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Lake Mead National Recreation Area Vegetation Monitoring and Management: Quarterly Progress Report, Period Ending June 30, 2007

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Executive Summary

- Weed Sentry staff surveyed several springs and seeps on the Desert Range National Wildlife Refuge, measuring exotic species abundance and plant community composition. In addition, 63 miles were surveyed for exotic species on National Park Service (NPS) land, nine miles on Bureau of Land Management (BLM) land, and 119 miles on U.S. Fish and Wildlife Service (USFWS) land. A total of 867 exotic plants in incipient populations were treated on NPS land, and 53 plants were treated on ISFWS land.

- Research Assistant Ms. Jessica Spencer assumed coordination duties for Weed Sentry mapping this quarter to replace Ms. Carrie Nazarchyk, who accepted a position with Lake Mead National Recreation Area (Lake Mead NRA). Mr. Alex Suazo was hired to fill this vacant position, and will begin work August 1. NPS ATR Ms. Alice Newton served on the search committee, which was chaired by PI Dr. Scott Abella.

- A Joint Fire Science grant of $179,000 was awarded this quarter, and will fund projects at Lake Mead NRA and on BLM land to study native species that may be easily established and can compete with exotic annual grasses.

- Monitoring of four covered MSCHP rare plant species was completed this quarter. In addition, technical assistance and labor was provided to Ms. Newton for establishing exclosures around sticky buckwheat due to concerns about trespass cattle grazing.

- A gypsum seed bank study was initiated to support ecological restoration of the Northshore Road construction project.

Program Activities

The task agreement was awarded to UNLV on October 1, 2006. For the quarter ending June 30, 2007, the following activities have occurred toward meeting or exceeding deliverables in the statement of work.

Invasive Plant Monitoring and Analysis

A. Mapping and Treatment: National Park Service Holdings
This quarter, Weed Sentry staff surveyed a total of 63 miles, covering 386 acres. Approved roads 13 and 22 were surveyed. Sections of Lake Mead and Lake Mohave shorelines were also surveyed. Eight exotic species, totaling almost 900 plants, were treated this quarter (Table 1).

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>Avena fatua (Wild oat)</td>
<td>658</td>
</tr>
<tr>
<td>Brassica tournefortii (Sahara mustard)</td>
<td>13</td>
</tr>
<tr>
<td>Bromus tectorum (Cheatgrass)</td>
<td>46</td>
</tr>
<tr>
<td>Nerium oleander (Oleander)</td>
<td>4</td>
</tr>
<tr>
<td>Pennisetum setaceum (Fountain Grass)</td>
<td>2</td>
</tr>
<tr>
<td>Sisymbrium orientale (Indian hedgemustard)</td>
<td>9</td>
</tr>
<tr>
<td>Tamarix ramosissima (Salteedar)</td>
<td>16</td>
</tr>
<tr>
<td>Washingtonia filifera (Fan Palm)</td>
<td>119</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>867</strong></td>
</tr>
</tbody>
</table>

B. Mapping and Treatment: Bureau of Land Management Holdings

A total of nine miles, covering 72 acres, were surveyed on BLM land this quarter. The Lorrane Station Road, southeast of Searchlight, was the only road surveyed, but no weeds were found. This was a follow-up survey of the area to see if any weed infestations had come up after any of the late spring rain events.

C. Mapping and Treatment: Fish and Wildlife Service Holdings

Research Assistants Ms. Jill Craig and Ms. Jessica Spencer surveyed several springs on the Desert Range National Wildlife Refuge for exotic plant species, and characterized plant communities at the springs including assessing the presence or absence of any rare species. This survey is of interest to the USFWS refuge manager.

In total, 119 miles covering 917 acres were surveyed this quarter by Weed Sentry staff. Roads, trails, springs and backcountry areas were surveyed. The roads surveyed included Alamo Road, Cabin Spring Road, Corn Creek Visitor Center Entrance Road, Cow Camp Road, Deadhorse Road, Deadhorse Road 2, Hidden Forest Road, Joe May Road, Mormon Well Road and White Rock Road. The trails surveyed included Deadhorse Pack Trail, Hidden Forest Trail and White Rock Spring Trail. The following springs were surveyed: Bootleg, Perkins, Shalecut and Wiregrass. The backcountry areas that were surveyed included the routes to Bootleg Spring, Perkins Spring, Rye Patch Spring, Shalecut Spring, and Wiregrass Spring. The following weeds were treated on USFWS land: Bromus diandrus, Bromus tectorum, Centaurea melitensis, Descurainia sophia and Sisymbrium irio (Table 2).

Table 2. Exotic plants treated by Weed Sentry this quarter on U.S. Fish and Wildlife Service land.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromus diandrus (Ripgut brome)</td>
<td>1</td>
</tr>
<tr>
<td>Bromus tectorum (Cheatgrass)</td>
<td>6</td>
</tr>
<tr>
<td>Centaurea melitensis (Malta star-thistle)</td>
<td>42</td>
</tr>
<tr>
<td>Descurainia sophia (Tansy mustard)</td>
<td>3</td>
</tr>
<tr>
<td>Sisymbrium irio (London rocket)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53</strong></td>
</tr>
</tbody>
</table>
D. Other Invasive Species Projects

Survey for effect of Brassica tournefortii on plant community composition

Ms. Engel conducted a plant community assessment on April 3, 2007 to assess the impact of Sahara mustard on native plant species (particularly native annual establishment). Transects were established along a plant density gradient of *B. tournefortii* in an early successional community at a restored landfill site west of the NPS plant nursery. Data indicate a negative relationship between *B. tournefortii* and the dominant native annual *Phacelia crenulata*. This was the strongest relationship among species within this site, and no other species had a negative relationship with *B. tournefortii*. However, density of *Chaenactis fremontii* was positively related to density of *B. tournefortii*. The presence of *B. tournefortii* did not affect community diversity or richness at this site.

E. Training/Professional Development

Dr. Abella maintained his red card by attending an annual 8-hour refresher course on April 21, 2007 (Saturday, off work time) at the Clark County Fire Department training center. The Weed Sentry crew also attended a gypsum workshop in St. George, UT, as outlined in the rare plant section of this report.

F. Agency Meetings Attended

Dr. Abella attended Resource Management Staff Meeting, April 9, 2007 and June 4, 2007.

G. Hiring

From a large pool of applicants and following interviews, Mr. Alex Suazo was unanimously recommended by the search committee (Dr. Abella, chair, members Drs. Gregory Haynes and Jef Jaeger, and NPS ATR Ms. Newton) for hiring. Mr. Suazo will start with the Weed Sentry program on August 1, 2007.

Sahara Mustard Research

Research assistant Ms. Diane Bangle has completed two additional *Brassica tournefortii* experiments (seedpod/resource filling; effectiveness of herbicide on seed development). The *Brassica* self-pollinating study was terminated pre-maturely due to complications and will be initiated again in the fourth quarter of this year. An additional experiment (seed burial/longevity of *Brassica* and *Malcolmia*) was initiated this quarter and will be assessed each year for a proposed ten years.

Rare Plant Monitoring and Analysis

A. Rare Plant Literature Reviews and Distributions

Preparation of distribution maps for use in creating habitat maps for each species was not completed this quarter as projected due to the additional time spent implementing new monitoring plans. A significant amount of time will be spent next quarter on producing initial habitat maps, which can be modified and improved as new research provides more knowledge on each species. Ms. Bangle met with GIS technician Mr. Joe Hutcheson (UNLV Harry Reid Center staff at Lake Mead NRA) regarding using the Clark County soil database with rare plant data.
Two additional surveys of the Overton Powerline Road were conducted; one with the nursery crew to familiarize them with the area and specific plants of concern, and another with John Walsh (compliance specialist) and cultural crew to evaluate any potential problems with the placement of some additional stakes. A report was prepared this quarter and for NPS compliance manager Mr. Mike Boyles.

Ms. Bangel and three members of the Lake Mead nursery crew spent three days surveying rare plant sites and select high diversity areas for habitat conditions on the Shivwits Plateau.

B. Monitoring

Monitoring of the four MSHCP covered species was completed this quarter. The new monitoring methods implemented and are summarized below:

- Las Vegas bearpoppy and ringstem – permanent plots were set up and data (including plant community data) were collected by Ms. Bangel at three locations (Echo Wash, Rainbow Gardens, Road 100). Data have been entered into an Excel database this quarter and we will begin data analysis next quarter.
- Three-corner milkvetch – grid plots were set up on the main dune areas of Sandy Cove (a total of eight 20 x 20 meter grids) and data (including plant community data) were collected and entered into an Excel database. Data analysis will begin next quarter. Data were collected by Ms. Bangel, Ms. Engel, Ms. Spencer, and one volunteer.
- Sticky buckwheat – macro-plots and transects were set up in three locations along the eastern shoreline of the Overton Arm of Lake Mead. Data were collected (including plant community data) and is currently being entered into an Excel database; data analysis will begin next quarter. Data were collected by Ms. Bangel, Ms. Craig, Ms. Engel, Ms. Spencer, and two NPS vegetation employees.

Ms. Bangel and Ms. Engel designed a monitoring strategy for vegetative and reproductive phenological development of *Anulocaulis leiosolenus* (sticky ringstem). Observations are conducted on 21 individuals at each of three sites in the rare plant habitat in the vicinity of Northshore Road. Monitoring is designed to follow the development of the plants from the rosette stage through bolting, flowering, and fruit development. Plants are observed every two weeks when populations are in the vegetative rosette stage, and weekly when individuals within the populations bolt and flower. Plant phenological stage and floral phenological stage are recorded. Data collected to date have been entered into Excel spreadsheets. Data collection is expected to continue throughout the summer in concordance with the flowering period of *A. leiosolenus*.

C. Herbarium

The herbarium was moved to its new location last quarter. Organization of the herbarium is ongoing. An additional herbarium cabinet has been ordered to accommodate additional specimens. A significant amount of time will be spent in the herbarium next quarter for processing of specimens and keying back-logged specimens.

D. Rare Plant Graduate Student Research – Seed Banks

This project is now led by Dr. Abella. Soil seed bank samples were collected from 10 gypsum sites along Northshore Road or on adjacent BLM land. At each site, samples were collected from six microhabitats, including below canopies of three native shrubs, below Las Vegas bearpoppy and sticky ringstem (where
present), and in openings. The samples have been started in the UNLV greenhouse and are currently being monitored.

F. Training/Professional Development

Ms. Bangle (research assistant) attended a one-day course at UNLV titled “Time Management for Professionals” on April 13, 2007. She also attended a “Desert Survival” class offered by NPS on May 30, 2007. In addition, she completed a graduate level UNLV course titled Restoration Ecology for 3 credit hours.

Ms. Bangle also attended the Nevada Rare Plant Meeting held in Las Vegas at the Barrick Museum on the UNLV campus on April 3-4, 2007. She reported on the status of rare plants at Lake Mead NRA including a new addition to the NNHP watch species list *Lorandersonia salicina*.

All members of the UNLV vegetation group attended a rare plant meeting on April 25, 2007 in St. George, Utah, which included presentations on dwarf bear poppy and Holmgrens milkvetch.

G. Agency Meetings Attended

- Meeting with county representative (Sonja) on May 18, 2007 attended by Ms. Bangle and Dr. Abella concerning county funding for rare plant monitoring projects.
- Ms. Bangle attended two meetings (April 10, 2007 and May 11, 2007) with PLI and NPS supervisors concerning rare plant program updates and monitoring protocols.

Technical Assistance/Synergistic Work

A. Community Invasibility Experiment

Maintenance of this experiment has been conducted primarily in the form of weekly water application and periodic mortality monitoring.

B. Desert Burn Revegetation

Sites were visited for post-planting monitoring and assessment on April 9, 2007. At this time, Ms. Engel took pictures of each of the plants for foliar cover estimation and a live plants status report, replaced any broken or missing plant shelters and re-seated any disturbed driwater applications. Mortality appears to have been very heavy, most likely due to record-high temperatures and no precipitation since the planting.

C. Springs *Rana onca* habitat restoration project (Jef Jaeger, PI)

On May 1-2, 2007 we conducted a vegetation assessment of species specific foliar cover and height of the vegetation clipped and control plots at the Rogers and Blue Point Springs sites. On May 2, 2007 Ms. Engel performed a quality control exercise to assess consistency among data collectors. Upon completion of data entry (supervised by Dr. Jaeger), Ms. Engel will analyze the data for differences between the clipped and control plots and analysis of variation in site response (expected next quarter).
D. Germination studies for species common to gypsum soil habitats

Dr. Abella and Ms. Engel initiated investigations into the germination ecology of species common to the gypsum soils in Lake Mead NRA. Ms. Engel collected seeds periodically throughout May and June for use in germination trials to be conducted in the germination chambers at NPS headquarters and at UNLV. To date, germination trials of *Aristida purpurea*, *Astragalus prussii*, *Enceliopsis argophylla*, *Malcomia africana*, *Phacelia crenulata*, *Plangato ovata*, and *Pleuraphis rigida* have been conducted. We are testing several temperature and light combinations to find out which conditions are most preferable for the germination of each species. Information gained from these investigations will aid studies of rare plant seed banks and be useful information for use in revegetation with the restoration necessary for the Northshore Road realignment. Trials will be continued over upcoming months as space in the growth chambers becomes available. Each trial runs for two to three weeks.

E. Cattle Cove Eriogonum viscidulum exclosures

Dr. Abella and Ms. Engel accompanied several NPS employees (including ATR A. Newton) and a volunteer who installed fencing for cattle exclosures along the sandy shore at Lime Cove on the Overton arm of Lake Mead on May 20, 2007 (project referenced in the previous quarterly report). The fencing is designed to exclude cattle from patches of dense *E. viscidulum*.

F. Northshore Road realignment project visits and mapping

On June 13, 2007, Ms. Engel and Ms. Newton accompanied three NPS and FHA representatives involved with restoration plans and funding of the Northshore Road realignment to scout all construction sites and discuss plans for restoration in conjunction with the Northshore Road realignment.

G. Nevada Test Site FACE site seed bank sampling

On May 7, 2007, members of the UNLV vegetation group, together with Ms. Newton, sampled soil seed banks with Dr. Stan Smith at his long-term FACE site on the Nevada Test Site. These samples were started on the UNLV greenhouse on May 9, 2007, and monitoring is ongoing.

H. Teaching

As part of his joint appointment with UNLV School of Life Sciences, Dr. Abella completed teaching BIO 420x/730A (Restoration Ecology) this quarter. This course was attended by 36 students, including several members of the NPS and UNLV vegetation groups.

I. Other

This quarter, Dr. Abella was invited by the University of Leuven (Belgium) to serve on a review panel for internal funding proposals, which was completed in April 2007.

On May 3, 2007 Ms. Spencer with Dr. Abella had a media event “photo shoot” for UNLV magazine on the plant salvage work that has been undertaken in Las Vegas Valley. These plants have been used for restoration experiments at Lake Mead NRA and on BLM land, and have had substantial involvement from ATR Ms. Newton. Ms. Newton also attended the photo shoot on May 3. A popular article is expected to be produced by UNLV media.
Papers Published/Submitted

Four papers that were previously submitted during prior work were published this quarter:


Manuscripts from previous work submitted for review this quarter:


Two additional manuscripts are in progress this quarter:

Abella, S.R. A systematic review of burro grazing effects on Mojave Desert vegetation, USA. Environmental Management (in review).

Funding Proposals

One competitive grant submitted this quarter was not funded:

Abella, S.R. Where have the native species gone? A pilot study to develop techniques for reconstructing historical vegetation change in southern Nevada. Competitive President’s Award, University of Nevada Las Vegas, Las Vegas, NV. $49,999. (rejected).

Another competitive grant was funded:


Submitted by:

Margaret N. Rees, Principal Investigator

06/30/2007