12-31-2006

Lake Mead National Recreation Area Vegetation Monitoring and Management: Quarterly Progress Report, Period Ending December 31, 2006

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Executive Summary

- Two new Weed Sentry research assistants were hired.
- Weed Sentry staff surveyed for exotic species on 89 miles of roads on NPS and BLM land and treated more than 21,000 exotic plants in incipient populations.
- A grid-based rare plant monitoring method was tested this quarter.
- A manuscript detailing vegetation succession on a water pipeline at Lake Mead NRA was submitted for review to the journal *Crossosoma*.
- New integrative projects undertaken this quarter included establishing a competition study between a native grass and the exotic Sahara mustard, salvaging plants for research purposes from private sites with permission from landowners, rapidly assessing vegetation on grassy remnants, and initiating an invited synthesis of burro grazing effects on vegetation of the Mojave Desert.
- Two grant proposals were submitted and one scholarly paper was published this quarter.

Program Activities

The task agreement was awarded to UNLV on October 1, 2006. For the quarter ending December 31, 2006, the following activities have occurred toward meeting or exceeding deliverables in the statement of work.

Hiring

Two new research assistants for the Weed Sentry program began work this quarter. Jill Craig started November 1, and Cayenne Engel started December 1, 2006. The NPS ATR, Alice Newton, served on the hiring committee for these staff. In addition, a graduate student noted in the Task Agreement to conduct research on rare plants was formally admitted as a degree-seeking student in the UNLV School of Life Sciences. Lori Miles, will be arriving in early January to start classes and research for Spring Semester 2007.
Invasive Plant Monitoring and Management

A. Mapping and Treatment: National Park Service Holdings

This quarter, Weed Sentry staff surveyed 82 miles covering 634 acres. For comparative purposes, during the same quarter last year, 11 miles and 195 acres were surveyed. Survey methods have changed from 2005 to 2006. Weed Sentry staff now use a 10-meter buffer for surveying instead of the 20 meters used in 2005. We believe this change facilitates more thorough and accurate surveying.

Approved roads and areas surveyed in the park were: 2, 31, 43, 45, 46, 47, 69, 74, 109, 110, 136, Lake Mead shoreline, Las Vegas Wash, and Sandy Cove.

In addition, more than 21,000 plants were treated this quarter (Table 1). These plants were treated at Las Vegas Wash, Callville Bay parking area, Lake Mead Shoreline, Cottonwood Cove developed area, Lakeshore Drive, Sandy Cove, Sunset View Overlook, and approved roads 1, 1a, 2, 31, 43, 46, 78b5, 136. *Pennisetum setaceum* growing along Lakeshore Drive also was discovered this quarter. This troublesome exotic has infested the shoreline of Lake Mohave from Cottonwood Cove to Davis Dam. The infestations were immediately removed to prevent further spread to Lake Mead.

Shoreline surveys were continued this quarter on Lake Mead for invasive aquatic species as well as terrestrial species that have naturalized along the shoreline from developed areas. Plant species found infesting the shoreline of Lake Mead were athel, oleander, tree tobacco, Sahara mustard, and saltcedar. No invasive aquatic plants were found this quarter.

Table 1. Exotic plants treated by Weed Sentry this quarter on National Park Service land.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Brassica tournefortii</em></td>
<td>21,364</td>
</tr>
<tr>
<td><em>(Sahara mustard)</em></td>
<td></td>
</tr>
<tr>
<td><em>Lepidium latifolium</em></td>
<td>134</td>
</tr>
<tr>
<td><em>(Perennial pepperweed)</em></td>
<td></td>
</tr>
<tr>
<td><em>Parkinsonia aculeate</em></td>
<td>8</td>
</tr>
<tr>
<td><em>(Mexican paloverde)</em></td>
<td></td>
</tr>
<tr>
<td><em>Nicotiana glauca</em></td>
<td>6</td>
</tr>
<tr>
<td><em>(Tree tobacco)</em></td>
<td></td>
</tr>
<tr>
<td><em>Pennisetum setaceum</em></td>
<td>15</td>
</tr>
<tr>
<td><em>(Fountain grass)</em></td>
<td></td>
</tr>
<tr>
<td><em>Tamarix ramosissima</em></td>
<td>131</td>
</tr>
<tr>
<td><em>(Saltcedar)</em></td>
<td></td>
</tr>
<tr>
<td><em>Tribulus terrestris</em></td>
<td>46</td>
</tr>
<tr>
<td><em>(Puncturevine)</em></td>
<td></td>
</tr>
<tr>
<td><em>Washingtonia filifera</em></td>
<td>11</td>
</tr>
<tr>
<td><em>(California fan palm)</em></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21,715</td>
</tr>
</tbody>
</table>

B. Mapping and Treatment: Bureau of Land Management Holdings

A total of 7 miles and 58 acres were surveyed this quarter. For comparative purposes, during the same quarter last year, 26 miles and 335 acres were surveyed. The lower total this year is a result of increased surveying on NPS lands (e.g., > 7 times more miles on NPS land this year than last). Approved roads surveyed on BLM holdings were AR 30, 31, 43, and 110. The naming of these roads is a continuation of NPS roads onto BLM land.

This quarter, Weed Sentry staff also treated 279 plants of *Peganum harmala* (African rue), and one plant of *Parkinsonia aculeate* (Mexican paloverde). These plants were treated at the junction of highways 93 and 95. *Peganum harmala* was initially treated on May 8, 2006, and plants were retreated with herbicide on October 9, 2006. For effectiveness monitoring, we revisited this site and it appears that the second treatment was successful. *Peganum harmala* has not been recorded in previous survey areas in the
county. This site will be monitored on a regular basis to ensure immediate action on any reoccurrences of this species.

C. Crews Treating Sahara Mustard: National Park Service

A Nevada Conservation Corps crew controlled Sahara mustard in developed areas (vectors) around the park and at Sandy Cove (a rare plant site). PLI Research Assistant Carrie Nazarchyk provided 2.5 work days of guidance to this crew.

D. Training/Professional Development

Research Assistants Carrie Nazarchyk and Jessica Spencer attended the California Invasive Plant Council Conference held October 4-6, 2006, in Rohnert Park, Calif. Jill Craig also defended her M.S. thesis at the University of Wisconsin on December 6, 2006.

E. Agency Meetings Attended

- Southern Nevada Restoration Team (SNRT), October, 28, 2006. Attended by Carrie Nazarchyk and Scott Abella.
- BLM and FWS (2 separate meetings), October 30, 2006. The purpose of these meetings was to coordinate Weed Sentry activities on BLM and FWS land. Attended by Carrie Nazarchyk, Scott Abella, and Jill Craig.

F. Other Projects Initiated

This quarter, Weed Sentry staff also performed a GIS analysis of associations between soil types (mapped in a recently published Clark County soil survey) and exotic species distributions mapped by Weed Sentry. The objective is to determine if soil type can predict which areas certain species will infest across the landscape. This analysis is in the early stages, and a goal is to eventually publish the findings.

Sahara Mustard Research

Research Assistant Dianne Bangle has conducted several germination experiments with Sahara mustard. A manuscript summarizing the findings is in progress and is expected to be submitted for review to a peer-reviewed journal next quarter. The tentative title for this manuscript is: “Seed germination in the invasive plant \textit{Brassica tournefortii} (Sahara mustard).” Dianne also has indicated that she is starting additional experiments on \textit{Brassica}, including self-pollination studies and re-burial experiments on sand dunes environments.
**Rare Plant Monitoring and Management**

**A. Monitoring Methods Development**

A grid-based method was tested by Principal Investigator Scott Abella at Echo Wash, a bearpoppy and sticky ringstem site, for its efficiency in monitoring these plant populations. This method was found to meet the general objectives of estimating target population densities, providing information on the resident plant community as a whole (including potential exotic species threats), and having flexibility to be conducted at varying intensities with fewer time, personnel, or money available. The fact that this method estimates actual population densities is significant – previous monitoring methods in this region for these species have relied on counts in survey areas of uncertain sizes. Dr. Abella discussed the proposed method with ATR Alice Newton, who was supportive. This method has also been mentioned to BLM botanist Christina Lund. The goal is to employ a monitoring strategy that is generally accepted across agency boundaries. This method is discussed in the BLM's 1998 Measuring and Monitoring Plant Populations (page 115, “Grid-Cell Method”). Implementing the monitoring method is a priority for next quarter for the spring season.

**B. Rare Plant Literature Reviews and Surveys**

In collaboration with botanists at Northern Arizona University, the Public Lands Institute is continuing work on literature reviews and surveys of rare plant monitoring and management actions taken or not taken based on monitoring data. Data gathering for this synthesis is expected to be completed next quarter or the quarter after. The initiation of this project was previously documented in the September 30, 2006, close-out report for Task Agreement J8R07050009.

Research Assistant Dianne Bangle is currently preparing species and distribution reports for *Enceliopsis argophylla* (sunray), *Penstemon bicolor* ssp. *roseus* (two-tone rosy beardtongue), and *Eriogonum corymbosum* var. *nilesii* (Las Vegas buckwheat). She is preparing distribution maps for use in creating habitat maps for each species. Dianne also is researching several other MSHCP listed and watch species by conducting interviews with professional botanists, internet and herbaria searches, and UNLV library searches.

Ms. Bangle also conducted rare plant surveys along the power line road from Overton to Echo Bay to assess potential impacts to plant species of concern and sensitive habitats. Additional surveys will be conducted during the power line project as necessary.

Ms. Bangle also met with Craig Palmer (UNLV Harry Reid Center for Environmental Studies) concerning the I & M plant species database certification (NPS Species) within Lake Mead NRA. Dianne indicated that the remaining plants species were certified. She also had e-mail correspondence with Jim Moorefield of the Nevada Natural Heritage Program concerning data-sharing of rare plants within LAME this quarter. Dianne also included Mark Sappington (LAME data manager and GIS specialist) on these plans and initiated a protocol for data exchange with the Heritage Program.

**C. Herbarium**

This quarter, 37 plant specimens were processed for the herbarium, and the information was entered into the NPS database. Plants were keyed on a regular basis for all vegetation programs including Exotic Plant Management Team, Weed Sentry, Nursery, and Botany.
D. Rare Plant Graduate Student Research

As previously noted, graduate student Lisa was admitted to the M.S. program at UNLV this quarter and will begin performing sticky ringstem research during the next quarter.

Integrative Work

A. Pipeline Restoration Research Project

We finished data collection and installation of permanent plots initiated last quarter to monitor plant community and soil changes on a water pipeline right-of-way through Lake Mead NRA. This project was requested by ATR Alice Newton and had substantial involvement from her in the participation of a research protocol and analysis mechanisms as well as participation in the presentation of results in publications. A presentation on this work as delivered during a Southern Nevada Restoration Team field workshop this quarter, and a manuscript has also been submitted for review to a peer-reviewed journal:


B. Plant Salvage

With substantial involvement from ATR Alice Newton in the form of directly participating in methods, organization of personnel, and coordinating the NPS nursery, we performed a significant plant salvage in Las Vegas Valley, which took place on a privately owned site with permission of the land owner. Principal Investigator Scott Abella initially located the site and contacted the owner to make this project happen. The site is for sale and will likely be developed soon. Using a Nevada Conservation Corps crew coordinated by Ms. Newton, we salvaged ~1,000 purple three awn (*Aristida purpurea*) and deergrass (*Muhlenbergia rigens*) plants, along with seed, which were transported to the LAME nursery. A second salvage conducted December 18, 2006, is estimated to have recovered more than 1,000 plants with a total of 9 species. These plants will be used in several research projects.

C. Las Vegas Valley Grassy Remnant Vegetation Assessment

Also with support and substantial involvement from ATR Alice Newton, we sampled two 0.25-ha plots on remnant grassy sites in the Las Vegas Valley. One of the sites was the plant salvage site noted above. The purpose of this assessment was to document vegetation on these unique sites before they are destroyed, to identify additional species for salvage, and to make herbarium collections for both the Lake Mead and UNLV herbariums. With about 40 plant species on each plot, this also provided our research assistants with a unique opportunity to become familiar with some species they have not seen before. With an eye for time efficiency, the ATR supports some additional targeted sampling of this vegetation to provide a regional reference before this opportunity is lost. Data were emailed the day they were collected to Ms. Newton for review.

D. Community Invasability and Native-Exotic Plant Competition

What traits make a plant community more or less invasable by exotic species is clearly a key topic related to Weed Sentry activities, monitoring of rare plant sites, and restoration. This quarter, we initiated an experiment to examine competition between a native grass (purple three-awn) and Sahara mustard, a troublesome exotic. This project also had substantial involvement by ATR Alice Newton, who participated in the design, implementation, and maintenance of the project, which is ongoing.
We also submitted a permit this quarter to perform a revegetation experiment on a large burn on BLM land near Goodsprings, Nevada. This experiment involves planting seven native species (salvaged from the privately owned site described above) and performing various treatments designed to increase survival. Prior to submitting the permit, Dr. Abella discussed the experiment and site with BLM botanist Christina Lund. Revegetating burns is very much a regional problem affecting all the federal agencies in southern Nevada.

E. Invited Presentation

This quarter, Dr. Abella was invited by the Society for Range Management to present results at a symposium of an ongoing literature synthesis of burro grazing effects on plant communities in the Mojave Desert. The symposium, titled “Ecology and Management of Wild and Non-Native Equids,” will take place on February 15, 2007, in Reno, Nevada. The submitted abstract is below:

A Systematic Review of Burro and Wild Horse Grazing Effects on Vegetation of the Mojave Desert and Surrounding Regions

Scott R. Abella

Abstract

Burro and wild horse populations in the southwestern United States have been and continue to be contentious political, social, and management issues. New considerations also have emerged concerning burro and horse grazing effects, such as potential interactions with exotic plant distributions and successional trajectories after novel, widespread fires in desert regions. However, scientific literature on grazing effects of burros and horses is fragmented and often inaccessible to both researchers and resource managers, resulting in uncertainty about possible tradeoffs and effects of different grazing management strategies. This presentation describes findings of a systematic review focused on the Mojave Desert and adjacent regions of published and unpublished literature of burro and horse effects on plant species richness, composition, and the abundance of individual native and exotic species. Findings may be useful for understanding historical changes in Mojave Desert vegetation and for anticipating tradeoffs and effects of current burro and horse management approaches.

Other Activities

In October 2006, Dr. Abella was selected as a Distinguished Alumnus-In-Residence to deliver three invited seminars to faculty and students at Grand Valley State University in Michigan (see below). He also participated in a day-long field trip to Midewin National Tallgrass Prairie (U.S. Forest Service, near Chicago, Ill.) with a 20-member student chapter of the GVSU Soil and Water Conservation Society. This trip included three hours of volunteer work collecting seed for prairie restoration, and a tour of the ~18,000-acre preserve.


Abella, S.R. Lessons learned: reflections from the field of a 2000 NRM alumnus. Invited presentation to NRM 150 [Introduction to Natural Resources] class, Grand Valley State University, Allendale, MI. 19 October 2006.

Competitive Research Grant Proposals

With ATR Alice Newton as co-principal investigator, Dr. Abella submitted a competitive research grant proposal to the Joint Fire Science program this quarter. Should this proposal be funded, the NPS, and LAME specifically, is designated as the lead agency with BLM as collaborating agency. The proposed research directly supports the current collaboration between UNLV and NPS, and calls for research that is anticipated to enhance our understanding for how to make native communities less susceptible to invasion by exotic plant species. The citation for this proposal is:


Also, a letter of intent was submitted for a second competitive research grant proposal this quarter. This proposal is a resubmission of a rejected proposal Dr. Abella originally submitted in January 2006 while working at Northern Arizona University:


Papers Published

One paper was published this quarter: