

Initial Results of Foliar Application of Herbicides to Flowering Rush
Peter Rice, Virgil Dupuis and Alvin Mitchell
26 October 2009

Summary:

The Noxious Weed Trust Fund awarded Salish Kootenai College/University of Montana funds to conduct foliar herbicide application trials on flowering rush (*Butomus umbellatus*) in Flathead Lake (Montana). Replicated plot trials using Habitat (imazapyr), Clearcast (imazamox), and Renovate (triclopyr) were implemented in May 2008 for spring emerging flowering rush when the lake level was below the infestation site, and also in July at full pool when only 6 to 18 inches of leaf was above the water line (4.5 to 5.5 feet of leaf below the water line).

We did our first replicated plot trial applications on May 27, 2008 when Flathead Lake was at low pool and the rhizome mat was exposed and 5 to 7 inches of leaf had emerged. The surface water was totally off the site. The sprayer was mounted on an Argo wetland crawler. We used a single Boom Buster 125 nozzle elevated 42 inches above the rhizome mat. Running at 40 PSI this gave us an effective swath width of 15.5 ft and total volume output was 35 GPA. We applied Habitat at 2 and 3 quarts/acre, Clearcast at 2 quarts per acre, and Renovate (triclopyr) at 8 quarts per acre. Each treatment was applied to three plots in a randomized complete block design. All four treatments included Competitor methylated seed oil at 2 quarts per acre.

The Renovate plots looked good at 30 days after treatment but at two months after treatment were indistinguishable from the no-spray controls. Both Habitat rate treatments and the Clearcast still had at least 97% suppression at 3 months after treatment. In the fall all the flowering rush plants begin to senesce and the leaves eventually collapse to the lake bottom. In conclusion Habitat and Clearcast provided at least “season long” control when applied in spring to emerged leaves at drawdown.

We did the same herbicide treatments from a small boat at high pool on July 26 with a total volume output of 31 GPA. We had raised the nozzle to 48 inches above the water surface getting an effective swath width of 21 feet at 40 PSI. On average for the leaves that were above water there were 12 inches exposed, with an average of 40 inches of leaf below water. The Renovate quickly burnt the exposed leaf but had no obvious effect on the portion of the leaf below the waterline. There are no visible symptoms during the first season from the Habitat and Clearcast high pool treatments; but the efficacy of these two slow acting herbicides cannot be determined before the spring of 2009.

Flowering rush also has a lax-leaved fully submerged form rooting in bottom sediments to a depth of 20 feet. The fully submerged phenotype can only be controlled by water column treatment. A large portion of the rigid-leaved emerged phenotype infestations have only the leaf tips (or no leaf) above the water line so that these portions of the overall infestation would also require water column herbicide injection.

Data Analysis:

Habitat and Clearcast applied to the leaves emerging from the exposed rhizome mat at low pool provided 97% plus season long suppression of flowering rush, that is nearly complete suppression until the normal October/November leaf die back period (Table 1 and Figures 1 & 2). The Renovate treatments produced quick topgrowth burn down but there was rapid regrowth from the rhizomes so that by mid-season the Renovate plots were indistinguishable from the no-spray controls. The full pool foliar treatments cannot be evaluated until spring 2009 because of the slow action of Habitat and Clearcast.

Summary of 1st Growing Season Flowering Rush Response to Low Pool Foliar Treatments

Table 1. Percent control of flowering rush, based on visual scoring (Dunnett t >control).

Dependent Variable	(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval
						Lower Bound
% Control 25 Days After Treatment (DAT)	Clearcast	No-Spray	99.7(*)	.2582	.000	99.030
	Habitat 2 qt/ac	No-Spray	100.0 (*)	.2582	.000	99.363
	Habitat 3 qt/ac	No-Spray	99.8 (*)	.2582	.000	99.197
	Renovate	No-Spray	97.3 (*)	.2582	.000	96.697
% Control 82 Days After Treatment (DAT)	Clearcast	No-Spray	97.3 (*)	2.0221	.000	92.348
	Habitat 2 qt/ac	No-Spray	98.7(*)	2.0221	.000	93.681
	Habitat 3 qt/ac	No-Spray	98.0 (*)	2.0221	.000	93.014
	Renovate	No-Spray	5.0 (*)	2.0221	.049	.014

* The mean difference is significant at the .05 level.

this Dunnett t-test compares each herbicide treatment to the No-Spray Controls

Figure 1. Percent control (visual scoring) of flowering rush 25 days after low pool (exposed sediments) foliar treatments.

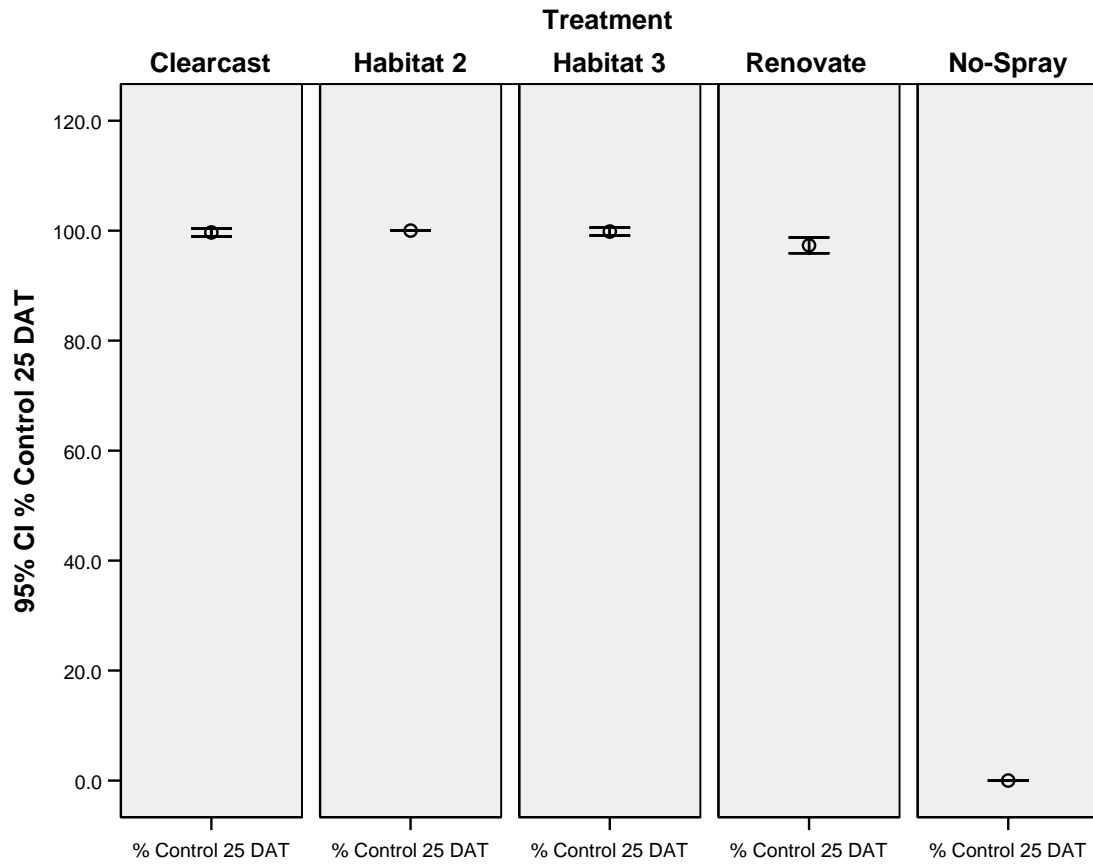
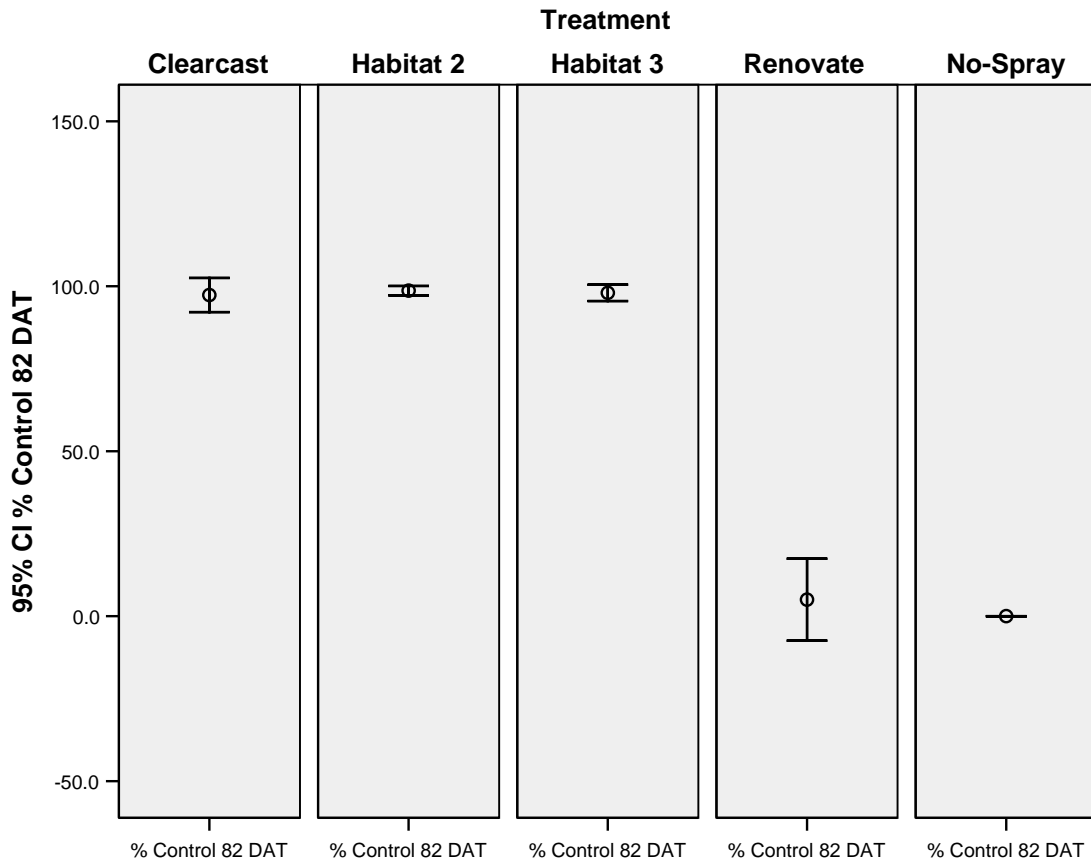


Figure 2. Percent control (visual scoring) of flowering rush 82 days after low pool (exposed sediments) foliar treatments.



Point intercept sampling of the low pool foliar treatments was conducted in September. Some flowering rush was still growing in all the treated plots (Table 2; Figure 3). A vertical rod was dropped at one meter intervals along a 41 meter transect line down the center of the plot. Species touching the rod were recorded as present. This method of obtaining frequency of occurrence approximates % canopy cover. Also note that in Table 2 that although the control maintained by Clearcast and the two rates of Habitat is very highly significant ($p < .001$), there is no significant difference ($p > .05$) between the abundance of flowering rush in the Renovate and the No-Spray Control plots. However in the years after the initial foliar spraying these survivors in the Clearcast and Habitat sprayed plots could have the potential to start increasing the density of flowering rush in the treated areas.

Table 2. Difference in percent frequency of occurrence^ψ of point intercepts of flowering rush at 1 meter intervals in September 2008 after the May 27, 2008 foliar treatments (Dunnett t <control).

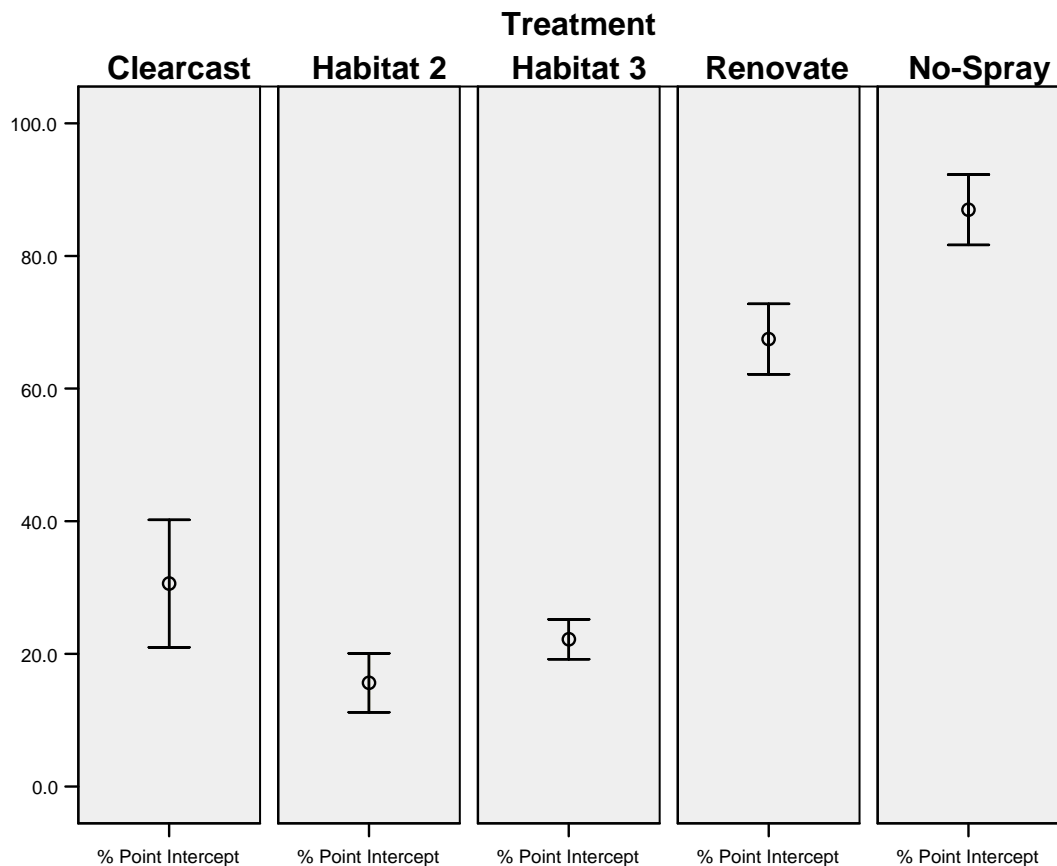
(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval
					Upper Bound
Clearcast	No-Spray	-56.3667(*)	8.4319	.000	-35.577
Habitat 2	No-Spray	-71.3333(*)	8.4319	.000	-50.544
Habitat 3	No-Spray	-64.7667(*)	8.4319	.000	-43.977
Renovate	No-Spray	-19.5000	8.4319	.064	1.290

^ψPercent frequency of occurrence by this point intercept method approximates % canopy cover

* The mean difference is significant at the .05 level.

this Dunnett t-test treats the No-Spray group as a control, and compare all other treatments against it.

Figure 3. Frequency of occurrence^ψ ± one standard error for flowering rush at 1 meter intervals by point (vertical rod) intercept in September after the May 27 foliar treatments.



^ψPercent frequency of occurrence by this point intercept method approximates % canopy cover.

Figure 4. An example no-spray control plot on August 18, 2008 (82 Days After Treatment) for the low pool foliar trial.



Figure 5. An example Clearcast plot on August 18, 2008 (82 Days After Treatment) for the low pool foliar trial.



A greenhouse trial on potted flowering rush was conducted for foliar application of Galleon SC (penoxsulam) in May 2008. Galleon at 5.6 oz/ac (maximum label rate for emerged foliar treatment) and methylated seed oil at 2 qt/ac were applied when the flowering rush leaves averaged 15 inches in length. Total volume was 52 gallons per acre using TeeJet 8002 nozzles regulated with carbon dioxide. The foliar Galleon treatment did not produce any visible injury and there was no restriction in subsequent leaf elongation relative to no-spray control pots. Some incidental smartweed in the flowering rush pots did succumb to the Galleon treatment.