Final Report
Idaho Nursery and Florists Grant Program
NAC-ISDA 2012-3 "Native plant tolerance to several pre- and postemergence herbicides"

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Introduction and Objective:
The market potential of native plants is recognized by the nursery industry. As native plant production increases to meet increasing consumer demand, development of management methods for growing native plants on a large scale will be necessary. Although there is considerable data available regarding efficacy of herbicides on specific weeds, there is very little information available regarding herbicide tolerance of native plants. In fact, the only native forb-specific herbicide research found is work evaluating effect of six herbicide/rate combinations on *Eriogonum umbellatum* and three Penstemon species seed production. However, this research did not include evaluating herbicide injury and effect on plant growth and flowering that might affect marketability. This was the second and final year of a proposed two year field study. The study was established to evaluate the tolerance of four native plants to six herbicides applied at the 1X and 2X use rates.

Methods:
The four native plants were: blanketflower (*Gaillardia aristata* Pursh), Sherman big bluegrass (*Poa secunda* J. Presl), fringed sage (*Artemesia frigida* Willd.), and strict buckwheat (*Eriogonum strictum* Benth.). The six herbicides and their 1X rate were: Freehand (dimethenamid-P and pendimethalin) at 3.5 lb active ingredient (ai) per acre (A) or 200 lb product/A, Gallery (isoxaben) at 1.0 lb ai/A or 1.33 lb product/A, Plateau (imazapic) at 0.0625 lb ai/A or 4 fl oz/A, Prowl H_2O (pendimethalin) at 1.9 lb ai/A or 2 quarts/A, SureGuard (flumioxazin) at 0.383 lb ai/A or 0.75 lb product/A, and mustard seed meal at 2000 lb/A. The 2X rates of each herbicide was twice the amount of the 1X herbicide rates. Mustard seed meal was included as an organic weed control alternative.

All four species were transplanted into the field site at Kimberly on June 8, 2011. Two rows of each species, consisting of five plants per row were planted 16 inches apart. Each plot consisted of 10 plants of all four species. The plants sprayed in 2012 with the different herbicides were the same plants that were planted in 2011. The experimental design is a two (herbicide rate) by six (herbicide) factorial randomized complete block design with four replications. All herbicide treatments were applied May 8, 2012. The sprayable herbicides were applied with a bicycle-wheel plot sprayer equipped with a CO_2-pressurized boom calibrated to deliver 10 gallons per acre. The granular herbicide treatments, Freehand and Mustard Seed Meal were applied by hand after measuring the amount of material needed for each plot. Plant injury was evaluated visually 15, 30, 55 and 83 days after herbicide application (DAA). Notes were recorded regarding the

physical condition of each plant in every plot.

Results:
Unlike 2011, SureGaurd injured big bluegrass with both application rates in 2012. SureGaurd was the only herbicide that significantly injured big bluegrass in 2012. Injury averaged 20 and 25% 15 and 30 DAA. The primary symptom was leaf discoloration, which persisted even at 83 DAA. This was not observed in 2011. Slight injury, averaging 3% was observed with Freehand and Prowl at 83 DAA, although no injury was observed in the earlier evaluations. It is not clear why this was observed.

SureGaurd also injured blanket flower in 2012 at both application rates on the 15 DAA evaluation. Injury with the 1X and 2X rates averaged 8 and 19%, respectively on the first evaluation date. There was no significant injury at any of the other evaluation dates. No other herbicides injured blanket flower.

Mustard seed meal injury was observed on fringed sage at each of the evaluations except the first one at 15 DAA. This was most likely due to the study site being irrigated sometime after the 15 DAA evaluation. Fringed sage injury at 30 and 55 DAA averaged 9 and 8%, respectively. No other herbicide injured fringed sage.
Strict buckwheat exhibited some injury (8%) with the 2X SureGaurd rate 15 DAA. At 30 DAA, the injury from this same treatment had declined to 3% and was not observable after that. Similar to the injury caused by Mustard seed meal on fringed sage, strict buckwheat exhibited 4% injury 30 DAA, even though no injury was observed 15 DAA. At 83 DAA, Plateau applied at the 2X rate showed some injury (8%) on strict buckwheat even though very little injury was observed at earlier evaluations.

The four native plant species were more tolerant to Mustard seed meal and SureGaurd (flumioxazin) in 2011, while some injury was observed with Freehand (dimethenamid-P and pendimethalin), Gallery (isoxaben), and Pendulum (pendimethalin). In 2012, Mustard seed meal did slightly injure Sherman big bluegrass and fringed sage, but it was not substantial. SureGaurd caused the most significant injury to big bluegrass and blanket flower and was the only herbicide that raised any concern of the safety of using these herbicides on the four native plants evaluated.

In summary, there was some variability in plant response to the herbicides applied in this study. Injury levels in 2011 were overall greater than in 2012. This is most likely due to the relative establishment age of the native plants. These results would indicate a longer establishment time period is needed before applying these herbicides with the exception of Plateau. Exactly how long the establishment time period is cannot be answered from the results of this study. Plateau caused the least amount of injury to all four species. Mustard seed meal was the second least injurious herbicide. Freehand, Gallery, Prowl and SureGuard caused significant injury in the establishment year of these plants. In 2012, SureGuard was the most injurious and that was primarily to Sherman big bluegrass.

Table 1. Strict buckwheat response to 1X and 2X herbicide rates applied one year after transplanting. Plant injury ratings were compared to an untreated control, are averaged across all herbicides and were taken 15, 39, 63 and 93 days after herbicides were applied in 2012.

Herbicide rate	5/23	6/7	7/2	8/1
	----------%----------			
1X	0	1	0	0
2X	3	3	2	3
LSD (0.05)	1	1	ns	ns

Table 2. Effect of six herbicides on Sherman big bluegrass, fringed sage and strict buckwheat tolerance. Plant injury ratings were compared to an untreated control, are averaged across herbicide rates and were taken 11 and 25 days after herbicides were applied.

	Sherman big bluegrass		Fringed sage		Strict buckwheat	
Herbicide	5/23	6/7	5/23	6/7	5/23	6/7
	----------%----------					
Freehand	0	2	0	0	0	0
Gallery	0	1	0	1	0	0
Mustard Seed Meal	1	1	0	9	1	4
Plateau	0	1	0	0	1	1
Prowl	0	2	0	0	1	1
SureGuard	20	25	0	1	8	3
LSD (0.05)	3	5	ns	3	3	3