Final Report for FY 2014 funding

Date: April 7, 2016
Reporting period: April 15, 2015-Feburary 29, 2016
Project title: Building capacity for *Phragmites* control and wetland conservation in the Great Salt Lake Ecoregion

IWJV Project Number: CG 2014 USU-1 / US-IM-5-1
Project Location by County: Box Elder, Weber, Davis, Salt Lake
Project State: Utah
Congressional District: 1 and 2
Bird Conservation Region: Great Basin (#9)
Bird Habitat Conservation Area: Great Salt Lake (#3)

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Project objectives and need

One of the biggest threats to wetland conservation in the Great Salt Lake (GSL) Ecoregion is the invasion of *Phragmites australis*. Across the continent and in Utah, managers seek effective tools for controlling *Phragmites* and reestablishing critical migratory bird habitat. The **purpose** of this project is to improve *Phragmites*-invaded wetland habitat for the millions of migratory birds in the Central and Pacific Flyways that use GSL wetlands. Our project **goal** is to develop effective techniques for *Phragmites* control and wetland habitat restoration in GSL wetlands. The two **specific objectives** of this project were to (1) evaluate the effectiveness of different herbicide and mowing treatments for *Phragmites* removal and native plant reestablishment and (2) develop effective means for reestablishing three bulrush species, critical for migratory bird habitat, via seeds.

Project activities and accomplishments

Objective 1: Evaluate the effectiveness of different herbicide and mowing treatments for Phragmites removal and native plant reestablishment.

Quantitative measures

Effectiveness is being evaluated in terms of reduction of *Phragmites* cover and increase in native vegetation cover, particularly for three habitat-forming bulrush species: *Bolbschoenus maritimus* (alkali bulrush), *Schoenoplectus acutus* (hardstem bulrush), *Schoenoplectus americanus* (threesquare bulrush). These measurements are being taken in two experiments: the **large stand experiment** with 3 acre treatment plots (summer imazapyr application, winter mow; summer glyphosate application, winter mow; fall imazapyr application, winter mow; fall glyphosate application, winter mow; untreated control) at 4 Great Salt Lake sites and the **small patch study** with 0.25 acre treatment plots at 6 Great Salt Lake sites (summer glyphosate application, winter mow; summer imazapyr application, winter mow; fall glyphosate application, winter mow; summer mow, fall glyphosate application; summer mow, cover with heavy-duty black plastic; untreated control).

Activities

- We applied the final year of the three year (2012-2014) *Phragmites* control treatment sequence to the experimental plots in summer and fall 2014.
- We documented changes in *Phragmites* cover and native plant recovery in the experimental plots in summer/fall 2014 and summer/fall 2015
- We analyzed the data during winter 2014-2015 and 2015-2016.

Significant findings

- We found that all herbicide treatments (glyphosate and imazapyr) and treatment timing (summer vs. fall application) were equally effective at reducing the cover of *Phragmites* for the first three years (2012-2014; see **Figures 1 and 2** below). *Phragmites* cover was greatly reduced from 80% pre-treatment to 5-35% post-treatment.
- However, in the large stand experiment, *Phragmites* cover increased dramatically in the summer herbicide plots in 2015 (the year after the last herbicide application; see **Figure 1**

below). An increase in *Phragmites* cover in the summer herbicide plots also occurred in the small patch study, but the change was less substantial (**Figure 2**).

- Only treatments that involved mowing or herbicide application in the *summer* greatly reduced the ability of *Phragmites* to produce inflorescences vs. fall-only treatments (data not shown). But this finding is only relevant for the first year of *Phragmites* control since by the second year, *Phragmites* cover had been reduced so substantially that inflorescence production was minimal.
- We found that the return of native, habitat-forming bulrushes was extremely limited through 2015 (data not shown).
- It will be **critical to monitor these plots through 2016** to determine if native, habitat-forming plants return now that the *Phragmites* herbicide and mowing treatments are complete, and to document any *Phragmites* cover increases as well.

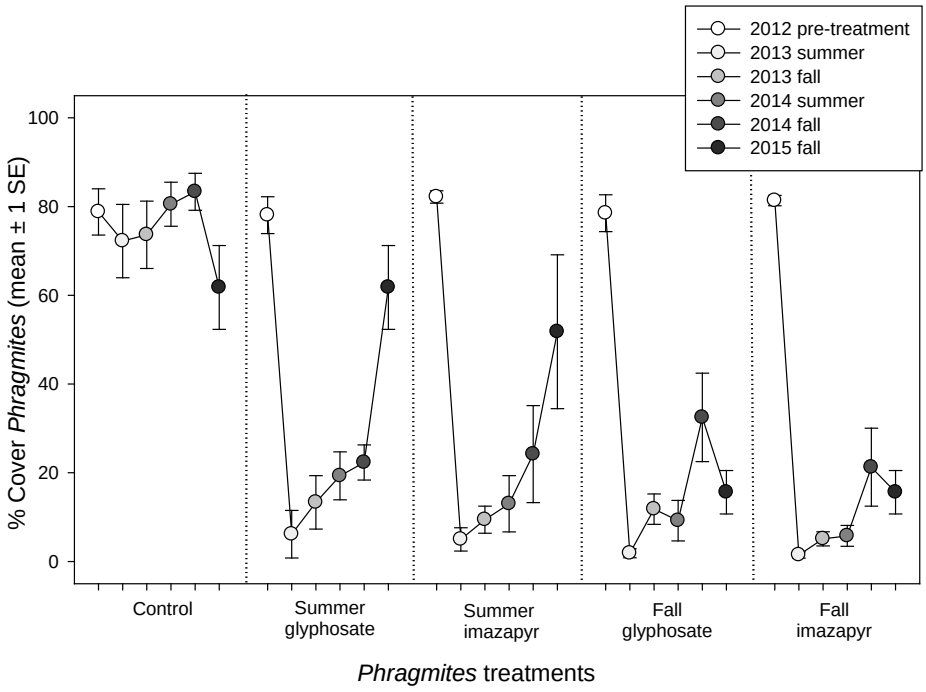

Figure 1. Changes in *Phragmites* cover in the large stand experiment (3 acre treatment plots; Chad Cranney MS thesis research). Note the large increase in *Phragmites* cover in 2015 in the summer glyphosate and summer imazapyr herbicide plots.

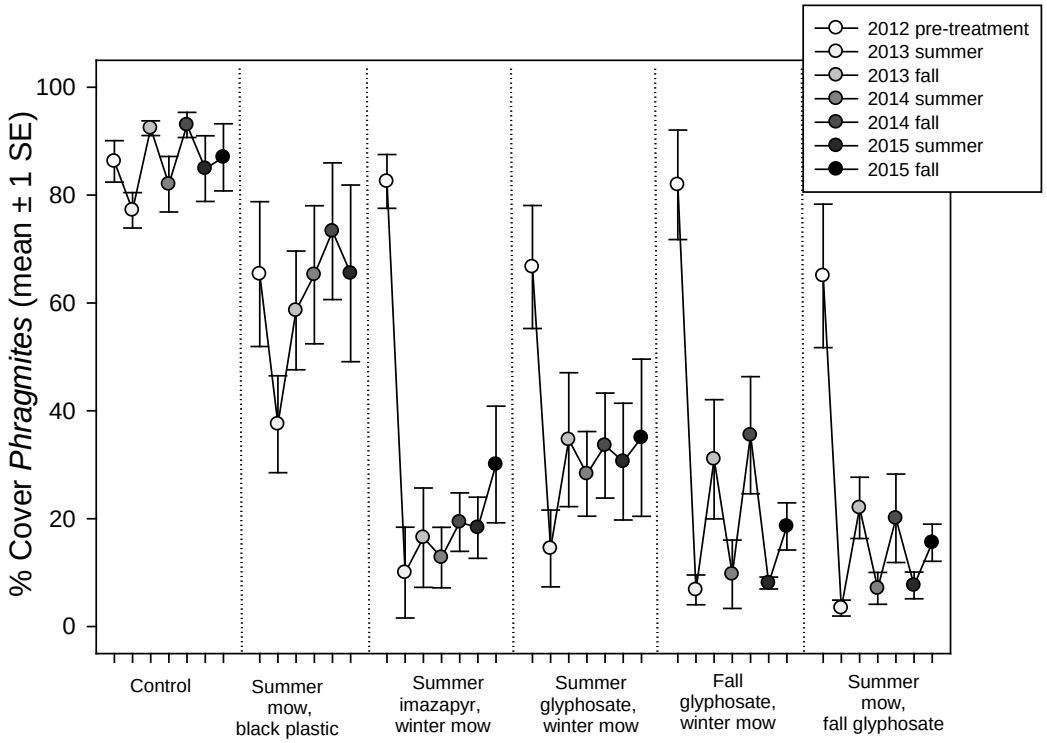

Figure 2. Changes in *Phragmites* cover in the small patch study (0.25 acre treatment plots; Christine Rohal Ph.D. dissertation research). Note the smaller increase in *Phragmites* cover in 2015 in the summer glyphosate and summer imazapyr herbicide plots relative to the large stand experiment.

Objective 2: Develop effective means for reestablishing three bulrush species via seeds.

Quantitative measures

Effectiveness in being evaluated in terms of percent germination of bulrush seeds in germination trials.

Activities

- We collected seeds of the three bulrush species from throughout the Great Salt Lake Watershed in fall 2014. We stripped the seeds from their inflorescences and prepared the seeds for the start of the various experiments.
- We applied a series of seed dormancy break treatments that included cold stratification (storing seeds at 4°C in moist soil for 30 days), chemical scarification with bleach (seeds were soaked in household bleach diluted to 3% sodium hyperchlorite for 24 or 48 hours), chemical scarification with acid (seeds were placed in concentrated 37.4% hydrochloric acid for either 30 or 40 minutes), and mechanical scarification (seeds were placed in a box lined with 120 grit sand paper and rubbed between a block coated with sand paper and the box. Low treated seeds were scarified for 15 seconds and high treated seeds were scarified for 30 seconds).
- Seeds were then placed in a greenhouse and left to germinate under high light and high temperature conditions.

Significant findings

- For *S. americanus* and *S. acutus*, cold stratification for 30 days had the largest positive effect on seed germination.
- For *B. maritimus*, germination was greatest with bleach scarification for 24 or 48 hours, or with cold stratification combined with 48 hour bleach scarification.

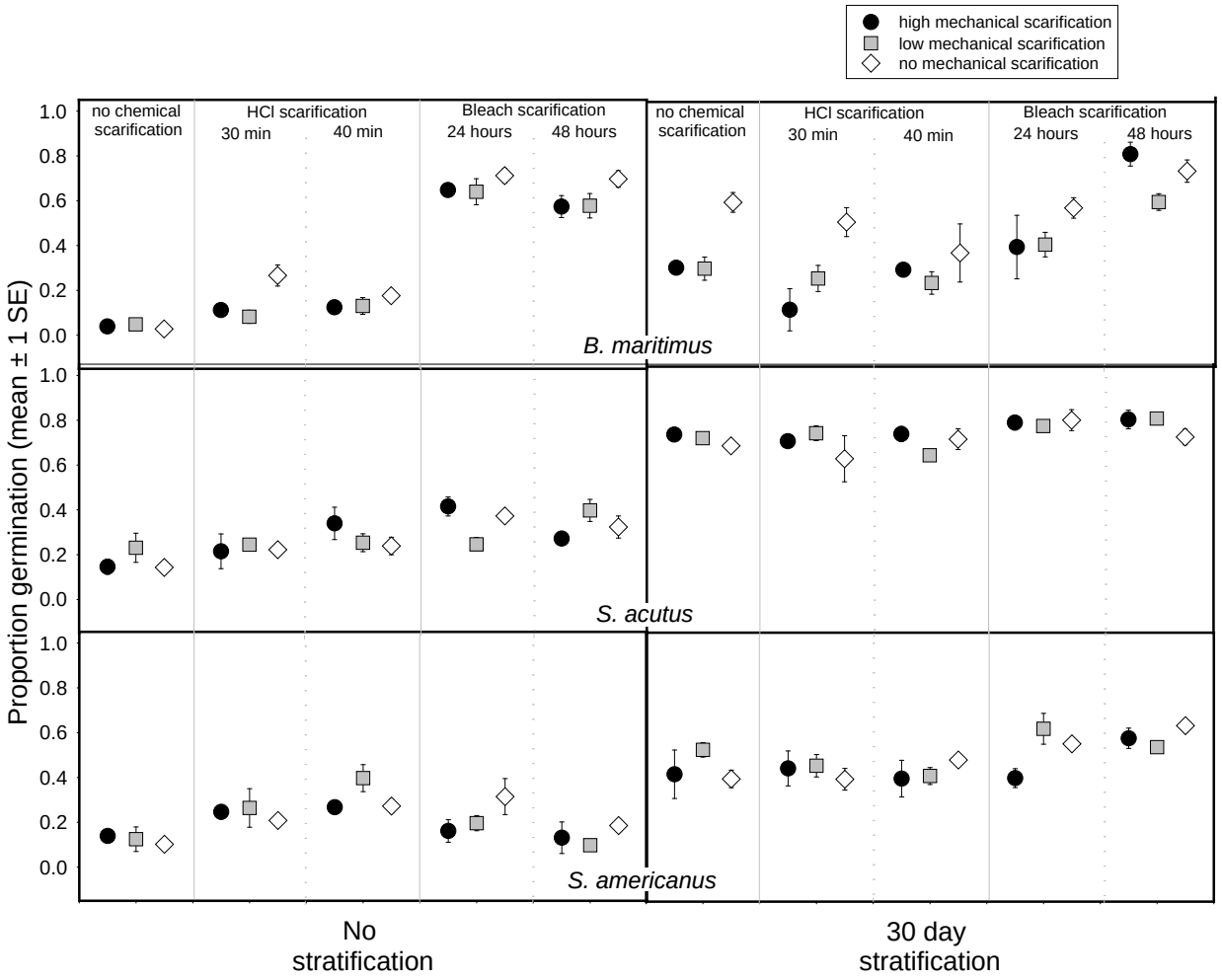

Figure 3. Seed germination for three bulrush species following dormancy breaking treatments: (1) cold stratification, (2) mechanical scarification, and (3) chemical scarification – either acid or bleach treatments.

Additional considerations

Project benefit to priority bird species and priority habitats

Given the critical importance of Great Salt Lake wetland habitat (a priority area in the IWJV 2013 Implementation Plan) to priority bird species (see below), developing techniques to control invasive *Phragmites* and restore lost wetland habitat is essential. Chapter 4 of the IWJV 2013 Implementation Plan explicitly identifies *Phragmites* as a primary factor negatively impacting avian and wetland habitat quality at Great Salt Lake. Our research results are a positive step towards meeting those habitat needs of wetland birds. Effective treatment of *Phragmites* and restoration will provide valuable foraging or breeding habitat for numerous priority species identified by the IWJV including, but not limited to: Northern Pintail, Cinnamon Teal, White-faced Ibis, American Avocet, Black-necked Stilt, and Marbled Godwit. Significant proportions (>15%) of each of these populations annually use the GSL wetlands (J. Vest personal communication).

Relationship between project and anticipated goals to regional and/or continental bird plans

The Great Salt Lake is identified as a continentally or hemispherically important landscape for wetland birds in the North American Waterfowl Management Plan, Western Hemispheric Shorebird Reserve Network, Intermountain West Shorebird Conservation Plan, Intermountain West Waterbird Conservation Plan, and, accordingly, in the IWJV Implementation Plans (1995, 2005, 2013). *Phragmites* has been identified as a primary factor negatively impacting avian habitat quality at Great Salt Lake (IWJV 2013 Implementation Plan). Our research will directly inform management actions at Great Salt Lake to restore and sustain quality wetland habitat for migratory birds. Our research project has tightened linkages among wetland managers on the Great Salt Lake who work for state and federal agencies, as well as NGOs and private duck clubs. This highly collaborative project, with its strengthened partnerships among regional constituencies, will benefit broad goals of increasing migratory bird habitat in the Great Salt Lake Ecoregion.

Other results that were not anticipated

The dramatic changes in research results between 2014 and 2015 were surprising in terms of *Phragmites* response to control treatments. These plant community changes underscore the critical importance of multi-year monitoring.

Changes in capacity needs since the proposal was developed

There have been no major changes in capacity needs.

The single most important step as a result of the project and next steps

The most important step as part of this was being able to provide science-backed recommendations to managers based on our research findings. This was particularly important given that our recommendations changed between 2014 and 2015 due to differences in response to *Phragmites* control treatments. It was important for managers to see the scientific process “in

action" (i.e., results can change year-to-year) and that our research has no agenda other than to provide sound recommendations to improve their management efforts. Next steps will be to see how the *Phragmites* control results are similar or different in 2016 (summer field sampling) vs. 2015 findings.

Duration of the project benefits

The research benefits will extend as long as *Phragmites* control and native plant revegetation is occurring in this region. Our research results can guide these control and revegetation efforts into the future.

Monitoring success of the project from this point on

The specific research plots will be monitored through the 2016 field season. At the regional scale, we will be able to assess the effects our research results have on management through our on-going outreach / extension efforts. We will be able to see if research results are resulting in change in management practices and if those "best practices" are followed by managers over the years to come.

Project transferability

- In previous years, we suggested that there was no difference in spraying *Phragmites* in the summer vs. fall, but the most recent experimental results from 2015 suggest that fall spraying is much more effective for controlling *Phragmites*, particularly when dealing with large stands of *Phragmites*. A summer spray might still be preferred in the first year of a three year control sequence to prevent additional seed production, but then shifting to a fall spray is better for longer-term *Phragmites* control. We have communicated these findings and recommendations to managers this winter as we have given a number of outreach presentations. In addition, on February 25, 2016, Chad Cranney and Christine Rohal gave a presentation to the Great Lakes *Phragmites* Collaborative as part of their webinar series, which was an opportunity for their research results to be disseminated across North America to those working on-the-ground doing *Phragmites* management and *Phragmites* researchers.
- Given the challenges of getting bulrush seeds to germinate in the field, we have some specific recommendations to managers now on how to break seed dormancy prior to sowing seeds in the field. For *B. maritimus*, a bleach scarification treatment seems to be optimal whereas for *S. acutus* and *S. americanus* cold stratification is preferred. In this next year, we will be looking at whether these same recommendations hold for different seed sources (=sites) of these species from throughout the Intermountain West. In addition, we will be evaluating techniques for seeding in these species (following dormancy breaking treatments) into wetland restoration sites with fluctuating water levels. We will specifically look at mulching and tackifier as ways to keep seeds in place so that they do not wash out of restoration sites.
- ***Major upcoming milestones that will drive transferability.*** Chad Cranney and Jimmy Marty will defend their M.S. theses in April 2016. Their work (partially funded by this grant) will be presented in a public seminar and their theses will be published online and be freely available to the public. Christine Rohal plans to finish her Ph.D. dissertation in spring 2017. As these students wrap up, there will be additional opportunities for peer reviewed

publications (to disseminate findings to the academic scientific community), outreach presentations to managers and landowners throughout Utah, and development of formal restoration guidance documents based on research findings.

SUMMARY (add fields if necessary)		
Number	**Description/Unit**	**Comments**
	Partner Biologist Position Established	N/A
	Total Acres Protected	N/A
	Total Acres Restored	Large stand study: 4 sites * 4 treated plots per site * 3 acres per plot = 48 acres Small patch study: 6 sites * 4 treated plots per site * 0.25 acre per plot = 6 acres
	Total Acres Enhanced	N/A
	Conservation Easements Acquired	N/A
	Conservation Plans/Contracts Developed	N/A
	Landowner Visits	N/A
	Partnering Organizations Involved	**Federal**: Howard Browers, US Fish and Wildlife Service, Bear River Migratory Bird Refuge. **State**: Randy Kaufman and Laura Vernon, Utah Division of Forestry, Fire & State Lands, Sovereign Lands. Val Bachman, Randy Berger, Rich Hansen, Chad Cranney, Jason Jones, Arlo Wing, Utah Division of Wildlife Resources. **NGO**: Chris Brown, The Nature Conservancy, Great Salt Lake Shorelands Preserve. **Private**: Ann Neville, Kennecott Utah Copper, Inland Sea Shorebird Reserve
	Meetings/Work Groups Facilitated	N/A
	Field Tours Hosted	N/A
	Grant Proposals Written & Funded	Utah Division of Wildlife Resources, Utah Division of Forestry, Fire & State Lands, U.S. Fish and Wildlife Service, Utah Division of Water Quality, South Davis Sewer District, Utah Wetlands Foundation, Delta Waterfowl Foundation, Community Foundation of Utah
	Other (OUTREACH presentations)	Great Salt Lake *Phragmites* Working Group, Salt Lake City, UT Great Salt Lake Technical Team meeting, Salt Lake City, UT Science Unwrapped, Logan, UT Southshore Wetlands & Wildlife Management, Inc. annual meeting, Salt Lake City, UT Utah Division of Wildlife Resources, Salt Lake City, UT Utah Wetlands Foundation, Salt Lake City, UT

BY PROJECT* (add fields if necessary)		
Number	**Description/Unit**	**Comments**
Property/Project Name:		Location (GPS Waypoint or Nearest Town):

	Acres Protected	N/A
	• Wetland Acres	
	• Riparian Acres	
	• Upland Acres	(Specify Habitat Type)
	Acres Restored	
54	• Wetland Acres	
	• Riparian Acres	
	• Upland Acres	(Specify Habitat Type)
	Acres Enhanced	
	• Wetland Acres	
	• Riparian Acres	
	• Upland Acres	(Specify Habitat Type)