

Monitoring of Upland Restoration Study at Ouray NWR FY14 Progress Report

Project Description

Ouray NWR is part of the Upper Colorado River Ecosystem. Within the Refuge are 5 wetland bottoms and 16 miles of the Green River bordered by riparian habitat. Bordering the riparian and wetland habitat is grassland and shrubland/grassland habitat. As the surrounding landscape is high desert, the wetland, riparian and grassland habitats are a unique and important refuge on the Green River. Much of the Refuge has been highly modified or disturbed from a variety of sources, such as wetland alteration and manipulation, changes in Green River flows as a result of the Flaming Gorge dam, invasive species, hatchery development, and historic and current farming. Restoration has become a high priority for Ouray NWR. Specifically, upland restoration of native grasses has been ongoing for several years. Past attempts of grassland restoration have failed despite extensive effort by Refuge staff and assistance and advice from many agencies and individuals. Restoration is currently needed in areas 1) where invasive species eradication has been successful but native plant species are not present to colonize, and 2) on the former hatchery site.

A large, intensive grassland restoration study has been undertaken at Ouray NWR with the objectives of determining the most successful methods of seeding native grasses under a variety of conditions. Study design was based on a similar restoration study in a desert environment using many of the same species (Lair and O'Meara).

Monitoring of the entire study should be conducted each year for at least 5 years as many desert grasses can take that many years to fully establish, especially in non-irrigated areas (Habitat Restoration Plan, RMA). In addition, due to the high variance of precipitation (but totaling less than 7 inches/year), response from year to year varies significantly as well which would be detected from yearly monitoring.

Objectives: To determine the most effective method of native grass establishment based on 1) season, of planting, 2) irrigation, 3) seeding technique, 4) soil prep, and 5) soil amendment.

Methods: Study sites and plots were prepared as needed for the prescribed treatment. Initially all fall plots were seeded October, 2010 and spring plots seeded April, 2011. Irrigation on study site 1 was initiated spring of 2011. Weed control in study site 1 was ongoing during 2011 and 2012. However, the extensive flooding in 2011 destroyed study site 2. Study site 2 was reestablished in a new location. Spring planting of the reestablished study site 2 was completed April, 2012 and fall planting completed October, 2012.

The established monitoring method is using a modified Daubenmire method tailored for this project to measure canopy cover, frequency, and composition by canopy cover as well as use of photo points. To monitor, a tape measure is stretched down the middle of each row of grass which is 6 feet wide. A 20x50 cm quadrat frame is placed at every two foot increments in one of five positions: 18 inches to the left of the tape, 6 inches to the left, directly on the tape, 6 inches to the right, or 18 inches to the right for a total of 20 completed quadrats. For each quadrat, the canopy cover of the target species is determined by 1 of 6 cover classes.

Analysis: The influence of treatments on canopy cover and frequency of native grass species will be assessed using a generalized linear mixed-effects modelling (GLMM) framework to account for the bounded nature of the data (i.e., values cannot be below 0 or above 1) and the repeated measures design. Fixed effects will include factors outlined above, while year and plot will be considered random effects. Model selection will follow Zuur et al. (2009) and be conducted in R using package lme4.

Data Management: FWS protocols will be followed regarding data management. Past data is contained in an Excel spreadsheet.

Partners: Conservation Seeding and Restoration (CSR) was contracted to design part of the study, implement and install all study plots, and monitor the plots for two years, which was completed in 2013. In 2014, an agreement was established with USGS Fort Collins Science Center to continue with the monitoring of the study.

Sources of Support: Ouray NWR has funded over \$83,000 of the initial \$151,800 contract. I&M has funded past monitoring and funded all monitoring for 2014.

Current Status: The monitoring for 2014 of the study plots was conducted August 11 thru August 14. Monitoring needs to continue for Study Site 1 through 2015. Monitoring for Study Site 2 needs to be conducted through 2017.

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Literature Citations

Lair, K.D., N. Ritter, and A. Howard. 2006. Use of activated charcoal to protect native seeds from herbicides (California). Restoration Note No. 109. Ecol. Restor. 24(2):122-124.

Lair, K. D., and S. O'Meara. 2009. Interim report: revegetation strategies and plant materials selection for restoration of xeric *Tamarix* infestation sites following fire. Tech. Memo. No. 86-68220-09-05. Environmental Applications and Ecological Research Group, Technical Service Center, Bureau of Reclamation, Denver, CO. 50pp. (In press).

Habitat Restoration Plan. Rocky Mountain Arsenal National Wildlife Refuge. August 1999.

Zuur, A.F., Ieno, E.N., Walker, N., Saveliev, A.A. & Smith, G.M. 2009. Mixed Effects Models and Extensions in Ecology with R. Springer, New York, New York, USA.