Vegetation Recovery in a Desert Landscape After Wildfires: Influences of Community Type, Time Since Fire and Contingency Effects

By E. Cayenne Engel and Scott R. Abella

Article available online - early view in the Journal of Applied Ecology

**Summary**

Theories of plant succession are poorly developed in arid lands, hindering our understanding of how long communities may take to recover after disturbances such as fire. In desert landscapes vulnerable to fire, information about vegetation recovery is important when deciding whether land managers should facilitate vegetation recovery. The deserts of the southwestern USA are increasingly subject to unprecedented fires, facilitated by fuel from exotic grasses, yet management strategies are unclear.

We evaluated post-fire recovery patterns of perennial plant species richness and diversity, compared the rate and direction of succession between two major community types, and explored the relationship of time since fire (TSF) and other environmental factors with vegetation recovery. We sampled perennial plant communities and environmental variables (e.g. soil N) on 32 burns, ranging from 2-29 years TSF and each paired with their own unburned area, within a 1.8 million-ha landscape in the Mojave Desert, USA.

Species richness, diversity and composition exhibited different post-burn recovery patterns, and recovery rates differed between community types. Specifically, diversity in *Coleogyne ramosissima* communities was greater in burned than unburned areas, but diversity did not differ in *Larrea tridentata* communities. Species composition in *Larrea* communities exhibited trajectories that indicate convergence with unburned community composition after 19 years TSF. Conversely, burned
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https://www.gsaadvantage.gov/advantage/contractor/contractor_detail.do?mapName=/s/search/&contractNumber=GS-10F-0035X

VOICE IN THE WILDERNESS

Reproduced from an article by Jason Whited

“UNLV researcher says the West’s next big fire could strike Mountain Charleston.”

Excerpt from a 2011 article published in the weekly newspaper Las Vegas CityLife, July 7-13, which provided perspective on fire in western forests during the summer 2011 fire season burning millions of acres in the Southwest.

At 7,000 feet up, the slopes of Mount Charleston look nothing like one of the biggest fire hazards in the American West. Blanketed in thick-bark Ponderosa pine, hardy squirrel-tail grass and the ubiquitous, draping purple flowers of the lupin plant, the peak, which presides over the Spring Mountains, is more bucolic refuge than clear danger.

Catch fire? It’s barely warm up here. Although it’s mid-morning on a July day, the temperature up here has hardly risen above 70 degrees. You want a fire hazard? Head back down to the valley. With two hours until noon, Las Vegas is already broiling under 95-degree heat. Talk about a fire starter...

Yet Professor Scott Abella is worried. For several years now, Abella and a team of fellow researchers and graduate students have combed this area, sampling the mountain soil and the wood of those Ponderosas while monitoring the overall density of the forests. What the woods tell them is potentially alarming. See the full article at:

and unburned *Coleogyne* communities lacked convergence irrespective of TSF. Environmental variables (e.g., soil texture and P) accounted for 79-83% of the variation in burned species composition, suggesting environmental characteristics in part control recovery patterns.

We found that geographically similar vegetation types within the same landscape can have markedly different post-disturbance successional rates and trajectories.

Furthermore, the persistence of fire effects varied depending on the community measure, with fire effects on species composition more long-lasting than effects on species diversity. This work supports (1) the use of post-disturbance successional analyses for helping to prioritize management where it is most needed (e.g., communities not recovering naturally) and (2) the need to assess whether persistent, early successional desert communities meet functional management objectives.

(a) Unburned and (b) burned fire K389 (1986) in a *Coleogyne* community; (c) unburned and (d) burned 1980 Ghost fire in a *Larrea* community; (e) a road functioned as a fire break in the 2005 Fork fire; and (f) the Scenic fire (2006) while burning. Picture (f) provided by Troy Phelps, all others by C. Engel.
Vegetation Mapping at Three National Parks

By Kate Prengaman

It is official - there is a lot of creosote in the Mojave Desert. The vegetation mapping crew wrapped up their field work this summer, after surveying 1,662 vegetation plots at Death Valley National Park (DEVA), Lake Mead National Recreation Area (LAKE), and Mojave National Preserve (MOJA). The project aimed to sample as many different distinct vegetation communities, also known as alliances, as possible, while also providing accurate coverage of the parks. Creosote, in either monotypic or shared dominance communities, made up a full 20% of the vegetation stands sampled. However, the crew found a lot more diversity than that first statistic could lead you to believe; they recorded 179 different vegetation alliances.

This mapping project kicked off back in February of 2010 on a cooperative agreement between UNLV and the NPS Mojave Network Park’s Inventory and Monitoring Program. The goal for the field crews was to hike around the parks and collect data that describe the stands of vegetation and their positions on the landscape. In addition to species cover data, the crew described the landform and topographic position, slope and aspect, and the general size and extent of the vegetation community, as well as its relationships to other nearby communities. These data will be used by a team of map-makers, to draw vegetation-based polygons onto satellite and aerial images that will represent the plant communities surveyed on the ground.

The first phase of the project, focused on sampling at Lake Mead, finished last summer. http://www.unlv.edu/staff/cengel/Fall10News.pdf. The second phase consisted of field work in DEVA and MOJA. The sampling strategy for these two parks was based on an older vegetation map, the Central Mojave Map (CMM; Thomas et al. 2004).

Each park was broken into work areas, roughly based each major valley or range, and 3-5 points were randomly located in each predicted vegetation type in each work area.

The crews collected data on the vegetation found at the point, as well as collected data on other communities they encountered while en route to target points. Hopefully, our data will provide a much needed upgrade to the CMM for these parks. We found that the CMM only had 30% accuracy for vegetation types, relative to what we sampled on the ground at MOJA, and 25% at DEVA.

We sampled a total of 623 communities at DEVA, recording 109 alliances, including 36 types that were recorded at more than 4 sites. Larrea tridentata and L. tridentata-Ambrosia dumosa were the most commonly observed vegetation communities, followed by Artemisia tridenta, Coleogyne ramosissma, and A. dumosa communities. Our data show a much more complicated and diverse distribution of vegetation than the initial map predicted. We recorded an additional 45 alliances that were not predicted by the previous map.

We sampled 600 communities at MOJA, recording 94 different alliances, 35 of which were recorded 4 or more times. The most common community was L. tridentata-A. dumosa, followed closely by Yucca brevifolia and Y. schidigera communities. Similar to the situation at DEVA, we recorded 45 new alliances.

In addition to meeting the needs of the mapping project, this large dataset will be a valuable resource for park managers and researchers for years to come.
Map of Death Valley National Park showing the location of various plant communities found in the park. Data show a much more complicated and diverse distribution of vegetation than predicted by previous maps.

**Save the Date:**

**Parashant Partnership: Mojave Workshop**  
**October 3 - 5, 2011**

At the Casa Blanca Resort, Mesquite, Nevada

On October, 4, as part of the workshop, Cayenne Engel and Scott Abella will be giving a field tour of a site in Parashant National Monument where we are assessing the establishment ecology and control of red brome.
UNLV Library Special Collections

By Peter Michel, Director, Special Collections

UNLV Libraries maintain a comprehensive collection of monographs and journals which support teaching and research in the various disciplines that study the environment.

http://guides.library.unlv.edu/environmentalstudies

In addition, the libraries hold a wide range of specialized environmental collections. These include government publications, series, reports and maps dating from the earliest 19th century geological and topographical survey expeditions in the region; the later United States Geological Surveys; voluminous environmental impact studies, geological and hydrological reports conducted by or for federal, state, county and municipal government agencies on Yucca Mountain, the Nevada Test Site, the MX Missile sites, Lake Mead, highways, forests, transmission lines, water and waste management, soil and irrigation, and archaeological sites, and documents from urban and regional planning agencies. The libraries also house the results of environmental research conducted by the university, such as the UNLV’s Lake Mead Limnological Research Center, The Desert Research Institute and the Harry Reid Center for Environmental Studies. Integral parts of this research have resulted not only in textual reports, but in mapping, photography, and illustration. UNLV Libraries house a comprehensive regional map collection of both current government maps and historic maps housed in Special Collections.

http://digital.library.unlv.edu/collections/maps

The Architectural Studies Library houses a variety of materials on the relationship between the built and natural environments in the development of sustainable architecture.

http://www.library.unlv.edu/arch/rsrce/resguide/sustainability.html

UNLV Libraries Special Collections also houses regional environmental collections. The files of the Las Vegas Land and Water Company, part of the corporate archives of the Union Pacific Railroad, contain documentation of the creation and management of an urban water distribution system and conservation programs. The Colorado River Commission Collection are the records of the Nevada state government agency charged with acquiring, managing and protecting all of Nevada’s water and hydroelectric resources from the Colorado River. An online guide to the library’s resources on water resources can be found at http://www.library.unlv.edu/speccol/water_resources.html

Manuscript collections include the papers of John Wittwer, District Agricultural Extension Agent for Clark County in Aerial photo of the Las Vegas Strip from Sunset Road south to Charleston Avenue north taken March 1963

Photo from Special Collections - UNLV Library

UNLV Library cont. on page 6
The 1920’s which document agricultural, irrigation and CCC programs in Southern Nevada; the records of the local Sierra Club and other environmental groups; the papers of prominent geologist Chester Longwell, whose field work in the 1920’s and 30’s was the basis of much of the geological mapping of southern Nevada and which include a large photograph collection which documented his field work. There are extensive photograph collections depicting a changing landscape, from mining towns, to urban sprawl, to the shrinking of Lake Mead.

UNLV Libraries has recently launched a new digital project that incorporates many of its environmental collections. The Historic Landscape of Nevada: Develop, Water and the Natural Environment http://digital.library.unlv.edu/collections/historic-landscape is a collection of digitized original materials in a variety of formats, from many different sources and perspectives that documents the landscape of southern Nevada and the history of man’s interaction with it.

The collections are drawn entirely from UNLV Libraries Special Collections. The main objectives in selecting and presenting these collections was to provide a visual record, through photographs and maps of the landscape of Southern Nevada, as it changed as a result of Las Vegas’ growth as a an urban metropolitan area, to provide, through the original records, the history of water management in the Las Vegas Valley and to provide a digital repository for published technical and scientific reports related to geology, water supply, and water quality in the Las Vegas Valley that have been produced by scientists and engineers over the years. Also included in this project are the maps that were produced to accompany these reports. This project complements, and can usefully be used in conjunction with other UNLV digital projects, Las Vegas, Water in the West, http://digital.library.unlv.edu/collections/water which focuses on the planning and construction of Hoover Dam, and Southern Nevada, The Boomtown Years. http://digital.library.unlv.edu/boomtown/ which focuses on the early mining settlements of Southern Nevada, and the beginnings of Las Vegas.

A variety of undated photographs from the various collections available from the UNLV Library Special Collections.
2011 MSHCP Progress Report Symposium

The Desert Conservation Program (DCP) held their annual symposium on August 17, 2011. Scott Abella was an Invited Speaker at the symposium, which was held to highlight progress made to date on projects to implement the Multiple Species Habitat Conservation Plan (MSHCP), and to advance thinking about major conservation issues through a panel discussion of participants. It was held at the Desert Research Institute, 755 East Flamingo Road, Las Vegas, Nevada

Copies of all presentations are now posted on their website: http://www.clarkcountynv.gov/Depts/dcp/Pages/Symposium.aspx


47 studies
Year's to recovery
Cover: 76
Richness: 38
Composition: 216
Annuals: shorter

Location of 47 studies meeting selection criteria for a quantitative analysis of plant recovery and succession in the Mojave and Sonoran Deserts of the American Southwest. (Excerpt from Scott’s presentation).

Interest in New Project Opportunities

We are actively interested in continuing existing partnerships and building new partnerships by working with agencies and others in developing new funded projects. We are interested in identifying projects of mutual interest and writing funding proposals, including for sources such as year-end money and other opportunities.

Thank you.......

We thank our current funding partners for their support:
Lake Mead National Recreational Area - Alice Newton
Bureau of Land Management Ely District - Karen Prentice
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.
Benefits of Publications Available to Resource Managers and Stakeholders

By Scott Abella

As a manager, have you exasperatedly scoured the office for a report you know was done but can’t find since the office files were moved? Ever walked around the office asking if anyone knows where so and so transferred and now you can’t find the monitoring data you know they collected and now need? Or how about searching for a solid research document to support a management action in a NEPA document or management plan? Also given the high current turnover within agencies, would it be useful to have consolidated locations for key information that new hires or contractors should know about the ecology and management history of a region?

Quality, scientific publications are useful in resource management for many reasons, such as:

- Publications are readily picked up by Google searches, and with open access and permissible posting of PDFs by individual researchers or for government-funded projects, many articles are now readily available online.

- Data management is a known problem for land management agencies. Many scientific journals now support posting supplemental information (e.g., raw data, plot locations) online associated with studies.

- Archival and search engines are transferred to entities who do this for a living - namely libraries, Google, and other organizations. This responsibility is thus transferred away from resource management agencies that can instead focus on managing natural resources.

- Data by themselves are not generally useful - collecting data that are never analyzed provides little benefit. If it were possible to calculate how much public funding has been spent on collecting monitoring data that are never analyzed, it would be appalling, especially considering that money for natural resources is hard to come by. By nature, data are both analyzed and interpreted in publications.

- Scientific publications are not all created equally in terms of quality and utility, but they have gone through a peer review process and are considered more rigorous, transparent, and accessible than unpublished reports.

- Useful publications contain information relevant to management planning, laying a foundation for future research priorities, supporting management decisions, helping agencies meet technical monitoring mandates, attracting project funding, and providing an important scientific context.

Ultimately a goal in science is to periodically synthesize all of the scattered, individual studies on particular topics into comprehensive reviews to develop general principles. For example, general principles on what makes ecosystems invasible by exotic species, and how managers can reduce invasibility, would be enormously valuable. Our lab group has completed many syntheses, such as on burro grazing effects (Abella 2008), recovery of desert ecosystems from disturbance (Abella 2010), revegetation techniques for desert ecosystems (Abella and Newton 2009), and managing ponderosa pine-oak forests (Abella 2008).
Publications cont. from page 10

We believe that resource management agencies often could get more out of their monitoring and discretionary funds if contractors have the interest and ability to publish good science. Most monitoring or research projects that have clear objectives, quality methods, and follow through on analysis and article development are publishable somewhere, even if as a peer-reviewed agency publication such as BLM Technical Notes.

Producing publishable science represents an excellent opportunity for forming partnerships. For instance, our lab group has partnered with the Maricopa County Parks and Recreation Department to publish an article on post-fire seeding effectiveness in the Sonoran Desert (Abella et al. 2009a); with the National Park Service to author an article on desert revegetation techniques (Abella and Newton 2009), with the Bureau of Land Management to monitor post-fire plant recovery (Abella et al. 2009b), and with the Forest Service on a forest reference condition assessment (Abella et al. 2011a) and to analyze an existing data set on forest change (Abella et al. 2011b). When appropriate, resource managers sometimes help co-author the papers, and John Gunn, Alice Newton, Christina Lund, Wayne Robbie, Rory Steinke, and Jim Hurja are among the manager co-authors on the above publications.

A primary focus of our research group is publishing applied projects that both advance science and have clear usefulness to management planning.

Citations are available from our website - http://www.unlv.edu/staff/cengel/AERGHome.htm

Another Save the Date

11th Biennial Conference of Research on the Colorado Plateau
October 23 - 27, 2011

“Cultural and Natural Resource Management on the Colorado Plateau: Science and Management at the Landscape Scale”

At the High Country Conference Center at Northern Arizona University, Flagstaff, AZ.

For more information please visit them on the web at http://www.research.nau.edu/events/biennial-conference/default.aspx

Scott Abella, E. Cayenne Engel, and Lindsay Chiquoine will be speakers at the workshop.

Presentations are scheduled for:
Tuesday, October 24 at 1:50 pm
LINDSAY CHIQUIONE, M. Bowker, L. Stark, S. Abella - Biological soil crust rehabilitation on disturbed gypsiferous soils.

Wednesday, October 26 at 8:30 am
SCOTTABELLA - Identifying native species for use in successful restoration projects.

Wednesday, October 26 at 1:00 pm
E. CAYENNE ENGEL, S. Abella - Relationships of exotic species with native vegetation, environmental factors, disturbance, and ecosystem classifications of ponderosa pine forests.
More Save the Dates

2011 Nevada Weed Management Association Conference

“Moving to the Future”
Nov. 8-9, 2011 - Sparks, Nevada

For complete conference agenda, please visit the NWMA website at: www.nvvm.org.

California Native Plant Society

Conservation Conference: Conserving and Restoring the Roots of California’s Richness
Jan. 10 - 11, 2012 - San Diego, California

For more information please visit: http://www.cnps.org/cnps/conservation/conference/2012/

Southwest Fire Ecology Conference

Fire Landscapes, Wildfire, and People: Building Alliances for Restoring Ecosystem Resilience
Feb. 27-March 1, 2012 - Santa Fe, New Mexico

The Association for Fire Ecology (AFE), in association with Humboldt State University and the Southwest Fire Science Consortium announce the Southwest Fire Ecology Conference in Santa Fe, New Mexico. This conference will engage researchers, decision makers, and practitioners across disciplines in friendly roundtable discussions on key issues, informed by scientific and practitioner talks and panel debates. For more information please visit: http://www.humboldt.edu/swfire/

NWRA 2012 Lake Mead Symposium

March 5-6, 2012 - Las Vegas, Nevada

2012 Lake Mead Symposium Program: The 2012 Lake Mead Symposium Planning Committee is hard at work and will have a draft program available in early November 2011. Please watch for additional information about the 2012 Lake Mead Symposium on their website, www.nvvmra.org

Please feel free to contact Tina Triplett at 775-473-5473 or creativerno@charter.net for more information.
Review of 2011 Publications and in Press Articles

In press:

Available online early view:

Published:

PDFs available from http://faculty.unlv.edu/abellas2/