



MOJAVE NETWORK

Inventory Summary Report

INVENTORY OF VASCULAR PLANTS AT MOJAVE NATIONAL PRESERVE AND MANZANAR NATIONAL HISTORIC SITE

INTRODUCTION AND OBJECTIVES

The inventory of vascular plant species at Manzanar National Historic Site and Mojave National Preserve was identified as the top inventory priority by the Mojave Network in 2001. Prior to this study, little to no information on the occurrence of vascular plant species existed for MANZ and although 831 species had been reported at MOJA, significant regions of the park remained undocumented. The primary objective of this inventory was to document the occurrence of at least 90% of vascular plants within each park. Additional objectives were to provide one voucher specimen for each new taxon for which there was no previous voucher, provide a list of sensitive species that are known to be federally or state listed, rare, NPS sensitive or worthy of special consideration that occur within each park and to provide a GIS-compatible digital file of the precise coordinates for these species.



Booth's Suncup, MOJA - Photo courtesy James M. Andre

Significant threats to MOJA natural resources and biological integrity exist due to legislation which allows mining, hunting, trapping, and utility rights of way in the park. Other threats include the introduction of non-native plant and animal species and increased vehicular traffic. While natural vegetation patterns are reasserting themselves over much of MANZ, the twentieth century agricultural and residential uses have significantly affected the vegetation on-site. Existing threats to natural resources at MANZ include non-native plants such as black locust and tamarisk and groundwater withdrawal to Los Angeles.

METHODS

Herbarium surveys, database and bibliographic query - The Jepson Online Interchange, which is contributed to by a consortium of herbariums in CA, was surveyed for all vouchers from MANZ and MOJA. Botanical literature was surveyed for recent taxonomic revisions, new species descriptions, or other notable range extensions. A full query of RAREFIND, the California Natural Heritage Program's Natural Diversity Data Base software program, was also conducted. Literature on regional endemism, sensitive habitat, and known or potential occurrences of special-status plant species within the parks was documented.

Field surveys - Mojave National Preserve: This inventory tried to strike a balance between probability-based sampling, to allow extrapolation of results to areas of interest, and techniques that would most efficiently add to park species lists. This was done by: 1) establishing a core set of randomly-located sample sites; 2) identifying small scale 'rare and sensitive features' to be targeted for sampling; and 3) describing ancillary data collection techniques and promoting opportunistic data collection. A combination of "Area Searches of Priority Locations", "Opportunistic Surveys" and "Targeted Surveys" were conducted. Area Searches incorporated the relevé concept whereby vegetation types of an area were searched until the number of species no longer increased. Priority Locations included the Piute Range, Castle Peaks area, Kelso Dunes, the dry lake basins at Soda Dry Lake and near Nipton, and disturbed sites, such as the Hackberry Burn area. Targeted Surveys were

usually conducted in sensitive habitats, or areas with high potential to add new species to the park master list. Opportunistic Surveys were done in areas that, because of favorable conditions, incidental observation, or through leads from other sources, had high potential of new species.

Manzanar Historic Site: Because the areal extent of MANZ is only 814 acres a comprehensive census of the entire site was done.

Voucher specimens – This survey aimed to collect at least two vouchers for all species found at MANZ since no voucher specimens had previously been collected. At MOJA, a voucher specimen was collected for each new plant species and any species that lacked a voucher collection. Voucher locations were recorded using GPS. All MANZ specimens were deposited at DEVA. MOJA vouchers were deposited at the University of California's Sweeney Granite Mountain Desert Research Center.

Survey timing - Surveys at MOJA began in October 2002 and continued into 2006. Emphasis for all surveys was to capture peak flowering phenology for all major groups of plants. Thus, the majority of surveys were conducted in spring, early summer, and early fall of each year. In response to one of the wettest winters on record, spring and early summer of 2005 was an epic bloom in MOJA. Significant rainfall also occurring during the late summer of 2005 resulting in an outstanding bloom of summer annuals in late September and early October 2005. These flowering events offered a rare opportunity to find unique or new species in the area. To capture this opportunity surveys were extended through 2005. MANZ was surveyed in spring 2003 and 2004 and the late summer and fall of 2003. Above average blooms occurred during both years.

RESULTS AND DISCUSSION

Manzanar Historic Site - 108 vascular plant taxa were documented at MANZ. 169 vouchers were collected for 93 taxa. No special-status or otherwise notable native plants were found during this survey, but some introduced species are of great interest. Seven of the 23 non-native species found could be classified as historic cultivars likely left from human use in the 1940s. These included several fig trees and Arizona cypress. The latter may be a horticultural variety of *Cupressus stephensonii*, known only from Cuyamaca Peak in San Diego County. Horticultural transplants of rare California cypress are common. The list of historic cultivars included tamarisk, black locust, Siberian Elm, Catalpa, English Elm and white mulberry. Although our surveys were comprehensive over the entire 814 acres, subsequent surveys could add perhaps three to five taxa to the inventory. These additional taxa would most likely be annual species found during late summer or fall, following sufficient summer rainfall. It is estimated that more than 95% of the species at MANZ were documented during this survey.

Mojave National Preserve - It is estimated that 95-97% of the MOJA flora has been documented. However, only 1.4% of the total area of MOJA was surveyed and it is estimated 25 native and 10 non-native plant taxa could be found with continued surveys.

New vascular plant taxa – During this project, 85 new taxa were documented, bringing the number of vascular plant taxa known to occur at MOJA to 913. Of these, 827 are native. Included in the new taxa are several species new to science: *Prunus eremophila* from the Von Trigger Hills, a new species of *Cryptantha* from the New York Mountains and a new *Arctostaphylos* species from the Granite Mountains. All three taxa are listed as extremely rare in California. Eight species represent new discoveries for the Mojave Desert of California, including three that have status as rare plants in California. Of the 85 newly documented taxa, 24 were non-native species that recently naturalized either in localized or widespread areas. Some of these are noxious weeds and merit immediate management attention. The *Triticum aestivus* (wheat) which has not been previously observed in the Mojave Desert as a problem species was especially widespread throughout MOJA in 2004 and it appears quite capable of reproducing and rapidly dispersing into most native plant communities.

Special-status plants - Currently, a total of 113 vascular plant taxa in MOJA retain state or federal listing status. *Penstemon bicolor* was added to the list because of its prominent status and its occurrence just outside the Preserve boundaries in and around the Hart Mine in the Castle Mountains. This candidate for federal listing was previously observed in this area but never

Project Synopsis

Partner: University of California, Riverside

Principal Investigator: James M. André

Documented: 913 Plants at MOJA; 108 Plants at MANZ

Project Duration: 2002 - 2006

Cost: \$56,200

formally recorded there. We also discovered several other populations in the Castle Mountains that are new records for California. This project recorded 655 occurrences of rare plants, bringing the total to 875 special-status plant occurrences known to occur in MOJA.

Non-native alien plants - 86 non-native alien plant taxa occur in MOJA. Of these, 69 are invasive and 17 taxa are casual aliens with no invasive potential. Several invasive species are ubiquitous at MOJA, especially *Bromus madritensis* ssp. *rubens*, *Bromus tectorum*, *Erodium cicutarium*, and *Schismus barbatus*. These four renowned invasives of the Mojave Desert established here decades ago and are well-known for their deleterious impacts upon native plant associations and natural ecological processes. All four species were present in nearly all surveys. Other prominent invasives have more recently advanced into MOJA and continue to spread. Of these, Sahara mustard and tumbleweed represent the most serious threat to continue their spread within MOJA, especially in the sandy soils at Kelso Dunes/Soda Dry Lake, Ivanpah Valley, and Lanfair Valley.

RECOMMENDATIONS AND FUTURE WORK

Continue the inventory of MOJA - Many areas remain relatively unexplored and would likely yield additional species. These include the Castle Peaks, Woods Mountains, Piute Range, Devil's Playground, remote canyons of the higher ranges and all springs, seeps and riparian areas. Future surveys should be based upon the phenologies of all taxa, not just more abundant spring-flowering species. Numerous taxa are suspected to occur within MOJA, but have yet to be documented. For example, this inventory discovered *Penstemon bicolor*, a federal candidate for listing as Endangered, in the Castle Mountains in 2005, less than 1 mile from the Preserve boundary. Additional surveys in suitable habitat in the Castle Peaks and near the Hart and Viceroy Mines have reasonable probability of finding this taxon within MOJA. In addition to continuing field surveys, herbarium searches should be conducted regularly.

Complete the inventory of MANZ - Several additional summer and fall flowering annuals may be added through surveys following sufficient summer rains.

Rare plants management program - The results of this study provide an excellent foundation to develop a rare plant program at MOJA. In addition to the occurrence information provided here, the author manages an extensive database on observations regarding rare plant distributions, ecological and life history attributes, known or potential threats and wishes to share this information with the Preserve. Starting with those species that merit highest priority, status or management plans that summarize or prescribe inventory, mapping, basic research, and protection and enhancement of rare plant populations are needed. In addition to the 113 special-status species, there are dozens of taxa that do not have state or federal status, but represent important relict or disjunct populations within MOJA. Examples of such species include hackberry, white fir and maidenhair fern. These "unique populations" also merit high management concern and should be included in the rare plants management program.

Inventory and monitor exotic species - Priorities for the management of non-native alien species in the Preserve are being developed. This effort begins with an understanding of the distribution of alien species throughout MOJA, and the potential invasive threat that each poses. The distribution and abundance of alien species presented in this report forms a foundation to build upon. However, it is recommended that MOJA launch an ongoing inventory and monitoring program that focuses on early detection, and the rate of spread for invasive alien species.

Develop a digital library for MOJA and MANZ plants - During this project, hundreds of species were photographed and it is recommended that these photos be used to develop a photo library. Of particular interest to management is the need for photos of all special-status and alien plants.



Spectacle Fruit, MOJA - Photo courtesy James M. Andre