied at your maintenance facility?

   div. personnel _____ superintendent _____

   TMW I or II _____ .....other: _____
9. Do you currently have a Calc-An-Acre digital speed monitor that is mounted on your spray truck(s) and is in working order? _____ **Yes** _____ **No**
10. How many informal landowner complaints/concerns (phone calls, personal visits, etc…) did you have this year as a result of your herbicide program? _____
11. How many, if any, formal complaints were filed against your herbicide program with the Okla. Dept. of Agriculture? If yes, please include a brief description of complaint(s).

_____

_____

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

Summary of 2007/2008 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.