

## **Project Quarterly Report Template for Reclamation & Development Grants**

Project Sponsor: Salish Kootenai College

Grant Agreement Number: RITA 18 8850

Dates Covered: Feb 6, 2019 Final Report

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**When to Submit Quarterly Reports:** *15th of the month following the end of each quarter: January 15, April 15, July 15, and October 15. Bills will be paid only if reporting requirements are current.*

- 1. Progress Summary:** List project tasks outlined in the grant agreement. Summarize activities that have occurred under each task, including tasks with no activity. Show costs incurred, funds remaining, and match funds in Section 2, Expenditures Summary. Provide an overview of progress on the overall project. Indicate tasks completed.

1. Apply 2 herbicide treatments (Clearcast & Habitat) in 2018, following four previous annual treatments, with three treatments including controls, 5 replicates each=30 test plots. To be done April 2018. Sample pre-spray, collect rhizome cores, spray, and post spray evaluation.

Completed and reported previous quarter.

- 1. Sample for post-spray plant composition and efficacy at 3 months and 1 year.**

Post spray assessments of suppression of flowering spring initial leaf tip emergence were done by Daubenmire frame counts on May 1-2, 2017 and April 30-May 5, 2018. Canopy cover measurements were done by point intercept on July 26, 2018 and July 27, 2018. A summary of the past five year's mid-summer assessments of percent control of leaf growth is presented in Table 1. The block 5 plots were at a lower lakebed elevation and were inundated by water much sooner than the other four blocks. Control tended to be less on the block 5 plots in most years. Without including the early flooded block 5 the 2018 annual control of canopy cover after 5 sequential years of herbicide treatments was 91% for Habitat and 78% for Clearcast treatments. Including the block 5 data the canopy cover suppression was 88% for Habitat and 66% for Clearcast treatments. Habitat was consistently more efficacious than Clearcast. A graphic summary for the trend of increasing canopy cover control from sequential spraying is presented as Figure 1.

**Table 1. Summary of % control of flowering rush obtained over 5 years with Habitat and Clearcast herbicides applied during the spring drawdown (May) period.**

Sampled		<u>% Control</u>	
<u>Date</u>	<u>DAFT*</u>	<u>Clearcast</u>	<u>Habitat</u>
8/13/2014	<b>107</b>	61.8	95.6
10/8/2014	<b>163</b>	46.1	88.2
4/20/2015	<b>357</b>	93.7	97.4
7/13/2015	<b>441</b>	64.1	77.7
4/19/2016	<b>722</b>	62.1	87.3
8/1/2016	<b>826</b>	85.2	90.5
5/2/2017	<b>1100</b>	89.4	95.4
7/25/2017	<b>1166</b>	62.2	77.8
4/30/2018	<b>1462</b>	76.4	93.0
7/27/2018	<b>1533</b>	66.3	88.1

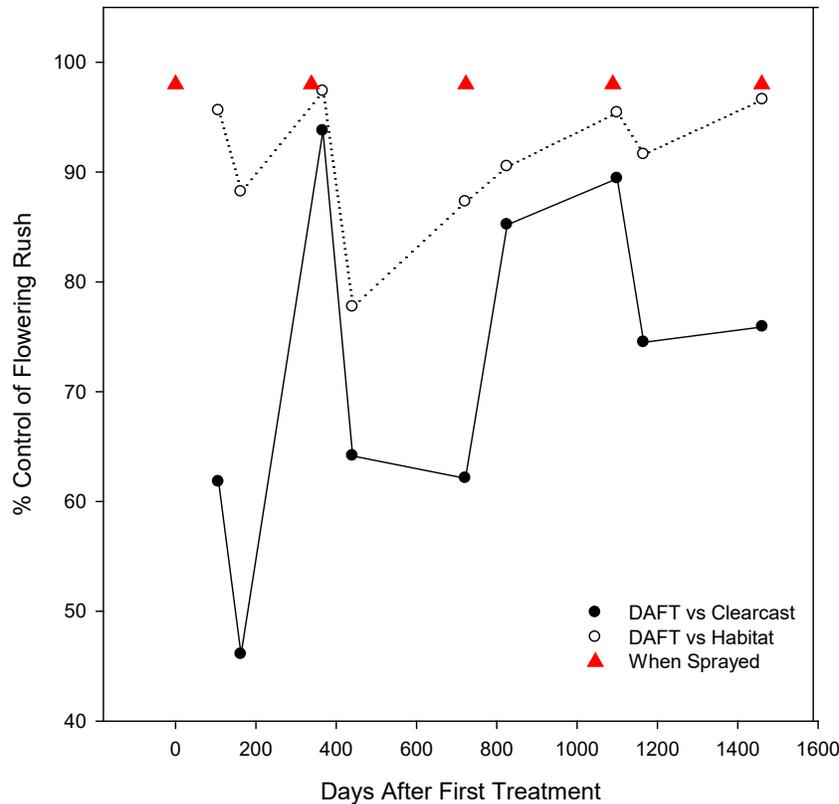
\*Days After First Treatment

Without Block 5:		<u>% Control</u>	
<u>Date</u>	<u>DAFT*</u>	<u>Clearcast</u>	<u>Habitat</u>
8/13/2014	<b>107</b>	62.0	96.0
10/8/2014	<b>163</b>	55.3	98.5
4/20/2015	<b>357</b>	94.3	98.6
7/13/2015	<b>441</b>	69.5	95.2
4/19/2016	<b>722</b>	65.9	91.1
8/1/2016	<b>826</b>	96.4	98.2
5/2/2017	<b>1100</b>	91.8	98.0
7/25/2017	<b>1166</b>	74.5	91.6
4/30/2018	<b>1462</b>	77.8	96.6
7/27/2018	<b>1533</b>	78.5	91.1

\*Days After First Treatment

\*\*Block five has wetter soil conditions resulting in later flowering rush maturity that likely affects efficacy. Block 5 had much denser flowering rush at the beginning of the trial five years ago.

**Figure 1. Graphic summary of increasing flowering rush canopy cover suppression obtained by sequential spraying with Habitat and Clearcast herbicides from May 2014 through May 2018.**



**2. Collect rhizome cores 12 months after each year treatment, count viable buds, and grow samples in greenhouse to assess rhizome depletion.**

Lakebed substrate cores were taken in April of 2017 and April 2018. The cores were washed to free the flowering rush rhizomes and fine roots. Viable rhizome buds were counted and rhizome wet weights were taken. Fine root wet weights were also determined in 2018. After the initial set of measurements were completed the April samples of washed rhizome fragments were planted in pots and allowed to grow in the greenhouse through the summer and the same measurements made in August. Standard deviations of the response measurements were approximately equal to the means (Table 2) and most of the data sets included one or more outliers. So in most cases the variances did not meet Levene’s Test for Homogeneity of Variances. We did not find an appropriate transformation that could be applied to all cases. Accordingly the nonparametric ranked Kruskal-Wallis Test for Independent Samples was applied. Overall differences for the three treatments were very highly significant ( $p \leq 0.001$ , not tabled) for all measurements and assessment dates. Accordingly pairwise comparisons were warranted. In Kruskal-Wallis pairwise comparisons the individual

herbicide treatments were always very highly significant compared to the no-spray controls ( $p \leq 0.001$ , not tabled). Pairwise comparisons of Habitat versus Clearcast by the Kruskal-Wallis Test and Tamhane's T2 for unequal variance indicate the trend for Habitat to be more suppressive of rhizomes. The Habitat versus Clearcast p. values were  $< 0.05$  in four of the ten pairwise and test specific minimum p values range from 0.079 to 0.291 in the other six pairwise herbicide comparisons (Table 2).

**Table 2. 2017 & 2018 rhizome leaf sprout counts and rhizome grams wet weights; and 2018 fine roots grams wet weights (without block 5).**

		Sprout Count		Rhizome Weight*	
Herbicide	Mo. & Yr.	Apr 2017	Aug 2017	Apr 2017	Aug 2017
Clearcast	Mean	10.7	28.6	18.1	18.3
	n	24	24	24	24
	Std. Dev	9.35	27.43	14.98	15.38
Habitat	Mean	2.4	13.6	10.9	10.1
	n	24	24	24	24
	Std. Dev	2.92	16.56	12.26	11.26
No-Spray	Mean	30.7	113.8	51	80.4
	n	24	24	24	24
	Std. Dev	9.79	26.22	22.22	26.27
<b>Pairwise Clearcast vs. Habitat</b>					
Kruskal-Wallis p.		0.029	0.168	0.172	0.159
Tamhane's T2 p.		0.001	0.079	0.211	0.117
		Sprout Count		Rhizome Weight*	
	Mo. & Yr.	Apr 2018	Aug 2018	April 2018	Aug 2018
Clearcast	Mean	10.3	15.6	13.3	15.5
	n	24	24	24	24
	Std. Dev	15.75	16.38	17.6	16.36
Habitat	Mean	4.4	4.1	7.8	5.8
	n	24	24	24	4.1
	Std. Dev	9.17	5.13	9.1	5.13
No-Spray	Mean	39.5	94.5	73.6	94.5
	n	24	24	24	24
	Std. dev.	19.94	23.96	21.36	23.96
<b>Pairwise Clearcast vs. Habitat</b>					
Kruskal-Wallis p.		0.189	0.090	0.291	0.090
Tamhane's T2 p.		0.338	0.009	0.417	0.009
				Fine Root Weight*	
	Mo. & Yr.			April 2018	Aug 2018
Clearcast	Mean			30.4	11.9
	n			24	24
	Std. Dev			24.78	7.4
Habitat	Mean			19.8	5.3
	n			24	24
	Std. Dev.			12.16	6.46
No-Spray	Mean			51.4	43.3
	n			24	24
	Std. dev.			18.15	11.49
<b>Pairwise Clearcast vs. Habitat</b>					
Kruskal-Wallis p.				0.127	0.028
Tamhane's T2 p.				0.191	0.006

<sup>Y</sup>Kruskal-Wallis tests (not tabled) for overall differences for the three treatments were very highly significant ( $p \leq 0.001$ ) for all measurements and assessment dates justifying pairwise comparisons.

\*weights are grams wet weight

**3. Data analysis with two annual progress reports and a final report**

Results have been disseminated to interested parties including the Washington Weed Control Association, Flathead Lakers, Flathead Lake Biological Station and private landowners interested in managing flowering rush. The expanded use of herbicides for flowering rush control permitting, environmental documentation, and planning issues and process discussions were held with the Confederated Salish and Kootenai Tribes Shoreline Protection Office, Environmental Protection Office, and Th Historic Preservation Office on NPDES process, environmental assessment, cultural review, and approval processes for a Flathead Lake Flowering Rush Management Area.

Related, non-project work relating to flowering rush includes assembly of a database of lakeshore owners impacted by flowering rush, mapping, contacting landowners, developing bid documents, completing an environmental assessment, cultural review, and complying with non-point pollution discharge requirements.

**2. Expenditures Summary:** All expenses must be reported on the quarterly report, including match funds. Use the table below or a budget tracking spreadsheet.

<b>EXPENDITURES SUMMARY</b>	<b>BUDGET</b>	<b>RDG COST</b>	<b>MATCH COST</b>	<b>TOTAL SPENT</b>	<b>BALANCE</b>
List tasks here	\$	\$	\$	\$	\$
Herbicide applications, rhizome cores, pre and post sampling: Personnel; \$2595.71, supplies; \$1,128, administrative costs; \$257	11,280	8,501	\$4,151.09	\$11,281.74	\$0
UM sub-award technical assistance, data analysis	\$3,720	\$0	\$0	\$3,718.26	\$0
<b>TOTAL PROJECT COSTS</b>	<b>\$15,000</b>	<b>\$4,151.09</b>	<b>\$4,151.09</b>	<b>\$15,000</b>	<b>\$0</b>

**3. Discuss any problems or concerns that have arisen** (example: problems with the schedule, subcontractors or budget items).

Due to the slow growth of flowering rush in the spring, and rapid filling of Flathead Lake, herbicide control was less at some of the 2018 demonstration sites treated around the lake due to inundation less than one week after spraying. Inundation was one week for the Ducharme plots after the 2018 treatments. Less control was also obtained on the lower elevation early inundation block 5 in East Bay every year the East Bay herbicide trials site was sprayed. Timing of actual management spraying should be done as early as possible in the spring.

**4. Next Quarter’s Activities.** Outline anticipated activities that will take place in the next quarter.

This is a final report.

**5. Request for Contract Amendments (if needed):** Contact DNRC for approval and to complete a contract amendment before making purchases or agreements on goods or services other than those specifically identified in the grant agreement. Expenses incurred that are not allowed under the grant agreement will not be paid unless the grantee obtains prior approval and an amendment is completed.