Final Report to
North Carolina Department of Transportation
Roadside Environmental Unit

Herbicide Options for Weed Management in the North Carolina Highway Wildflower Program

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16. Abstract

The North Carolina Department of Transportation Roadside Environmental Unit plants wildflowers on approximately 3500 roadside acres in North Carolina. Methyl Bromide, a broad-spectrum soil fumigant, has been used to prepare roadside areas for wildflower plantings. Out of concern for the atmospheric ozone layer, a complete ban of methyl bromide production by 2005 was agreed to by 160 nations. The loss of methyl bromide facilitated the need for research to find alternative weed control herbicides. Field trials were conducted at North Carolina Department of Agriculture research stations in the piedmont and coastal plain regions of the state. Research was conducted with multiple preemergence and postemergence herbicides having differing modes of action on twenty-one wildflower species. Periodic visual evaluations were made to determine wildflower tolerance and weed control. This final year's research concentrated on herbicides that were tolerant to the most number of wildflower species and herbicides that were labeled for use on roadsides and/or wildflower plantings. Additionally, Callisto and Staple were evaluated due to outstanding tolerance with several wildflower species. For the most part, wildflower species were more tolerant to herbicides applied preemergence. However, there was great variability with regards to tolerance among the 21 wildflower species evaluated. For example, many species were tolerant to Prowl H2O 3.8CS with the exception of red corn poppy, which was severely injured. In contrast, red corn poppy was tolerant to Callisto 4SC applied PRE and POST; however, most all other species were severely injured. No herbicide evaluated proved to be as versatile as methyl bromide with regards to tolerance. When planting wildflower species, NC DOT personnel should consider grouping species with similar herbicide tolerances in order to have an effective herbicide program.

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SUMMARY

The purpose of this project was to determine herbicide options to be used on popular wildflower species used by the North Carolina Department of Transportation in their highway wildflower program. This was done in response to a phase out of the soil fumigant methyl bromide and a desire by North Carolina Department of Transportation to determine herbicides or combinations of herbicides that could be used as replacements for methyl bromide. In order to achieve this goal, herbicide tolerance would first have to be determined. At the start of this project, many herbicides with differing modes of action were examined on various wildflower species. It was discovered that herbicide tolerance was an issue. Most herbicides evaluated caused severe injury to the treated wildflower species or the herbicides were not labeled for use on wildflowers or on roadsides. Subsequent experiments narrowed the list of herbicides to those that caused minimal injury to wildflower species and were labeled for use on wildflowers or roadsides. An exception was made for several herbicides due to exceptional tolerance by certain wildflower species. Timing of herbicide applications was also evaluated. The information gathered from this project is to be used to create a decision aid for use in the North Carolina Department of Transportation Highway Wildflower Program.

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INTRODUCTION

The North Carolina Department of Transportation Wildflower Program began in 1985 as an integral part of highway beautification (Anon. 2008). Wildflowers are planted and maintained on approximately 3,500 roadside acres in North Carolina by the Roadside Environmental Unit. Many wildflower species planted on North Carolina's roadsides are non-native species selected for their display of colors. When wildflower species are taken out of their native habitats and established in tilled areas along highway rights-of-way, they must compete with native weedy vegetation. The typically planted wildflower species generally are not very competitive with the aggressive weedy species that inhabit the state. Weeds are not only unsightly, but they also compete with wildflowers for growth inputs and reduce wildflower stands, growth, and bloom production. Hence, control of weeds is a necessity in successful establishment and maintenance of wildflowers (York, 2003).

With the initial phase out of methyl bromide, a soil fumigant, starting in 1999 and eventual ban in 2005 (USDA-ERS, 2000), a useful weed control tool has become unavailable to assist with wildflower establishment. Herbicides would appear to be a logical alternative to methyl bromide fumigation of wildflower planting sites. Information on the use of herbicides in wildflowers is limited. Much of the needed information on the efficacy of herbicides can be gleaned from other sources, such as herbicide labels and crop experiments. However, there is a considerable lack of information on wildflower tolerance of herbicides (York, 2003).

Research was conducted at North Carolina State University to determine herbicides that could be used as an alternative to methyl bromide, to determine wildflower tolerance of herbicides on twenty-one wildflower species planted by North Carolina Department of Transportation-Roadside Environmental Unit, and to determine weed control effectiveness on fall-planted wildflower species and residual control in established wildflower plantings.

MATERIALS AND METHODS

For this third season (2006/2007), all experiments were conducted with fall-seeded wildflowers in conventional tillage systems. With the exception of one location, all species were seeded in fields fumigated with methyl bromide. The remaining location was seeded in a field treated with Vapam. Fertilizer was broadcast during land preparation and twice during the spring growing season. Plots were seeded in early November using a wildflower drill furnished by NCDOT. Herbicides were applied using a CO_2-pressurized backpack sprayer equipped with flat-fan nozzles and calibrated to deliver 15 gallons/acre at 24 psi and 3 mph. The preplant incorporated (PPI) herbicides were applied immediately before seeding and mechanically incorporated using a field

cultivator. The preemergence (PRE) herbicides were applied immediately after planting. The post-emergence (POST) herbicides were applied in early March to late April.

Experiment 1 focused on sixteen wildflower species previously evaluated. These species included toadflax, catchfly, red corn poppy, bird's eye, mountain garland, gloriosa daisy, dame's rocket, sweet william, baby blue eyes, wallflower, rocket larkspur, shasta daisy, bachelor's button, Indian blanket, purple coneflower and clasping coneflower. Experiments 2 and 3 focused on the sixteen wildflower species mentioned in experiment 1, plus an additional five species previously evaluated. These species included lance-leaved coreopsis, ox-eye daisy, California poppy, plains coreopsis and black-eyed susan.

Most individual plots were 6.5 feet wide by 12 or 13 feet long. For all experiments, the experimental design was a randomized complete block. Experiment 1 treatments were replicated two times per location. Experiments 2 and 3 treatments were replicated three times per location.

Wildflower injury was estimated visually at various times during the growing season; only evaluations at selected dates are presented in this report. In most cases, both stand reduction and stunting were recorded for experiments that contained PPI or PRE herbicides. Wildflower injury was then calculated based on the following formula:

Injury = (stand reduction) + ((100 – stand reduction) x (stunting/200)).

The above formula places greater emphasis on stand reduction as compared to stunting. Where adequate stands were obtained, and with the exception of ox-eye and shasta daisy species which bloom poorly in their first year, bloom reduction ratings were recorded at peak bloom. This was accomplished by selecting the plot with the most blooms within a replication (this was seldom the check) and comparing all other plots against it. In many cases, the untreated check had a substantial reduction in blooms due to weed competition.

Data were subjected to analysis of variance using ARM7, a commonly used data management and analysis software program. Statistics are not presented in this report. As was observed during the 2004-2006 evaluations, considerable variability existed in the data within a location and among locations.

The following experiments were conducted at the Umstead Research Farm, Butner, NC; the Upper Piedmont Research Station, Reidsville, NC; and the Peanut Belt Research Station, Lewiston, NC. The field in Reidsville was fumigated with methyl bromide a week before planting. The experiments in Butner were placed in two separate fields. Both fields were fumigated with methyl bromide; however, due to precipitation and wet field conditions, plantings were delayed by more than a week. The field in Lewiston was treated with Vapam. The soils were a clay loam at Butner, and a sandy loam at Lewiston and Reidsville.

Fall-seeded wildflower tolerance of PPI/PRE herbicides. Sixteen wildflower species were planted. Wildflower species and seeding rates are listed in Table 1. The experiment included 11 treatments of differing herbicides, combinations of herbicides, or various rates of herbicides. This experiment was conducted at the three locations listed

above. Each experiment consisted of two replications due to size constraints of each field. Herbicides evaluated and rates are listed in Table 2.

Fall-seeded wildflower tolerance of POST herbicides. Twenty-one wildflower species were planted at Butner and Lewiston. Twenty wildflower species were planted at Reidsville; clasping coneflower was not planted. Wildflower species and seeding rates are listed in Table 1. The experiment included three herbicides applied POST. The herbicides were applied early March to late-April before wildflowers initiated spring growth. The various wildflower species grew at differing rates, thus necessitating multiple visits to treat only the wildflower species that had reached sufficient size. A non-ionic surfactant (0.25% v/v) was added to two treatments and a crop oil concentrate (1 pt/acre) was added to the remaining treatment. Treatments and application rates and methods listed in Table 3.

Fall-seeded wildflower tolerance to Staple LX applied PRE and POST. Twenty-one wildflower species were planted at Butner and Lewiston. Twenty wildflower species were planted at Reidsville; clasping coneflower was not planted. Wildflower species and seeding rates are listed in Table 1. Staple LX was evaluated and application rates are listed in Table 4. PRE treatments were applied at planting and POST applications were applied early March to late-April before wildflowers initiated spring growth. The various wildflower species grew at differing rates necessitating multiple visits to treat only the wildflower species that had reached sufficient size. A non-ionic surfactant (0.25% v/v) was added to the POST treatments.

FINDINGS AND CONCLUSIONS

The primary objective of the 2006-2007 experiments was to obtain information on wildflower response to various herbicides, herbicide combinations, or herbicide systems applied PPI, PRE, or POST. Herbicides were selected from those that exhibited tolerance in the 2004-2006 trials, with emphasis on products labeled for roadside use and/or on products that potentially could be registered.

In general, tolerance was set as good in situations where late-season injury and bloom reduction was than 20%. Acceptable tolerance was assumed to be 20 to 35% injury or bloom reduction, although some adjustments (downward) were made in the ratings if the tolerance was acceptable averaged over locations but unacceptable at one or two individual locations. Marginal tolerance was assumed to be 36 to 50% injury or bloom reduction. A product with marginal tolerance probably should not be used unless there are no other alternatives. Poor tolerance was assumed to be greater than 50% injury or bloom reduction. Products with poor tolerance should not be used in any situation as significant plant damage will most likely result.

Fall-seeded wildflower tolerance of PPI/PRE herbicides. Adequate stands were obtained at the Lewiston research station for 15 species; one species, purple coneflower, lacked an adequate stand and was discarded. Several other species had weak stands, but evaluations were made, nonetheless. Adequate stands were obtained at the Butner research farm for all 16 species. At Butner, most species germinated later than at the

other two locations. This resulted in an absence of early season ratings as indicated in Table 5. Adequate stands were obtained at the Reidsville research station for 13 of the 16 species; toadflax, mountain garland, and purple coneflower lacked adequate stands and all three were discarded. The lack of stand can be attributed to several factors. The field at Lewiston was extremely wet in places at planting. Stands either established poorly in these wet areas or not at all. The field in Reidsville was at a moderate downward slant and washing proved problematic for the above listed species.

Clasping coneflower, which was planted at the other two locations, was not planted at Reidsville. Sweet william and shasta daisy did not bloom before the conclusion of this experiment. Therefore, there is no bloom reduction rating for these two species at any of the locations.

There appears to be a discrepancy related to Prowl H2O treatments. Almost every species has a higher injury ratings with Prowl H2O at the lower rate (1.0 pt/A) compared to the higher rates (2.0 and 4.0 pt/A). Plots that received the lower rate of Prowl H2O tended to be at the ends of each field at all three locations. These plots appear to have been subject to washing more so than other plots. It is believed that this resulted in inflated injury ratings for almost all species tested by increasing stand reduction (Table 5). This discrepancy was taken into account when making herbicide recommendations.

With the exception of toadflax and Indian blanket, there appears to not be a significant rate effect with Prowl H2O (Table 6).

Wildflower response, both injury ratings and bloom reduction ratings where applicable, is listed by species in Table 5. The data are summarized in Table 6. Tolerance ratings of good, acceptable, marginal, and unacceptable were made based upon late-season injury and bloom production.

Eleven of sixteen species evaluated had good or acceptable tolerance of Prowl H20 (pendimethalin) applied PPI (Table 6). Corn poppy was severely injured by Prowl H20. Mountain garland exhibited unacceptable tolerance last year, but acceptable tolerance this year. Poor stand last year may be a factor in the discrepancy. Shasta daisy showed marginal tolerance last year, but good tolerance this year. Dame's rocket was tolerant to Prowl H2O applied PPI in two earlier trials. This year, it showed only marginal tolerance. A weak stand was most likely the cause for the discrepancy.

Three of sixteen species exhibited acceptable to good tolerance of Dual (s-metolachlor) applied PPI at the lower rate (Table 6). Tolerance of gloriosa daisy was acceptable at the lower rate, but only marginal at the higher rate. Tolerance of catchfly was marginal for the lower and higher rate of Dual. Corn poppy, Indian blanket, and clasping coneflower tolerance was marginal at the lower rate, but definitely unacceptable at the higher rate. Dame's rocket and baby blue eyes showed much more tolerance in previous years' experiments compared to this year.

Good tolerance was noted with the combination of Prowl H2O plus Dual with shasta daisy and bachelor's button. Clasping coneflower exhibited acceptable tolerance at the lower rate, but unacceptable at the higher rate. Gloriosa daisy tolerance was marginal at both rates; purple coneflower tolerance was marginal at the lower rate only. Overall, in

previous years' experiments, species performed much better and exhibited greater tolerance to the combination of Prowl H2O and Dual. This year appears to be somewhat of an anomaly when comparing data from the past three seasons.

Callisto (mesotrione), a corn herbicide with PRE and POST activity, was included in this trial because of observed tolerance of corn poppy. The herbicide was applied PRE in this experiment. Again, red corn poppy exhibited good tolerance with very little bloom reduction. At Reidsville, some washing occurred early in the growing season and affected injury as indicated in Table 5. However, stand recovered for the late rating and bloom production. At Butner, deer grazing reduced blooms. Ratings reflect this as indicated in Table 5. Surprisingly, rocket larkspur was noted as having acceptable to marginal tolerance to Callisto. In previous years' experiments, when Callisto was applied PRE, most plots remained completely devoid of any vegetation well into the late spring. The exception was always red corn poppy. As this is the only experiment conducted with rocket larkspur and Callisto, and after observing the effect on other wildflower species, tolerance is suggested, but not completely certain.

Spartan (sulfentrazone) is a soil-applied selective herbicide used mainly in tobacco and sunflowers. Spartan was applied PRE and evaluated at three incremental rates. Most species were severely injured at the rates tested. The exception was bachelor's button which exhibited good tolerance at all three rates. Marginal tolerance was observed with corn poppy, Gloriosa daisy, wallflower, Indian blanket and clasping coneflower at the lower rate only. Except where noted, all other rates resulted in severe injury. In a previous year's experiment, Spartan was only applied at one rate. That rate corresponded to the lowest of the three rates in this experiment. No other data exists for the higher two rates. Those species showing acceptable tolerance to Spartan at the low rate in last year's trial only showed marginal tolerance in this year's trials. The exception was bachelor's button which showed good tolerance and rocket larkspur which showed marginal tolerance for both years, respectively. California poppy and plains coreopsis both showed acceptable tolerance in a prior year's trial.

Fall-seeded wildflower tolerance of POST herbicides. Wildflower injury ratings and bloom reduction ratings are listed by species and locations in Table 7. Adequate stands of twenty species were obtained at the Lewiston research station; purple coneflower never effectively established. At Butner, mountain garland, purple coneflower, and clasping coneflower never established satisfactory and these trials were discarded. All other species at this location established with satisfactory stands. Most all species germinated later than at the other two locations. This resulted in an absence of early season ratings at Butner, as indicated in Table 7. At Reidsville, 17 of 20 species had acceptable stands; toadflax, mountain garland, and purple coneflower were the exception and were discarded. Sweet william, shasta daisy and ox-eye daisy did not bloom before the conclusion of this experiment. Therefore, there is no bloom reduction rating for these two species at any location. Results of this experiment are summarized in Table 8.

Acceptable tolerance of Transline (clopyralid) was noted with many of the 21 wildflower species (Table 8). Tolerance of dame's rocket and shasta daisy was marginal, with regards to bloom. Gloriosa daisy, bachelor's button, Indian blanket, lance-leaved coreopsis, plains coreopsis, black-eyed susan, and clasping coneflower all exhibited unacceptable tolerance of Transline.

Aim EC (carfentrazone-ethyl) is a PPO inhibitor used in corn and cotton. It is a contact-type herbicide with no residual activity. Tolerance of Aim EC was noted with several species (Table 8). Bird's eye, baby blue eyes, Gloriosa daisy exhibited marginal tolerance. Indian blanket showed good tolerance of plant growth, but marginal tolerance with regards to bloom production. Mountain garland, dame's rocket, wallflower, rocket larkspur, California poppy, and clasping coneflower were observed to have unacceptable tolerance.

Callisto was included in this experiment due to earlier observations of good tolerance of red corn poppy. Earlier experiments evaluated the use of Callisto POST on some of the 21 species planted this year, but not all. It was decided to evaluate tolerance of these new species. Red corn poppy and rocket larkspur were observed to have acceptable tolerance. Shasta daisy and black-eyed susan showed marginal tolerance. California poppy exhibited marginal plant injury, but unacceptable bloom reduction. All other species were not tolerant of Callisto and experienced severe plant injury. Although Callisto is not labeled for use on wildflowers or roadsides, it is an excellent herbicide for red corn poppy. Tolerance of rocket larkspur to Callisto was unexpected. As noted in Experiment 2 above, tolerance is suggested.

Fall-seeded wildflower tolerance to Staple LX applied PRE and POST. Staple LX (pyrithiobac-sodium), a cotton herbicide with PRE and POST activity, was included in the trials because of observed tolerance of several species in last year's trials and because of some expression of interest by the manufacturer. Injury ratings and bloom reduction ratings are listed by species and locations in Table 9. Results are summarized in Table 10. At Lewiston, purple coneflower never established sufficiently and the trial was discarded. Purple coneflower and black-eyed susan did not establish at Butner and both trials were discarded. Mountain garland only established sufficiently for the PRE-applied portion of the trial; there was no POST-applied portion or bloom reduction rating. At Reidsville, catchfly, mountain garland, and purple coneflower did not establish and the trials were discarded. All other species at each respective location established sufficiently to evaluate.

Shasta daisy, bachelor's button, and ox-eye daisy exhibited good tolerance of Staple LX applied PRE at both rates (Table 10). There was a slight reduction to acceptable tolerance when Staple LX was applied POST at either rate to the afore-mentioned species. Shasta daisy exhibited slightly less tolerance at the higher POST rate. Bloom reduction rating for shasta daisy and ox-eye daisy were conducted at only one location, each. Last year's data reflect the same trend of tolerance for shasta daisy, bachelor's button, and ox-eye daisy as this year.

Marginal tolerance was observed for lance-leaved coreopsis and black-eyed susan of Staple LX applications at the lower rate (Table 10). When Staple LX was applied PRE at the higher rate or POST, lance-leaved coreopsis was observed to have unacceptable tolerance; black-eyed susan was observed to have marginal tolerance.

When Staple LX was applied PRE at the lower rate, Indian blanket showed marginal plant injury, but unacceptable bloom reduction (Table 10). The higher PRE rate and both POST treatments caused unacceptable injury to Indian blanket.

Plains coreopsis was tolerant of Staple LX applied PRE at both rates; bloom was affected slightly at the higher PRE rate (Table 10). Staple LX applied POST exhibited marginal tolerance at the lower rate and unacceptable tolerance at the higher rate. Plains coreopsis performed well last year when treated with lesser rates of Staple LX POST (0.6 and 1.2 fl oz/A); acceptable tolerance was observed this year with both rates, respectively.

Rocket larkspur was observed to have unacceptable tolerance to Staple LX applied PRE (Table 9). Likewise, last year, rocket larkspur was not tolerant to Staple LX applied PRE (0.6 fl oz/A). This rate was slightly less than half of the lower rate applied this year. When Staple LX is applied POST, acceptable tolerance resulted at the lower rate; marginal to unacceptable tolerance at the higher rate.

California poppy exhibited acceptable tolerance last year at 0.6 fl oz/A rate of Staple LX applied POST. However, at higher rates this year, as well as last year, tolerance was unacceptable (Table 10).

Staple LX applied PRE to sweet william revealed unacceptable tolerance; however, when applied POST at a low rate (0.6 to 2.6 fl oz/A), marginal tolerance was observed (Table 10). Unacceptable tolerance was noted at a higher rate (3.8 fl oz/A). Sweet william did not bloom at any location; no bloom rating conducted.

Last year, bird's eye and Gloriosa daisy showed acceptable tolerance to Staple LX applied PRE. This year, tolerance of Staple LX was unacceptable. An explanation for the discrepancy could be a difference in rates. Last year's rate was less than half of the lower rate this year (0.6 and 1.3 fl oz/A, respectively)

All other species exhibited unacceptable tolerance to Staple LX applied PRE and POST (Table 10).

RECOMMENDATIONS AND TECHNOLOGY IMPLEMENTATION

Variability in response to herbicides appears to be the norm with wildflowers. After three seasons, data from year to year has varied considerable. An explanation for this variability seems warranted, but it is hard to ascertain, as many variables seem to play a role. Insufficient rainfall, extreme temperatures, planting depth, field erosion, damage from animals or insects, soil variability, seed quality, seeding rates, and weed competition all seem to play a part in whether wildflower plantings are a success or failure. Additionally, it has been observed that some species appear inherently difficult to establish given optimal conditions (i.e. toadflax, purple coneflower, mountain garland, clasping coneflower, dame's rocket).

However, even with variability, some trends are noticeable. A chart of herbicide recommendations (Table 11) has been developed taking into account all of the data from the past three seasons. Some recommendations for particular species have changed from previous years as new data suggest these species are more or less tolerant of certain herbicides than previously thought. It is suggested that these recommendations be utilized with caution and on a limited basis until an applicator feels secure in their use on

particular wildflower species or combinations of wildflower species. Some herbicides listed in Table 11 are not registered or labeled for use on wildflowers, roadsides, landscapes, etc. They are included, however, in the anticipation of being available in the future for use. One should always read and follow the label for any herbicide. Herbicide labels can often be incomplete in terms of species tolerance and weeds controlled. Additional work is needed to evaluate control of weeds commonly found in wildflower plantings.

It should be noted that herbicide common names have been used in this report. Trade names may differ; however, the active ingredient is the same.

For several wildflower species, herbicide options are very limited or non-existent. Several actions can be taken to maximize the effectiveness of herbicides or minimize their use. Select wildflower locations with relatively low infestations of winter annual broadleaf weeds (i.e. chickweed, henbit, wild mustard, wild radish, Virginia pepperweed, shepherd's purse). Avoid locations with high infestations of curly dock. There are almost no options for curly dock control in wildflowers. Harmony (thifensulfuron-methyl) herbicide provides very effective control of dock; however, Harmony is labeled for post-emergent applications on small grains and fallow land. Thoroughly eliminate all established weeds before planting. The use of a product containing the active ingredient glyphosate would be an ideal choice. Repeat applications, followed by tilling, will be required to control difficult weeds, such as curly dock. Treat the location in sufficient time to kill unwanted vegetation and allow the decomposition of residue before planting. Accurately calibrate any sprayer used to deliver a herbicide application. Avoid overlapping passes. When incorporating herbicides, apply the herbicide prior to seeding and incorporate as shallowly as possible. Use of a field cultivator or power-driven tiller, instead of a disk, is recommended. When using a field cultivator, two passes in opposite directions are suggested. Calibrate seed drill accurately and thoroughly clean out after planting a particular species. Control grassy weeds with post-emergence applications of Envoy (clethodim) at 17 fl oz/acre. Apply when grassy weeds are less than three inches tall. Avoid applications following an extreme cold period. After annual wildflower species bloom, do not allow weeds to produce seed. Avoid seed production by mowing the site and follow with tillage. If the site is erodible, which will probably be the case on the side of a highway, mow and allow the site to re-grow to about six inches tall. Then make an application with a glyphosate product.

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APPENDICES

Table 1. Wildflower Species Seeding Rates.

Code	Species	Scientific Name	Rate (lb/A)	Experiments
A	Toadflax	*Linaria maroccana*	1.75	1, 2, 3
B	Catchfly	*Silene armeria*	2.0	1, 2, 3
C	Corn Poppy	*Papaver rhoeas*	3.0	1, 2, 3
D	Bird's Eyes	*Gilia tricolor*	2.0	1, 2, 3
E	Mountain Garland	*Clarkia unguiculata*	2.0	1, 2, 3
F	Gloriosa Daisy	*Rudbeckia hirta*	2.0	1, 2, 3
G	Dame's Rocket	*Hesperis matronalis*	8.0	1, 2, 3
H	Sweet William	*Dianthus barbatus* 'Tall Single'	6.0	1, 2, 3
I	Baby Blue Eyes	*Nemophila insignis*	9.0	1, 2, 3
J	Wallflower	*Cheiranthus allionii*	6.0	1, 2, 3
K	Rocket Larkspur	*Delphinium ajacis*	11.0	1, 2, 3
L	Shasta Daisy	*Chrysanthemum maximum* 'Alaska'	5.0	1, 2, 3
M	Bachelor's Button	*Centaurea cyanus*	5.0	1, 2, 3
N	Indian Blanket	*Gaillardia aristata*	11.0	1, 2, 3
O	Purple Coneflower	*Echinacea purpurea*	12.0	1, 2, 3
P	Lance-leaved Coreopsis	*Coreopsis lanceolata*	15.75	2, 3
Q	Ox-eyed Daisy	*Chrysanthemum leucanthemum*	6.0	2, 3
R	California Poppy	*Eschscholzia californica*	10.0	2, 3
S	Plains Coreopsis	*Coreopsis tinctoria*	6.0	2, 3
T	Black-eyed Susan	*Rudbeckia hirta*	3.0	2, 3
U	Clasping Coneflower	*Rudbeckia amplexicaulis*	4.75	1, 2, 3

Table 2. Fall-seeded wildflower tolerance of PPI/PRE herbicides. Herbicide List. Experiment 1. 2006-2007.

	Herbicide		Application	Application rate	
Tmt no.	Active ingredient	Trade name	method[e]	product/A	lb ai/A
1	Pendimethalin	Prowl H2O[a] 3.8 L	PPI	1.0 pt	0.475
2	s-Metolachlor	Dual Magnum[b] 7.64L	PPI	1.0 pt	0.95
3	Pendimethalin + s-metolachlor	Prowl H2O + Dual Magnum	PPI	1.0 + 1.0 pt	0.475 + 0.95
4	Pendimethalin	Prowl H2O	PPI	2.0 pt	0.95
5	s-Metolachlor	Dual Magnum	PPI	2.0 pt	1.9
6	Pendimethalin + s-metolachlor	Prowl H2O + Dual Magnum	PPI	2.0 + 2.0 pt	0.95 + 1.9
7	Pendimethalin	Prowl H2O	PPI	4.0 pt	1.9
8	Mesotrione	Callisto[c]	PRE	4.0 fl oz	0.125
9	Sulfentrazone	Spartan[d] 4 F	PRE	1.5 fl oz	0.047
10	Sulfentrazone	Spartan	PRE	3.0 fl oz	0.094
11	Sulfentrazone	Spartan	PRE	5.0 fl oz	0.157

[a] Equivalent to Pendulum AquaCap, which is registered for use on wildflower plantings, roadsides, and for landscape maintenance.

[b] Equivalent to Pennant Magnum, which is registered for use on roadsides and landscape plantings.

[c] Active ingredient not registered for use on roadsides or wildflower plantings.

[d] Equivalent to Portfolio 4L, which is registered for use on roadsides and right-of-ways.

[e] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 3. Fall-seeded wildflower tolerance of POST herbicides. Herbicide List. Experiment 2. 2006-2007.

	Herbicide			Application rate	
Tmt. no.	Active ingredient	Trade name	Adjuvant	product/A	lb ai/A
1	Clopyralid	Transline 3L[a]	NIS[d]	4.0 fl oz	0.094
2	Carfentrazone	Aim 2 EC[b]	NIS	1.0 fl oz	0.016
3	Mesotrione	Callisto[c]	COC[e]	3.0 fl oz	0.094

[a] Registered for roadside and rights-of-way use.

[b] Same active ingredient as Quicksilver 1.9 EC, which is registered for use on highway rights-of-way.

[c] Active ingredient not registered for use on roadsides or wildflower plantings.

[d] Nonionic surfactant, 0.25% by volume.

[e] Crop oil concentrate, 1 pt/acre.

Table 4. Fall-seeded wildflower tolerance of Staple LX applied PRE and POST. Herbicide List. Experiment 3. 2006-2007.

	Herbicide				Application rate	
Tmt no.	Active ingredient	Trade name	Adjuvant	Application Method	product/A	lb ai/A
1	Pyrithiobac	Staple LX[a]	None	PRE	1.3 oz	0.0325
2	Pyrithiobac	Staple LX	None	PRE	2.1 oz	0.0525
3	Pyrithiobac	Staple LX	NIS[b]	POST	2.6 oz	0.065
4	Pyrithiobac	Staple LX	NIS	POST	3.8 oz	0.095

[a] Active ingredient not registered for use on roadsides or wildflower plantings.

[b] Nonionic surfactant, 0.25% by volume.

Table 5. Fall-seeded wildflower tolerance of PPI/PRE herbicides. Experiment 1, 2006-2007.

Species = Toadflax

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville[f]			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[g]	Mid[h]	Late[h]
Prowl H2O	1.0 pt	PPI	87	89	72		20	23				87	55	48
Dual Magnum	1.0 pt	PPI	95	93	86		79	58				95	86	72
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	98	96	94		91	64				98	94	79
Prowl H2O	2.0 pt	PPI	81	71	25		58	33				81	65	29
Dual Magnum	2.0 pt	PPI	97	97	96		98	96				97	98	96
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	100	97	96		98	93				100	98	95
Prowl H2O	4.0 pt	PPI	97	94	86		84	51				97	89	69
Callisto	4.0 fl oz	PRE	100	100	100		100	100				100	100	100
Spartan	1.5 fl oz	PRE	100	100	100		100	100				100	100	100
Spartan	3.0 fl oz	PRE	100	100	100		100	100				100	100	100
Spartan	5.0 fl oz	PRE	100	100	100		100	100				100	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.
[b] All Early ratings made in late January.
[c] All Mid ratings made in early March.
[d] All Late ratings made in late April.
[e] No early rating - stand not established.
[f] Species did not establish - trial discarded at this location.
[g] One location evaluated.
[h] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville[b]	Average
Prowl H2O	1.0 pt	PPI	57	31		44
Dual Magnum	1.0 pt	PPI	86	65		76
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	93	68		81
Prowl H2O	2.0 pt	PPI	14	38		26
Dual Magnum	2.0 pt	PPI	90	97		94
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	97	96		97
Prowl H2O	4.0 pt	PPI	81	54		68
Callisto	4.0 fl oz	PRE	100	100		100
Spartan	1.5 fl oz	PRE	100	100		100
Spartan	3.0 fl oz	PRE	100	100		100
Spartan	5.0 fl oz	PRE	100	100		100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.
[b] Species did not establish - trial discarded at this location.

Table 5. Continued.

Species = Catchfly

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	100	100	99		95	96	100	100	100	100	98	98
Dual Magnum	1.0 pt	PPI	80	69	66		39	22	98	100	95	89	69	61
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	100	100	99		96	97	100	100	100	100	99	99
Prowl H2O	2.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Dual Magnum	2.0 pt	PPI	89	58	80		71	60	100	100	100	95	76	80
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Prowl H2O	4.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Callisto	4.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100
Spartan	1.5 fl oz	PRE	100	100	99		100	100	100	100	100	100	100	100
Spartan	3.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100
Spartan	5.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early rating - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville[b]	Average
Prowl H2O	1.0 pt	PPI	99	90		95
Dual Magnum	1.0 pt	PPI	100	11		56
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	59	90		75
Prowl H2O	2.0 pt	PPI	100	100		100
Dual Magnum	2.0 pt	PPI	58	45		52
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	100	100		100
Prowl H2O	4.0 pt	PPI	100	100		100
Callisto	4.0 fl oz	PRE	100	100		100
Spartan	1.5 fl oz	PRE	95	100		98
Spartan	3.0 fl oz	PRE	100	100		100
Spartan	5.0 fl oz	PRE	100	100		100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species never bloomed at this location.

Table 5. Continued.

Species = Corn Poppy

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	91	89	91		77	63	94	95	88	93	87	81
Dual Magnum	1.0 pt	PPI	78	85	63		41	15	82	92	60	80	73	46
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	97	96	96		92	90	100	100	100	99	96	95
Prowl H2O	2.0 pt	PPI	95	95	93		93	92	99	99	98	97	96	94
Dual Magnum	2.0 pt	PPI	83	88	62		75	52	98	98	97	91	87	70
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	99	98	93		99	99	100	100	100	100	99	97
Prowl H2O	4.0 pt	PPI	100	99	99		100	100	100	100	100	100	100	100
Callisto	4.0 fl oz	PRE	8	3	0		16	16	60	53	16	34	24	11
Spartan	1.5 fl oz	PRE	64	52	3		46	35	99	98	98	82	65	45
Spartan	3.0 fl oz	PRE	90	77	34		75	48	100	100	99	95	84	60
Spartan	5.0 fl oz	PRE	98	97	92		94	93	100	100	100	99	97	95

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early rating - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	94	90	95	93
Dual Magnum	1.0 pt	PPI	63	85	90	79
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	98	95	100	98
Prowl H2O	2.0 pt	PPI	88	95	100	94
Dual Magnum	2.0 pt	PPI	72	95	100	89
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	95	100	100	98
Prowl H2O	4.0 pt	PPI	100	100	100	100
Callisto	4.0 fl oz	PRE	3	68	28	33
Spartan	1.5 fl oz	PRE	0	100	98	66
Spartan	3.0 fl oz	PRE	22	100	100	74
Spartan	5.0 fl oz	PRE	80	100	100	93

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Bird's Eye

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	94	100	98		83	83	92	98	99	93	94	93
Dual Magnum	1.0 pt	PPI	100	100	100		99	97	100	100	100	100	100	99
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	100	100	100		99	99	100	100	100	100	100	100
Prowl H2O	2.0 pt	PPI	99	100	100		100	100	99	100	100	99	100	100
Dual Magnum	2.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Prowl H2O	4.0 pt	PPI	100	100	100		100	100	100	100	100	100	100	100
Callisto	4.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100
Spartan	1.5 fl oz	PRE	99	98	95		88	63	100	100	100	100	95	86
Spartan	3.0 fl oz	PRE	100	100	99		98	97	100	100	100	100	99	99
Spartan	5.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early rating - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	95	70	99	88
Dual Magnum	1.0 pt	PPI	100	98	100	99
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	100	99	100	100
Prowl H2O	2.0 pt	PPI	100	100	100	100
Dual Magnum	2.0 pt	PPI	100	100	100	100
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	100	100	100	100
Prowl H2O	4.0 pt	PPI	100	100	100	100
Callisto	4.0 fl oz	PRE	100	100	100	100
Spartan	1.5 fl oz	PRE	88	50	100	79
Spartan	3.0 fl oz	PRE	97	93	100	97
Spartan	5.0 fl oz	PRE	100	99	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Mountain Garland

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville[f]			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[g]	Mid[h]	Late[h]
Prowl H2O	1.0 pt	PPI	16	39	45		13	10				16	26	28
Dual Magnum	1.0 pt	PPI	89	97	97		66	45				89	82	71
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	90	96	97		62	54				90	79	76
Prowl H2O	2.0 pt	PPI	6	5	13		62	60				6	34	37
Dual Magnum	2.0 pt	PPI	94	99	99		95	98				94	97	99
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	93	99	99		95	98				93	97	99
Prowl H2O	4.0 pt	PPI	10	14	9		55	47				10	35	28
Callisto	4.0 fl oz	PRE	100	100	100		100	94				100	100	97
Spartan	1.5 fl oz	PRE	98	100	99		100	100				98	100	100
Spartan	3.0 fl oz	PRE	100	100	100		100	100				100	100	100
Spartan	5.0 fl oz	PRE	100	100	100		100	100				100	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] Species did not establish - trial discarded at this location.

[g] One location evaluated.

[h] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner[b]	Reidsville[c]	Average
Prowl H2O	1.0 pt	PPI	53			53
Dual Magnum	1.0 pt	PPI	100			100
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	98			98
Prowl H2O	2.0 pt	PPI	0			0
Dual Magnum	2.0 pt	PPI	99			99
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	99			99
Prowl H2O	4.0 pt	PPI	0			0
Callisto	4.0 fl oz	PRE	100			100
Spartan	1.5 fl oz	PRE	100			100
Spartan	3.0 fl oz	PRE	100			100
Spartan	5.0 fl oz	PRE	100			100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species never bloomed at this location.

[c] Species did not establish - trial discarded at this location.

Table 5. Continued.

Species = Gloriosa Daisy

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
Prowl H2O	1.0 pt	PPI	25	28	34	19	16	25	80	16	13	41	20	24
Dual Magnum	1.0 pt	PPI	70	51	24	35	25	20	100	97	54	68	58	33
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	90	63	54	53	37	38	99	68	20	81	56	37
Prowl H2O	2.0 pt	PPI	14	8	0	10	11	10	79	28	8	34	16	6
Dual Magnum	2.0 pt	PPI	80	60	22	97	89	89	100	93	79	92	81	63
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	69	52	19	91	63	60	100	99	90	87	71	56
Prowl H2O	4.0 pt	PPI	23	14	10	39	15	18	53	40	6	38	23	11
Callisto	4.0 fl oz	PRE	100	100	100	100	100	100	100	100	50	100	100	83
Spartan	1.5 fl oz	PRE	41	33	15	77	61	54	90	58	48	69	51	39
Spartan	3.0 fl oz	PRE	71	75	28	99	90	96	97	69	58	89	78	61
Spartan	5.0 fl oz	PRE	98	94	60	100	96	95	99	93	75	99	94	77

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in early March.

[c] All Mid ratings made in late April.

[d] All Late ratings made in early June.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	40	37	27	35
Dual Magnum	1.0 pt	PPI	38	42	98	59
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	52	50	36	46
Prowl H2O	2.0 pt	PPI	30	11	25	22
Dual Magnum	2.0 pt	PPI	36	88	91	72
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	28	60	95	61
Prowl H2O	4.0 pt	PPI	27	19	18	21
Callisto	4.0 fl oz	PRE	100	100	100	100
Spartan	1.5 fl oz	PRE	19	56	57	44
Spartan	3.0 fl oz	PRE	34	87	62	61
Spartan	5.0 fl oz	PRE	56	92	69	72

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Dame's Rocket

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	28	41	56		56	19	30	66	41	29	54	39
Dual Magnum	1.0 pt	PPI	40	65	50		89	64	89	99	94	65	84	69
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	57	73	72		84	53	76	92	83	67	83	69
Prowl H2O	2.0 pt	PPI	0	5	7		87	59	46	55	53	23	49	40
Dual Magnum	2.0 pt	PPI	42	58	55		100	99	95	99	96	69	86	83
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	29	36	32		100	100	97	100	96	63	79	76
Prowl H2O	4.0 pt	PPI	0	3	5		96	90	5	36	29	3	45	41
Callisto	4.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100
Spartan	1.5 fl oz	PRE	18	24	19		99	96	46	71	43	32	65	53
Spartan	3.0 fl oz	PRE	30	28	27		100	98	62	83	82	46	70	69
Spartan	5.0 fl oz	PRE	38	36	28		100	100	99	99	93	69	78	74

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early rating - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	90	50	57	66
Dual Magnum	1.0 pt	PPI	99	75	100	91
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	100	70	97	89
Prowl H2O	2.0 pt	PPI	21	65	50	45
Dual Magnum	2.0 pt	PPI	90	100	100	97
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	85	100	100	95
Prowl H2O	4.0 pt	PPI	15	100	48	54
Callisto	4.0 fl oz	PRE	100	100	100	100
Spartan	1.5 fl oz	PRE	39	100	55	65
Spartan	3.0 fl oz	PRE	73	100	61	78
Spartan	5.0 fl oz	PRE	65	100	100	88

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Sweet William

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early[e]	Mid	Late	Early[e]	Mid	Late
Prowl H2O	1.0 pt	PPI	43	61	99		99	93		100	100	43	87	97
Dual Magnum	1.0 pt	PPI	28	35	46		68	61		100	100	28	68	69
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	73	93	100		80	78		100	100	73	91	93
Prowl H2O	2.0 pt	PPI	62	52	97		91	93		95	100	62	79	97
Dual Magnum	2.0 pt	PPI	23	38	38		99	90		100	100	23	79	76
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	76	98	99		100	100		100	100	76	99	100
Prowl H2O	4.0 pt	PPI	68	62	100		100	100		100	100	68	87	100
Callisto	4.0 fl oz	PRE	99	100	100		100	99		100	100	99	100	100
Spartan	1.5 fl oz	PRE	31	60	48		96	75		100	99	31	85	74
Spartan	3.0 fl oz	PRE	57	76	71		100	97		100	99	57	92	89
Spartan	5.0 fl oz	PRE	74	99	96		100	100		80	99	74	93	98

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] One location evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction[b]			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI				
Dual Magnum	1.0 pt	PPI				
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI				
Prowl H2O	2.0 pt	PPI				
Dual Magnum	2.0 pt	PPI				
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI				
Prowl H2O	4.0 pt	PPI				
Callisto	4.0 fl oz	PRE				
Spartan	1.5 fl oz	PRE				
Spartan	3.0 fl oz	PRE				
Spartan	5.0 fl oz	PRE				

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species never bloomed.

Table 5. Continued.

Species = Baby Blue Eyes

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	26	10	25		6	15	38	54	30	32	23	23
Dual Magnum	1.0 pt	PPI	76	88	88		47	18	98	99	98	87	78	68
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	87	95	96		54	12	97	100	98	92	83	69
Prowl H2O	2.0 pt	PPI	6	5	0		22	5	13	12	11	10	13	5
Dual Magnum	2.0 pt	PPI	95	97	95		97	98	99	100	100	97	98	98
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	87	91	93		98	100	97	100	99	92	96	97
Prowl H2O	4.0 pt	PPI	28	15	5		32	28	35	46	11	32	31	15
Callisto	4.0 fl oz	PRE	97	96	95		100	99	100	98	98	99	98	97
Spartan	1.5 fl oz	PRE	46	45	9		92	98	76	82	58	61	73	55
Spartan	3.0 fl oz	PRE	81	74	44		97	99	96	98	94	89	90	79
Spartan	5.0 fl oz	PRE	96	92	91		100	100	100	100	99	98	97	97

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	43	20	52	38
Dual Magnum	1.0 pt	PPI	88	22	96	69
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	96	20	98	71
Prowl H2O	2.0 pt	PPI	3	10	22	12
Dual Magnum	2.0 pt	PPI	97	98	100	98
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	95	100	100	98
Prowl H2O	4.0 pt	PPI	8	40	29	26
Callisto	4.0 fl oz	PRE	90	98	98	95
Spartan	1.5 fl oz	PRE	12	97	65	58
Spartan	3.0 fl oz	PRE	53	98	95	82
Spartan	5.0 fl oz	PRE	85	100	99	95

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Wallflower

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	17	21	24		4	0	28	50	36	23	25	20
Dual Magnum	1.0 pt	PPI	25	30	40		72	36	80	98	95	53	67	57
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	45	41	70		73	37	76	88	88	61	67	65
Prowl H2O	2.0 pt	PPI	6	8	5		38	27	8	29	13	7	25	15
Dual Magnum	2.0 pt	PPI	41	47	53		96	86	90	99	93	66	81	77
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	44	47	51		95	86	87	100	97	66	81	78
Prowl H2O	4.0 pt	PPI	5	16	14		51	35	15	47	28	10	38	26
Callisto	4.0 fl oz	PRE	99	100	100		100	100	100	100	100	100	100	100
Spartan	1.5 fl oz	PRE	46	53	27		84	64	43	53	43	45	63	45
Spartan	3.0 fl oz	PRE	79	87	74		97	93	75	74	78	77	86	82
Spartan	5.0 fl oz	PRE	98	99	94		100	100	99	98	98	99	99	97

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	27	5	24	19
Dual Magnum	1.0 pt	PPI	38	18	94	50
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	58	25	82	55
Prowl H2O	2.0 pt	PPI	8	24	11	14
Dual Magnum	2.0 pt	PPI	39	74	93	69
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	39	90	97	75
Prowl H2O	4.0 pt	PPI	15	25	20	20
Callisto	4.0 fl oz	PRE	100	100	100	100
Spartan	1.5 fl oz	PRE	39	64	44	49
Spartan	3.0 fl oz	PRE	73	90	74	79
Spartan	5.0 fl oz	PRE	95	100	99	98

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Rocket Larkspur

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	30	31	36		10	46	22	63	46	26	35	43
Dual Magnum	1.0 pt	PPI	68	72	72		94	83	95	100	98	82	89	84
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	48	50	51		96	89	91	100	99	70	82	80
Prowl H2O	2.0 pt	PPI	20	5	8		62	56	22	26	30	21	31	31
Dual Magnum	2.0 pt	PPI	62	69	67		97	90	97	100	98	80	89	85
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	57	70	61		98	93	98	99	96	78	89	83
Prowl H2O	4.0 pt	PPI	14	10	15		39	40	23	48	43	19	32	33
Callisto	4.0 fl oz	PRE	8	27	32		84	74	48	73	68	28	61	58
Spartan	1.5 fl oz	PRE	64	52	46		94	94	15	23	32	40	56	57
Spartan	3.0 fl oz	PRE	92	88	78		99	99	56	70	61	74	86	79
Spartan	5.0 fl oz	PRE	98	99	96		100	100	67	86	74	83	95	90

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	37	18	33	29
Dual Magnum	1.0 pt	PPI	57	65	100	74
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	89	91	100	93
Prowl H2O	2.0 pt	PPI	10	55	23	29
Dual Magnum	2.0 pt	PPI	69	94	100	88
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	74	96	100	90
Prowl H2O	4.0 pt	PPI	10	38	45	31
Callisto	4.0 fl oz	PRE	12	48	70	43
Spartan	1.5 fl oz	PRE	27	95	32	51
Spartan	3.0 fl oz	PRE	75	98	61	78
Spartan	5.0 fl oz	PRE	93	99	88	93

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Shasta Daisy

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
Prowl H2O	1.0 pt	PPI	20	23	12	48	38	25	69	31	69	46	31	35
Dual Magnum	1.0 pt	PPI	27	26	8	22	24	18	90	73	90	46	41	39
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	38	41	13	23	23	10	74	74	74	45	46	32
Prowl H2O	2.0 pt	PPI	5	11	0	7	7	3	47	26	47	20	15	17
Dual Magnum	2.0 pt	PPI	44	43	17	66	73	63	68	38	68	59	51	49
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	36	39	10	55	65	49	58	59	58	50	54	39
Prowl H2O	4.0 pt	PPI	10	15	0	25	50	36	36	21	36	24	29	24
Callisto	4.0 fl oz	PRE	100	100	100	100	100	99	98	96	98	99	99	99
Spartan	1.5 fl oz	PRE	100	98	88	100	99	97	62	75	62	87	91	82
Spartan	3.0 fl oz	PRE	100	100	99	100	100	100	99	99	99	100	100	99
Spartan	5.0 fl oz	PRE	100	100	99	100	100	100	100	100	100	100	100	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in early March.

[c] All Mid ratings made in late April.

[d] All Late ratings made in early June.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction[b]			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI				
Dual Magnum	1.0 pt	PPI				
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI				
Prowl H2O	2.0 pt	PPI				
Dual Magnum	2.0 pt	PPI				
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI				
Prowl H2O	4.0 pt	PPI				
Callisto	4.0 fl oz	PRE				
Spartan	1.5 fl oz	PRE				
Spartan	3.0 fl oz	PRE				
Spartan	5.0 fl oz	PRE				

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species never bloomed.

Table 5. Continued.

Species = Bachelor's Button

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early[f]	Mid	Late
Prowl H2O	1.0 pt	PPI	8	11	18		0	0	10	12	16	9	8	11
Dual Magnum	1.0 pt	PPI	30	34	24		9	0	48	49	44	39	31	23
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	37	38	35		15	3	34	42	34	36	32	24
Prowl H2O	2.0 pt	PPI	13	8	12		5	0	15	20	23	14	11	12
Dual Magnum	2.0 pt	PPI	41	39	34		35	15	58	60	54	50	45	34
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	34	34	30		40	15	61	64	47	48	46	31
Prowl H2O	4.0 pt	PPI	5	5	11		10	5	10	12	14	8	9	10
Callisto	4.0 fl oz	PRE	100	100	100		100	100	100	100	100	100	100	100
Spartan	1.5 fl oz	PRE	8	5	5		68	41	0	0	10	4	24	19
Spartan	3.0 fl oz	PRE	15	12	7		30	20	18	5	8	17	16	12
Spartan	5.0 fl oz	PRE	21	14	12		35	17	26	24	23	24	24	17

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in late January.

[c] All Mid ratings made in early March.

[d] All Late ratings made in late April.

[e] No early ratings - stand not established.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	18	0	16	11
Dual Magnum	1.0 pt	PPI	26	8	53	29
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	28	18	43	30
Prowl H2O	2.0 pt	PPI	10	6	24	13
Dual Magnum	2.0 pt	PPI	35	38	65	46
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	32	43	68	48
Prowl H2O	4.0 pt	PPI	12	18	6	12
Callisto	4.0 fl oz	PRE	100	100	100	100
Spartan	1.5 fl oz	PRE	7	60	13	27
Spartan	3.0 fl oz	PRE	0	29	8	12
Spartan	5.0 fl oz	PRE	10	30	18	19

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Indian Blanket

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Early[b]	Mid[c]	Late[d]	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
Prowl H2O	1.0 pt	PPI	43	28	43	60	43	52	99	61	53	67	44	49
Dual Magnum	1.0 pt	PPI	64	46	54	59	51	41	99	60	75	74	52	57
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	61	46	57	54	42	46	100	76	74	72	55	59
Prowl H2O	2.0 pt	PPI	15	17	17	22	24	24	96	60	64	44	34	35
Dual Magnum	2.0 pt	PPI	68	63	45	94	70	78	98	74	82	87	69	68
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	65	62	39	91	67	68	90	73	73	82	67	60
Prowl H2O	4.0 pt	PPI	24	16	22	32	28	35	35	28	15	30	24	24
Callisto	4.0 fl oz	PRE	100	100	100	100	100	100	100	100	98	100	100	99
Spartan	1.5 fl oz	PRE	40	38	27	63	48	57	37	14	13	47	33	32
Spartan	3.0 fl oz	PRE	88	84	81	98	83	71	85	62	64	90	76	72
Spartan	5.0 fl oz	PRE	100	97	91	100	99	98	92	61	64	97	86	84

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in early March.

[c] All Mid ratings made in mid-April.

[d] All Late ratings made in early June.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Prowl H2O	1.0 pt	PPI	59	60	96	72
Dual Magnum	1.0 pt	PPI	98	63	99	87
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	97	60	96	84
Prowl H2O	2.0 pt	PPI	6	10	85	34
Dual Magnum	2.0 pt	PPI	97	99	95	97
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	92	93	96	94
Prowl H2O	4.0 pt	PPI	10	90	18	39
Callisto	4.0 fl oz	PRE	100	100	99	100
Spartan	1.5 fl oz	PRE	64	80	13	52
Spartan	3.0 fl oz	PRE	98	100	73	90
Spartan	5.0 fl oz	PRE	100	100	70	90

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

Table 5. Continued.

Species = Purple Coneflower

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston[g]			Butner			Reidsville[g]			Average		
			Early[b]	Mid[c]	Late[d]	Early[e]	Mid	Late	Early	Mid	Late	Early	Mid[f]	Late[f]
Prowl H2O	1.0 pt	PPI					49	50					49	50
Dual Magnum	1.0 pt	PPI					64	64					64	64
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI					51	54					51	54
Prowl H2O	2.0 pt	PPI					18	9					18	9
Dual Magnum	2.0 pt	PPI					92	98					92	98
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI					74	80					74	80
Prowl H2O	4.0 pt	PPI					21	23					21	23
Callisto	4.0 fl oz	PRE					94	100					94	100
Spartan	1.5 fl oz	PRE					77	64					77	64
Spartan	3.0 fl oz	PRE					100	73					100	73
Spartan	5.0 fl oz	PRE					100	99					100	99

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in early March.

[c] All Mid ratings made in late April.

[d] All Late ratings made in early June.

[e] No early ratings - stand not established.

[f] One location evaluated.

[g] Species did not establish at these locations.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston[b]	Butner	Reidsville[b]	Average
Prowl H2O	1.0 pt	PPI		50		50
Dual Magnum	1.0 pt	PPI		68		68
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI		80		80
Prowl H2O	2.0 pt	PPI		8		8
Dual Magnum	2.0 pt	PPI		99		99
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI		98		98
Prowl H2O	4.0 pt	PPI		30		30
Callisto	4.0 fl oz	PRE		100		100
Spartan	1.5 fl oz	PRE		65		65
Spartan	3.0 fl oz	PRE		90		90
Spartan	5.0 fl oz	PRE		100		100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species did not establish - no bloom rating.

Table 5. Continued.

Species = Clasping Coneflower

Herbicide	Rate/acre	Application method[a]	% Injury											
			Lewiston			Butner			Reidsville[e]			Average		
			Early[b]	Mid[c]	Late[d]	Early	Mid	Late	Early	Mid	Late	Early[f]	Mid[f]	Late[f]
Prowl H2O	1.0 pt	PPI	27	19	16	50	50	50				39	35	33
Dual Magnum	1.0 pt	PPI	34	37	24	99	83	68				67	60	46
Prowl H2O + Dual Magnum	1.0 pt +	PPI	32	21	12	100	88	62				66	55	37
Prowl H2O	2.0 pt	PPI	18	21	21	60	41	32				39	31	27
Dual Magnum	2.0 pt	PPI	41	38	38	100	99	99				71	69	69
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	44	36	30	100	87	92				72	62	61
Prowl H2O	4.0 pt	PPI	3	15	14	95	33	21				49	24	18
Callisto	4.0 fl oz	PRE	100	100	100	100	100	99				100	100	100
Spartan	1.5 fl oz	PRE	61	56	48	99	50	50				80	53	49
Spartan	3.0 fl oz	PRE	96	92	93	100	69	56				98	81	75
Spartan	5.0 fl oz	PRE	100	98	99	100	100	100				100	99	100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] All Early ratings made in early March.

[c] All Mid ratings made in late April.

[d] All Late ratings made in early June.

[e] Species was not planted at this location.

[f] Two locations evaluated.

Herbicide	Rate/acre	Application method[a]	% Bloom Reduction			
			Lewiston	Butner	Reidsville[b]	Average
Prowl H2O	1.0 pt	PPI	13	50		32
Dual Magnum	1.0 pt	PPI	17	80		49
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	9	85		47
Prowl H2O	2.0 pt	PPI	17	48		33
Dual Magnum	2.0 pt	PPI	34	99		67
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	29	100		65
Prowl H2O	4.0 pt	PPI	16	24		20
Callisto	4.0 fl oz	PRE	100	100		100
Spartan	1.5 fl oz	PRE	53	50		52
Spartan	3.0 fl oz	PRE	97	50		74
Spartan	5.0 fl oz	PRE	99	100		100

[a] PPI = preplant incorporated, using field cultivator; PRE = preemergence immediately after planting.

[b] Species was not planted at this location - no bloom rating.

Table 6. Fall-seeded wildflower tolerance of PPI/PRE herbicides. Summary by Species. Experiment 1, 2006-2007.[a]

Herbicide	Rate/acre	Application method	Toadflax 2 loc.	Catchfly 3 loc.	Corn Poppy 3 loc.	Bird's Eye 3 loc.	Mountain Garland 2 loc.[b]	Gloriosa Daisy 3 loc.	Dame's Rocket 3 loc.	Sweet William 3 loc.[c]	Baby Blue Eyes 3 loc.	Wall-flower 3 loc.	Rocket Larkspur 3 loc.	Shasta Daisy 3 loc.[c]	Bachelor's Button 3 loc.	Indian Blanket 3 loc.	Purple Cone-flower 1 loc.	Clasping Cone-flower 2 loc.
Prowl H2O	1.0 pt	PPI	A	U	U	U	A	G	M	U	G	G	A	G	G	A	G	A
Dual Magnum	1.0 pt	PPI	U	M	M	U	U	A	U	U	U	U	U	A	A	M	U	M
Prowl H2O + Dual Magnum	1.0 pt + 1.0 pt	PPI	U	U	U	U	U	M	U	U	U	U	U	A	A	U	M	A
Prowl H2O	2.0 pt	PPI	A	U	U	U	A	G	M	U	G	G	A	G	G	A	G	A
Dual Magnum	2.0 pt	PPI	U	M	U	U	U	M/U	U	U	U	U	U	A	A	U	U	U
Prowl H2O + Dual Magnum	2.0 pt + 2.0 pt	PPI	U	U	U	U	U	M	U	U	U	U	U	A	A	U	U	U
Prowl H2O	4.0 pt	PPI	U	U	U	U	A	G	M	U	G	G	A	G	G	M	G	A
Callisto	4.0 fl oz	PRE	U	U	G	U	U	U	U	U	U	U	M	U	U	U	U	U
Spartan	1.5 fl oz	PRE	U	U	M	U	U	M	M	U	U	M	M	U	G	M	U	M
Spartan	3.0 fl oz	PRE	U	U	M	U	U	U	U	U	U	U	U	U	G	U	U	U
Spartan	5.0 fl oz	PRE	U	U	U	U	U	U	U	U	U	U	U	U	G	U	U	U

[a] G = good tolerance; A = acceptable tolerance; M = marginal tolerance, product should be used only in salvage situations; U = unacceptable tolerance.
[b] Bloom reduction rating conducted at one location only.
[c] No bloom reduction rating conducted at any location.

Table 7. Fall-seeded wildflower tolerance of POST herbicides. Experiment 2, 2006-2007.

Species = Toadflax

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville[f]		Average	
			2-WAT[c]	4-WAT[d]	2-WAT[e]	4-WAT	2-WAT	4-WAT	2-WAT	4-WAT
Transline	4.0 fl oz	POST[a]	13	0		16			13	8
Aim EC	1.0 fl oz	POST[a]	57	13		13			57	13
Callisto	3.0 fl oz	POST[b]	45	45		62			45	54

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville[f]	Average
Transline	4.0 fl oz	POST[a]	3	8		6
Aim EC	1.0 fl oz	POST[a]	0	10		5
Callisto	3.0 fl oz	POST[b]	59	100		80

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Four weeks after POST treatment.
[e] Poor stand at 2 week rating.
[f] Species did not establish at this location - trial discarded.

Species = Catchfly

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	5-WAT[d]	3-WAT	5-WAT[e]	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]	34	32	5		33	33	24	33
Aim EC	1.0 fl oz	POST[a]	34	8	66		43	32	48	20
Callisto	3.0 fl oz	POST[b]	48	59	89		62	76	66	68

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	32	5	33	23
Aim EC	1.0 fl oz	POST[a]	12	85	38	45
Callisto	3.0 fl oz	POST[b]	95	99	65	86

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.
[e] Species reached peak bloom before 5-week rating.

Table 7. Continued.

Species = Corn Poppy

Herbicide	Rate/acre	Application method	% Injury								
			Lewiston			Butner			Reidsville		
			3-WAT[c]	5-WAT[d]	7-WAT	3-WAT[e]	5-WAT	7-WAT	3-WAT	5-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	13	3	12		25	0	11	7	8
Aim EC	1.0 fl oz	POST[a]	33	7	8		66	10	18	30	29
Callisto	3.0 fl oz	POST[b]	4	2	0		26	4	8	19	17

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	22	46	22	30
Aim EC	1.0 fl oz	POST[a]	7	52	28	29
Callisto	3.0 fl oz	POST[b]	0	3	22	8

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.
[e] Injury not visible - rate in 2 weeks.

Species = Bird's Eye

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			5-WAT[c]	7-WAT[d]	5-WAT	7-WAT	5-WAT	7-WAT	5-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	20	12	0	0	3	13	8	8
Aim EC	1.0 fl oz	POST[a]	23	14	49	38	83	58	52	37
Callisto	3.0 fl oz	POST[b]	98	97	100	100	98	100	99	99

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	9	0	16	8
Aim EC	1.0 fl oz	POST[a]	21	64	74	53
Callisto	3.0 fl oz	POST[b]	99	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Five weeks after POST treatment.
[d] Seven weeks after POST treatment.

Table 7. Continued.

Species = Mountain Garland

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner[e]		Reidsville[e]		Average	
			2-WAT[c]	4-WAT[d]	2-WAT	4-WAT	2-WAT	4-WAT	2-WAT	4-WAT
Transline	4.0 fl oz	POST[a]	23	23					23	23
Aim EC	1.0 fl oz	POST[a]	82	71					82	71
Callisto	3.0 fl oz	POST[b]	86	98					86	98

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner[e]	Reidsville[e]	Average
Transline	4.0 fl oz	POST[a]	36			36
Aim EC	1.0 fl oz	POST[a]	95			95
Callisto	3.0 fl oz	POST[b]	100			100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Four weeks after POST treatment.
[e] Species did not establish at this location - trial discarded.

Species = Gloriosa Daisy

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	5-WAT[d]	3-WAT	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]	64	100	85	94	89	99	79	98
Aim EC	1.0 fl oz	POST[a]	71	17	49	34	68	65	63	39
Callisto	3.0 fl oz	POST[b]	55	72	90	75	50	92	65	80

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	100	100	100	100
Aim EC	1.0 fl oz	POST[a]	23	49	7	26
Callisto	3.0 fl oz	POST[b]	68	91	46	68

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.

Table 7. Continued.

Species = Dame's Rocket

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			2-WAT[c]	4-WAT[d]	2-WAT	4-WAT	2-WAT	4-WAT	2-WAT	4-WAT
Transline	4.0 fl oz	POST[a]	13	0	15	21	0	19	9	13
Aim EC	1.0 fl oz	POST[a]	47	39	74	32	67	63	63	45
Callisto	3.0 fl oz	POST[b]	36	67	100	100	80	73	72	80

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	17	92	10	40
Aim EC	1.0 fl oz	POST[a]	32	100	97	76
Callisto	3.0 fl oz	POST[b]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Four weeks after POST treatment.

Species = Sweet William

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c,d]	5-WAT[e]	3-WAT	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]		0	3	28	0	7	2	12
Aim EC	1.0 fl oz	POST[a]		40	7	33	16	16	12	30
Callisto	3.0 fl oz	POST[b]		42	60	89	52	68	56	66

Herbicide	Rate/acre	Application method	% Bloom Reduction[f]			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]				
Aim EC	1.0 fl oz	POST[a]				
Callisto	3.0 fl oz	POST[b]				

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Was going to discard, but decided to keep trial at 5 week rating.
[e] Five weeks after POST treatment.
[f] Species did not bloom - no bloom ratings.

Table 7. Continued.

Species = Baby Blue Eyes

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	5-WAT[d]	3-WAT[e]	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]	13	3		17	3	8	8	9
Aim EC	1.0 fl oz	POST[a]	31	14		65	80	73	56	51
Callisto	3.0 fl oz	POST[b]	90	99		99	96	98	93	99

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	18	28	22	23
Aim EC	1.0 fl oz	POST[a]	0	80	86	55
Callisto	3.0 fl oz	POST[b]	99	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.
[e] Started rating at 5 weeks.

Species = Wallflower

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			5-WAT[c]	7-WAT[d]	5-WAT	7-WAT	5-WAT	7-WAT	5-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	9	3	7	5	13	3	10	4
Aim EC	1.0 fl oz	POST[a]	81	34	88	62	74	53	81	50
Callisto	3.0 fl oz	POST[b]	60	96	100	100	100	100	87	99

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	17	3	0	7
Aim EC	1.0 fl oz	POST[a]	92	95	90	92
Callisto	3.0 fl oz	POST[b]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Five weeks after POST treatment.
[d] Seven weeks after POST treatment.

Table 7. Continued.

Species = Rocket Larkspur

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			2-WAT[c]	4-WAT[d]	7-WAT[e]	2-WAT[f]	4-WAT	7-WAT	2-WAT	4-WAT	7-WAT	2-WAT	4-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	18	8	16		0	27	8	17	7	13	8	17
Aim EC	1.0 fl oz	POST[a]	74	52	52		67	73	88	88	89	81	69	71
Callisto	3.0 fl oz	POST[b]	10	7	7		25	44	38	47	39	24	26	30

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	18	7	7	11
Aim EC	1.0 fl oz	POST[a]	34	76	67	59
Callisto	3.0 fl oz	POST[b]	14	23	28	22

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Four weeks after POST treatment.
[e] Seven weeks after POST treatment.
[f] Started rating at 4 weeks.

Species = Shasta Daisy

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	6-WAT[d]	3-WAT	6-WAT	3-WAT	6-WAT	3-WAT	6-WAT
Transline	4.0 fl oz	POST[a]	20	34	23	33	30	24	24	30
Aim EC	1.0 fl oz	POST[a]	24	3	9	10	33	29	22	14
Callisto	3.0 fl oz	POST[b]	33	27	78	86	42	55	51	56

Herbicide	Rate/acre	Application method	% Bloom Reduction[e]			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]				
Aim EC	1.0 fl oz	POST[a]				
Callisto	3.0 fl oz	POST[b]				

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Six weeks after POST treatment.
[e] Species did not bloom - no bloom ratings.

Table 7. Continued.

Species = Bachelor's Button

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			3-WAT[c]	5-WAT[d]	7-WAT[e]	3-WAT[f]	5-WAT	7-WAT	3-WAT	5-WAT	7-WAT	3-WAT	5-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	84	100	100		100	100	87	100	100	86	100	100
Aim EC	1.0 fl oz	POST[a]	13	11	6		22	13	8	9	3	11	14	7
Callisto	3.0 fl oz	POST[b]	60	50	38		81	78	63	70	74	62	67	63

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	100	100	100	100
Aim EC	1.0 fl oz	POST[a]	16	3	4	8
Callisto	3.0 fl oz	POST[b]	37	98	92	76

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.
[e] Seven weeks after POST treatment.
[f] Started rating at 5 weeks.

Species = Indian Blanket

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	5-WAT[d]	3-WAT	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]	18	51	88	95	28	64	56	70
Aim EC	1.0 fl oz	POST[a]	28	9	27	25	22	5	26	13
Callisto	3.0 fl oz	POST[b]	19	63	100	99	39	49	65	70

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	50	100	100	83
Aim EC	1.0 fl oz	POST[a]	80	52	0	44
Callisto	3.0 fl oz	POST[b]	30	100	96	75

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.

Table 7. Continued.

Species = Lance-leaved Coreopsis

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c,d]	5-WAT[e]	3-WAT	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]		70	68	78	47	75	58	74
Aim EC	1.0 fl oz	POST[a]		15	19	26	14	10	17	17
Callisto	3.0 fl oz	POST[b]		55	86	90	56	88	71	78

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	100	100	100	100
Aim EC	1.0 fl oz	POST[a]	22	14	12	16
Callisto	3.0 fl oz	POST[b]	88	99	100	96

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Started rating at 5 weeks.
[e] Five weeks after POST treatment.

Species = Ox-eye Daisy

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT[c]	5-WAT[d]	3-WAT	5-WAT	3-WAT	5-WAT	3-WAT	5-WAT
Transline	4.0 fl oz	POST[a]	21	33	28	39	20	29	23	34
Aim EC	1.0 fl oz	POST[a]	28	32	14	8	29	5	24	15
Callisto	3.0 fl oz	POST[b]	33	77	60	77	37	68	43	74

Herbicide	Rate/acre	Application method	% Bloom Reduction[e]			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]				
Aim EC	1.0 fl oz	POST[a]				
Callisto	3.0 fl oz	POST[b]				

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Three weeks after POST treatment.
[d] Five weeks after POST treatment.
[e] Species did not bloom - no bloom ratings.

Table 7. Continued.

Species = California Poppy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			2-WAT[c]	4-WAT[d]	7-WAT[e]	2-WAT[f]	4-WAT	7-WAT	2-WAT	4-WAT	7-WAT[g]	2-WAT	4-WAT	7-WAT
Transline	4.0 fl oz	POST[a]	0	9	0		13	20	10	35		5	19	10
Aim EC	1.0 fl oz	POST[a]	85	72	68		75	37	88	64		87	70	53
Callisto	3.0 fl oz	POST[b]	77	55	52		55	29	63	49		70	53	41

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	0	23	63	29
Aim EC	1.0 fl oz	POST[a]	75	90	100	88
Callisto	3.0 fl oz	POST[b]	67	97	95	86

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Four weeks after POST treatment.
[e] Seven weeks after POST treatment.
[f] Started rating at 4 weeks.
[g] Species reached peak bloom before 7 week rating.

Species = Plains Coreopsis

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			2-WAT[c,d]	5-WAT[e]	8-WAT[f]	2-WAT	5-WAT	8-WAT	2-WAT[d]	5-WAT	8-WAT[g]	2-WAT	5-WAT	8-WAT
Transline	4.0 fl oz	POST[a]		64	98	100	100	100		60	81	100	75	93
Aim EC	1.0 fl oz	POST[a]		10	3	14	12	7		4	0	14	9	3
Callisto	3.0 fl oz	POST[b]		42	50	100	99	98		36	39	100	59	62

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	100	100	100	100
Aim EC	1.0 fl oz	POST[a]	0	3	7	3
Callisto	3.0 fl oz	POST[b]	60	100	77	79

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Two weeks after POST treatment.
[d] Started rating at 5 weeks.
[e] Five weeks after POST treatment.
[f] Eight weeks after POST treatment.

Table 7. Continued.

Species = Black-eyed Susan

Herbicide	Rate/acre	Application method	% Injury							
			Lewiston		Butner		Reidsville		Average	
			3-WAT	6-WAT	3-WAT	6-WAT	3-WAT	6-WAT	3-WAT	6-WAT
Transline	4.0 fl oz	POST[a]	28	100	55	74	39	58	41	77
Aim EC	1.0 fl oz	POST[a]	38	5	17	13	34	22	30	13
Callisto	3.0 fl oz	POST[b]	38	30	41	25	38	29	39	28

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Transline	4.0 fl oz	POST[a]	100	100	100	100
Aim EC	1.0 fl oz	POST[a]	19	13	65	32
Callisto	3.0 fl oz	POST[b]	41	27	89	52

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.

Species = Clasping Coneflower

Herbicide	Rate/acre	Application method	% Injury			
			Lewiston	Butner[d]	Reidsville[e]	Average
			4-WAT[c]	4-WAT	4-WAT	4-WAT
Transline	4.0 fl oz	POST[a]	96			96
Aim EC	1.0 fl oz	POST[a]	56			56
Callisto	3.0 fl oz	POST[b]	92			92

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner[f]	Reidsville[e]	Average
Transline	4.0 fl oz	POST[a]	100			100
Aim EC	1.0 fl oz	POST[a]	87			87
Callisto	3.0 fl oz	POST[b]	100			100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Crop oil concentrated (1.0% v/v) added.
[c] Four weeks after POST treatment.
[d] Species did not establish at this location - trial discarded.
[e] Species was not planted at this location.
[f] Species did not establish at this location - no bloom rating.

Table 8. Fall-seeded wildflower tolerance of POST herbicides. Summary by Species. Experiment 2. 2006-2007.[a]

Herbicide	Rate/acre	Adjuvant	Toadflax 2 loc.	Catchfly 3 loc.	Corn Poppy 3 loc.	Bird's Eye 3 loc.	Mountain Garland 1 loc.	Gloriosa Daisy 3 loc.	Dame's Rocket 3 loc.	Sweet William 3 loc.[b]	Baby Blue Eyes 3 loc.	Wall-flower 3 loc.
Transline 3L	4.0 fl oz	NIS	G	A	G	G	G/A	U	G/M	G	G	G
Aim EC	1.0 fl oz	NIS	G	G/M	A	M	U	A	U	A	M	U
Callisto	3.0 fl oz	COC	U	U	G	U	U	U	U	U	U	U

Herbicide	Rate/acre	Adjuvant	Rocket Larkspur 3 loc.	Shasta Daisy 3 loc.[b]	Bachelor's Button 3 loc.	Indian Blanket 3 loc.	Lance-leaved Coreopsis 3 loc.	Ox-eye Daisy 3 loc.[b]	California Poppy 3 loc.	Plains Coreopsis 3 loc.	Black-eyed Susan 3 loc.	Clasping Cone-flower 1 loc.
Transline 3L	4.0 fl oz	NIS	G	M	U	U	U	A	G	U	U	U
Aim EC	1.0 fl oz	NIS	U	G	G	G/M	G	G	U	G	G	U
Callisto	3.0 fl oz	COC	A	M	U	U	U	U	M/U	U	A/M	U

[a] G = good tolerance; A = acceptable tolerance; M = marginal tolerance, product should be used only in salvage situations; U = unacceptable tolerance.

[b] No bloom reduction rating conducted at any location.

Table 9. Fall-seeded wildflower tolerance of Staple LX applied PRE and POST. Experiment 3, 2006-2007.

Species = Toadflax

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP[d]	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	100	99	99	100	98	97	100	100		100	99	98
Staple LX	2.1 fl oz	PRE	100	100	100	100	100	100	100	100		100	100	100
Staple LX	2.6 fl oz	POST[a]		52	50		99	93		89			80	72
Staple LX	3.8 fl oz	POST[a]		51	63		100	97		78			76	80

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	99	98	100	99
Staple LX	2.1 fl oz	PRE	100	100	100	100
Staple LX	2.6 fl oz	POST[a]	87	97	100	95
Staple LX	3.8 fl oz	POST[a]	92	100	100	97

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.
[d] Species reached peak bloom before 4 week rating.

Species = Catchfly

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville[e]			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP	4-WAP[d]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	100	100	100	100	100					100	100	100
Staple LX	2.1 fl oz	PRE	100	100	100	100	100					100	100	100
Staple LX	2.6 fl oz	POST[a]		57	67		99						78	67
Staple LX	3.8 fl oz	POST[a]		58	66		100						79	66

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville[d]	Average
Staple LX	1.3 fl oz	PRE	100	100		100
Staple LX	2.1 fl oz	PRE	100	100		100
Staple LX	2.6 fl oz	POST[a]	100	100		100
Staple LX	3.8 fl oz	POST[a]	100	100		100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.
[f] Species reached peak bloom before 4 week rating.
[e] Species did not establish at this location - trial discarded.

Table 9. Continued.

Species = Corn Poppy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	4-WAP[b]	7-WAP[c,d]	Before-POST	4-WAP	7-WAP[d]	Before-POST	4-WAP	7-WAP[d]	Before-POST	4-WAP	7-WAP[d]
Staple LX	1.3 fl oz	PRE	92	76		92	68		96	95		93	80	
Staple LX	2.1 fl oz	PRE	99	98		96	76		99	99		98	91	
Staple LX	2.6 fl oz	POST[a]		88	96		95	97		80	97		88	97
Staple LX	3.8 fl oz	POST[a]		89	97		96	98		73	95		86	97

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	60	96	100	85
Staple LX	2.1 fl oz	PRE	99	73	100	91
Staple LX	2.6 fl oz	POST[a]	100	100	100	100
Staple LX	3.8 fl oz	POST[a]	99	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Four weeks after POST treatment.
[c] Seven weeks after POST treatment.
[d] PRE plots reached peak bloom before 7 week rating.

Species = Bird's Eye

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	4-WAP[b]	7-WAP[c]	Before-POST	4-WAP	7-WAP	Before-POST	4-WAP	7-WAP	Before-POST	4-WAP	7-WAP
Staple LX	1.3 fl oz	PRE	85	61	53	75	51	47	93	87	75	84	66	58
Staple LX	2.1 fl oz	PRE	96	90	77	86	69	69	97	90	81	93	83	76
Staple LX	2.6 fl oz	POST[a]		90	77		81	47		90	69		87	64
Staple LX	3.8 fl oz	POST[a]		92	89		89	77		90	86		90	84

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	47	45	79	57
Staple LX	2.1 fl oz	PRE	63	67	81	70
Staple LX	2.6 fl oz	POST[a]	89	99	92	93
Staple LX	3.8 fl oz	POST[a]	90	99	98	96

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Four weeks after POST treatment.
[c] Seven weeks after POST treatment.

Table 9. Continued.

Species = Mountain Garland

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville[e]			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP[d]	4-WAP[d]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	100	100	100	100	100	100				100	100	100
Staple LX	2.1 fl oz	PRE	100	100	100	100	100	100				100	100	100
Staple LX	2.6 fl oz	POST[a]		65	93								65	93
Staple LX	3.8 fl oz	POST[a]		28	69								28	69

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	100			100
Staple LX	2.1 fl oz	PRE	100			100
Staple LX	2.6 fl oz	POST[a]	99			99
Staple LX	3.8 fl oz	POST[a]	92			92

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.
[d] No plants in POST plots to rate.
[e] Species did not establish at this location - trial discarded.

Species = Gloriosa Daisy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	2-WAP[b]	6-WAP[c]	Before-POST	2-WAP	6-WAP	Before-POST	2-WAP	6-WAP	Before-POST	2-WAP	6-WAP
Staple LX	1.3 fl oz	PRE	99	99	97	71	63	52	95	78	42	88	80	64
Staple LX	2.1 fl oz	PRE	99	97	94	96	92	88	97	92	91	97	94	91
Staple LX	2.6 fl oz	POST[a]		56	83		91	92		64	94		70	90
Staple LX	3.8 fl oz	POST[a]		60	86		97	98		76	98		78	94

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	100	62	68	77
Staple LX	2.1 fl oz	PRE	100	94	92	95
Staple LX	2.6 fl oz	POST[a]	100	98	98	99
Staple LX	3.8 fl oz	POST[a]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Six weeks after POST treatment.

Table 9. Continued.

Species = Dame's Rocket

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP[d]	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	100	100	100	100	100	100	100	100		100	100	100
Staple LX	2.1 fl oz	PRE	100	100	100	100	100	100	100	100		100	100	100
Staple LX	2.6 fl oz	POST[a]		70	98		100	100		100			90	99
Staple LX	3.8 fl oz	POST[a]		61	96		100	100		97			86	98

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	100	100	100	100
Staple LX	2.1 fl oz	PRE	100	100	100	100
Staple LX	2.6 fl oz	POST[a]	100	100	100	100
Staple LX	3.8 fl oz	POST[a]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.
[d] Species reached peak bloom before 4 week rating.

Species = Sweet William

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c,d]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	100	100		89	96	90	97	85	77	95	94	84
Staple LX	2.1 fl oz	PRE	100	100		99	100	100	100	100	100	100	100	100
Staple LX	2.6 fl oz	POST[a]		76			73	65		43	23		64	44
Staple LX	3.8 fl oz	POST[a]		84			74	63		90	78		83	71

Herbicide	Rate/acre	Application method	% Bloom Reduction[e]			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE				
Staple LX	2.1 fl oz	PRE				
Staple LX	2.6 fl oz	POST[a]				
Staple LX	3.8 fl oz	POST[a]				

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.
[d] Ended trial before 5 week rating.
[e] Species did not bloom at any location.

Table 9. Continued.

Species = Baby Blue Eyes

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c]	Before-POST	3-WAP[d]	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	98	99	99	89		66	94	95	87	94	97	84
Staple LX	2.1 fl oz	PRE	100	100	100	96		89	99	99	99	98	100	96
Staple LX	2.6 fl oz	POST[a]		95	99			99		96	100		96	99
Staple LX	3.8 fl oz	POST[a]		95	100			100		100	100		98	100

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	99	74	88	87
Staple LX	2.1 fl oz	PRE	100	93	98	97
Staple LX	2.6 fl oz	POST[a]	100	100	100	100
Staple LX	3.8 fl oz	POST[a]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.
[d] Started rating at 5 weeks.

Species = Wallflower

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	100	100	100	100	99	97	100	98	99	100	99	99
Staple LX	2.1 fl oz	PRE	100	100	100	100	100	100	100	100	100	100	100	100
Staple LX	2.6 fl oz	POST[a]		47	100		100	100		93	100		80	100
Staple LX	3.8 fl oz	POST[a]		65	100		100	100		96	100		87	100

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	100	100	100	100
Staple LX	2.1 fl oz	PRE	100	100	100	100
Staple LX	2.6 fl oz	POST[a]	100	100	100	100
Staple LX	3.8 fl oz	POST[a]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.

Table 9. Continued.

Species = Rocket Larkspur

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP[d]	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	75	96	96	74	63	91	66	75		72	78	94
Staple LX	2.1 fl oz	PRE	89	99	99	97	98	98	98	99		95	99	99
Staple LX	2.6 fl oz	POST[a]		26	17		38	36		50			38	27
Staple LX	3.8 fl oz	POST[a]		43	47		57	65		85			62	56

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	99	92	100	97
Staple LX	2.1 fl oz	PRE	98	99	100	99
Staple LX	2.6 fl oz	POST[a]	0	29	79	36
Staple LX	3.8 fl oz	POST[a]	74	65	95	78

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.
[d] Species reached peak bloom before 4 week rating.

Species = Shasta Daisy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b,c]	5-WAP[d]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	38		8	8	2	7	46	33	23	31	18	13
Staple LX	2.1 fl oz	PRE	45		14	27	7	4	61	39	26	44	23	15
Staple LX	2.6 fl oz	POST[a]			18		27	21		24	27		26	22
Staple LX	3.8 fl oz	POST[a]			21		35	28		23	29		29	26

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE		14		14
Staple LX	2.1 fl oz	PRE		31		31
Staple LX	2.6 fl oz	POST[a]		47		47
Staple LX	3.8 fl oz	POST[a]		81		81

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Started rating at 5 weeks.
[d] Five weeks after POST treatment.

Table 9. Continued.

Species = Bachelor's Button

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	2-WAP[b]	4-WAP[c]	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP	Before-POST	2-WAP	4-WAP
Staple LX	1.3 fl oz	PRE	29	27	22	6	8	0	8	15	18	14	17	13
Staple LX	2.1 fl oz	PRE	38	30	29	10	6	3	33	19	18	27	18	17
Staple LX	2.6 fl oz	POST[a]		39	49		29	23		40	25		36	32
Staple LX	3.8 fl oz	POST[a]		50	62		52	33		44	33		49	43

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	20	13	5	13
Staple LX	2.1 fl oz	PRE	23	5	16	15
Staple LX	2.6 fl oz	POST[a]	26	18	18	21
Staple LX	3.8 fl oz	POST[a]	42	43	32	39

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Two weeks after POST treatment.
[c] Four weeks after POST treatment.

Species = Indian Blanket

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	99	99	99	45	25	18	70	79	50	71	68	56
Staple LX	2.1 fl oz	PRE	100	100	99	90	79	80	98	94	86	96	91	88
Staple LX	2.6 fl oz	POST[a]		32	79		89	97		31	78		51	85
Staple LX	3.8 fl oz	POST[a]		51	86		87	97		58	88		65	90

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	100	15	87	67
Staple LX	2.1 fl oz	PRE	100	79	95	91
Staple LX	2.6 fl oz	POST[a]	71	99	100	90
Staple LX	3.8 fl oz	POST[a]	70	100	100	90

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.

Table 9. Continued.

Species = Purple Coneflower

Herbicide	Rate/acre	Application method	% Injury[b]			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE				
Staple LX	2.1 fl oz	PRE				
Staple LX	2.6 fl oz	POST[a]				
Staple LX	3.8 fl oz	POST[a]				

Herbicide	Rate/acre	Application method	% Bloom Reduction[b]			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE				
Staple LX	2.1 fl oz	PRE				
Staple LX	2.6 fl oz	POST[a]				
Staple LX	3.8 fl oz	POST[a]				

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Species did not establish at any location - no ratings.

Species = Lance-leaved Coreopsis

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	73	45	53	50	46	33	65	70	65	63	54	50
Staple LX	2.1 fl oz	PRE	97	59	52	67	63	49	82	80	78	82	67	60
Staple LX	2.6 fl oz	POST[a]		3	29		64	77		55	86		41	64
Staple LX	3.8 fl oz	POST[a]		53	71		73	86		90	99		72	85

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	62	43	70	58
Staple LX	2.1 fl oz	PRE	86	56	93	78
Staple LX	2.6 fl oz	POST[a]	100	100	100	100
Staple LX	3.8 fl oz	POST[a]	100	100	100	100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.

Table 9. Continued.

Species = Ox-eye Daisy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c,d]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	46	23		27	13	12	69	40	26	47	25	19
Staple LX	2.1 fl oz	PRE	67	45		48	30	22	81	55	27	65	43	25
Staple LX	2.6 fl oz	POST[a]		39			33	39		14	15		29	27
Staple LX	3.8 fl oz	POST[a]		59			52	46		33	39		48	43

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston[e]	Butner	Reidsville[e]	Average
Staple LX	1.3 fl oz	PRE		17		17
Staple LX	2.1 fl oz	PRE		44		44
Staple LX	2.6 fl oz	POST[a]		33		33
Staple LX	3.8 fl oz	POST[a]		37		37

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.
[d] POST treatment applied late due to plant size; trial was concluded before 5 week rating.
[e] Species did not bloom at these locations.

Species = California Poppy

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b]	5-WAP[c]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	95	97	98	81	60	55	100	99	99	92	85	84
Staple LX	2.1 fl oz	PRE	100	99	99	97	95	85	99	99	99	99	98	94
Staple LX	2.6 fl oz	POST[a]		88	89		43	24		30	68		54	60
Staple LX	3.8 fl oz	POST[a]		95	95		53	41		22	72		57	69

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	97	80	100	92
Staple LX	2.1 fl oz	PRE	99	98	100	99
Staple LX	2.6 fl oz	POST[a]	96	92	93	94
Staple LX	3.8 fl oz	POST[a]	99	95	100	98

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.

Table 9. Continued.

Species = Plains Coreopsis

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b,c]	5-WAP[d]	Before-POST	3-WAP	5-WAP[2]	Before-POST	3-WAP[c]	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	90		54	57	18	10	71		55	73	18	40
Staple LX	2.1 fl oz	PRE	97		82	72	28	21	55		47	75	28	50
Staple LX	2.6 fl oz	POST[a]		49	33		91	55		58	47		66	45
Staple LX	3.8 fl oz	POST[a]		80	68		89	81		70	62		80	70

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	60	13	62	45
Staple LX	2.1 fl oz	PRE	81	18	53	51
Staple LX	2.6 fl oz	POST[a]	34	81	74	63
Staple LX	3.8 fl oz	POST[a]	78	92	87	86

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Started rating at 5 weeks.
[d] Five weeks after POST treatment.

Species = Black-eyed Susan

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville			Average		
			Before-POST	3-WAP[b,c]	5-WAP[c]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	97	91	79	33	0	4	91	58	23	74	50	35
Staple LX	2.1 fl oz	PRE	99	98	91	74	32	29	89	53	23	87	61	48
Staple LX	2.6 fl oz	POST[a]		40	39		53	35		45	58		46	44
Staple LX	3.8 fl oz	POST[a]		63	67		54	43		55	72		57	61

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville	Average
Staple LX	1.3 fl oz	PRE	80	19	18	39
Staple LX	2.1 fl oz	PRE	89	23	23	45
Staple LX	2.6 fl oz	POST[a]	47	35	87	56
Staple LX	3.8 fl oz	POST[a]	97	43	87	76

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] POST application applied after 3 week rating.
[d] Five weeks after POST treatment.

Table 9. Continued.

Species = Clasping Coneflower

Herbicide	Rate/acre	Application method	% Injury											
			Lewiston			Butner			Reidsville[e]			Average		
			Before-POST	3-WAP[b]	5-WAP[c,d]	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP	Before-POST	3-WAP	5-WAP
Staple LX	1.3 fl oz	PRE	100	100		47	50	55				74	75	55
Staple LX	2.1 fl oz	PRE	100	100		94	91	79				97	95.5	79
Staple LX	2.6 fl oz	POST[a]		97			68	85					82.5	85
Staple LX	3.8 fl oz	POST[a]		100			84	94					92	94

Herbicide	Rate/acre	Application method	% Bloom Reduction			
			Lewiston	Butner	Reidsville[e]	Average
Staple LX	1.3 fl oz	PRE	100	78		89
Staple LX	2.1 fl oz	PRE	100	97		99
Staple LX	2.6 fl oz	POST[a]	100	100		100
Staple LX	3.8 fl oz	POST[a]	100	100		100

[a] Non-ionic surfactant (0.25% v/v) added.
[b] Three weeks after POST treatment.
[c] Five weeks after POST treatment.
[d] Species reached peak bloom before 5 week rating.
[e] Species was not planted at this location - no ratings.

Table 10. Fall-seeded wildflower tolerance of Staple LX applied PRE and POST. Summary by Species. Experiment 3. 2006-2007.[a]

Herbicide	Rate/acre	Adjuvant	Toadflax 2 loc.	Catchfly 3 loc.	Corn Poppy 3 loc.	Bird's Eye 3 loc.	Mountain Garland 1 loc.	Gloriosa Daisy 3 loc.	Dame's Rocket 3 loc.	Sweet William 3 loc.[c]	Baby Blue Eyes 3 loc.	Wall-flower 3 loc.
Staple LX	1.3 fl oz	PRE	U	U	U	U	U	U	U	U	U	U
Staple LX	2.1 fl oz	PRE	U	U	U	U	U	U	U	U	U	U
Staple LX	2.6 fl oz	POST[b]	U	U	U	U	U	U	U	M	U	U
Staple LX	3.8 fl oz	POST[b]	U	U	U	U	U	U	U	U	U	U

Herbicide	Rate/acre	Adjuvant	Rocket Larkspur 3 loc.	Shasta Daisy 3 loc.[d]	Bachelor's Button 3 loc.[e]	Indian Blanket 3 loc.	Lance-leaved Coreopsis 3 loc.	Ox-eye Daisy 3 loc.[d]	California Poppy 3 loc.	Plains Coreopsis 3 loc.	Black-eyed Susan 3 loc.	Clasping Cone-flower 2 loc.
Staple LX	1.3 fl oz	PRE	U	G	G	M/U	M	G	U	A	M	U
Staple LX	2.1 fl oz	PRE	U	G	G	U	U	G	U	A/M	M	U
Staple LX	2.6 fl oz	POST[b]	A	G/M	A	U	U	A	U	M	M	U
Staple LX	3.8 fl oz	POST[b]	M/U	A/M	A	U	U	A	U	U	U	U

[a] G = good tolerance; A = acceptable tolerance; M = marginal tolerance, product should be used only in salvage situations; U = unacceptable tolerance.
[b] Non-ionic surfactant (0.25% v/v) added.
[c] No bloom reduction rating conducted at any location.
[d] Bloom reduction rating conducted at only one location.
[e] Bloom reduction rating conducted at two locations for PRE treatments.

Table 11. Summary of wildflower response to herbicides. Year 2005-2007.

When to Apply	Herbicide and Formulation	Amount of Formulation per Acre	Wildflower Species with Acceptable Tolerance	Wildflower Species with Marginal Tolerance	Wildflower Species with Unacceptable Tolerance	Notes
PREPLANT INCORPORATED	pendimethalin (Pendulum Aquacap) 3.8L	1.0-2.0 pt	Baby Blue Eyes Bachelor's Button Black-eyed Susan California Poppy Clasping Coneflower Dame's Rocket Gloriosa Daisy Indian Blanket* Lance-leaved Coreopsis Ox-eye Daisy Plains Coreopsis Purple Coneflower** Rocket Larkspur Shasta Daisy Toadflax Wallflower	Mountain Garland	Bird's Eye Catchfly Corn Poppy Sweet William	Apply herbicide prior to seeding, avoid overlapping passes, incorporate as shallowly as possible using a field cultivator or power-driven tiller. **Do not plant corn poppy in areas treated with pendimethalin; severe injury will result.** Possibility of injury to Lance-leaved coreopsis if applied PRE. Mountain garland may have good tolerance; poor stands make it hard to ascertain. Possibility of moderate injury to Shasta daisy at rates higher than 1.0 pt. per acre. *Only one year's data on Indian blanket. **Only one year's data on purple coneflower and at only one location.
	s-metolachlor (Pennant Magnum) 7.62 EC	1.0 pt	Bachelor's Button Black-eyed Susan California Poppy Corn Poppy Gloriosa Daisy Ox-eye Daisy Plains Coreopsis Shasta Daisy	Baby Blue Eyes Catchfly Clasping Coneflower Dame's Rocket Lance-leaved Coreopsis Rocket Larkspur Sweet William Toadflax	Bird's Eye Indian Blanket Mountain Garland Purple Coneflower Wallflower	Possibility of injury to California poppy and black-eyed susan if applied PRE. Do not exceed 1.0 pt per acre for corn poppy.
	pendimethalin (Pendulum Aquacap) 3.8L + s-metolachlor (Pennant Magnum) 7.62 EC	1.0 - 2.0 pt + 1.0 pt	Bachelor's Button Black-eyed Susan California Poppy Lance-leaved Coreopsis Ox-eye Daisy Plains Coreopsis Shasta Daisy	Clasping Coneflower Dame's Rocket Gloriosa Daisy Rocket Larkspur Toadflax Wallflower	Baby Blue Eyes Bird's Eye Catchfly Corn Poppy Indian Blanket Mountain Garland Purple Coneflower Sweet William	Possibility of injury to California poppy, black-eyed susan and lance-leaved coreopsis if applied PRE.

Table 11. Continued.

PREPLANT INCORPORATED (con't)	imazapic (Plateau) 2L	2.0 fl oz	Black-eyed Susan California Poppy Corn Poppy Lance-leaved coreopsis Ox-eye Daisy		Baby Blue Eyes Dame's Rocket Plains Coreopsis Wallflower	Lance-leaved coreopsis may be less tolerant if applied PRE. Label lists more wildflower species as tolerant; however, these species have not been evaluated for this guide.
PREEMERGENCE	sulfentrazone (Portfolio) 4L	1.5 fl oz	Bachelor's Button Black-eyed Susan California Poppy Corn Poppy Plains Coreopsis	Clasping Coneflower Dame's Rocket Gloriosa Daisy Indian Blanket Rocket Larkspur Sweet William Wallflower	Baby Blue Eyes Bird's Eye Catchfly Lance-leaved Coreopsis Mountain Garland Ox-eye Daisy Purple Coneflower Shasta Daisy Toadflax	Do not exceed 1.5 fl oz per acre.
	mesotrione (Callisto) 4F	4.0 fl oz	Corn Poppy Rocket Larkspur		Baby Blue Eyes Bachelor's Button Bird's Eye Black-eyed Susan California Poppy Catchfly Clasping Coneflower Dame's Rocket Gloriosa Daisy Indian Blanket Lance-leaved Coreopsis Mountain Garland Ox-eye Daisy Plains Coreopsis Purple Coneflower Shasta Daisy Sweet William Toadflax Wallflower	Mesotrione in labeled for use on corn and has PRE and POST activity. It is not labeled for use on roadsides or wildflower plantings. It is included here because of its tolerance of corn poppy and for informational purposes only. Read and follow labeled use. Use caution when applying to rocket larkspur. Only one year's data. All other listed species were severely injured by mesotrione.

Table 11. Continued.

PREEMERGENCE (con't)	pyrithiobac-sodium (Staple LX) 3.2 SL	1.3-2.1 fl oz	Bachelor's Button Black-eyed Susan Ox-eye Daisy Plains Coreopsis Shasta Daisy	Lance-leaved Coreopsis	Baby Blue Eyes Bird's Eye California Poppy Catchfly Clasping Coneflower Dame's Rocket Gloriosa Daisy Indian Blanket Mountain Garland Purple Coneflower Rocket Larkspur Sweet William Toadflax Wallflower	Staple LX is a cotton herbicide with PRE and POST activity. It is not labeled for use on roadsides or wildflower plantings. It is included here because of its tolerance of several wildflower species and for informational purposes only. Read and follow labeled use.
POST-EMERGENCE OVERTOP	clopyralid (Transline) 3L	4.0 fl oz	Baby Blue Eyes Bird's Eye California Poppy Catchfly Corn Poppy Dame's Rocket Rocket Larkspur Sweet William Toadflax Wallflower	Mountain Garland Ox-eye Daisy Shasta Daisy	Bachelor's Button Black-eyed Susan Clasping Coneflower Gloriosa Daisy Indian Blanket Lance-leaved Coreopsis Plains Coreopsis	Addition of a non-ionic surfactant (0.25% v/v) is recommended.
	carfentrazone-ethyl (Quiksilver) 1.9 EW	1.0 fl oz	Bachelor's Button Black-eyed Susan Catchfly Corn Poppy Gloriosa Daisy Lance-leaved Coreopsis Ox-eye Daisy Plains Coreopsis Shasta Daisy Sweet William Toadflax	Baby Blue Eyes Bird's Eye Dame's Rocket Indian Blanket	California Poppy Clasping Coneflower Mountain Garland Rocket Larkspur Wallflower	Addition of a non-ionic surfactant (0.25% v/v) is recommended.

Table 11. Continued.

POST-EMERGENCE OVERTOP (con't)	mesotrione (Callisto) 4F	3.0 fl oz	Corn Poppy Rocket Larkspur	Shasta Daisy	Baby Blue Eyes Bachelor's Button Bird's Eye Black-eyed Susan California Poppy Catchfly Clasping Coneflower Dame's Rocket Gloriosa Daisy Indian Blanket Lance-leaved Coreopsis Mountain Garland Ox-eye Daisy Plains Coreopsis Sweet William Toadflax Wallflower	Mesotrione in labeled for use on corn and has PRE and POST activity. It is not labeled for use on roadsides or wildflower plantings. It is included here because of its tolerance of corn poppy and for informational purposes only. Read and follow labeled use. Use caution when applying to rocket larkspur. Only one year's data. Shasta daisy was injured. All other listed species were severely injured by mesotrione. Addition of a crop oil concentrate (1.0% v/v) is recommended.
	pyrithiobac-sodium (Staple LX) 3.2 SL	2.6 fl oz	Bachelor's Button Ox-eye Daisy Rocket Larkspur Shasta Daisy	Plains Coreopsis Sweet William	Baby Blue Eyes Bird's Eye Black-eyed Susan California Poppy Catchfly Clasping Coneflower Corn Poppy Dame's Rocket Gloriosa Daisy Indian Blanket Lance-leaved Coreopsis Mountain Garland Toadflax Wallflower	Staple LX is a cotton herbicide with PRE and POST activity. It is not labeled for use on roadsides or wildflower plantings. It is included here because of its tolerance of several wildflower species and for informational purposes only. Read and follow labeled use. Do not exceed 2.6 fl oz per acre when treating rocket larkspur. Addition of a non-ionic surfactant (0.25% v/v) is recommended.
	pendimethalin (Pendulum Aquacap) 3.8L + sulfentrazone (Portfolio) 4L	4.0 pt + 8.0 fl oz	Lance-leaved Coreopsis (established)		Ox-eye Daisy (established)	Use only on established beds of lance-leaved coreopsis.

Table 11. Continued.

POST-EMERGENCE OVERTOP (con't)	pendimethalin (Pendulum Aquacap) 3.8L + s-metolachlor (Pennant Magnum) 7.62 EC	4.0 pt + 2.0 pt	Lance-leaved Coreopsis (established) Ox-eye Daisy (established)			Use only on established beds of lance-leaved coreopsis or ox-eye daisy.
	pendimethalin (Pendulum Aquacap) 3.8L + flumioxazin (Broadstar) 0.25G	4.0 pt + 30.0 lb	Lance-leaved Coreopsis (established) Ox-eye Daisy (established)			Use only on established beds of lance-leaved coreopsis or ox-eye daisy. Broadstar, same active ingredient as Valor, but in granular form. Labeled for container and field grown ornamentals and ground covers. Listed here for informational purposes only. Always read and follow labeled use. Broadstar is very safe on lance-leaved coreopsis and causes almost no injury or bloom reduction. Gives residual control.