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Lake Mead National Recreation Area Vegetation Monitoring and Management: Quarterly Progress Report, April 1, 2008 to June 30, 2008

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Executive Summary

- The Weed Sentry program surveyed over 182 miles of transportation corridors on federal land in Clark County for incipient populations of exotic plants.
- Five manuscripts attained published or in-press status this quarter. The published manuscripts are (1) assessing vegetation in grassy remnants of the Las Vegas Valley (Desert Plants), (2) assessing exotic species distributions in Clark County (Environmental Monitoring and Assessment), (3) a synthesis of burro effects on Mojave Desert vegetation (Environmental Management), and (4) examining canopy-tree influences along a soil parent material gradient in (Journal of the Torrey Botanical Society).
- Staff delivered eight presentations this quarter at conferences, university lectures or agency meetings.
- A total of 13 permanent sites were established and sampled as part of a microhabitat and distance-from-road invasibility study.

Program Activities

The task agreement was awarded to UNLV on October 1, 2006. This report covers the period April 1, 2008 to June 30, 2008. The following activities have been conducted toward meeting or exceeding deliverables in the statement of work.

Invasive Plant Monitoring and Treatment (Weed Sentry Program)

Research assistants in the Weed Sentry Program are tasked with mapping and treating incipient populations of exotic species on targeted federal lands throughout Clark County. Surveying activities for invasive species that took place from April 1, 2008, to June 30, 2008, are divided into sections by federal agency, and are summarized in Table 1. More than 182 miles and 1,451 acres were surveyed for exotic, invasive species during this period. A new database and data dictionary have been developed with the help of the GIS staff at Lake Mead. New GPS units
were also purchased, eliminating many of the technical difficulties that Weed Sentry had in the past few quarters.

Table 1. Summary of miles and acres surveyed, Weed Sentry Program, April 1, 2008 - June 30, 2008, by federal agency.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Miles</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Park Service</td>
<td>14.52</td>
<td>115.48</td>
</tr>
<tr>
<td>Bureau of Land Management</td>
<td>148.65</td>
<td>1,182.29</td>
</tr>
<tr>
<td>Forest Service</td>
<td>0.84</td>
<td>6.65</td>
</tr>
<tr>
<td>Fish and Wildlife Service</td>
<td>18.43</td>
<td>146.58</td>
</tr>
<tr>
<td>Total</td>
<td>182.44</td>
<td>1,451</td>
</tr>
</tbody>
</table>

A. Locations surveyed: National Park Service

Surveys on land managed by the NPS occurred in the following locations: Highway 167 – Northshore Road and Pinto Valley.

B. Locations surveyed: Bureau of Land Management

Surveys on BLM holdings occurred in the following locations: Route 545, Route 550 – Trout Canyon, Route 552, Wheeler Pass Road, Calnevari Road, Carp Elgin Road, Carpenter Canyon Road, Castle Mountain Road, Wheeler Pass Connector Road, Cottonwood Pass Road, Glendale Powerline Road, Horse Spring Road, Horse Spring Spur, Lost Cabin Spring Road, Mercury Powerline Road, Old Homestead Road, Point of Rocks Roads, Roads NW of Spring Mountains, Ten Mile Well Road, Toquop Wash Road, Turner Road, Walking Box Ranch Road, Wallace Canyon Road, Weiser Wash Road and Z Street. A few of these areas are within Nye County, but the BLM requested that we survey them because they are near rare plant populations.

C. Locations surveyed: Forest Service

Areas surveyed on USFS lands included the Cold Creek area and Willow Creek.

D. Locations surveyed: Fish and Wildlife Service

Surveys on the Desert Range National Wildlife Refuge included Gass Peak Road and Quail Spring Road.

E. Small Incipient Population Treatment

In addition to surveying, the Weed Sentry staff are tasked with treating upon discovery (often hand pulling) small, incipient populations of invasive plants. This represents a pro-active effort to remove invasive species before they become larger infestations and, therefore, increasingly costly and difficult to eradicate. During the third quarter of 2008, a total of 935 individual invasive plants were removed by Weed Sentry staff from federal lands in Clark County. These removals are summarized by agency lands in Tables 2 and 3 below.
Table 2. Number of individual invasive plants removed, Weed Sentry Program, April 1, 2008- June 30, 2008, National Park Service lands.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Plants Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avena fatua</td>
<td>834</td>
</tr>
<tr>
<td>Malcolmia africana</td>
<td>43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>877</strong></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Plants Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brassica tournefortii</td>
<td>1</td>
</tr>
<tr>
<td>Bromus tectorum</td>
<td>1</td>
</tr>
<tr>
<td>Hirschfeldia incana</td>
<td>1</td>
</tr>
<tr>
<td>Sisymbrium altissimum</td>
<td>4</td>
</tr>
<tr>
<td>Sisymbrium irio</td>
<td>46</td>
</tr>
<tr>
<td>Sisymbrium orientale</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>59</strong></td>
</tr>
</tbody>
</table>

Sahara Mustard Research

- A. Suazo designed a field study to investigate how Sahara mustard spreads during early stages of invasion. Permanent 1 m² plots will document the spatial and temporal distribution of Sahara mustard at 5, 15, 30, 60, and 100 meters from roads. Data on Sahara mustard density will be collected at 5 distances from roads in open and undershrub microhabitats, and will be used to explain invasibility patterns during early stages of habitat invasion.

- A. Suazo, J. Spencer, and S. Abella submitted an abstract entitled “Response of Sahara mustard (Brassica tournefortii) to soil disturbance and water addition in the southern Mojave Desert” to be presented as a poster at the 93rd Ecological Society of America annual meeting August 2-8, 2008 in Milwaukee, WI.

- A. Suazo, J. Spencer, and S. Abella submitted an abstract entitled “Responses of Sahara mustard (Brassica tournefortii) to water additions and soil disturbance manipulations” for the Natural Areas Conference to be presented as a poster Oct 14-17, 2008 in Nashville, TN.

- D. Bangle submitted an abstract titled “Management techniques for the control of Sahara mustard (Brassica tournefortii) in the Mojave Desert” for the Natural Areas Conference to be presented as a poster Oct 14-17, 2008 in Nashville, TN.

Rare Plant Monitoring and Research

A. Monitoring

Astragalus geyeri var. triquetrus
Monitoring for threecorner milkvetch continued this quarter. A total of 10 days were spent monitoring this species on Sandy Cove. The timing and amount of rainfall in the 2007-2008 growing season was suitable to produce a significant threecorner milkvetch germination event. D. Bangle was the lead researcher and was present on all survey dates and was aided by significant contributions from members of PLI and NPS personnel. Without the additional help, the project would have taken considerably longer than it did. Recommendations for next year include hiring an assistant for the botany program and securing a full week from an NCC crew; some can assist in collecting monitoring data while others work on Sahara mustard control. Having the additional personnel would cut the number of survey days in half allowing more time to complete other, time sensitive, spring work. Total numbers of threecorner milkvetch have not yet been tabulated and data currently being added to an excel database and will be available next quarter.

Eriogonum viscidulum

D. Bangle was the lead researcher for this project and present on all field days. Monitoring for sticky buckwheat took place this quarter. A total of 16 days were spent monitoring this species at Lime Cove and Glory Hole. As with the threecorner milkvetch, the rainfall this past season contributed to higher densities of sticky buckwheat than have been previously recorded in the Lime Cove area. Glory Hole did not have the same high densities, but to the intense cattle and saltcedar presence (see below). The monitoring design was modified twice in the field because the original design was time consuming and impossible to complete with the time and personnel available. We originally proposed to complete three macroplots on the eastern side of the Overton Arm, but it was concluded that two would be sufficient to represent the area. Again, PLI and NPS staff helped on this project. Recommendations for next year are the same as with threecorner milkvetch as follows; hiring an assistant for the botany program and securing a full week (possibly two) from an NCC crew. Total numbers of sticky buckwheat have not yet been tabulated but data has been entered into an excel database and will be analyzed and available next quarter.

Details of each of the above projects will be provided in the annual report, but one threat worthy of emphasizing is the seemingly increased presence and damage done by trespass cattle on the eastern side of the Overton Arm area. Every survey day researchers encountered or observed cattle in the area. On two occasions researchers needed to scare them off in order to access the site. Glory Hole was especially affected in that the beaches and sandy areas smelled intensely of cattle urine and were covered with cattle dung. This cove used to be one of the most popular coves for park visitors in the past, but now it is unsightly and malodorous, which likely discourages visitor use. An additional concern is for visitor safety should they choose to spend the day at a cove frequented by cattle.

The cattle tracks are so intense and the saltcedar so abundant at Glory Hole that sticky buckwheat was affected. Cattle tracks and dung were recorded as present or absent in all plots (both Lime and Glory). Trampling and chewed plants of any plant species within the plots were also recorded. Almost every plot had cattle tracks going through them. Many plants were chewed, especially Camissonia multijuga. We suspect that chewing damage was in some cases from cattle but also from the sphinx moth caterpillar, which apparently experienced a population boom this year. The caterpillar was abundant.
on many species including sticky buckwheat. We observed them chewing branch tips off
of many plants. It is unknown what effect the caterpillars might have in boom years such
as this. The sphinx moth is an important pollinator of several plant species in the Mojave
Desert.

It is unfortunate that little progress seems to be made in curtailing the illegal
trespassing of cattle on park service land.

It was reported last quarter that a new population of sticky buckwheat was
discovered near Middle Point. This turned out to be a false discovery. The first visit was
early in the season when the plants were still young rosettes. A second visit revealed
more developed plants, which were clearly identified as *E. thomasii*.

*Arctomecon californica*

D. Bangle was lead researcher and present on all field days. Monitoring for Las
Vegas bearpoppy took place in May and June, later than planned due to the intensive
annual plant survey and monitoring schedule. Three out of 10 proposed sites were set up
in March of this year. A delay with the BLM permitting process made set up of the
additional sites unrealistic because of the importance of initiating the annual species
monitoring projects.

Data were collected at the three Las Vegas bearpoppy sites. The lead researcher
found it necessary to alter the protocols for the community ecology plots for the current
year. The original design called for collecting data on all plant species within the plots,
annuals and perennials. Because data collecting occurred mostly in June after annual
species senesced, they were not included in this year’s data set. Total numbers of Las
Vegas bearpoppy have not yet been tabulated, but data was entered into an excel database
and will be analyzed and available next quarter.

One recommendation has developed based on this year’s field efforts. It is
recommended that the proposed 10 Las Vegas bearpoppy sites be adjusted to 7 total sites.
The field component for this project proved to be more intense and time consuming than
originally foreseen and sites may be too intense when combined with all other survey and
monitoring projects. Seven sites will still represent the range of the species. I propose
only cutting the duplicate sites from an area. For example, in the Gold Butte area we
could monitor one site instead of three and in Sunrise Hills, one site instead of two.

Hiring an assistant for the botany program should be a priority as the upcoming
fall field season will be intense. One fall project will be setting up plots at the remaining
Las Vegas bearpoppy sites (data will not be collected until spring). This should occur in
the 4th quarter of this year. We also plan to collect data on the abiotic plots, which include
setting up new weather stations.

*Anulocaulis leiosolenus* var. *leiosolenus*

Ringstem monitoring has not yet occurred for 2008. Again, all projects were
pushed back because of the field intensity of each previous project. D. Bangle is targeting
late September to set up plots and possibly collect data. The recommendation to downsize
the Las Vegas bearpoppy monitoring also applies to this monitoring project. Eight sites
are proposed for monitoring. Field reconnaissance of all ringstem sites is not complete, so
it is unknown if the eight proposed populations are suitable for monitoring. A more
reasonable number of sites (five or six) are recommended for the monitoring project.
D. Bangle and C. Engel resumed a second season of ringstem phenology, which is ongoing this quarter and will continue into the third and fourth quarters of this year. The results of this two year observation and monitoring project will result in a better understanding of ringstem ecology and will aid us in designing a more rigorous phenology study.

D. Bangle has begun the process of observing insect “victims” of the sticky ring located along the plants stems. So far, many species have been photographed and a few identified. The next step will be to collect the insects from the plants at several sites and continue the identification process. A few evenings were spent observing ringstem flowers, which open at night, to confirm a suspicion that these flowers are moth pollinated. The third evening proved successful when a sphinx moth was observed pollinating several ringstem plants shortly after dark. Pollination research will continue in the next quarter.

Gypsum Seed Bank Study

D. Bangle assisted Scott Abella with data collection at several sites included in the ongoing gypsum seed bank study and will continue to participate in the project as needed.

B. Herbarium and Native Plants

This quarter, plant identifications occurred consistently. Plants were keyed as necessary for all vegetation programs including Exotic Plant Management Team, Weed Sentry, Nursery, and Botany plus wildlife division.

Weather station monitoring at four Las Vegas bearpoppy sites continued this quarter. New rain, temperature, and relative humidity gauges arrived this quarter and will be installed throughout the remainder of the year at all rare plant monitoring locations.

Technical Assistance/Synergistic Work

A. Desert Burn Revegetation / Community Invasibility Experiments

Follow-up was done on fertile island development and the overall vitality of Larrea tridentata, Ambrosia dumosa, and Opuntia bigelovii that had been planted in the Goodsprings area in early December 2007. Fertile island treatments were geojute, rock mulch, and none. The results are that all O. bigelovii remain living. A. dumosa have been annihilated by herbivory with only three remaining. Thirty percent of L. tridentata remain for each of the three fertile island treatments.

B. Springs Rana onca Habitat Restoration Project (Jef Jaeger, PI)

Vegetative cover assessments were conducted at Blue Point and Lower Rogers Springs June 2, 2008. C. Engel, D. Craig, J. Spencer, A. Decort, J. Jaeger, D. Drake and D. Bangle, M. participated as data collectors. Biomass from the January clip has been weighed and data electronically entered. Analysis is pending.

C. Germination Studies for Species Common to Gypsum Soil Habitats
S. Abella is continuing with soil seed bank studies from soil collected from gypsum soil habitats.

D. **North Shore Road Realignment Project Visits and Mapping**

A. Suazo sampled desert arthropods from Gypsum and non-gypsum soil types. Collected samples are being sorted out and cataloged. C. Engel assisted LAME restoration manager in locating and quantifying regions of significant biological soil crust composition along the corridor of road construction. She also provided park managers with quantification of plant species to estimate time needed to allocate salvage. Preliminary planning for biological soil crust research projects related to the Northshore realignment has been initiated.

E. **Nevada Test Site FACE Site Seed Bank Sampling**

Seed banks continue to be monitored for new seeding emergence.

F. **Cacti Poaching**

Revisiting PIT-tagged cacti is ongoing, and follow-up on 1051 out of a total 1419 cacti is complete. A request by UNLV Professor Allen Gibbs was made that J. Craig assist him with locating high density barrel cacti populations for his Drosophila (fruit fly) research. A permit application is in process, and if the permit is approved, assistance will be provided. J. Craig submitted the abstract, “Lake Mead National Recreation Area’s Program to Curtail Barrel Cactus Poaching by Using Passive Integrated Transponders” to the Natural Areas Conference to be presented as a poster Oct 14-17 in Nashville, TN.

G. **Re-measurement of Holland Plots in the Newberry Mountains**

One-hundred permanent transects have been established, sampled and photographed by Chris Roberts and the technician. Data entry has begun with expected completion by next quarterly report. Expanded data collection has been conducted and includes collection of interviews and research from numerous historical sources.

H. **Clark County Desert Burn Succession**

S. Abella and C. Engel sampled the Vegas and Dry Lake fires on FWS land Devil’s Peak fire on BLM land. C. Engel has compiled relevant information from LAME fire archives to attempt to locate older fires for use in investigating regeneration after invasive grass induced wildland fires.

I. **Community Invasibility (Distance from Roads)**

Permanent sampling frameworks were established and sampling was completed at 13 sites. Two sites are located on BLM land and 11 are within Lake Mead National Recreation Area (LAME). Ten sites were selected using stratified random sampling. These sites were selected to include gravel and paved transportation corridors, and sample throughout LAME by dividing the park into five sections. An additional three sites were located in areas with known weed infestations, (per request of Carrie Nazarchyk, LAME Park Weed Manager). Collected data were entered and
analysis is ongoing. D. Craig, S. Abella, and J. Craig submitted an abstract, “Exotic annual plant invasions and their relationships to roads and native perennial species in the Mojave Desert, Southwestern USA” for the Natural Areas Conference to be presented as a poster Oct 14-17, 2008 in Nashville, TN.

J. Other

- J. Craig assisted Lake Mead National Recreation Area’s Disturbance Manager, Michelle Zuro-Kreimer, by providing road assessments for AR75, AR75A, AR75B, and AR75C.
- C. Engel assisted Lake Mead National Recreation Area’s Disturbance Manager, Michelle Zuro-Kreimer by providing road assessments for AR 90 and AR 91.
- J. Spencer assisted Lake Mead National Recreation Area’s Disturbance Manager, Michelle Zuro-Kreimer by providing road assessments for AR 32, AR 32A, AR 33, AR 34, AR 35, AR 37 and AR 80.
- J. Craig compiled and produced Issue 1(2) of a regional newsletter to communicate to collaborating agencies about research we are conducting. Dr. Abella, and Research Assistants, J. Spencer, D. Craig, D. Bangle and A. Suazo contributed articles.
- J. Craig provided an article review of “Plant recruitment in a northern Arizona Ponderosa Pine Forest: testing seed- and leaf litter-limitation hypotheses” for the Fort Valley Centennial Conference proceedings.
- J. Craig provided an article review of “Gambel Oak Growth Forms: Management Opportunities for Ecological Diversity” for a Rocky Mountain Research Station Technical Note.
- J. Spencer assisted Natural Resources Conservation Service staff with soil surveys on USFWS lands on 4/3/08 and 4/10/08.
- D. Bangle met with employees representing the Great Basin Bird Observatory in the Newberry Mountains to familiarize them with the flora in areas they’ll be working this year.

Papers Published/Submitted


Presentations

- J. Craig presented “Mojave Invasibility Research” to UNLV Restoration Ecology 430x, 730 on April 2, 2008.
- C. Engel presented a lecture on “ecological restoration in the context of global climate change” to the UNLV Restoration Ecology class (biology 430/730) on April 9, 2008.
- J. Craig presented “Research on the Sheep Range” at the PLI April 21, 2008 staff meeting.

Agency Meetings/Training Attended/Professional Development

- C. Engel and J. Spencer attended NPS staff meeting April 7, 2008.
- C. Engel, C. Roberts, A. Suazo, J. Craig, D. Craig, D. Bangle and J. Spencer attended the PLI Vegetation Group meeting on April 17, 2008.
- J. Spencer met with Lake Mead GIS staff on April 18, 25 and 29, 2008 and June 6, 2008 to work on refining the database and data dictionaries, as well as developing back-up survey protocols.
- J. Spencer met with Everett Bartz (BLM) to discuss BLM’s survey needs on April 29, 2008 and May 12, 2008.
- S. Abella, J. Craig, and C. Engel attended the Lower Colorado River Basin Riparian Revegetation Workshop on May 7, 2008; J. Spencer attended the workshop May 7-8, 2008.
On May 13, 2008 C. Engel met with NPS staff A. Newton and M. Zuro-Kreimer regarding plans for soil crust and native plant salvage from the path of destruction for the realignment of Northshore Road.


D. Bangle attended the Climate Change Symposium held in Laughlin, NV on April 9-10, 2008.

D. Bangle attended the annual Nevada Rare Plant Meeting held in Reno, NV on April 2-3, 2008.

Submitted by:

Margaret N. Rees, Principal Investigator

Date 07/01/08