

Fall 2010

Mojave Applied Ecology Notes Fall 2010

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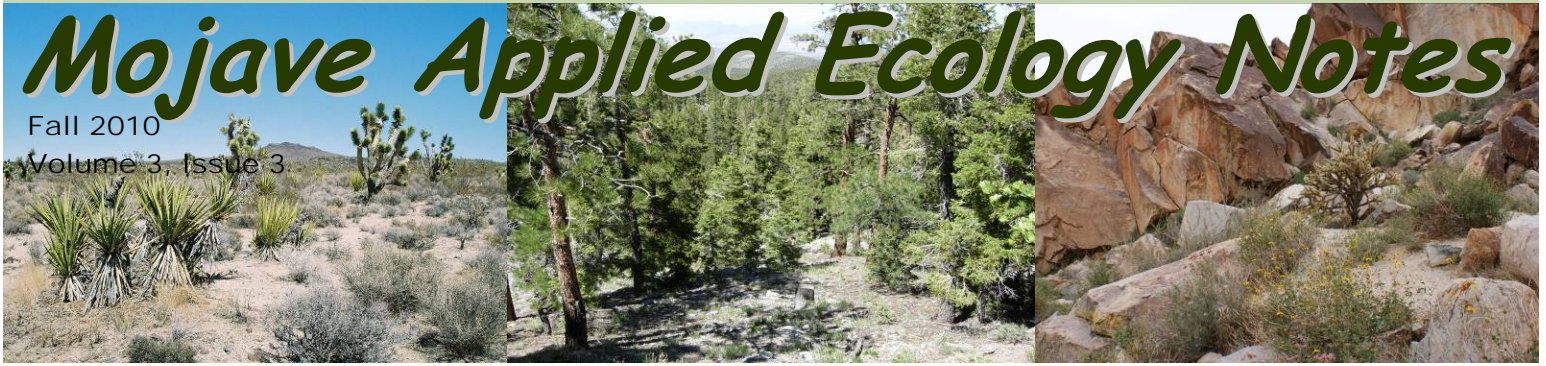
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Mojave Applied Ecology Notes

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Graduate Student Project on Habitat Invasibility Defense Date Set

Adria DeCorte, M.S. candidate in Environmental Science with the School of Environmental and Public Affairs at UNLV, has set an open thesis defense time of November 2, 2010, at 9:30 a.m. The location is in the Greenspun Building on the southeast side of the UNLV campus, either in the west side computer lab, or in the auditorium at the north entrance, depending on the number of people attending.

Adria's project, supported through a cooperative agreement with Lake Mead National Recreation Area working with vegetation manager Alice Newton, involved establishing research plots along the park's Northshore Road. Here is an excerpt from Adria's thesis:

Relationships of Exotic Plant Invasions with Biological Soil Crusts, Desert Pavement, and Soil Carbon in the Eastern Mojave Desert

By Adria DeCorte
Thesis for M.S. in Environmental Science, UNLV

Plant invasibility is a key topic in the Mojave Desert where exotic species invasions result in new fire regimes and reduced biodiversity. The most effective technique for preventing the spread of invasive species may be increasing the health of native plant communities in order to fortify them against invasion. Consequently, protecting soil surfaces in conjunction with reducing soil fertility through carbon addition could serve as useful tools for prevention.

In my thesis work, I examined how soil surface types (biological soil crust, desert pavement, and open areas that were neither) effect the establishment of three exotic plant species (*Bromus rubens*, *Schismus* sp., and *Brassica tournefortii*) in Lake

See *Graduate Project* on page 5



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"The most effective technique for preventing the spread of invasive species may be increasing the health of native plant communities to fortify them against invasion."

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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.

DDFRG Welcomes 2 New Botanists

By Sharon Altman

SHANNON HENKE joins the Desert and Dryland Forest Research Group from the National Park Service where most recently she was a Biological Technician working for Vegetation and Ecological Restoration at Yosemite National Park. She enjoys hiking, camping and music in her free time. Shannon has a BS, emphasizing Plant Ecology, from California State University, Chico.



Shannon

Our second new botanist is JOSLYN CURTIS. Joslyn graduated with a B.S. in Botany and minors in Horticultural Science and Anthropology from North Carolina State University, where she also was Botany Club Vice President and graduated Magna Cum Laude. She enjoys backpacking, scuba diving and traveling. Before coming to UNLV, she worked as a botanist with the Eastern Nevada Landscape Coalition, in Ely, Nevada, measuring plant community responses to wildfires in eastern Nevada.



Joslyn

Their botany and plant ecology expertise and experience with arid land fieldwork will make them an asset to the group. They are currently working on the vegetation mapping project described on the next page.

Mojave Desert Vegetation Mapping Project Continues

By Sharon Altman – from the report: Prengaman, Kathryn A., Teague M. Embrey, Sarah M. Schmid, Karin J. Edwards, Carl Howard, Julia S. Gehring, and Scott R. Abella, 2010. Vegetation Mapping for the Mojave Network Parks: Annual report for the first year fieldwork at Lake Mead National Recreation Area and Death Valley National Park. Submitted by the University of Nevada, Las Vegas to the Mojave Inventory and Monitoring Network of the National Park Service.

This project was supported through a cooperative agreement with the Mojave Desert I&M Network Inventory and Monitoring Program of the National Park Service.

The primary goal for the data collection for this project was to sample plots that describe stands of vegetations and their locations. Plots were established, within an environmental stratification framework, in areas that provide a representative sample of the vegetation patterns present in a given area, including both large stands and small but repeating or important/unique stands like drainages and springs.



Lake Mead, photo courtesy of Scott Abella

We conducted our primary field season at Lake Mead NRA from February 18 to May 13, 2010. We surveyed 394 sites, 157 Classification Plots and 237 Observation Points. We sampled points in 103 BPUs, meeting the initial goals of 400 sites, at 93 BPUs. We recorded 61 different alliances and more than 200 associations during our sampling. Twenty-one



Ocotillo (*Fouquieria splendens*) growing on a ridge overlooking Lake Mead. Photograph by: Kate Prengaman

alliances were recorded at four or more sites across the park, and the rest were rare alliances that were difficult to find with multiple stands. Additional fieldwork was done September 10 to October 7, 2010, with the goal of targeting alliances that were only represented by a few plots in the first phase of the fieldwork.

Our first field season of sampling at Death Valley National Park ran from May 17 to July 2, 2010. For this field season, we focused our efforts on the northern and central ranges, to work in the higher elevation areas while they were in bloom.

We sampled 224 sites, 38 Plots and 186 Observation Points. Fewer Plots were done at Death Valley National Park because a previous project (with data available to the Mojave Desert I&M Network) had already collected sufficient data for classification analysis on many of the common alliances.

These 224 data collections represent about 36% of the random sites in the five work area; the original goal was 40%. We recorded 56 alliances, including 15 types that were recorded at four or more sites across the park.

Work on the remaining 11 work areas is scheduled to begin in January, 2011.

Sampling/data collection will begin at Mojave National Preserve in the spring 2011 and the collection of accuracy assessment data at Great Basin National Park in early summer 2011.

Burial Depth Effect on Seeds of *Brassica tournefortii*, a Non-native Winter Annual

By Alex Suazo

Seeds are important in regulating plant population dynamics and community structure. In desert ecosystems such as the Mojave, seeds are stored in soil seed banks as a strategy to deal with temporal variability in precipitation. The timing and amount of precipitation are key cues for stimulating seed germination, and responses of winter annuals to adequate soil moisture can be appreciated in spring when dozens of species are responsible for spectacular wildflower displays. However, a fraction of viable seeds remains dormant even under ideal germination conditions and little work has been done that quantifies the proportion of viable seeds that remain dormant in the soil after a germination event. Understanding patterns of seed persistence in soil seed banks may be important for finding effective ways to manage non-native plant species by targeting the seed bank.

The non-native invasive forb, *Brassica tournefortii* (Sahara mustard), is a winter annual native to the southern and eastern parts of the Mediterranean rim, where it establishes viable populations on sandy soils. *B. tournefortii* is considered a top non-native species with the potential to cause extensive ecological damage in deserts of the American Southwest. In the Mojave Desert in southern Nevada, *B. tournefortii* has spread into a variety of habitats. As a winter annual, *B. tournefortii* seeds germinate after winter rainfall (October through April) and before many of the native annuals quickly monopolizing soil resources and leaving little water and nutrients for other species. The population densities are influenced by rainfall patterns, and during years of high rainfall dense stands dominate the landscape resulting in increased fuel loads, and consequently increased fire hazard.

We quantified patterns of seed dynamics in habitats with contrasting soil types (alluvial and sandy) (Fig. 1) to determine whether seed dormancy differs as a function of burial depth. Seeds of *B. tournefortii* were collected from infested areas at Lake Mead National Recreation Area in spring 2009. We mixed 100 seeds with 160 ml of sterile sand (commercially bought) and poured the seed / sand mix into nylon bags. Seed bags were buried at 2, 5, and 15 cm depths and exhumed after six months. In the lab, seeds were recovered from the soil using different mesh sizes. All recovered seeds were inspected using a dissecting microscope; opened seeds were classified as germinated, and closed seeds as un-germinated. Closed seeds

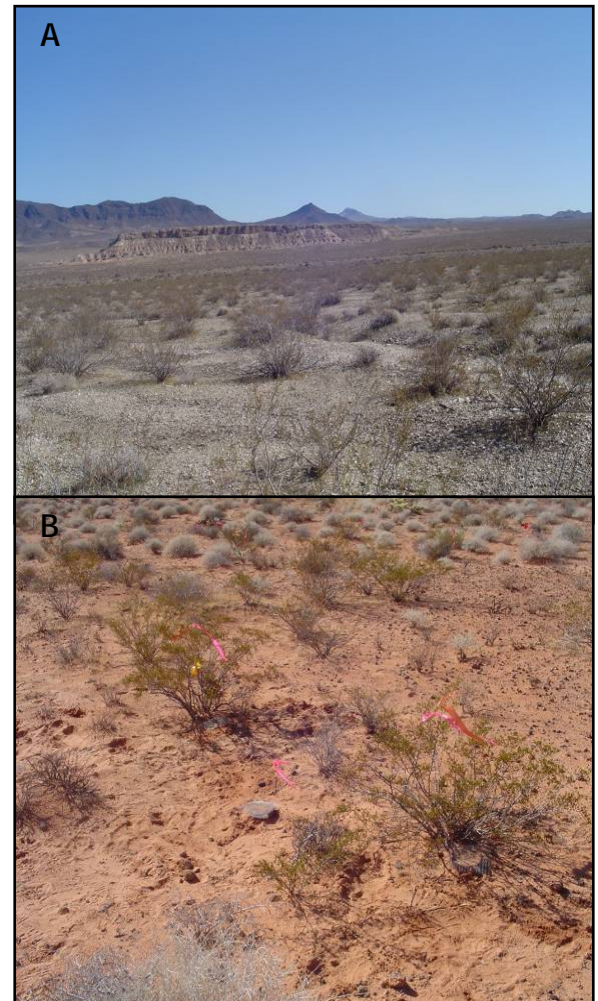


Fig.1 Different soil types A) alluvial and B) sandy where the seed burial study was conducted at Lake Mead National Recreation Area.

*“As a winter annual, *B. tournefortii* seeds germinate after winter rainfall and before many native annuals quickly monopolizing soil resources and leaving little water and nutrients for other species.”*

Overview Summary of Exotic Species Published in the Encyclopedia of Geography

Scott Abella's invited contribution to the Encyclopedia of Geography was published in September, 2010. Scott's contribution is on exotic species, and provides an overview of the ecology, distribution, threats, and management of exotic species, all in <1,000 words. This overview summary is intended for a general audience and may be useful for distributing to the public and others to further an awareness and understanding of exotic species. For those of you who don't want to purchase the six-volume, \$900 encyclopedia from Amazon, a PDF of the entry is available from: <http://faculty.unlv.edu/abellas2/>

Vegetation Mapping from page 3

The Abella Lab within the UNLV School of Environmental and Public Affairs is dedicated to increasing understanding of the applied plant ecology and management of the Mojave Desert. The National Park Service is providing financial support through a cooperative agreement with UNLV to collect vegetation data from which fine scale vegetation maps will be created. These vegetation maps will contribute to the body of knowledge regarding the species composition, abundance and distribution of plant communities within the Mojave Desert. The final products from this project will be available for use by the public for a wide range of scientific studies and land management planning efforts.

Graduate Project from page 1

Mead National Recreation Area in the eastern Mojave Desert. I conducted two experimental components - a greenhouse study and a field study - and a correlational field study. Using these studies, I also examined the effect of carbon addition and disturbance on the establishment of these species.

The findings are expected to contribute novel information to the broader understanding of these factors in arid lands as well as provide information applicable for local land managers tasked with protecting desert soil surfaces and minimizing impacts of exotic species.

Adria's committee is chaired by Scott Abella and includes the members Wesley Niles, Lloyd Stark and Bill Smith.

Thank you.....

We thank our current funding partners for their support:

Bureau of Land Management, Southern Nevada - Nora Caplette and Kevin Oliver, and Ely District - Karen Prentice

Lake Mead National Recreational Area - Alice Newton

Mojave Network of the National Park Service - Nita Tallent-Halsell and Jeanne Taylor

Parashant National Monument - Kathleen Harcksen

Saguaro National Park - Dana Backer

U.S Geological Survey / Clark County, Nevada - Lesley DeFalco

We look forward to continuing these partnerships and working with future new partners for mutual benefit

Burial Depth from page 4

were placed in Petri dishes with moistened blotter paper on a lab bench to test for seed dormancy. Radicle emergence was used to indicate germination.

Seed germination approximated 100% before burial indicating that seeds were highly viable; however, seed germination decreased as a function of burial depths. After six months of seed burial, the proportion of seeds that germinated was observed to vary between 0.50 (50%) and 0.20 (20%) at 2 and 15 cm burial depth, respectively. Seedling emergence was prevalent from 2 and 5 cm depths. The observed germination pattern indicates that a large number of viable seeds remained dormant, particularly at a 15 cm burial depth (Fig. 2). Approximately 100% of dormant seeds germinated in Petri dishes when exposed to ambient conditions (Fig. 2).

This study has shown that seeds of *B. tournefortii*, a non-native invasive species can remain viable in the soil seed bank as a means to ensure plant survival and establishment in an unpredictable environment such as the Mojave Desert. Proportion of un-germinated seed increased as a function of depth, suggesting that light availability may be responsible for stimulating seed germination hence seeds stay viable and dormant at deeper depths in the soil seed bank. Dormant seeds were quick to respond to ambient lab conditions as seed germination was observed one day after seeds were placed in Petri dishes. It is interesting that seed mortality caused by soil borne microbial seed pathogens appears to be not important in shaping seed fate. There were only a couple of seeds that showed decayed embryos. However, longer term seed burial studies may be needed to better understand the role of pathogens on seeds stored in soil seed bank. Seedling emergence and seed germination patterns suggest that a possible management approach for *B. tournefortii* is to bury seeds at a depth of 15 cm, and soil disturbance should be avoided as it could bring buried seeds to the surface where seeds will be exposed to optimal germination conditions.

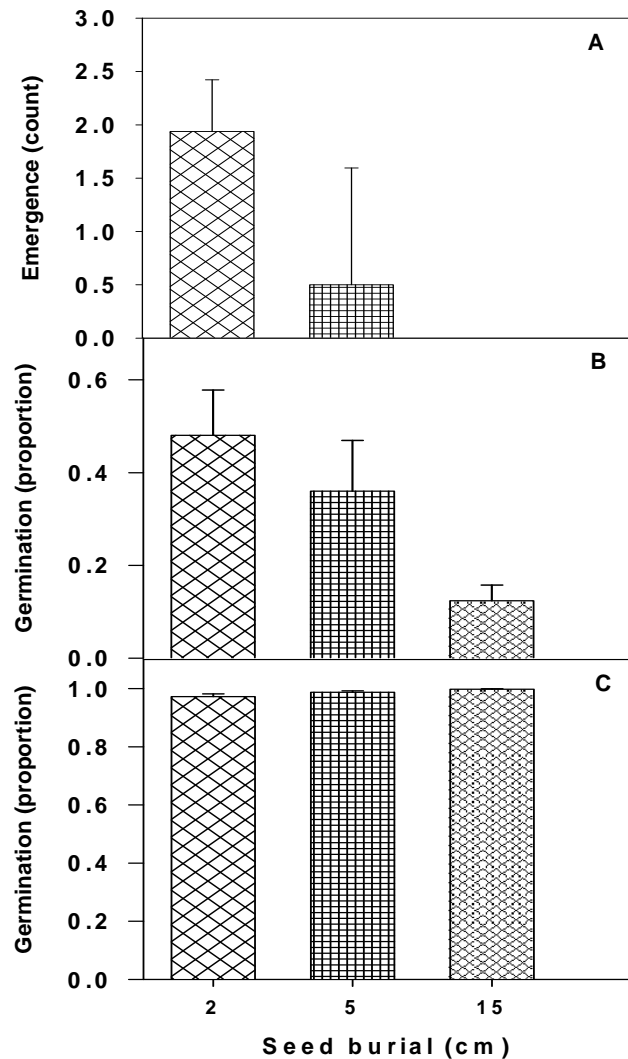


Fig. 2 *Brassica tournefortii* seed dynamics A) mean seedling emergence B) germination after six months of seed burial C) germination of dormant seeds in lab conditions. Bars represent SE.

**Climate Change Conference at UNLV
 Presentations Online**

In April 2010, over 300 people attended the workshop on natural resource needs associated with climate change in the Great Basin and Mojave Desert, at the University of Nevada Las Vegas. For anyone interested, full-length presentation videos, presentation slides, speaker and poster abstracts, and the posters are all now available online. **This program included an invited presentation by Scott Abella on conducting ecological restoration in a changing climate in the Mojave Desert.**

The clearinghouse is at:

<http://www.wr.usgs.gov/workshops/ccw2010/index.html>

Recent Media Appearances of Our Research

We try diligently to communicate our science to the public, managers and other interested stakeholders. Some examples of our recent outreach appearances include:

1. Coverage of science recommendations of an invited panel Scott Abella is serving on, the Independent Scientific Advisory Panel for the California Desert Renewable Energy Conservation Plan, in an article titled "Science report advocates using 'disturbed' land for solar plants," published in the Solar Home & Business Journal, 16 August 2010.
<http://sunpluggers.com/news/science-report-advocates-using-disturbed-land-for-solar-plants-0840>
2. Interview for article titled "Sometimes forests need fire," published in the Las Vegas Review-Journal, 18 August 2010. Perspective provided on forest changes and fire management in the Spring Mountains of southern Nevada.
<http://www.lvrj.com/news/sometimes-forests-need-fire-100963954.html>
3. Interview for article titled "Rising from the ashes: more efforts needed to rehabilitate post-wildfire ecosystems," published in Vegas Seven, 15 July 2010, page 37. Perspective provided on the recovery of native desert and forest ecosystems following wildfire.
<http://weeklyseven.com/news/2010/july/15/rising-ashes>
4. Interview for news coverage of Cathedral Fire in the Spring Mountains (southern Nevada). Perspective provided on changes in forest fuels, the prognosis for future severe fire, and the need for forest thinning and restoration. Coverage aired on the 4:30 p.m. news, Channel 3 Las Vegas, 2 July 2010.
5. Interview for news coverage of Cathedral Fire in the Spring Mountains (southern Nevada). Perspective provided on changes in forest fuels, the prognosis for future severe fire, and the need for forest thinning and restoration. Coverage aired on the 6:00 p.m. news, Channel 8 Las Vegas, 2 July 2010, and was also written as a news release.
<http://www.mynews3.com/story.php?id=21769&n=5035>
6. Summary of desert disturbance and succession publication (Abella 2010) summarized as a news release titled "UNLV study: Southwest desert ecosystems can take decades to recover from wildfires," by the Office of Public Affairs, University of Nevada Las Vegas, 1 July 2010.
<http://cms.unlv.edu/newscenter/releases.dot?newsid=124069>



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