

NELSON'S CHECKERMALLOW RECOVERY PROJECT: PHASE II



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2010 Report to the US Fish & Wildlife
Service

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PREFACE

The Nelson's checkermallow Recovery Project is coordinated by the Institute for Applied Ecology (IAE) and is funded by the United States Fish and Wildlife Service (USFWS) and the Oregon Watershed Enhancement Board (OWEB). IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research and education. IAE provides services to public and private agencies and individuals through development and communication of information on ecosystems, species, and effective management strategies. Restoration of habitats, with a concentration on rare and invasive species, is a primary focus. IAE conducts its work through partnerships with a diverse group of agencies, organizations and the private sector. IAE aims to link its community with native habitats through education and outreach.



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Cover photograph: Geoff Gardner preparing Nelson's checkermallow (*Sidalcea nelsoniana*) plugs for planting at Mud Slough 2010. *Photo by Corinne Duncan.*

REFERENCE

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Nelson's checkermallow Recovery Project: Phase II

2010 REPORT TO THE US FISH AND WILDLIFE SERVICE

EXECUTIVE SUMMARY

In the spring of 2008, the Institute for Applied Ecology received grants from the United States Fish and Wildlife Service (USFWS) and the Oregon Watershed Enhancement Board (OWEB) to work toward the recovery of Nelson's checkermallow in two of the largest recovery zones, Corvallis West and Salem West. Recovery zones are designated by the Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington (US Fish and Wildlife Service, 2010)(Recovery Plan). The Nelson's checkermallow Recovery Project is an implementation of this Recovery Plan. The objectives are to: 1) provide quality plant materials of Nelson's checkermallow through large scale seed collection and agricultural production, 2) increase and enhance habitat for Nelson's checkermallow at key introduction sites through weed control and seeding with native species, 3) meet recovery objectives by introducing at least 40 thousand checkermallow plants at protected sites, and 4) provide a model for recovery of other listed species.

This report summarizes Nelson's checkermallow Recovery Project Phase II activities completed from January 2010 through January 2011. In first year of Phase II we had numerous significant accomplishments, and we are on schedule to meet all of the project objectives. The efficient and innovative methodology used will contribute to the development of a recovery model. Below is a summary of 2010 accomplishments:

- **Plant Material Development of Nelson's checkermallow**
 - Produced 177 pounds of seed.
 - Grew 11,000 plugs.
 - Harvested 9,078 rhizomes.
- **Habitat Enhancement of Introduction Sites**
 - Monitored baseline conditions at all project sites.
 - Controlled weeds by herbicide application at 8 sites and woody encroachment by mowing at 9 sites.
 - Prepared sites for seeding by haying at 2 sites and prescribed burning at 5 sites.
 - Seeded prairie diversity mix at 9 sites.
- **Nelson's checkermallow Introduction**
 - Seeded 200 pounds of seed at 6 project sites.
 - Planted 9,078 rhizomes and 8,078 plugs over 11 project sites.
 - Started experiment comparing propagule success at 6 project sites.
- **Outreach**
 - Met with landowners and partners regularly. All landowners signed a cooperative agreement.
 - Produced and distributed over 300 Nelson's checkermallow brochures.
 - Information booth highlighting Nelson's checkermallow at 2 public functions.
 - Hosted 3 volunteer work parties.
 - Started development of a nature park at the Confederated Tribes of the Grand Ronde
 - Designed large, permanent interpretive signs for Nelson's checkermallow at 3 project sites.

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Nelson's checkermallow Recovery Project: Phase II

2010 REPORT TO THE US FISH AND WILDLIFE SERVICE

THE PROJECT

Nelson's checkermallow (*Sidalcea nelsoniana*) is listed as a threatened species under both the state of Oregon and federal Endangered Species Acts, and is listed as endangered by the state of Washington. Without direct intervention, its prospects for recovery are poor. The majority of populations are small, isolated, and are found on unprotected lands. Further, natural recruitment is low due to competition with invasive weeds, altered disturbance regimes, and threats to the genetic integrity of the species. However, of the prairie species targeted in the Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington (United States Fish & Wildlife Service, 2010), Nelson's checkermallow has the greatest potential for successful recovery. Recent advances in applied restoration ecology demonstrate that restoration of suitable habitat for this species is possible, and this species can be efficiently propagated and out-planted with a high probability of success. Due to these favorable qualities, Nelson's checkermallow has been chosen to be the first USFWS Recovery Plan prairie species to be targeted for large scale recovery. This project has successfully completed its first phase and is one year into its second phase. Through partnerships with local, state, and federal agencies, as well as non-profit groups and private landowners, the achievements of the project thus far represent significant progress toward lasting recovery of Nelson's checkermallow.

PHASE II ACCOMPLISHMENTS

Many partners are working together to help meet the objectives of the Nelson's checkermallow Recovery Project. Some of our major partners include the Oregon Watershed Enhancement Board, the US Fish and Wildlife Service, the Natural Resources Conservation Service (NRCS), NRCS Corvallis Plant Materials Center, City of Corvallis, Benton County, Oregon Department of Fish and Wildlife, USFWS Willamette Valley Refuge System, Oregon Department of Transportation, Yamhill County Parks, Polk County, Confederated Tribes of the Grand Ronde, and our many private landowners.

Phase II Accomplishments

The emphasis for Phase II is on harvest and outplanting of plant materials. In addition to outplanting activities, key tasks for 2010 included site preparation and installing an experiment comparing propagule types. Outreach is ongoing, as every step of this recovery project depends on public support and lasting stewardship. Site maintenance is also ongoing and necessary to project success.

Objective 1: Plant Material Development

REVIEW OF 2008-09 PRODUCTION FIELD ESTABLISHMENT

To increase the quantity and genetic diversity of Nelson's checkermallow plant material available for introductions, seed from 53 populations across both Corvallis West and Salem West recovery zones were collected in 2008 and 2009 for use in plug production and to establish and maintain seed increase fields (see Gisler et al, 2010). Plugs grown from this seed were field planted into two, 1/4 acre production blocks at the Corvallis PMC in the spring of 2009. Corvallis West and Salem West production blocks were placed on opposite ends of the production facility to isolate recovery zones, and individual population units were arranged to encourage pollination between different populations within recovery zones. In late 2009, an additional 800 Nelson's checkermallow plugs grown from seed collected in 2009 were planted in the production fields to increase genetic representation of underrepresented populations.

SEED PRODUCTION

Seed production has been highly successful. Nelson's checkermallow production fields in 2009 produced a total of 87 pounds of seed (51 and 36 pounds from Salem West and Corvallis West recovery zones respectively) and in 2010 produced 177 pounds (89 and 88 pounds from the Salem West and Corvallis West recovery zones respectively). Seed tests returned with 90% viability.

Figure 1. SW Zone Nelson's checkermallow production field at the Corvallis PMC April 2010.



Figure 2. Harvest of SW Zone July 29, 2010.



PLUG PRODUCTION

We estimated that a total of 24,000 plugs would be needed to complete the project. Production was divided into three plantings: Fall 2010, Spring 2011, and Spring 2012. The staggered approach can potentially improve survival of outplanted material as seasonal conditions can vary by year. For instance, in some years fall plantings may be susceptible to frost heaving while spring plantings may be susceptible to drought in other years. Also, this approach enables us to strategically plant at recovery sites that are ready and fully restored at the time plant material is available.

In March of 2010, conetainers were seeded (using seed from the 2009 production harvest) and cold stratified at the Corvallis PMC. Loss was minimal and 8,079 vigorous plugs resulted. In December 2010 the second conetainer seeding was completed, and plants from this seeding will be ready for planting in March 2011. Only 1500 plants were cultivated for each recovery zone since a limited number of sites were ready for spring planting. The final planting of plugs is expected to occur in December 2011 to be used introduced to project sites in March 2012.



Figure 3. Amy Bartow in Corvallis PMC hoop frame with Nelson's checkermallow plugs.

RHIZOME HARVEST

Rhizomes were harvested from production fields on November 2010. IAE had 3 staff members and contracted a 5 man crew with Integrated Resource Management to assist. We used an assembly line to increase efficiency and were able to process 8,578 rhizomes in three days. Select plants were removed from the production field and placed on the chopping block where the root mass was divided using an axe. Then the soil was rinsed off of rhizomes to prevent potential weed seed contamination of introduction sites. The rhizomes were further divided so that they were all a consistent size for the experiment (size of a child's fist) resulting in approximately 6 rhizomes per plant. All outplanted material had obvious meristematic nodes. At first we were also removing leaves but soon realized that this was not a necessary step since the rhizomes would be mostly buried. We sampled the field in a manner that enabled us to obtain individuals from all G1 source meta-populations to ensure a broad genetic representation. Rhizomes were then stored in plastic bags in batches of 100 for easy retrieval at destination site. Rhizomes were kept under 50°F during storage to prevent mildew. Rhizome storage was kept to a minimum to prevent rhizome deterioration; planting occurred within a week of harvest. Corvallis West and Salem West recovery zone fields were processed on separate days to ensure no accidental mixing. A total of 345 and 800 plants were harvested from Salem West and Corvallis west recovery zones respectfully. Differences were noted between Corvallis West and Salem West plants. Corvallis West plants tended to be smaller than Salem West plants with a more downward growing root mass. This differences are likely environmental as soils at each of these locations were different and the Corvallis West production field did not have weed fabric.



Figure 4. Rhizome harvest Corvallis PMC November 2010.

Objective 2: Habitat Enhancement of Introduction Sites

Project Sites - From a total of over 30 potential sites, 12 priority (Table 1) and 9 backup sites were selected for this recovery project. Partner coordination has been essential to the success of this project as many partners assisted with restoration of sites and partners have an interest in facilitating this project. Also we needed to ensure that we were meeting the needs of all landowners and easement holders as well as meeting the requirements of state and federal agencies. As such, all landowner agreement forms have been completed and signed and compatible use approval and all permits have been obtained. Lastly, a high level of coordination enhances our outreach potential.

Table 1. Nelson's checkermallow Recovery Project Priority Sites

Site Name	Ownership	Recovery Zone
E4	Private, NRCS WRP	Corvallis West
Brown – (renamed: Tyea Nature Preserve)	Confederated Tribes of Grand Ronde	Salem West
Deer Creek Park	Yamhill County Parks	Salem West
Dhooghe	Private, NRCS WRP	Salem West
EE Wilson Wildlife Refuge	Oregon Department of Fish & Wildlife	Corvallis West
Marys River Natural Area	City of Corvallis	Corvallis West
Mud Slough	Private, NRCS WRP	Salem West
Raindance Ranch	Private, NRCS WRP	Corvallis West
Sheldon-Holt	Private, NRCS WRP	Salem West

Spring Valley Creek	Private, NRCS WRP	Salem West
Tyee	Private, NRCS WRP	Corvallis West
Winter Creek	Private, NRCS WRP	Corvallis West

Acronyms: NRCS: Natural Resources Conservation Service, WRP: Wetlands Reserve Program, FSA: Farm Service Agency, CREP: Conservation Reserve Enhancement Program

Monitoring - Monitoring has been conducted throughout the project to assess baseline conditions, guide adaptive management, evaluate effectiveness of restoration treatments, document habitat improvements, and measure establishment success of Nelson's checkermallow. As detailed in the Final Report for Phase I (Gisler et al, 2010), baseline monitoring has been completed at all priority sites and included population censuses, photo-points, habitat descriptions, species lists, and functional group cover. In 2009, quantitative assessments were completed at four sites in which species composition was documented using the point intercept technique. During 2010 a standardized monitoring data collection was developed (Appendix A), monitoring data was updated, and new photo points were established. Photopoint data continues to be gathered at each site, each year of the project in the month of July. Phase II project funding will support post treatment effectiveness monitoring in 2014.

Site Preparation - With help from our partners, a substantial amount of effort has gone into enhancement and maintenance of the habitat at introduction sites. Site preparation activities for 2010 included mowing (Brown-CTGR, Dhooghe, E4 Ranch, Marys River Natural Area, Mud Slough, Sheldon-Holt, Tyee, Deer Creek, and Winter Creek), disking (Deer Creek), herbicide application (Winter Creek, Tyee, Marys River Natural Park, Mud Slough, Sheldon-Holt, EE Wilson, E4 Ranch, and Deer Creek), clearing of woody vegetation (Brown-CTGR, Deer Creek), native seeding (Brown-CTGR, Deer Creek, Marys River Natural Area, Mud Slough, Sheldon-Holt, Tyee, Raindance Ranch, E-4 Ranch, and Winter Creek), burning (Marys River Natural Area, Mud Slough, Sheldon-Holt, Tyee, and Winter Creek), transplanting of poverty rush (*Juncus tenuis*), big leaf lupine (*Lupinus polyphyllus*), Camas (*Camassia quamash* and *C. lechtlinii*), and Oregon saxifrage (*Saxifraga oregana*) (E4 Ranch, Marys River Natural Park, Mud Slough, Tyee, Winter Creek, Raindance Ranch, Brown-CTGR), and haying (Sheldon-Holt and Tyee).

Brown-CTGR

Brown (renamed as Tyee Nature Reserve) is owned and managed by the Confederated Tribes of the Grand Ronde (CTGR) and is located at 28450 Tyee Road, Grand Ronde, OR 97347 in the Salem West recovery zone. Nelson's checkermallow naturally occurs at this site although the population has been declining due to extremely heavy encroachment by woody species (i.e., native rose, spirea, blackberry, and hawthorn). The site was mowed to control woody species and invasive species were spot sprayed with herbicide. A few trees and shrubs were left to provide structural diversity, but even large trees (Douglas fir and cherry) were removed. Debris was pile-burned onsite and a native seeding was completed over the burn pile scar to prevent weed establishment. An IAE labor crew grubbed out rose, spirea, and blackberry (*Rubus laciniatus*) with picks and by hand in planting areas. After clearing, the disturbed ground was broadcast seeded with native species and planted with camas, rush, Oregon saxifrage, and Nelson's checkermallow plugs and rhizomes. Uprooted spirea plants were salvaged for CTGR riparian restoration projects.



Figure 5. Brown site before (March 2010) and after (November 2010) mowing. Treatment intended to release existing Nelson's checkermallow plants and create openings for augmenting this population.

Deer Creek

Deer Creek (Gopher Valley Road; McMinnville, OR 97128) is a Yamhill County Park located in the Salem West recovery zone. Even with high native plant diversity at this site, weeds (especially teasel, sow thistle, and velvet grass) continue to threaten this site. Woody plant encroachment is also a problem at the northern end of the site. In the summer of 2010 soil ridges were disked to reduce the number of dry micro-sites that are especially attractive to weeds. Sections of the site were mowed to control thatch and woody species and a broadspectrum herbicide was also applied to the entire site. In October the US Fish and Wildlife seeded the site with a diversity of native grass species using a no-till seed drill. The site is expected to be ready for seeding forbs and Nelson's checkermallow in 2013.

Dhooghe WRP

The Dhooghe organic farm (16385 Bridgeport Road; Dallas, OR 97338) is a private site enrolled in the NRCS Wetland Reserve Program and is located in the Salem West recovery zone. A natural population of Nelson's checkermallow exists here. Weed mitigation has been successful and site activities are on a maintenance basis. Small patches of invasive grasses around trees were mowed to reduce seed production and a broad mow was utilized to reduce above ground biomass of popcorn flower (*Plagiobothrys figuratus*) in the spring to release Nelson's checkermallow seedlings from light competition.



Figure 6. Dhooghe WRP Spring 2010.

EE Wilson

EE Wilson (29555 Camp Adair Road; Monmouth, OR 97361) is an Oregon Department of Fish and Wildlife refuge located in the Corvallis West recovery zone. Nelson's checkermallow naturally occurs here. Invasive grasses, vetch, teasel and other weedy species are overgrowing the current population and inhibiting its ability to expand. The site was mowed to control woody species and make it possible to spray herbicides, which were applied to control nonnative grasses. Hand weeding of vetch and teasel around the existing Nelson's checkermallow populations was also completed.

E4 Ranch WRP

E4 Ranch (Llewellyn Road; Corvallis, OR 97333) is a privately owned site enrolled in the NRCS Wetland Reserve Program located in the Corvallis West recovery zone. This site supports a higher proportion of sedges and rushes than the other 11 project sites as it is wetter than most of the other sites. It was selected to test the ecological amplitude of the species. In preparation for fall 2010 Nelson's checkermallow seeding, and rhizome and plug planting, this site received herbicide and mowing treatments. Native forbs were seeded and the site was enhanced with Oregon saxifrage divisions.

Marys River Natural Park

Marys River Natural Park (Brooklane Place; Corvallis, OR 97333) is owned by the City of Corvallis and is located in the Corvallis West recovery zone. Herbaceous weeds are a challenge on the south end of the site while encroachment of woody species poses a threat at the north end. The treatments for this site included: spot-spray herbicide application, a prescribed burn, native forb seeding, and planting Nelson's checkermallow, lupine, and Oregon saxifrage. The prescribed burn at this site, conducted by the City Fire Department, was the most complete of any burn conducted for the project.

Mud Slough WRP

Mud Slough (1875 N Greenwood Road; Rickreall OR 97371) is a large privately owned site enrolled in the NRCS Wetland Reserve Program and is located in the Salem West recovery zone. This site has existing population of Nelson's checkermallow all concentrated in a small unit in the interior. In preparation for

Nelson's checkermallow seeding and planting, the site underwent herbicide application, mowing, and a prescribed burn. The prescribed burn was incomplete but still created enough open ground for adequate seeding and planting in the north unit. After the burn Nelson's checkermallow was introduced and the site was enhanced with a native forb seeding and plantings of big leaf lupine (*Lupinus polyphyllus*) and Oregon saxifrage. The firelines were also seeded.



Figure 7. No-till seeding of Mud Slough WRP after fire, October 2010.

Raindance WRP

Raindance (25301 Gilbert Lane; Monroe, OR 97456) is a privately owned site enrolled in the NRCS Wetland Reserve Program and is located in the Corvallis West recovery zone. This is the southernmost site in the project, pushing up against the range for *Sidalcea cusickii*. In fact, a recent discovery of a potential Cusick's checkermallow population on an adjacent property has delayed introductions to this site since Nelsons and Cusicks can hybridize. The identity of these plants will be confirmed in 2011 upon flowering. Other challenges at this site include weeds and flashy hydrology. Further site preparation treatments are tentatively scheduled for 2011.

Sheldon-Holt WRP

Sheldon-Holt (17550 SW Briedwell Road; McMinnville, OR 97128) is a privately owned site enrolled in the NRCS Wetland Reserve Program and located in the Salem West recovery zone. Wild carrot (*Daucus carota*), reed canarygrass, and penny royal (*Mentha pulegium*) are the biggest challenges at this site. Due to late spring-early summer rains, the scheduled herbicide treatment was postponed. An accidental burn occurred on this site in early fall. After the fire we immediately seeded hardy native forbs and grass diversity. Nelson's checkermallow plants and seed were introduced after the seeding in November.

Spring Valley WRP

Spring Valley (6990 Spring Valley Road NW, Polk County) is a privately owned site enrolled in the NRCS Wetland Reserve Program. It is located in the Salem West recovery zone. The USFWS maintains native grass stands through periodic broadleaf herbicide applications. In 2011 the site is scheduled for a

prescribed burn and native forb seeding, including Nelson's checkermallow seed. Nelson's checkermallow plugs will be introduced in the spring of 2012.

Tyee WRP

Tyee WRP (26335 Greenberry Road; Corvallis, OR 97333) is a privately owned vineyard enrolled in the NRCS Wetland Reserve Program in the Corvallis West recovery zone. A small population of Nelson's checkermallow naturally occurs a few units away from the introduction site. To prepare for 2010 Nelson's checkermallow introductions, the site was spot-sprayed, and burned. Because prescribed burn was patchy, sections of this site were mowed to improve seeding establishment (no-till drill seeding of native forbs and grasses). Tyee was also enhanced with big leaf lupine and Oregon saxifrage plantings.

Winter Creek WRP

Winter Creek WRP (Robinson Road; Camp Adair, OR 97361) is a privately owned site enrolled in the NRCS Wetland Reserve Program within the Corvallis West recovery zone. A naturally occurring population of Nelson's checkermallow at this site is being augmented through this project. In preparation for 2010 Nelson's checkermallow plantings, the site underwent multiple herbicide applications, a mow treatment, and a prescribed burn. Though the burn was patchy, it still allowed for adequate drilling of native forb and grass seed without needing to be mowed.

Objective 3: Nelson's checkermallow Introduction

GENERAL OUTPLANTING

The majority of introductions were scheduled for Phase II (Table 3), although two initial Nelson's checkermallow introductions (Dhooghe and Bezell Memorial Forest) took place during Phase I of the project.

Table 2: Outplanting Year for Priority Introduction Sites.

Site Name	Outplanting Year
<u>Corvallis West Recovery Zone</u>	
E4	2010
EE Wilson Wildlife Refuge	2011
Marys River Natural Area	2010
Raindance Ranch	2011
Tyee	2010
Winter Creek	2010
<u>Salem West Recovery Zone</u>	
Brown-CTGR	2010
Deer Creek Park	2011
Dhooghe	2010
Mud Slough	2010
Sheldon-Holt	2010
Spring Valley Creek	2011

Outplanting in 2010 was extensive. In November and December 2010, a total of 17,156 Nelson's checkermallow plants (8,078 plugs and 9,078 rhizomes) and 200 pounds of Nelson's checkermallow seed was

outplanted at 11 sites across Salem West and Corvallis West Recovery zones (Table 4). The vast majority of rhizomes were harvested from the Corvallis PMC production fields previously described. Both plugs and rhizomes were planted into moist soils in November and December 2010. Seeding occurred between September and November 2010. Rhizomes were planted creating a slot using a shovel, placing the rhizome near the surface, and folding the soil over it. Plugs were hand planted using a dibble, and seed was planted with a no-till seed drill. After dropping the plugs into the dibble hole, the dibble hole was covered native soil to help avoid wicking, frost heave, and erosion.

Table 3. *Sidalcea nelsoniana* (Nelson's checkermallow) Outplanting by Site and Proagule Type

Site	Address/UTM Coordinates	Ownership	2010 Date	Propagule Type	Quantity
Bald Hill Park	Oak Creek Road; Corvallis, OR 97333 (UTM 10)	City of Corvallis	19-Nov	rhizomes	1223
Baskett NWF	10995 Highway 22; Dallas, OR 97338 (UTM 10)	Federal	30-Nov	plugs	500
Brown- CTGR	28450 Tyee Road; Grand Ronde, OR 97347	Confederated Tribes of the Grand Ronde	15-Nov	rhizomes	505
	(UTM 10 0451998E, 4991309N)		16-Dec	plugs	490
Dhooghe WRP	16385 Bridgeport Rd. Dallas, OR 97338 (UTM 10 471397E, 4966027N)	Private WRP	11-Nov	seed	20 pounds
			23-Mar	rhizomes	500
			30-Nov	plugs	294
E4 Ranch WRP	Llewellyn Rd, Corvallis, OR 97333 (UTM 10 474218E, 4924560N)	Private WRP	19-Oct	seed	20 pounds
			10-Nov	rhizomes	1000
			10-Nov	plugs	1000
Corvallis Home Depot	1780 NW Four Acre Place; Corvallis, OR 97330 (UTM 10)	Private Mitigation	11-Nov	rhizomes	250
Marys River Natural Park WRP	Brooklane Place; Corvallis OR 97333 (UTM 10 0477159E, 4931584N)	City of Corvallis	17-Sep	seed	30 pounds
			8-Nov	plugs	1000
			8,11-Nov	rhizomes	1500
Mud Slough WRP	1875 N Greenwood Road; Rickreall OR 97371 (UTM 10 484367E, 4977786N)	Private WRP	13-Oct	seed	50 pounds
			4-Nov	rhizomes	1000
			4,22,30-Nov	plugs	1794
Sheldon Holt WRP	17550 SW Briedwell Road; McMinnville, OR 97128 (UTM 10 480387E, 4998271N)	Private WRP	4-Nov	rhizomes	1000
			4-Nov	plugs	1000
			20-Nov	seed	30 pounds
Tyee WRP	26335 Greenberry Road; Corvallis, OR 97333) (UTM 10 474601E, 4923695N)	Private WRP	28-Sep	seed	30 pounds
			10-Nov	plugs	1000

			10-Nov	rhizomes	1500
Winter Creek WRP	Robinson Road; Camp Adair, OR 97361	Private WRP	6-Oct	seed	20 pounds
	(UTM 10 480972E, 4952369N)		8-Nov	rhizomes	1000
			8-Nov	plugs	1000

In addition, poverty rush (*Juncus tenuis*), camas, and Oregon saxifrage (*Saxifraga oregana*) transplants were also included in the outplanting efforts to enhance native diversity in November and December 2010. The Brown-CTGR site received 1690 poverty rush divisions, 426 camas bulbs, and 150 Oregon saxifrage. Marys River Natural Area, Mud Slough, Dhooghe, and Tyee received 1600, 500, 243, and 1000 Oregon saxifrage respectively. These transplants were placed in November and December 2010.



Figure 8. Planting rhizomes in experimental plots at Marys River Natural Area, November 2010.

PROPAGULE EVALUATION EXPERIMENT

Planting seed, rhizomes, and plugs of Nelson's checkermallow at introduction sites provides a unique opportunity to measure the relative establishment success of three different propagule types (Figure 9). We developed an experiment at six sites (covering a wide geographic range in both recovery zones) to evaluate these materials (Figure 8). Experimental plots, marked with metal poles, consisted of three ¼ acre planting blocks. Each planting block was randomly assigned plugs, rhizomes, or seed. Seed was drilled at a rate of 5 pounds per acre, and 1000 plugs and 1000 rhizomes were planted in a grid with one meter spacing at each experimental site (Figure 10). After five years, establishment success and planting cost will be measured and compared between propagule types. This study is expected to guide efficient, cost effective, and successful introductions of Nelson's checkermallow in the future.



Figure 9. Nelson's checkermallow propogules types: plugs, rhizomes, and seed (in seed drill box).



Figure 10. Experimental plot design.

OUTREACH

Several outreach venues have been used to both heighten awareness of Nelson's checkermallow and its habitat, and to share information about the Nelson's checkermallow Recovery Project. Interpretive signs, describing Nelson's checkermallow and the importance of wet prairie habitat, were designed for Marys River Natural Area (Figure 11), Deer Creek Park, and Brown-CTGR. These sites were chosen to receive signs both to have representation in each recovery zone and because these three locations are publically accessible and are likely to receive the most visitors. In 2010, 300 Nelson's checkermallow informational brochures (totaling 600 for the project duration thus far) were produced and distributed to watershed councils in the Corvallis

West and Salem West Recovery Zones, Soil and Water Conservation Districts, US Fish and Wildlife field offices, Natural Resources Conservation Service field offices, Confederated Tribes of the Grand Ronde, local organizations (Benton Public Library, bookstores, etc.) and at booths, conferences and environmental festivals including DaVinci Days and Earth Day. Additional outreach occurred at landowner and partner meetings, and collaboration with watershed councils. Weed removal at EE Wilson also provided an outreach opportunity for volunteers.

Perhaps the most exciting 2010 outreach accomplishment was work toward a park at Brown-CTGR. Because the site is optimally located for outreach purposes, significant time was spent planning and coordinating the implementation of a park plan. The emphasis of our outreach efforts here is to demonstrate how culturally significant plants and Nelson's checkermallow both depend on the same habitat. We strive to provide learning opportunities and appreciation for both types of plants. The site is located near the CTGR Housing Authority and is within walking distance of the tribal hospital. A trail system, including a boardwalk is planned and three camas harvesting sites were planted in November and December 2010. A kiosk has been built on site where the interpretive sign for Nelson's checkermallow will be posted. Plans for a camas processing table, as well as a traditional art piece are underway. CTGR partners have contributed a significant amount of labor and resources to see this outreach vision through.

We will continue to share information about Nelson's checkermallow and other listed species through our project website, environmental events, volunteer efforts, and brochure distribution.



Figure 11. Interpretive sign erected at Marys River Natural Area.

MODEL FOR RECOVERY

The strategy of this recovery project and process has been explicitly tracked to provide a model for recovery for further Nelson's checkermallow as well as recovery of other species. The database for this recovery project details each project stage: collection site and project site information, GIS maps, seed mixes, site treatments, treatment costs, plant materials development data, partner and contractor contact information, contractor services provided, decision trees, outplanting tracking, and permitting information. In addition, several templates have been developed for direct transfer to other recovery efforts including: a standardized monitoring form, site preparation schedules and checklists, experimental plot set-up diagrams, and standardized site forms. Through the propagule evaluation experiment, the most cost effective propagule

type for Nelson's checkermallow will be identified for future recovery efforts. As well, our records of harvesting and outplanting time will be very useful in future planning. The complete package for the model will be provided at project completion.

LESSONS LEARNED

- We encountered a number of political roadblocks in gaining permission to utilize sites in the Wetland Reserve Program as the NRCS did not have the infrastructure developed yet to manage or provide technical determinations for introductions of listed species on their easement sites. The progress made with the NRCS through the Nelson's checkermallow Recovery Project has paved the way for other listed species introductions on WRP sites in the future.
- Rhizomes are extremely prolific. Even one inch pieces are with no obvious nodes will root and shoot. As such, a single plant can produce easily be divided into 10-20 viable rhizomes. Rhizomes need to be kept cool. Even a couple of hours in plastic bins in the back of a truck can predispose rhizomes to mildew. The method of harvesting entire plants greatly increased efficiency. Rhizomes must be planted very shallowly (perhaps even with a small portion of the rhizome exposed) otherwise they will be susceptible to rot.
- Scheduling burns was highly labor intensive as a great deal of paperwork needed to be completed and approved by several groups. Burning was also a very unpredictable treatment which depended on weather conditions, site conditions, and site prioritization. However, prescribed burning truly improved conditions for seeding.

REFERENCES

Gilser, Melanie, Corinne Duncan, and Stephanie Miller. 2010. Nelson's checkermallow Recovery Project: Phase I. Final Report to the United States Fish and Wildlife Service. Prepared by the Institute for Applied Ecology, Corvallis OR. 18 pp.

U.S. Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. U.S. Fish and Wildlife Service, Portland, Oregon. xi + 241 pp.

APPENDIX A

Baseline Monitoring Data Sheet

Nelson's checkermallow Recovery Project

Date: _____

Observers: _____

Site Name: _____

Photopoints:

Number	Bearing	Location and Bearing Descriptions

GPS waypoints taken?

Habitat Description:

General Site Description _____

List of Dominant Species

Functional Group	Dominant Species	Co-dominant Species (if applicable)
Forb		
Shrub		
Grass		

Problem Species (Ranked)

1.	4.	7.
2.	5.	8.
3.	6.	9.

Ratios:

Native:Non-Native ____ : ____

Shrub:Graminoid:Forb ____ : ____ : ____

Annual:Perennial ____ : ____

Notes: