2004 Annual
Oklahoma Department of Transportation
Herbicide Program Report

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In order that the information in this publication may be more useful, it was necessary to use trade names of products, rather than chemical names. As a result, it is unavoidable in some cases that similar products that are on the market under other trade names may not be cited. No endorsement of products is intended nor is criticism implied of similar products that are not mentioned.

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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 2004. 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 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 use surveys (Appendix A). 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 or adjust recommendations.

Finally, we would like to thank the divisions for their participation in this year's survey. Without the survey data from each division, this report will not reflect the entire ODOT herbicide program effort. 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 2-11 no apparent concerns arose. Also, a meeting was held at Division One headquarters on September 6, 2004 to solicit comments and opinions from division administrative personnel. Due to recent personnel changes at Division One Headquarters the meeting was attended solely by Mr. Jim Dixon. 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 this year consisted of a Campaign + AMS broadcast treatment. Acreages treated increased slightly from the previous year and the weed control results were very good. From the division headquarters perspective the annual application of Campaign + AMS saves one late spring/early summer clear-zone mowing. There were a few Campaign + AMS applications made well late of the mid-April cutoff. ODOT crews need to remember that final applications should be made when bermudagrass is around the 10-15% greenup range. Applying later than this can hurt the bermudagrass more than will be gained in weed control. Also at these later dates, winter annual weeds are getting very large and weed control will decrease. Campaign + AMS rates used were right on the money. For their summer weed control program Division One ran into some problems. Mainly they didn't have a summer herbicide program. As surveyed from Mr. Dixon this was mainly due to budgeting problems. Only Division One administrators and the ODOT county crews can tell for themselves what actually happens when one takes the traditional summer Roundup Pro + Oust or Outrider out of the roadside vegetation management program. We suspect there was more johnsongrass and summer weeds growing in clear-zones than in years when these applications were made. We would also suspect roadsides didn't look quite as good in between mowings without the summer herbicide treatment. While the summer herbicide treatments are harder to finance, administrate, and implement, they are highly beneficial. And lastly, a few treatments of selective rates of Roundup Pro were used alone to treat selected roadsides with good to fair results. As in the past a small amount of Garlon 4 was successfully used to control brush.

2.2 Comments and Recommendations from OSU Personnel

From both the survey and division comments, it appears Division One had a successful 2004 roadside vegetation management program, at least for the part of the program they were able to continue. Results from their Campaign + AMS treatments have proven to be very successful in producing the desired results. It is important to remember that the summer herbicide treatment has also produced successful results in Division One in the past. A return to the summer treatments would be beneficial. Staying the course with this program will provide long-term benefits to Division One roadsides as with other divisions. A well-timed properly designed herbicide program should produce good quality manageable stands of desirable roadside grasses. A sustained mowing and herbicide program approach will ultimately show a reduction in vegetation management operations. A reduction would be noticed in minimizing mowing cycles to its lowest level because you are only mowing shorter growing desirable

grasses and not tall growing weeds, eventually leading to the use of reduced rates or even spot applications of herbicide treatments. With the recent hiring of a new division maintenance person, we are hopeful that this new program member can assist with the many detailed division-level decisions to implement the Campaign + AMS and Roundup Pro Concentrate + Oust or Outrider treatments next year. We would recommend picking up where the late Mike Cox and Ernie Myers left off with Division One programs in the recent past. It is helpful if there is a budget increase to help fund this effort. While budgets are quite tight and we would challenge those divisions (and there were several in 2004) that have had trouble budgeting for their herbicide treatments to visit with those divisions that continue to keep their treated acreages up year after year. The divisions that are maintaining consistent herbicide programs can be found in Table 10 by comparing treated acreages in consecutive years.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
Campaign + AMS	2 pt + 4.5 lb (1) 2 pt + 4.24 lb (7) 2 pt + 3.8 lb (1) 2 pt + 3.4 lb (1)	winter annuals	3-8-04	7-27-04	566	5,662	good (10)
Roundup Pro Concentrate + Outrider	2 qt + 1.25 oz (1)	johnsongrass annuals	6-1-04	6-3-04	16	16	good (1)
Roundup Pro	11.2 oz (1) 32 oz (1)	johnsongrass broadleaf weeds	3-30-04	8-12-04	84	168	good (1) fair (1)
Roundup Pro	32 oz (1) 43 oz/300 gal (1) ??? (1)	spot spraying in-yard	3-18-04	7-21-04	-----	32+	good (2) ??? (1)
Garlon 4 + surfactant	1.25 gal (1)	brush woody plants	6-28-04	7-12-04	72	72	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.

3.0 Survey of the Division Two Herbicide Program

3.1 Herbicide Program Survey Results

A total of 6 out of 10 maintenance facilities in Division Two responded to the survey this year. In response to survey questions 2-11 only a single concern arose. In response to Survey Questions 3 and 4, which asks how many personnel are involved in the mixing/loading of herbicides (Question 3) and involved in herbicide applications (Question 4), it appears that Pittsburg County responded that only one person is involved in each of these procedures. From time to time an ODOT crew might find themselves shorthanded and have to complete an herbicide application with only a single employee but it is not a safe practice to routinely put all of the responsibilities of herbicide applications on one person. There may even be ODOT personnel whom request to work alone but the area of herbicide applications is not an area for ODOT personnel to work alone. For personal safety and environmental concerns ODOT should always try and have a minimum of two certified personnel involved in the mixing/loading of herbicides along with their application. Also, a meeting was scheduled and attempted at Division Two headquarters on September 9, 2004 but division administrative personnel were unable to attend. The following observations and comments are made based on the surveys only as division personnel comments are unavailable for this report. It should also be noted that with six of ten Division Two maintenance facilities participating in the survey there could be several herbicide applications unaccounted for within this report.

Division Two herbicide usage is summarized in Table 2. Division Two herbicide programs consisted mainly of atrazine for winter annual weed control and Roundup + Oust, Mirage + Oust or MSMA for summer weed control. Atrazine use declined significantly this year over past years. Treatment times and rates were good and overall fair weed control was achieved. The summer weed control program consisted of three main treatments. Roundup Pro or Mirage + Oust and MSMA were all used to successfully control johnsongrass and other summer weeds. Garlon 4 was successfully used at a rate of 2 qt/A to control broadleaf weeds which is a very high product rate. Garlon 4 (with a good surfactant) should provide good broad spectrum broadleaf weed control at rates between 1-2 pt/A. While results were good with 2 qts/A, lower rates would have likely produced the same results. We suggest using the lower rates in the future and if one is not satisfied with the results, please contact us.

3.2 Comments and Recommendations from OSU Personnel

Weed control successes from Division Two atrazine programs have been marginal for the last few years. This is consistent with atrazine use in other field divisions. Due to the overall reduction in ODOT atrazine use in the last several years, its erratic effectiveness, and the many environmental concerns, atrazine will soon be removed from the recommendation list from Oklahoma State University. Removing atrazine from the recommendation list will affect future Division Two herbicide programs due to its lack of availability. We recommend moving to the atrazine alternative treatment of Campaign + AMS, immediately, which should produce excellent control of winter annual weeds. If Division Two transitions to this new treatment, their personnel should get the same results that many other field divisions are currently experiencing. The new Campaign + AMS treatment will be applied at different timings and product rates so

there is critical new information for Division Two county personnel to learn before this treatment is implemented. The new Campaign + AMS treatment should be easier to apply (no more white residues) and is much more environmentally sound (no more no-spray buffer zones next to all surface waters). The new treatment can be safely sprayed up to but not into surface water sources. If Division Two does plan on transitioning to the Campaign + AMS treatment, it will be important to let OSU personnel know so that the herbicide training program can be adjusted to supply their personnel with the necessary information for a quick and easy implementation.

We would like to encourage Division Two to continue their current summer weed control programs. Division Two has four or five different summer herbicide treatments that revolve around Roundup Pro/Mirage, Oust, MSMA and some broadleaf herbicide mixtures. As long as these treatments are providing satisfactory weed control results, we would encourage their continued use. With this assortment of treatments, we would like to encourage the county supervisor's to call OSU personnel and check on the treatment combinations one would like to use. As consultants to all ODOT personnel, we would simply check to make sure that the target weeds will be controlled with the selected treatment and rates. There are times that we may be able to simplify the treatment selection making it more economical while still controlling the target problem weeds.

This past year has not been the best effort as far as communications between OSU personnel and Division Two personnel. A reduction in the number of participants in this annual survey and a failure for completion of our year-end field division herbicide meeting are examples. We want to make sure that all Division Two personnel are aware that as per our contract with ODOT, we spend the entire year working on the many different facets of the ODOT Roadside Vegetation Management Programs. In so doing, we accumulate a lot of information that we feel is important for each field division to produce a quality roadside vegetation management program. Without the necessary communication of our information to your personnel, much of our efforts will not find their way into Division Two programs. We are open to any and all forms of communication that would fit the needs and desires of Division Two personnel. We apologize for any communication shortcomings on our end and would like personnel to remember that we consider Division Two roadside vegetation management programs to be our own, we just want them to be the best they can be.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
atrazine	2 qt (1) ??? (2)	winter annual weeds	11-19-03	2-18-04	-----	1,558+	poor (1) ??? (2)
Roundup Pro + Oust	16.6 oz + 1 oz (1) ??? (2)	perennial weeds thistles	4-18-04	6-5-04	-----	1,300+	good (1) ??? (2)
Mirage + Oust	16.6 oz + 1 oz (1) 16 oz + 1 oz (2)	annual and perennial weeds johnsongrass thistles	5-20-04	7-13-04	728	2,183	good (2) fair (1)
MSMA	0.5 gal (1)	johnsongrass	7-8-04	7-9-04	132	132	good (1)
MSMA + Overdrive	0.5 gal + 4 oz (1)	johnsongrass	7-14-04	7-19-04	66	66	good (1)
Mirage + Garlon 4 + Oust	0.83 + 0.83 + 1.33 oz (1)	johnsongrass annual grass	6-10-04	6-30-04	18	18	good (1)
Tordon K + Garlon 4	??? (1)	-----	6-3-04	6-10-04	75	75	??? (1)
Garlon 4 + surfactant	0.5 gal (1)	broadleaf	9-24-03	8-11-04	175	175	good (1)

[1]Total number of responses to survey: 6 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 12 out of 13 maintenance facilities in Division Three responded to the survey this year. In response to survey questions 2-11 no apparent concerns arose. Also, a meeting was held at Division Three headquarters on September 9, 2004 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 Campaign + AMS (March) followed by Roundup Pro or Mirage + Outrider (May/June) treatments to successfully control roadside weeds. Campaign + AMS treatments continue to provide good weed control as both rate and timing criteria are being met. This past year Division Three used both name brand (Roundup Pro) and generic glyphosate (Mirage) to mix with Outrider. No major differences between the generic and name brand glyphosate products were documented through the surveys from the past two years. Roundup Pro was also successfully used at various rates for cut-stump treatments and spot treating for total vegetation control.

4.2 Comments and Recommendations from OSU Personnel

Division Three continues to obtain good results with current Campaign + AMS treatments for winter annual weed control. This specific treatment is currently producing the most consistent weed control results for all eight of the ODOT field divisions. The only reason to change this treatment is if annual ryegrass or musk thistle needs to be included as a targeted weed. The addition of more glyphosate (for annual ryegrass control) and/or Overdrive (for musk thistle control) could be of benefit if these particular weeds become a maintenance problem. Please call OSU personnel for recommendations on rates. This past year Division Three, along with a couple of other field divisions, used Mirage (a generic) as their main source of glyphosate. Using the generic glyphosate, when compared to the name brand product of choice (Roundup Pro Concentrate), probably saved Division Three around $5,000 dollars last year. While we will always applaud the efficient use of taxpayer's money, the use of the generic product does come at a cost and it is our job to make sure that ODOT personnel are aware of this so they can continue to make informed purchasing decisions. The cost in purchasing generics is there will be little if any product support from the company marketing the generic material. Typically companies stand behind their products in drift claims, environmental issues, and personnel exposures issues, etc. There can also be issues with product quality and more specifically, generics will tend to have more variability from one batch to the next with respect to herbicide and surfactant concentrations. This will manifest itself in more variability in weed control from one area to the next. It is in the opinion of OSU personnel that if ODOT field divisions can afford name brand products that it is a wise investment of the extra few thousand dollars. When comparing the use of Roundup Pro Concentrate vs. Mirage, ODOT is spending an additional $0.70/Acre (comparing equivalent use rates) to use the highest quality product on the market backed by full company support. We are currently working with ODOT Maintenance Division personnel to develop an approval program to address quality and compatibility issues with new and possibly

changing products. This effort is driven by the increased pressure to use generic herbicides and adjuvants and will be discussed in more detail in Section 10 of this report.

Division Three currently has one of the more consistent herbicide programs in the state. We encourage Division Three to continue to invest in both the Campaign + AMS program and the glyphosate + Outrider programs as these two major efforts combined with a quality safety and contour mowing program are the most efficient and effective way of managing today's roadside vegetation. If budgeting issues become a problem we encourage Division Three to examine a possible reduction in both mowing and herbicides to absorb funding losses and resist the temptation to cut only the herbicide program.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
Campaign + AMS	2 pt + 2.5 lb (5) 2 pt + 3.4 lb (1) 2 pt + 4.5 lb (1) 2.15 + ??? (1) 2 pt + 3.5 lb (1) 2 pt + 3.0 lb (1)	winter annual weeds thistle	3-4-04	4-5-04	698	6,983	good (9) ??? (1)
Roundup Pro + Outrider	3.6 pt + 1.8 oz (1)	johnsongrass	3-23-04	3-23-04	11	11	good (1)
Mirage + Outrider	1 pt + 1 oz (8) 1.25 pt + 1 oz (1)	johnsongrass broadleaf weeds switchgrass	3-17-04	7-12-04	744	6,692	good (8) ??? (1)
Roundup Pro + Outrider	17 oz + 1 oz (1)	johnsongrass	6-23-04	6-28-04	210	210	good (1)
Roundup Pro + Outrider	3.6 pt + 1.8 oz (1)	johnsongrass	3-23-04	3-23-04	11	11	good (1)
Roundup Pro (hand gun)	1 pt (1)	johnsongrass	4-27-04	5-21-04	-----	-----	good (1)
Roundup Pro	1:1 solution (1)	cut stump treatment	2-1-04	3-9-04	1	1	good (1)
Roundup Pro (12-volt sprayer)	10% solution (1)	weeds around signs, shoulders	4-13-04	4-21-04	6	6	good (1)
Roundup Pro	2% solution (1)	weeds guardrails	5-16-04	-----	5	5	good (1)

[1]Total number of responses to survey: 12 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.

5.0 Survey of the Division Four Herbicide Program

5.1 Herbicide Program Survey Results

A total of 9 out of 12 maintenance facilities in Division Four responded to the survey this year. In response to survey questions 2-11 no apparent concerns arose. Also, a meeting was held at Division Four headquarters on September 10, 2004 to solicit comments and opinions from division administrative personnel and field superintendents. The comments and recommendations in this report are based on the surveys and meeting.

Division Four herbicide usage is summarized in Table 4. Last year Division Four herbicide programs saw reductions in many of their traditional herbicide treatments. Atrazine use has completely discontinued within Division Four as Campaign +/- AMS is being used successfully to control winter annual weeds. Campaign + AMS rates and timings used were very good this year. In the survey results there was one facility using the combination treatment of Campaign + Overdrive (Overdrive would be for additional musk thistle control) but they did not say they used AMS. Hopefully the crew forgot to include this in the survey because at the low Campaign rates used (2 pt/A), it is critical that ODOT use the AMS adjuvant to enhance the weed control. OSU data shows that Campaign at 2 pt/A alone without AMS will produce poor to moderate control of winter annual weeds. It appears a little over half of Division Four was treated with Honcho Plus (generic glyphosate) or MSMA + Oust to successfully control johnsongrass and other summer weeds. The treatment rates on the Honcho Plus were more variable than necessary. It would be best to select a basic rate (1 pt/A) and go with it instead of nearly everyone having different product rates per acre. The Oust rate was much more uniform. As in the past, the Roundup Pro + Oust treatments were being applied about one month later than optimum. Because of the dry May followed by a wet summer, this deviation worked out to the advantage of Division Four. However, to gain the full affects of Honcho Plus + Oust treatment, they are better suited for May rather than June/July applications. Krovar IDH and Roundup Pro were used successfully as a shoulder and guardrail encroachment treatment. Division Four used Transline + surfactant and Overdrive alone treatments to successfully control musk thistle. Both of these products have provided very good musk thistle control in OSU research trials, but it is critical that one add a non-ionic surfactant with both of these products unless it is being tank mixed with traditional Campaign + AMS treatment.

5.2 Comments and Recommendations from OSU Personnel

Division Four, along with a few other field divisions, has experienced budget and decision making complications the past few years that has impacted its herbicide program consistency. This year saw a good effort to return to quality herbicide programs integrated with safety and contour mowing efforts. The challenge is to try to solidify the herbicide program into a division-wide program next year amongst the other challenges. We would like to encourage Division Four to continue with the basic Campaign + AMS program, but remember where annual ryegrass has become a big problem, the basic treatment will need to have an additional 12-16 oz/A of Honcho Plus (or 11-13 oz/A of Roundup Pro Concentrate) to control the annual ryegrass. Without this measure ODOT may find themselves having to do the late spring mowing when the design of the Campaign + AMS treatment is to prevent this mowing. Also, we would

like to remind Division Four and Eight that the Overdrive 2 oz/A addition to the basic Campaign + AMS treatment should provide very good control of musk thistle in areas that have moderate to severe problems. The addition of this particular low-rate of Overdrive (applicators must have a 2ee label in possession to apply this low rate) is by far the least expensive treatment for musk thistle control. We would also like to encourage a return to a division-wide summer herbicide treatment using Roundup Pro Concentrate + Oust or Outrider applied as early in the summer as possible. We are confident that in an average year, May/early June applications of these treatments will produce better results than late June/July applications. For the earlier applications to be made, the decision to use such treatments would have to be early enough to allow the purchase, delivery and distribution of the products to individual county facilities. For the first time Division Four elected to use a generic form of glyphosate (Honcho Plus) in its summer weed control program. We do currently support the use of some generic glyphosate products but there are costs to their use in that each field division needs to be aware of if they are to be used. Please refer to the explanation in Section 4.2 for further information.

We have also noticed in our travels around the interstate highway system that it appears Division Four I-35 Interstate maintenance facilities have reduced or eliminated their broadcast herbicide efforts the last few years. Our observations were verified on the surveys. Specifically, the Campaign + AMS and glyphosate + Oust or Outrider programs were absent. Typically interstate roadsides see increased mowing cycles compared to more rural state highways. Therefore, the interstate roadsides, more than any other area could benefit from a quality herbicide program. There could be a misconception that the interstate roadsides are being mowed frequently enough to eliminate the need for weed control using herbicides. Proper selection, timing and application of certain herbicide treatments will lower mowing requirements in clear zones and increase the aesthetic value of clear zones in between mowing cycles. We would encourage both the Guthrie and Tonkawa yards to reevaluate their roadside vegetation management programs and give OSU personnel a call this winter if there are questions as to the various components in integrating quality mowing and herbicide programs.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
Campaign + AMS	1.85 pt + 4.7 lb (2) 2 pt + 4.7 lb (1) 2 pt + 5.1 lb (1) ??? (2)	brome, cheat vetch, wheat rye	3-17-04	4-6-04	759	4,556	good (4) fair (1) ??? (1)
Campaign + Overdrive	2 pt + 4 oz (1)	musk thistle winter annuals	3-15-04	3-30-04	1,126	1,126	good (1)
Honcho Plus + Oust	1 pt + 1 oz (2) 15 oz + 0.78 oz (1) 12 oz + 1 oz (1) 22.2 oz + 1.1 oz (1) ??? (1)	johnsongrass broadleaf weeds	6-1-04	7-21-04	671	4,023	good (4) fair (1) ??? (1)
MSMA + Oust	0.5 gal + 1 oz (1)	johnsongrass	6-16-04	7-1-04	838	838	??? (1)
Roundup Pro	0.5 gal (1)	guardrails annual weeds	6-22-04	6-23-04	2	2	good (1)
Krovar I DF	9 lb (1)	bare ground	6-2-04	6-11-04	2	2	good (1)
Overdrive	2 oz (1) 1 oz/3 gal handsprayer (1)	musk thistle	3-17-04	3-29-04	-----	87+	good (1) handgun fair (1)
Transline + surfactant	0.66 pt (1) 12.8 oz + 12.8 oz (1) 10 oz + 16 oz (1) ??? (1)	musk thistle	2-25-04	6-24-04	-----	125+	good (1) ??? (2)
Garlon 3A + Aqua King (hand gun)	48 oz + 8 oz in 30 gal water	willows, etc aquatic	early summer	-----	-----	-----	good (1)

[1]Total number of responses to survey: 9 of 12.

[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 2-11 no apparent concerns arose. Also, a meeting was held at Division Five headquarters on September 2, 2004 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 Table 5. Division Five continues to have a very consistent winter annual weed control program. Campaign + AMS continues to provide good winter annual weed control as proper rates and timings are being achieved. As in the past there are a few tank loads that are going out in mid to late April. Division Five facilities that are finding themselves finishing their Campaign treatments at that time should start one to two weeks earlier next year. For the Division Five summer herbicide treatment, most of the acreage is treated with Roundup Pro Concentrate alone or combined with Oust. These treatments continue to provide good control of johnsongrass and other troublesome weeds. Division Five continues to use MSMA alone or combined with Vanquish or Roundup Pro Concentrate to control johnsongrass and broadleaf weeds successfully. The timing of these summer herbicide applications looks good and most of the application rates are well within recommendations with a couple of small exceptions. There was some Roundup Pro Concentrate at 27 oz/A used for selective johnsongrass control. This rate of Roundup Pro Concentrate is extremely high and should not be used in the future as a broadcast treatment as it will result in severe damage to desirable bermudagrass and native buffalograss. Bareground guardrail and shoulder treatments used included Roundup Pro Concentrate + Arsenal, Roundup Pro Concentrate + Arsenal + Oust, and Roundup Pro Concenstrate + Karmex. Good control was achieved from each of these treatments except the later which produced fair control. The treatment of Roundup Pro Concentrate + Arsenal + Oust was applied again this year using the Patchen roadside shoulder sprayer with good to fair results. Aqua Neat was used to control vegetation around bridges with good success. One crew surveyed used the new Overdrive + surfactant treatment to control musk thistle with fair success. The date of this application was late considering the use rate of Overdrive at 2 oz/A which requires the reduced-rate application must be made on rosettes stage only.

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 Campaign + AMS followed by the various summer herbicide treatments used. Continuing to use the proper rates and timings will achieve the best control possible with the selected treatments. One of the problems that will happen to a consistent herbicide program is that there is always the chance that weed escapes will occur. Treatment modifications for escapes can usually be made to remedy any new weed problems. There is no doubt that some of the various treatments being used in the summer, in Division Five, are a result of treatment modifications. Once the modifications have been made and a particular weed problem has been remedied, it would likely be best to revert back to the original summer

treatment or alternate between two treatments. There was no scotch thistle control treatments surveyed this year even though there are new reports of scotch thistle increasing in many western Oklahoma counties. Even though there may be very little enforcement going on with regard to the Oklahoma Noxious Weed Law, it really falls within ODOT's "Good Neighbor Policy" to continue to control musk and scotch thistle as all 77 counties within Oklahoma are required to control these thistle on their rights-of-way. If a herbicide is used to control thistles, one is required by law to document it. If documented, please include efforts in next year's herbicide report.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
Campaign + AMS	40 oz + 3.4 lb (5) 40 oz + 3.19 lb (5) 40 oz + 3.8 lb (1) 47 oz + ??? (1) ??? (1)	winter annual weeds	3-8-04	4-13-04	753	9,793	good (11) fair (2)
Roundup Pro Concentrate + Oust	12 oz + 0.5 oz (1) 10 oz + 0.5 oz (4)	roadside weeds johnsongrass annual weeds silver bluestem			649	3,246	good (4) fair (1) (drought)
Roundup Pro Concentrate + Oust + AMS	10 oz + 0.5 oz + 3.4 lb (1)	broadleaf weeds	5-20-04	5-29-04	217	217	good (1)
Roundup Pro Concentrate	10 oz (2) 27 oz (1)	johnsongrass broadleaf weeds	5-20-04	7-19-04	483	1,450	good (3)
MSMA	2.67 pt (1) ??? (1)	johnsongrass	4-27-04	7-2-04	35	69	good (2)
MSMA + Oust	0.5 gal + 0.5 oz (1)	johnsongrass	4-26-04	4-27-04	130	130	fair (1)
MSMA + Vanquish	2.67 pt + 2.13 pt (1) 2.0 pt + 0.5 pt (1)	johnsongrass broadleaf weeds	4-26-04	5-25-04	244	488	good (2)
MSMA + Roundup Pro Concentrate	3 pt + 9 oz (1)	broadleaf weeds	5-31-04	6-14-04	476	476	good (1)
Vanquish	12 oz (1)	broadleaf weeds	7-8-04	7-8-04	33	33	good (1)
Banvel	24 oz (1)	broadleaf weeds	6-23-04	6-23-04	27	27	good (1)
Overdrive + surfactant	2 oz (1)	musk thistle	3-30-04	5-15-04	-----	-----	fair (1)
Roundup Pro Concentrate	1:1 ratio (1)	cut stump treatment	1-7-04	1-28-04	-----	-----	good (1)
Aqua Neat	2 qt (1)	vegetation around bridges	6-1-04	6-16-04	50	50	good (1)
Roundup Pro Concentrate + Arsenal + Oust (Roger Mills Co.)	10 oz + 4 pts + 2 oz 3.5 pt + 2 pt + 2.75 oz 0.8 pt + 2 pt + 1 oz	bare ground	5-15-04	7-14-04	56	56	good (1)
Roundup Pro Concentrate + Arsenal + Oust (Patchen)	1 gal + 3 gal + 12 oz/ 100 gal ??? (1)	shoulder encroachment	-----	-----	-----	-----	good (1) fair (1)
Roundup Pro Concentrate + Arsenal	1% + 0.5% (1) 3.75% + 1.25% (1) 8 pt + 4 pt (1)	total vegetation control, signs edge spraying	4-27-04	6-24-04	17	51	good (3)
Arsenal	2 qt (1)	all vegetation	6-2-04	6-3-04	20	20	good (1)
Roundup Pro Concentrate + Karmex	??? (1)	all vegetation	4-21-04	5-27-04	51	51	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 2-11 only a single concern arose. In response to Survey Question 4, which asks how many personnel are involved in the herbicide applications, it appears that one county (Woods) always uses one person and six of nine use one or two personnel to make herbicide applications. From time to time an ODOT crew might find themselves shorthanded and have to complete a herbicide application with only a single employee. However it is not a safe practice to routinely put all of the responsibilities of herbicide applications on one person. There may even be ODOT personnel whom request to work alone. The area of herbicide applications are not an area for ODOT personnel to safely work alone. For personal safety and environmental concerns, ODOT should always try and have a minimum of two certified personnel involved in the mixing, loading and application of herbicides. Also, a meeting was held at Division Six headquarters on September 3, 2004 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. Division Six treated most of the highway roadsides this past year with atrazine which produced good control of winter annual weeds. As per a decision from division headquarters personnel this year will likely be the last year for atrazine use in Division Six. Division Six will use up current atrazine warehouse supplies at which point they will transition into the alternative Campaign + AMS winter annual weed control program in March/April 2005. Division Six had a very limited summer weed control program which was primarily caused by lack of funding for the traditional Roundup Pro + Oust or Outrider program. There were a couple of facilities that were able to apply Roundup Pro + Oust with fair to good success. Banvel was used to successfully control musk thistle in early summer. Also, Roundup Pro + Arsenal was applied to produce total vegetation control on roadside shoulders with good success, however, there were a few treatments that were applied in early April which is too early for this type of foliar treatment. For a Roundup Pro + Arsenal treatment to give the full affect, it should be applied to actively growing summer weeds. It should be applied into the month of May at the least. If ODOT crews are only targeting winter annual weeds in April, they can use Roundup Pro by itself, but when targeting summer treatments that may include bermudagrass, the Arsenal product will produce a better longer term control.

7.2 Comments and Recommendations from OSU Personnel

Division Six, like many other field divisions, has struggled with finding the funds to continue with both a winter annual (atrazine and/or Campaign + AMS) and summer weed control programs (Roundup Pro + Oust). With mowing dollars remaining fairly constant and herbicide dollars consistently dropping, if permitted, one way to offset the reduction in the herbicide programs is to shift some mowing money to the herbicide program. In September of 2004 we were able to attend a regional highway roadside vegetation maintenance meeting where we found that the Louisiana Department of Transportation (LDOT) did exactly that practice last year

and they were able to get support for the effort from LDOT personnel. We're not saying ODOT is like LDOT but many times there are ways to use funds differently. Hopefully, Division Six can return to a Roundup Pro Concentrate + Outrider or Oust summer program in 2005. These treatments would control the more common tall-growing summer weeds and help Division Six maintenance personnel promote more desirable roadside plants. As per the request of James Robison (division headquarters), he wanted to know what the recommended treatment would be for a roadside infested with the summer weeds of field sandbur, johnsongrass and pigweed. The treatment combination of Plateau at 4-6 oz/A (this product can only be purchased directly from BASF to a government entity and will provide sandbur, crabgrass, and assist in johnsongrass control) + Roundup Pro Concentrate at 10 oz/A (this will assist in johnsongrass control) + Overdrive at 4 oz/A (this should provide the pigweed and other broadleaf weed control) should provide good control of each of these weed species at a herbicide cost of approximately $20.00/A. This is not an inexpensive treatment. There are other treatments that will also produce good control of these particular weeds but this recommendation should provide the most consistent control for the least amount of money. Obviously, with this elevated cost/A, this is not a treatment that would be applied division-wide or even county-wide, but it would be a justifiable treatment to apply only to those roadsides that have mixtures of these specific problem weed species.

Hopefully Division Six maintenance personnel can have a smooth transition from their atrazine programs to the new alternative treatment of Campaign + AMS. There are several differences in these two treatments. We will cover the differences in detail at the 2005 CEU Herbicide Applicator Workshops that will be held in February through March. We suggest that Division Six schedule workshops earlier in 2005 so there is plenty of time for the new treatment to be implemented and time for any follow-up phone calls. Like any change there will be resistance, but the Division Six personnel should be pleased with results from the Campaign + AMS program. It is the single most consistent treatment applied today by ODOT maintenance personnel. Division Six county personnel need only approach the change with an open mind and enjoy the fact they won't have to wipe white atrazine residues off their trucks and sprayers in the future.

At the request of Division Six personnel, a request was made to the Division Maintenance Office to replace the Patchen roadside shoulder sprayer that was destroyed last year in an accident. The request was duly noted and it was passed on to appropriate ODOT personnel (we tried).

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
atrazine	2 qt (5) ??? (1)	preemergent winter annuals broadleafs	2-15-04	3-28-04	-----	4,158+	good (5) ??? (1)
Roundup Pro + Oust	13 oz + 1 oz (2) ??? (1)	annual weeds grass johnsongrass	5-5-04	7-16-04	982	2,945	good (1) fair (2)
Roundup Pro + Outrider	1 pt + 1 oz (1)	annuals johnsongrass	5-5-04	5-18-04	250	250	good (1)
Roundup Pro + Oasis	1 pt + 3.2 oz (1)	annuals johnsongrass	5-19-04	5-26-04	100	100	good (1)
Roundup Pro + Oasis	2.5 pt + 2.7 oz (1)	total vegetation control on shoulder	7-20-04	7-20-04	59	59	good (1)
Roundup Pro + Arsenal	1% + 2% (1) ??? (1)	total vegetation control on shoulders	4-1-04	5-8-04	-----	-----	good (2)
Banvel + surfactant	1 qt (1)	musk thistle	4-1-04	6-30-04	6	6	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 2-11, no concerns arose. Also, a meeting was held at Division Seven headquarters on September 2, 2004 to solicit comments and opinions from division administrative personnel and field superintendents. Comments and recommendations in this report will be based on the surveys and meeting.

Division Seven herbicide usage is summarized in Table 7. Winter annual weed control programs consisted of atrazine or Campaign + AMS with treated acreages remaining fairly constant over past years. Atrazine results ranged from good to poor with Campaign + AMS producing consistently good results. For the second year in a row there were a high percentage of Campaign + AMS treatments being applied late in mid to late April. The southern counties in Division Seven should be ready for Campaign + AMS applications as early as the last week in February. This may sound early to some folks but as long as the air temperatures are getting into the 50 degree range, the winter annual weeds will be susceptible and equipment should function just fine. Division Seven counties in the northern part of the division would normally start their Campaign applications one to two weeks later than those along the Red River. The weed control results Division Seven achieves with the later treatments of Campaign + AMS have been very good for the last several years, but for those facilities that want to try and achieve a little bit better control or lengthen their window of application, they should start applications one to two weeks earlier. Division Seven county and interstate facilities (this years survey says five facilities) that have been using atrazine for the past several years will need to look to the alternative treatment of Campaign + AMS for their winter annual weed control needs in the future. This is due to OSU personnel removing atrazine as a recommended product. More information on the removal of the atrazine recommendation will be covered at the 2005 CEU Herbicide Workshops.

Division Seven used MSMA and Roundup Pro + Outrider to control johnsongrass and summer annual weeds with good success this past summer. Overall acreages treated were similar to last year with a little shift from MSMA to Roundup Pro + Outrider. MSMA rates were good for most facilities but one facility surveyed was using MSMA at 2.8 qt/A. The maximum use rate for MSMA is 2 qt/A. There is no benefit to going higher only added/wasted expense. Roundup Pro + Outrider treatment rates varied among the three facilities that used this treatment and dates of application were late. Some of Cotton County surveyed application dates were in August. This shouldn't create any problems, however, by treating in late summer, johnsongrass was being mowed for the past three months. The full benefits of the johnsongrass control programs were lost.

Overdrive and Transline herbicides were used by five facilities to control musk thistle successfully this past year. Some of the treatments of Overdrive were being applied in May and even June to mature (bolted/flowering) thistles. This late of growth stages dictates Overdrive at 4 oz/A (not the low rate of 2 oz/A). Roundup Pro was also used alone to successfully control johnsongrass and summer annual weeds on a small number of acres.

Roundup Pro (alone), Roundup Pro + Oust, Roundup Pro + Arsenal and Arsenal + Oust were all used on shoulders and guardrails to control all vegetation successfully. Garlon 4 + diesel oil was used as a low volume application to treat cut stumps.

8.2 Comments and Recommendations from OSU Personnel

Division Seven winter annual weed control programs for facilities that have been using atrazine will likely see dramatic changes if and when they transition to the alternative treatment of Campaign + AMS. While these treatments are very different as far as mode-of-action and persistence, the end results should be the same with good control of problem winter annual weeds that reduces the need for spring mowing. Because of the decline of use of atrazine statewide ODOT personnel over the past five years and the level of environmental sensitivity in using this particular herbicide, we feel like it is time to discontinue its use. We would encourage those Division Seven facilities that have been using atrazine to move to the new Campaign + AMS treatment. With the new Campaign + AMS treatment, new application dates and mixing instructions are necessary. These will be covered in detail in the 2005 ODOT CEU Herbicide Workshops. Division Seven summer weed control programs consisted mainly of MSMA alone and Roundup Pro + Outrider. These seemed to be working well and we would encourage their continued use. With future Roundup Pro + Outrider treatments, we would recommend purchasing the Roundup Pro Concentrate product instead of Roundup Pro, as it is a more cost effective formulation of the same herbicide.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
atrazine	2.1 pt (1) 2 qt (2) 2.1 lb (1) 2.2 lb (1)	broadleaf weeds johnsongrass perennials winter annuals	2-10-04	3-17-04	681	3,405	good (3) fair (1) poor (1)
Campaign + AMS	2 pt + 3.4 lb (4) 38 oz + 5.1 lb (2)	broadleaf weeds johnsongrass winter annuals	3-2-04	4-16-04	701	4,206	good (6)
Roundup Pro + Outrider	1.12 pt + 1.28 oz (1) 12 oz + 0.77 oz (1) 13 oz + 0.8 oz (1)	johnsongrass	6-4-04	8-25-04	410	1,230	good (3)
Roundup Pro	10 oz (1)	johnsongrass	6-18-04	6-23-04	210	210	good (1)
MSMA	0.5 gal (4) 2.8 qt (1) 0.33 gal (1) ??? (1)	johnsongrass sandbur	4-14-04	8-17-04	-----	3,710+	good (7)
Roundup Pro (hand gun)	1.5 pt	post emergent weeds	6-1-04	8-10-04	72	72	good (1)
Roundup Pro + Arsenal	0.9 gal + 0.3 gal (1) 3% + 0.5% (1) 2% + 0.2% (1)	total vegetation control shoulder treatment bermudagrass	5-11-04	8-10-04	26	78	good (3)
Arsenal + Oust (hand gun)	35 oz + 8 tsp/50 gal	bare ground signs guardrails	8-2-04	8-18-04	-----	-----	good (1)
Overdrive	1 tsp/2.5 gal (1) 4 oz (1) 2.75 oz (1)	musk thistle	4-12-04	6-3-04	-----	227+	good (3)
Transline + surfactant	1 pt (1) 0.66 pt (1)	musk thistle	4-12-04	5-6-04	38	76	good (2)
Garlon 4 + diesel (basal brush)	4:1 ratio (1) 3:1 ratio (1) diesel: herbicide	cut stump treatment basal small trees	1-21-04	2-23-04	-----	-----	fair (1) ??? (1)
Aquamasater + surfactant	1.5% (1)	cattail	7-15-04	7-15-04	2	2	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.

9.0 Survey of the Division Eight Herbicide Program

9.1 Herbicide Program Survey Results

A total of 8 out of 13 maintenance facilities in Division Eight responded to the survey this year. In response to survey questions 2-11 no concerns arose. Also, a meeting was held at Division Eight headquarters on September 10, 2004 to solicit comments and opinions from division administrative personnel. Comments and recommendations in this report are based on the surveys and meeting.

Division Eight herbicide usage is summarized in Table 8. Campaign + AMS was used to control winter annual weeds successfully as proper treatment rates and timing were achieved. Rogers County added Transline to their Campaign + AMS treatment to achieve better control of musk thistle and was successful. Acreages treated this year with Campaign + AMS was very similar to 2003. There were very few summer weed control treatments applied this year in Division Eight. Only a single facility applied Roundup Pro + Oust to successfully control johnsongrass and other summer weeds. Transline was used successfully by four facilities to control musk thistle. Garlon 4 + diesel oil was used to provide good brush control when applied as a low-volume basal bark and cut-stump treatment.

9.2 Comments and Recommendations from OSU Personnel

We would like to encourage Division Eight to continue their Campaign + AMS winter annual weed control program. If this treatment needs to be modified to produce higher levels of musk thistle control, we recommend adding Overdrive at 2 oz/A. The addition of the low rate of Overdrive at 2 oz/A requires a 2ee supplemental label be in the spray truck during application. The low rate of Overdrive would be much less expensive than Transline. It would produce very good musk thistle control. The addition of Overdrive to broadcast Campaign + AMS treatments should only be used on roadsides that have moderate to severe musk thistle problems. Roadsides with low musk thistle populations are more efficiently treated with handgun type applications. Division Eight, similar to a couple of other field divisions, is struggling with their summer weed control programs. There is no doubt that summer weed control programs are more difficult to design, implement, and finance as compared to the Campaign + AMS programs. The benefits that ODOT achieves with a well-timed summer application of Roundup Pro Concentrate + Oust XP, Outrider or Plateau are crucial to the sustainability of the bermudagrass release program that is more than 20 years old. Based on observations made during our travels this year within Pawnee, Rogers and Craig counties, there is no doubt that the absence of a summer herbicide programs during two of the last three years is allowing many troublesome weeds to reestablish in the clear zone. The herbicides, equipment and personnel are in place to make these very beneficial summer herbicide treatments. We would like to encourage Division Eight to return to an integrated roadside vegetation management program during the summer months. Personnel currently benefit from the integration of the winter annual weed control treatment of Campaign + AMS. Due to this effort, they are able to delay spring mowing for a least a month to six weeks. The summer weed control treatments can also be an important tool in reducing the mowing cycles and roadsides will look much better for longer periods of time in between mowing if many of the tall growing weed species are removed. At the discretion of Division Eight administrators, we are available to sit down and

reevaluate the many herbicide options that are currently available for providing a successful summer weed control program. Also, there were a couple of facilities that did not complete a survey this year. We would like to ask each facility to complete a survey so we can reduce data gaps. If one did not apply any herbicides, please submit a survey and simply state "no herbicide used this year" so that we can account for the facility in question.

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

Herbicide Treatments	Herbicide Rate/A[2]	Targeted Weed	Date Started	Date Ended	Acreages Treated		Overall Success (good, fair, poor)
					Average/Facility	Total Division	
Campaign + AMS	2 pt + 5.1 lb (5) 2 pt + 3.4 lb (1) 2 pt + 4 lb (1)	winter annuals cheat brome broadleaf weeds	3-16-04	4-27-04	632	4,424	good (6) fair (1)
Campaign + Transline + AMS	2 pt + 0.33 pt + 3.4 lb (1) (Rogers Co.)	brome cheat hairy vetch musk thistle	3-16-04	4-14-04	700	700	good (1)
Roundup Pro + Oust	1 pt + 1 oz (1)	johnsongrass	5-20-04	6-17-04	600	600	good (1)
Roundup Pro (hand gun)	1.6% (1) ??? (2)	guardrails sign posts total vegetation control	4-1-04	8-17-04	-----	-----	good (3)
Transline	1 oz/3 gal sprayer (1) 0.5 pt/25 gal sprayer (1) 1% (1) 10 oz/25 gal sprayer (1)	musk thistle	4-1-04	6-4-04	-----	7+	good (4)
Garlon 4 + diesel	4:1 ratio diesel:herbicide ??? (1)	cut stump treatment brush	year round		-----	-----	good (1) ??? (1)

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

10.0 Statewide Summary of ODOT Herbicide Programs

Integrated Roadside Vegetation Management (IRVM or RVM) is a process by which roadside vegetation management goals are met through the effective and efficient use of mowing and herbicides. There are a few other types of management tools used but all-in-all, mowing and herbicides constitute 95% of ODOT's efforts once proper vegetation is installed. Mowing and herbicide spraying are inter-linked to each other such that long-term goals of ODOT are achieved. Mowing alone is not a likely option for most roadsides as there are not enough personnel or money available to keep roadside vegetation heights down to a safe level and as documented, mowing only allows reestablishment of tall growing perennial weeds.

Herbicides alone are not an option as they will not give a roadside the aesthetic appearance that is desired by most roadside managers and they are also very expensive to rely upon alone. Continual integration of these two programs is paramount.

The data that has been produced in this report and previous reports has shown reductions in both the winter annual weed control programs (atrazine and Campaign + AMS) and summer weed control programs (MSMA combinations and/or Roundup Pro combinations with Oust or Outrider). The data in Table 10 is the basis of these observations. While the reduction in acreages treated with atrazine is a positive trend, there would have hopefully been a corresponding increase in acreages treated with the alternative treatment of Campaign + AMS to maintain the benefits of the winter annual weed control. Averaging over all field divisions, there has been a reduction (approximately 20%) in Oklahoma roadside acreages that are receiving winter annual weed control treatments during the last five years. The trends for the summer weed control programs are even more dramatic. The summer weed control programs, being much more expensive, have also shown an overall reduction (approximately 30-40%) in Oklahoma roadside acreages that are receiving the various Roundup Pro Concentrate or MSMA combination treatments. This is no doubt one reason why there has been an increase in weed escapes along many state highway roadsides. The reduction in herbicide programs usually comes with a cost of weeds reestablishing. This in turn will cause an increase in mowing requirements to keep ahead of reestablished tall growing weeds. If mowing efforts are not increased to meet the new demands, there will be an increase in safety and aesthetic concerns. We suggest that those field divisions that have experienced significant affects to either their winter and/or summer annual weed control programs in the past few years reinvest in integrating their mowing and herbicide programs. Finding the money to fund a herbicide program and having the support to make the timely decisions needed are crucial to keeping ODOT RVM programs as integrated as possible. Oklahoma is not the only state dealing with these issues as many state programs have had to adjust to decreasing maintenance budgets and personnel numbers. We would suggest that mowing programs, along with herbicide programs, be adjusted when funds are limited, in order to minimize any negative affects to roadside vegetation. OSU personnel are always available to assist any field division in providing technical guidance with the many mowing and herbicide decisions that are available to today's roadside vegetation manager.

Several field divisions have been on a trend of applying many of the winter annual weed control applications and summer weed control applications a little on the late side. Reasons for

this can vary greatly from one field division to the next but ODOT needs to remember that to gain the most benefits from selected herbicide treatments it is important to follow the recommended times of application as closely as possible. The benefits of a specific herbicide treatment rate and timing of application were established and developed under current and past OSU/ODOT Research Projects. The entire process starts with selecting herbicide treatments well in advance of the spray season as well as making purchase orders as early as possible so herbicides are on hand well before the spray season. We realize that ordering winter annual weed control herbicides in November-December and summer weed control herbicides in February-March is early and very difficult to accomplish under today's budget restrictions. We are learning that the ODOT purchasing systems can result in a 4-6 weeks delay from the time a purchase order is submitted before a product is delivered. If herbicides are ordered late, to begin with, followed by slow purchasing and delivery, many herbicide treatments are likely being applied late because they didn't really have a good chance of being applied earlier. We have consulted with each field division about this issue. We would simply suggest that the major broadcast herbicides be ordered as early as possible and that they be in the hands of the various maintenance facilities as quickly as possible so that applications can be made as close to recommended times as possible. For those field divisions that said they have problems with storing large quantities of herbicides at the division warehouse, the annual herbicide contract allows the herbicides to be delivered directly to individual county and interstate ODOT yards. This should eliminate division warehouse storage issues for those few divisions that experience this problem.

After meeting with each of the field divisions this past September we have come to the conclusion that it would be of benefit to make the following changes to the current ODOT non-encumbered statewide herbicide contract. The current herbicide contract is an all inclusive contract with herbicides, dyes, drift control products, surfactants and various container size choices. We are suggesting removing all of the minor use products (minor use in that they are purchased in small amounts by only a small amount of ODOT maintenance facilities) from the statewide contract. Removing them from the contract should facilitate their local purchase using P-cards or other means. The major use products (major use in that they are part of the winter annual weed control or summer weed control broadcast herbicide programs) would remain on the statewide contract to hopefully benefit from the competitive bid process. A copy of the minor and major-use product lists was generated by OSU in October 2004 and has been submitted to each field division for review. After changes are made to the existing statewide contract, we hope that the newly revised contract will be easier to read and understand by ODOT, Manufacturers, Distributors and Central Purchasing personnel. It was our intention that these changes assist the field divisions in make the purchasing process more efficient. It will be important in the next year or two that ODOT personnel evaluate whether these changes were indeed for the better and respond to both their field division personnel and OSU personnel.

Under one of our current contract items we are developing a program that will require all future herbicides and adjuvants to meet minimum requirements before they can be purchased by ODOT personnel. The new program/list, which will likely be called the "Approved Herbicide and Adjuvant List (AHAL)", is currently being produced cooperatively between OSU and ODOT Maintenance Division personnel. This effort is a quality assurance program that will require all products to be accompanied with research data and compatibility data to prove they

will work in current ODOT herbicide programs. We currently conduct many of these initiatives today but the AHAL will formalize the process. We hope to have the first AHAL for ODOT to use by early summer of 2005, followed by annual updates. Ultimately the AHAL will give ODOT personnel a list in hand to guide their purchase of non-contract herbicides and adjuvants. All products that are included on the AHAL will have met minimum program requirements.

Many field divisions have slowly but surely reduced their use of atrazine over the last several years. Some field divisions decided on their own to discontinue atrazine use while others slowly moved from atrazine to the alternative Campaign + AMS. OSU personnel have been recommending the transition from atrazine for the past several years but until recently have continued to support the few field divisions that rely on atrazine for their winter annual weed control. As of the September 2004 meetings with the field divisions, it appears there will only be a few thousand acres of potential atrazine use in 2005. Because atrazine use has fallen to such a low acreage, OSU has decided to remove its recommendation of atrazine for roadside weed control. It is our opinion that any benefits from the limited number of acres treated with atrazine are now outweighed by potential risks associated with its use. Atrazine is a herbicide that is consistently found in surface and ground water sampling across the Midwest. Atrazine has restricted areas in Oklahoma where it cannot be applied because of the possible negative effects on selected endangered species or their habitats. Atrazine also requires supplemental labeling efforts to maintain 24-C registrations that allow its legal use on roadsides. Atrazine is the only "Restricted Use" herbicide that ODOT applies as a broadcast treatment. It is because of these issues and the significant reduction in atrazine usage that we feel it is time to discontinue ODOT atrazine programs statewide. Since this is a voluntary ODOT effort (not a result of EPA intervention) we suggest that ODOT field divisions use up current warehouse supplies in a normal fashion and transition into a Campaign + AMS program for future winter annual weed control needs. OSU personnel plan on supplying the necessary training to those field divisions that will be switching from atrazine to Campaign + AMS treatments as there will be changes in both product rates used and timing of applications. While there will be no doubt a few growing pains in switching to Campaign + AMS, ODOT applicators should see very good winter annual weed control from their new treatment.

We would like to take this opportunity to give all of the ODOT maintenance personnel across the state a heads-up on a one-time research initiative that we will be performing next year. We will be doing a survey of the water quality issues that ODOT may be experiencing across the state. The water quality issues we are concerned about with this initiative is the water that ODOT crews use to mix with their herbicide treatments. Water quality (pH, hardness, salts, etc.) can have an affect on herbicide performance and it is a variable that we have never measured. We will be sending out containers next year asking ODOT personnel to collect water from their mixing water source and returning it to us for analysis. We will likely do this during February-April spray season and again in May-June spray season as water quality can change during the seasons. We will send out sampling and mailing instructions with the collection bottles and we would like to encourage 100% participation in this effort. We look forward to data collection and analysis followed by presenting the findings to ODOT in future training efforts.

This paragraph is being resubmitted into the 2004 report as we are still recommending the use of the Calc-An-Acre digital speed devises under the following conditions. **It should be**

noted that the Calc-An-Acre will work on all ODOT spray trucks when used with the cable/sensor/magnet that comes with the stock unit. It has been standard practice for ODOT to maintain specific herbicide rates per acre by adjusting and maintaining vehicle speeds during broadcast herbicide applications. This is a critical component of ODOT broadcast spray programs. ODOT applicators know that when they load a treatment like Campaign + AMS or Roundup Pro Concentrate + Oust and their spray pattern width changes, they must make a corresponding adjustment in their vehicle speed. Easy-to-read speed adjustment charts have been produced to facilitate "on-the-go" changes. For years ODOT has used the inexpensive Calc-An-Acre digital speedometer to accurately monitor slow vehicle speeds down to tenths-of-miles per hour. ODOT spray trucks have been able to get the Calc-An-Acre units to work consistently and effectively by using the cable/sensor/magnet that comes with each unit. The only problem with using the cable/sensor/magnet system is that the magnets will get damaged and need replacing. Under most circumstances magnets are only replaced a couple of times per spray season. Replacing the magnets, while inconvenient, is inexpensive and a small price to pay for a working Calc-An-Acre. The alternative system to the cable/sensor/magnet is the electronic wiring harness. The electronic wiring harness plugs into existing cables and is pig-tailed to existing transmission wiring. When it works, the wiring harness is the preferred method, however, most ODOT spray trucks have not been able to successfully use the electronic wiring harness. In those cases, the only option is to return to the original cable/sensor/magnet. The optional Calc-An-Acre electronic wiring harnesses are designed to go on tractors, 1-ton or smaller trucks. The fact that some of the larger ODOT trucks have been successful, simply means they have been fortunate. All things being considered, we believe that the $230 Calc-An-Acres are still the best value for a digital speedometer. Please contact OSU personnel for more information on this issue.

Table 9. Summary of ODOT herbicide treatments, target weeds and total acres treated with herbicides in Oklahoma.

Herbicide Treatment	Target Weed	Divisions Using Treatment(s)	Total Acreage Treated
atrazine	winter annual weeds	2, 6, 7	9,121
Campaign +/- AMS +/- Others	winter annual weeds	1, 3, 4, 5, 7, 8	37,450
glyphosate + Oust	johnsongrass and summer annual weeds	2, 4, 5, 6, 8	14,532
glyphosate + Outrider	johnsongrass and summer annual weeds	3, 6	8,404
Roundup Pro + Oasis	johnsongrass and summer annual weeds	6	100
MSMA +/- Oust, Outrider, Other	johnsongrass and summer annual weeds	2, 5, 7	5,909
glyphosate (alone)	johnsongrass and summer annual weeds	1, 5, 7	1,900
glyphosate Krovar DF glyphosate + Arsenal glyphosate + Arsenal + Oust glyphosate + Karmex	total vegetation control bare ground sign-posts guardrails shoulders, cracks	1, 3, 4, 5, 6, 7	362+
Garlon 4 Vanquish	general broadleaf weed control	2, 5	268
Overdrive +/- Others	musk thistle	4, 5, 7	1,440+
Transline +/- Others	musk thistle	4, 7, 8	208+
Garlon 4 + diesel	basal brush control	7, 8	-----+
Tordon K + Garlon 4	foliar brush control	2	75
Garlon 4	foliar brush control	1	72
Roundup Pro	cut stump treatment	3, 5	1+
Aquamaster/Aqua Neat	aquatic vegetation control	5	52
Garlon 3A	aquatic vegetation control	4	-----
Total			79,894

Table 10. Comparison of herbicide acreages treated in 2001, 2002, 2003 and 2004 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
		atrazine (winter annual weed control)	Campaign +/- AMS (winter annual weed control)	glyphosate + Oust (johnsongrass control)	glyphosate + Outrider (johnsongrass control)	MSMA +/- Oust/Outrider (johnsongrass control)	glyphosate (johnsongrass control)	
1	2001	0	1,468	480	0	0	175	2,123
	2002	0	5,140	4,573	0	0	18	9,731
	2003	170	5,356	862	4,794	0	222	11,404
	2004	0	5, 662	0	16	0	168	5,846
2	2001	6,229	0	3,643	0	4,260	1,580	15,172
	2002	2,240	0	3,018	0	20	0	5,278
	2003	5,197	0	4,666	0	1,372	1,500	12,735
	2004	1,558	0	2,183	0	216	0	3,957
3	2001	0	8,640	0	6,546	450	40	15,676
	2002	0	8,724	0	2,955	1,070	1,158	13,907
	2003	0	8,089	0	6,691	0	0	14,780
	2004	0	6,983	0	6,924	0	0	13,907
4	2001	2,332	1,349	2,954	1,494	45	0	8,174
	2002	616	4,956	5,211	260	70	0	11,113
	2003	606	562	915	0	80	1	2,164
	2004	0	5,682	4,023	0	838	0	10,543
5	2001	0	8,954	7,405	0	465	793	17,617
	2002	0	9,359	6,271	0	913	497	17,040
	2003	0	9,851	6,356	0	510	1,646	18,363
	2004	0	9,793	3,246	0	687	1,450	15,176
6	2001	7,082	200	1,643	4,925	0	0	13,850
	2002	7,300+	0	0	6,795	0	0	14,095
	2003	2,273	0	7,541[1]	0	0	0	9,814
	2004	4,158	0	2,945	250	0	0	7,353
7	2001	3,359	3,152	0	1,120	2,039	1,076	10,746
	2002	2,565	4,136	0	9	6,269	486	13,465
	2003	3,611	3,830	0	0	4,147	488	12,076
	2004	3,405	4,206	0	1,230	3,710	282	12,833
8	2001	871	5,946	5,864	0	0	102	12,783
	2002	0	422	1,637	0	0	149	2,208
	2003	0	4,693	3,700	0	0	0	8,393
	2004	0	5,124	600	0	0	0	5,724
All Divisions	2001	19,873	29,709	21,989	14,085	7,259	3,766	96,141
	2002	12,721	32,737	20,710	10,019	8,342	2,308	86,837
	2003	11,857	32,381	24,040	11,485	6,109	3,857	89,729
	2004	9,121	37,450	12,997	8,420	5,451	1,900	75,339

[1]This treated acreage included 7,421 acres treated with Roundup Pro + Oasis and 120 acres treated with Roundup Pro + Oust.

APPENDIX A

2004 ODOT/OSU HERBICIDE PROGRAM SURVEY

2004 ODOT/OSU Herbicide Program Survey (2 pages)

Please return to your Division Headquarters on or before Aug. 27, 2004, then forward to Doug Montgomery ASAP.

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

1. How many lane miles of state highway are in your maintenance area? _____
2. Was an application record filled out for each tankload? **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 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 (check all that apply)?

   Roundup Pro ___ Roundup Pro Concentrate ___ Mirage ___ Glystar Pro ___ other ___
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 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 with the Okla. Dept. of Agriculture? If yes, please include a brief description of complaint(s).

_____

_____

11. Did you have any contract herbicide applications performed in your maintenance area? If yes, please include a brief description. **yes_____ no _____**

_____

_____

Summary of 2003/2004 Herbicide Applications

(Please fill in the data for every block as precisely as possible, if you do not know then 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***		
atrazine										
Campaign + AMS										
Roundup Pro + Oust										
Roundup Pro + Outrider										
Roundup Pro + Oasis										
MSMA + _____										
Roundup Pro (alone)										
Rodeo + surfactant										
Arsenal + _____										
Vanquish + surfactant										
Transline + surfactant										
Distinct + surfactant										
Tordon K + Garlon 4										
Garlon 4 + oil carrier (basal)										

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

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