

Fall 2008

## Mojave Applied Ecology Notes Fall 2008

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Guest contributor: Alice Miller, PhD, Vegetation Program Manager

## Learning to Manage the Effects of Wildfire at Joshua Tree National Park

Joshua Tree National Park (JTNP) has seen an alarming increase in the frequency, size and intensity of wildfires over the last several decades. These fires threaten the persistence of iconic Mojave Desert plant communities, impact designated Critical Habitat for desert tortoise, and degrade aesthetic resources for park visitors. Research to better manage the effects of wildfire, and the proliferation of invasive annuals that fuel the fire cycle, is thus a key component of JTNP's Resource Management Program. Currently, three projects aimed at understanding different components of post-fire ecosystem recovery are underway at JTNP:

### Post-Fire Resource Island Degradation

In July 2006, the Central Complex Fire burned almost 3,000 acres of Mojave Desert shrub and Joshua Tree woodland in JTNP. In collaboration with the University of California, Riverside and the U.S. Forest Service, JTNP is investigating post-fire changes in soil physical, chemical, and biological properties of burned-over soil resource islands (shrub mounds), and coupling these with vegetation recovery patterns (Photo 1). This information will be used to guide soil restoration and revegetation prescriptions that promote native vegetation recovery, and resist invasion by exotic annuals.

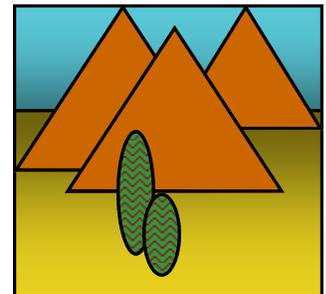
### Vegetation and Small Mammal Recovery

Michael Vamstad, Wildlife Ecologist at JTNP, is comparing vegetation composition and small mammal diversity in paired burned and unburned areas along a sixty-five year chronosequence. After approximately 20 years post-burn, perennial plant cover returns to similar levels as in unburned areas, however there is a shift in species composition. Small mammal diversity increases with time since burn, mirroring the increasing structural complexity of the vegetation. Small mammal abundance however, is similar across all burn ages, with more recent burns dominated by Kangaroo rats (*Dipodomys merriami*).

(Continued on page 4)

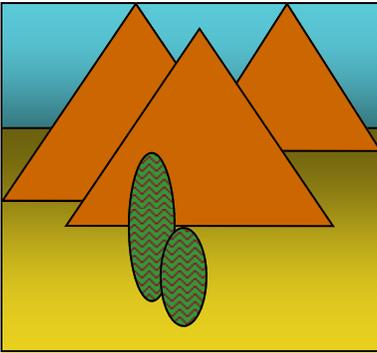


Photo 1. Measuring soil properties of a burned over *Lycium cooperi* mound in Joshua Tree National Park's Central Complex Fire.



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### Mojave Applied Ecology Notes

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Mojave Applied Ecology Notes is a newsletter published quarterly by the UNLV Desert and Dryland Forest Research Group. We specialize in working with resource managers to address key information needs for management through applied research. Submissions to the editor are welcome. We reserve the right to edit all article submissions.

## Introducing Adria DeCorte!

The Research Group is happy to introduce Adria DeCorte, graduate advisee of Scott Abella and Lloyd Stark. Adria is a long-time resident of Las Vegas, and has a Bachelor of Science in Architecture from UNLV. She joined the group in May, and this fall begins coursework for her Master of Science in Biology with an emphasis on Ecology.



Adria DeCorte, graduate advisee of Scott Abella and Lloyd Stark.

For Adria, it was a natural progression to expand upon her background in architecture to include the natural landscape. Adria's expertise lies in horticulture and plant taxonomy. For the last year and a

half, she has been a part of the Propagation Team at the Springs Preserve. Adria is responsible for the Preserve's seed collection program. This entails monitoring perennial and annual plants at more than ten sites throughout southern Nevada, and harvesting seeds at maturity. Seedlings are used for natural rehabilitation and garden plantings within the Springs Preserve. As production exceeds the Preserve's needs, the native plants have been available at the Preserve's Thursday Night Farmer's Market. It is Adria's hope that by having native plants available at the Market the public will be more likely to landscape with native plants.

Adria also maintains the Preserve's Herbarium Collection, and acts as a liaison to the UNLV Herbarium. She has collected and scanned specimens of over 100 plant species found within the Valley. Along with providing a valuable herbarium reference, her collection also acts as a learning tool for the Nature Exchange, a program for school-aged children that aims to foster an interest in natural science.

Adria is currently working with Scott Abella and Lloyd Stark to design a thesis research project focusing on Mojave Desert plant communities. We look forward to working with Adria to better understand the dynamics of the Mojave!

## Farewell

Weed Sentry—Jessica Spencer, Research Assistant



After 4 years with the Weed Sentry Program, I am moving on to greener pastures. I have accepted a position with the Army Corps of Engineers in Jacksonville, FL (my hometown). I will be working with their regulatory department. I also have plans to go back to school to get my Master of Science in Coastal Biology at the University of North Florida. I have enjoyed the time that I have spent here in southern Nevada. I have been lucky enough to work with some very bright people and have learned a lot in the process.

## Volunteers capitalize on a natural phenomenon

Guest contributor: Josh Hoines,  
Interagency Restoration Coordinator  
Southern Nevada Agency Partnership



Photo 1. Mast flower production in a blackbrush community.

Having lived in the Mojave Desert for a long time, I did not anticipate the response our local vegetation expressed to climatic conditions last winter and spring. The precipitation and temperatures didn't appear to be anything special; yet, as spring progressed, our local flora treated us to a fantastic and uncommon blackbrush flowering event. (Photo 1). Blackbrush (*Coleogyne ramosissima*), a paleoendemic member of the rose family, is a low growing non-descript shrub most of the time. However, by late spring, field personnel were seeing vast swaths of yellow across the landscape. Most years we see some plants flower, but they don't always pro-

duce seeds. In fact, many years can pass between range-wide mast fruiting events, making this past spring a unique experience.

In southern Nevada, blackbrush is typically found throughout the Mojave Desert, between 600-1600 m at an elevational transition between creosote-bush scrub and higher elevation sagebrush scrub and pinion-juniper woodlands. Blackbrush is typically the dominant plant within blackbrush scrub (up to 80% cover). Infrequent seed production and limited longevity in the soil seedbank slow recovery following disturbance. An increase in the frequency of fire and the introduction of non-native grasses can further delay or even prevent recovery. Since 2000, thousands of acres of blackbrush have burned in southern Nevada, leaving the newly exposed soils available for colonization by brome grasses and unsightly burn scars that will take decades or longer to return to blackbrush communities (Photo 2). Recovery time after disturbance is largely unknown, but is likely site dependent. Unfortunately, studies of blackbrush regeneration after fire have shown it may take centuries to return pre-fire conditions, if at all.

To preserve this trust resource for future generations, federal land managers are tasked with developing new restoration strategies to cope with these threats as well as increase public awareness and encourage public involvement in managing public lands. The Southern Nevada Restoration Team (SNRT) is an interagency group made up of the Bureau of Land Management, National Park Service, Forest Service, and Fish and Wildlife Service that have been working together to manage and restore public lands for the past 10 years.



Photo 2. Burned blackbrush habitat.

(Continued on page 5)

## New Book Chapter Reviewing Mojave Desert Revegetation Practices is Forthcoming

- Scott Abella

I was invited to write a chapter for a forthcoming book on Arid Environments to be published by Nova Science Publishers. This book is anticipated to appear in late 2008 or early 2009, and we will be able to provide additional details about the entire book at that time. I co-authored our chapter on revegetation with Alice Newton, Vegetation Manager at Lake Mead National Recreation Area. We systematically reviewed 23 published studies of planting or seeding native species in the Mojave Desert. We used this published literature to address the following questions:

- Which species have been most commonly and effectively planted or seeded?
- Which treatments (e.g., grazing protection) have increased plant establishment?
- What are the relative performances of planting and seeding, and are these species specific?

We found that 15 planting studies assessed a total of 41 species, 36 of them shrubs. None of the nine species planted in  $\geq 3$  studies avoided a complete failure (0% survival) in one or more treatments in one or more studies, but several species (e.g., *Larrea tridentata*, *Atriplex* spp.) consistently exhibited high ( $> 50\%$ ) survival even in years of below-average precipitation. Fencing, shelters, and irrigation increased survival of some species, but these treatments require cost/benefit analyses. Though seeding frequently has been discouraged relative to planting, seeding success has been species and situational specific. For example, *Baileya multiradiata*, *Phacelia parishii*, *Atriplex polycarpa*, *Penstemon palmeri*, and *Penstemon bicolor* became established at densities ranging from 3-9 plants/m<sup>2</sup> in individual seeding studies.

Of the 19 publications covering the 23 studies included in our review, 47% were published prior to 1988, only 16% since 2000, and none after 2001. This highlights a need to rejuvenate revegetation research and the defensible monitoring of operational revegetation projects in the Mojave Desert. For instance, most of the published studies took place prior to extensive, relatively recent desert wildfires. None of the research we systematically reviewed dealt with revegetating desert burns, which is currently a priority challenge for desert managers.

(Continued from page 1)

## JTNP post-fire ecosystem recovery research

### Burned Area Revegetation

Also in July 2006, the Western Complex Fire burned 1,525 acres in higher elevation shrub and woodland communities in the western portion of the park. To revegetate denuded burned over building sites in this area, several thousand native plants, propagated in JTNP's Center for Arid Lands Restoration (top and right photos), will be outplanted this fall. Revegetation will consist of early and late successional plant communities to compare the effectiveness of these community types in promoting post-burn recovery and/or resilience to invasive species.



Top: Jean Graham, nursery manager for JTNP's Center for Arid Land's Restoration, collecting seeds for burned area revegetation. Right: Mojave desert plants ready for outplanting in JTNP's Center for Arid Land's Restoration.

**MOJAVE APPLIED ECOLOGY NOTES**

*(Continued from page 3)*



Center: A group of volunteers at one of the blackbrush collection Saturdays. Top: Freshly collected blackbrush seeds. Bottom: A typical blackbrush shrub.



While the conditions required for blackbrush mast events are not clear, in late April 2008, SNRT members realized blackbrush was in the midst of a mast event. Blackbrush mast seed production is an opportunity for area land managers to take advantage of this natural phenomenon by procuring native plant materials from a variety of locations and in quantities large enough for landscape scale restoration. Collection of blackbrush seeds is an essential first step for attempting to restore burned habitats.

Over five successive Saturdays, SNRT recruited and trained 112 volunteers to harvest the outstanding blackbrush seed crop from a variety of locations throughout southern Nevada (above photos). In total, 683.5 volunteer labor hours harvested 255 gallons (estimated at 660 pounds) of unclean blackbrush seed. In the process volunteers were educated in three important conservation areas: (1) an overview of the local flora, fauna, ecology and geology, (2) the fragility of desert ecosystems and what conservation/restoration measures federal land managers employ, and (3) the importance of minimizing human impacts to the environment.

The restoration team is planning additional restoration projects using seeds collected this season with the overarching goal of expediting the natural succession of blackbrush habitats. Along the way we will be growing out blackbrush plants for revegetation of burned areas and developing an experimental restoration design to understand these communities. We anticipate future volunteer-based restoration projects as a result of blackbrush seed collection success.

If you are interested in volunteering on federal lands around southern Nevada look for upcoming projects at:  
[www.GetOutdoorsNevada.com](http://www.GetOutdoorsNevada.com)

Multiple projects to be presented at the joint conference of:  
**Natural Areas Association & National Association of Exotic Pest Plant Councils**

The Desert and Dryland Forest Research Group had four abstracts accepted for presentation at the October 14-17, joint Natural Areas Association & National Association of Exotic Pest Plant Council Conference which will be held in Nashville, TN. Since much of our work focuses on exotic plant invasion and desert restoration, it is especially relevant to the conference's theme this year: *Natural Areas Revival in Music City: Tuning in to a changing climate and biological invasion*. Here are highlights of the research we will be presenting at the conference this year.



EXOTIC ANNUAL PLANT INVASIONS AND THEIR RELATIONSHIPS TO ROADS AND NATIVE PERENNIAL SPECIES IN THE MOJAVE DESERT, SOUTHWESTERN USA.

Donovan Craig<sup>1</sup>, Jill E. Craig<sup>1</sup>, and Scott R. Abella<sup>1,2</sup>. Contact: [donovan.craig@unlv.edu](mailto:donovan.craig@unlv.edu).

Disturbances caused by roads and characteristics of native plant communities are two factors that may affect invasibility of communities by exotic species. We evaluated these factors by establishing permanent sampling sites along 13 roadsides in the Lake Mead National Recreation Area and adjacent public lands. Microsites under perennial species were sampled for community composition. Additionally, percent cover of exotics and natives were recorded using cover categorizations within a 0.25-m<sup>2</sup> frame around the center of the perennial plant. Six exotic species were detected throughout sampling. *Schismus arabicus* was the most frequently encountered exotic annual followed by *Erodium cicutarium* and *Brassica tournefortii*. Overall cover of exotic species declined slightly as distance from the road increased; however, differences were not significant. Over time, we will be able to monitor changes in the frequencies of both exotics and natives occurring in the microsites. This information will be of interest to managers and scientists alike in understanding exotic species invasions relative to roadways and possible associations with perennial natives.

SEEDING EFFECTIVENESS AND NATURAL REGENERATION OF MOJAVE DESERT PLANT COMMUNITIES AFTER 2005 WILDLAND FIRES

E. Cayenne Engel<sup>1</sup>, Scott Abella<sup>1,2</sup>, Christina Lund<sup>3</sup>. Contact: [cayenne.engel@unlv.edu](mailto:cayenne.engel@unlv.edu).

During Winter 2007 and Spring 2008 we surveyed burned and adjacent unburned sites in Mojave Desert shrubland communities throughout Clark County, to assess plant community recovery from 2005 wildfires. We quantified the cover of the perennial species and related their presence and abundance to abiotic site characteristics and soil chemistry. Additionally, we are monitoring the success of seeding perennial shrub species to burned sites to evaluate the effectiveness of this strategy for accelerating community recovery. After two years, community composition varied dramatically by site, with few of the formerly dominant species such as creosote, bursage, and blackbrush returning. However, other common shrubs such as globemallow have re-established at many of the sites where they were present pre-burn. Perennial species richness did not differ among sites, but identity and abundance varied dramatically. To date, seeding has not impacted the abundance of forbs and shrubs. Seed bank analyses should detect whether the added seeds are still present in the seed bank. Understanding the process of post-fire recovery in an increasingly fire rich landscape will help inform effective management strategies.

## MANAGEMENT TECHNIQUES FOR THE CONTROL OF SAHARA MUSTARD (*BRASSICA TOURNEFORTII*) IN THE MOJAVE DESERT.

Dianne Bangle<sup>1</sup> [dianne.bangle@unlv.edu](mailto:dianne.bangle@unlv.edu).

I tested seed germinability in Sahara mustard after fruiting plants were treated with either 2%, 5%, or 12% triclopyr. Sahara mustard seed pods were labeled based on three developmental stages prior to treatment. Application of herbicide decreased germination from control seeds, however effectiveness did not differ across concentrations of triclopyr (2, 5, and 12%). I also tested seed germinability in Sahara mustard after fruiting plants were separated from their resources and allowed to dry in the field. Seed pods were labeled by developmental stage before treatment. The three treatments consisted of; 1) pulling plants with roots intact; 2) pulling the plant and breaking the roots and leaf rosette from the inflorescence; 3) pulling off individual fruits. All treatments resulted in a decrease in germination from control seeds.



Top. Sahara mustard seedlings were individually marked and followed throughout the growing season. Bottom. A 1-m<sup>2</sup> plot was used to document Sahara mustard seedling density.

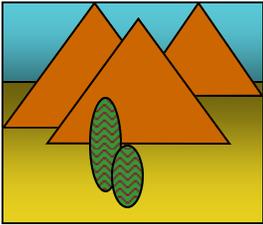


## RESPONSES OF SAHARA MUSTARD (*BRASSICA TOURNEFORTII*) TO WATER ADDITION AND SOIL DISTURBANCE MANIPULATIONS.

Alexis A. Suazo<sup>1</sup>, Jessica S. Spencer<sup>1</sup>, and Scott R. Abella<sup>1,2</sup>. Contact: [alex.suazo@unlv.edu](mailto:alex.suazo@unlv.edu).

To better understand the ecology of Sahara mustard, we established experimental plots in large washes, road shoulders, and disturbed areas and documented responses of this exotic species to water additions and soil disturbance. (See bottom photo). Water additions (7 liters/plot/application) were applied from November 2007 through January 2008 at a two week interval. We performed the soil disturbance treatment by dragging a metal rake to break up the top 5 cm of mineral soil and this treatment was applied once. We collected data on Sahara mustard seedling density, phenology, plant height, and number of fruits, and tested for treatment effects. (See top photo). At our study sites seedling emergence was patchy; we recorded low densities in large washes (Mean  $\pm$  SE,  $1.58 \pm 0.68$ ) and high densities ( $47.42 \pm 14.98$ ) in disturbed road sides. Seedling density was influenced by site ( $P < 0.001$ ) while experimental treatments had a marginal effect ( $P = 0.052$ ) on seedling density. Plant height and the number of fruits produced did not differ between treatments, but plant phenology was associated with treatments. Our results suggest that habitats with disturbed soils are conducive for the establishment of Sahara mustard, and we recommend that land managers monitor disturbed areas for sign of infestations.

<sup>1</sup>Public Lands Institute, University of Nevada, Las Vegas. <sup>2</sup>School of Life Sciences, University of Nevada, Las Vegas. <sup>3</sup>BLM – Las Vegas Field Office.



A Newsletter of the UNLV  
Desert and Dryland Forest  
Research Group

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Desert and Dryland Forest Research Group



## Mojave Events

Check out  
our new website!

<http://publiclands.unlv.edu/ddfgr/Home.htm>

### Oct 2-4, 2008—Cal-IPC Symposium

A gathering of weed scientists, land managers, federal, state and local agencies and concerned citizens to discuss invasive plant impacts, control and management strategies.

California State University- Chico

### Oct 14-17, 2008—Natural Areas Association & National Association of Exotic Pest Plant Councils joint conference

“Natural Areas Revival in Music City: Tuning in to a changing climate and biological invasion”

Nashville, TN

### January 13-14, 2009—Lake Mead Science Symposium

Numerous research and monitoring efforts have been conducted, are ongoing, or are in the planning stages for Lakes Mead and Mohave. A state-of-the-science symposium to share information and help synthesize these efforts. Planned conference sessions: Lake Management, Limnology and Water Quality, Aquatic Biota and Fisheries, Riparian and Shoreline Resources, Contaminants and Emerging Issues. Selected papers will be considered for publication in a special issue of *Lake and Reservoir Management*. Additionally, sessions will provide insight to assist with lake management and the development of an overall ecological monitoring strategy for the lakes. University of Nevada- Las Vegas [Abstract submissions are due Oct 14.](#)