



Data Quality Standards for Springs in the Mojave Desert Network—Vegetation Monitoring at Selected Large Springs

Natural Resource Report NPS/MOJN/NRR—2018/1846



ON THE COVER

Photo of Saratoga Spring in Death Valley National Park in Spring 2017.
Photograph courtesy of the National Park Service (Nicole Hupp)

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Abstract

This report documents the standards used by the Mojave Desert Network for activities related to the collection, processing, storage, analysis, and publication of monitoring data as described in the Spring Vegetation Protocol (Hupp et al. 2018). The policies and procedures documented in this quality-assurance plan for activities complement the quality-assurance plans for other monitoring activities conducted by the Mojave Desert Network and supplement the National Inventory & Monitoring Division Quality Management Plan. The plan also serves as a guide for all Mojave Desert Network personnel who are involved in protocol/program activities and as a resource for identifying memoranda, publications, and other literature that describe associated techniques and requirements in more detail.

Introduction

The Mojave Desert Network Inventory and Monitoring Program (MOJN) is one of 32 National Park Service (NPS) inventory and monitoring (I&M) networks nationwide. These networks monitor vital signs— indicators of ecosystem health – to assess the condition of park ecosystems. Through monitoring, networks work with parks to “improve the ability of the NPS to provide state-of-the-art management, protection, and interpretation of and research on the resources of the NPS” (NPS 1999).

Park superintendents and resource managers of MOJN parks have agreed that monitoring the vegetation at springs is a high priority resource management concern. Monitoring of this vital sign will take place at the MOJN parks that have abundant desert springs: Death Valley National Park (DEVA), Joshua Tree National Park (JOTR), Lake Mead National Recreation Area (LAKE), Mojave National Preserve (MOJA), and Parashant National Monument (PARA).

The purpose of this monitoring protocol is to gather baseline data about desert spring vegetation and document changes in community composition in Mojave Desert springs. To achieve these goals, this protocol asks two monitoring questions: 1) What are the status and trends in plant community composition at select desert springs in MOJN parks? 2) How are species diversity and richness associated with human-related and natural disturbances changing over time? To address these questions, the measurable objectives are:

1. Determine status and long-term trends in plant species composition and richness (e.g., percent cover, number of different species) in selected springs of management concern in MOJN parks.
2. Determine status and long-term trends in the distribution and abundance (e.g. plant cover, number of plants) of target invasive plant species at selected springs in MOJN parks.
3. Determine status and long-term trends in the distribution and abundance (e.g., canopy, tree size) of overstory tree species of special management interest at selected springs in MOJN parks.
4. Determine status and long-term trends of natural and anthropogenic disturbances measured by the percentage of the site impacted by some human activity (e.g., grazing, recreational vehicles, other disturbances) at selected springs in MOJN parks.

Accomplishing these monitoring objectives will allow resource managers in the MOJN parks to assess desert spring vegetation condition, and target limited personnel time and financial resources toward addressing the highest priority management concerns. Additionally, sharing information regarding vegetation at unique springs and their condition with park visitors will enhance visitor experiences and contribute to protecting these fragile ecosystems.

Protocol Activities and Modules

Data are collected or derived as a part of the Spring Vegetation Protocol (Hupp et al., 2018) in eight different activities or modules (Table 1). The protocol’s objectives are to:

- Determine status and long-term trends in plant species composition and richness (e.g. percent cover, number of different species) in selected springs of management concern in MOJN parks (“status and trends of community”).
- Determine status and long-term trends in the distribution and abundance (e.g. plant cover, number of plants) of target invasive plant species at selected springs in MOJN parks (“status and trends of invaders”).
- Determine status and long-term trends in the distribution and abundance (e.g. canopy cover, tree size) of selected overstory tree species of special management interest at selected springs in MOJN parks (“status and trends of overstory”).
- Determine status and long-term trends of natural and anthropogenic disturbances, measured by the percentage of the site impacted by some activity (e.g. grazing, recreational vehicles, human disturbance) at selected springs in MOJN parks (“status and trends of disturbance”).

Table 1. Protocol activity matrix for Spring Vegetation Protocol (Hupp et al. 2018).

Category	Activity Number	Activity	Description
Site Establishment and Maintenance	1	Site Establishment	Installation of permanent transect markers and designation of photopoints.
	2	Site Maintenance	Coordinates are recorded for each permanent transect marker.
Field Observations	3	Line Point Intercept Transects	Overstory taxa, understory taxa, soil surface, and disturbance at fixed points along 15m permanent transects.
	4	Tree Count Belt Transects	Census of tree and palm species in a 3m belt along 15m permanent transects, categorized by species, live/dead, and seedling/adult.
	5	Species Composition Belt Transects	Inventory of species in a 3m belt along 15m permanent transects (all spp. ID; will be remeasured less frequently than the rest of the plot).
Sensor Data	6	Photopoints	Overview photo taken from same coordinates every year. Photos of area beyond that which is sampled (for springs longer than 500m). Coordinates are recorded for each photo.
Field Sample & Specimen Collection and Processing	7	Identification of unknown species	Plants that cannot be easily identified in the field are described, photographed, and collected. Upon return from the field, plants will be identified to the species level by a trained botanist.
Derived Data	8	Diversity Indices	Community Diversity Index, based on species composition data.

For species composition and presence of disturbance within each selected spring for this protocol, the sampling unit is transect line. The total number of sampling units within a spring is a function of the total area of the spring. For total community composition, overstory estimation, and disturbance classes the sampling unit is subsampled using the Line Point Intercept method.

Additional overstory data and species inventory data will be collected in belt transects. These transects are identical to the ones described above, but are wider. These transects are 1.5m wide on each side of the permanent transect.

Repeat photographs will be taken from an overview location. There will be at least one overview photo for all springs, and that photo will be taken from the same location every visit.

Sampling Design

This protocol utilizes a targeted sampling design, monitoring 3 – 5 springs per park that resource managers have identified as having relatively high discharge and providing essential habitat and water for wildlife. Each permanent transect is an individual sampling unit. The number of transects at each spring is a function of spring length and therefore varies at each spring. However, all transects at all springs are 15 meters long. This protocol is designed to detect change within a spring over time, not differences across springs. Information regarding the sampling design is provided in Table 2.

Table 2. Activity-level sample design matrix for Spring Vegetation Protocol (Hupp et al. 2018).

Category	Activity Number	Activity	Sampling Design	Revisit Design
Field Observations	3	Line Point Intercept Transects	Targeted	Revisit every 3 years, or annually for springs undergoing active management
	4	Tree Count Belt Transects	Targeted	Revisit every 3 years, or annually for springs undergoing active management
	5	Species Composition Belt Transects	Targeted	Revisit every 9 years, or based on availability of experienced botanist
Sensor Data	6	Photopoints	Targeted	Revisit every 3 years, or annually for springs undergoing active management

Data Quality Objectives

Data quality values and standards for implementation are provided in Table 3 through Table 6.

Table 3. Data Quality Values (DQVs) for Spring Vegetation Protocol (Hupp et al. 2018).

Category	Data Quality Value	Definition	Protocol Considerations
Intrinsic Data Quality	Accuracy	Measurements reflect the true value of the parameter being observed. This applies to measures (length, width, position) or classes (species, types, or categories). Includes components of precision and bias.	This protocol requires that all plants encountered as part of the sampling effort be identified to species. Accuracy and consistency will be ensured by a) hiring field crews with prior experience identifying Mojave desert plants, b) providing training at the start of the field season in spring vegetation ID, and c) collecting vegetation specimens for ID in office when field crew is not able to make a field identification.
	Representativeness	Measurements represent conditions at the time of sampling. Combined with accuracy, leads to repeatable data collection.	The number of transects at a spring is a function of spring length, which ensures that data are representative of the full extent of the spring. The species inventory will generate an up-to-date, representative species list for each spring every 9 years which can also be used to evaluate the representativeness of the data collected at each 3-year revisit.
Contextual Data Quality	Comparability	The degree to which data can be compared among sample locations, data sources, or periods of time.	Within-spring data comparability across time is achieved by sampling along permanent transects using repeatable methods (documented in detail in the SOPs). Due to their uniqueness and rarity, the springs selected for this protocol are few and non-random. Therefore, statistical comparisons should be performed within springs across time and not across springs.
	Timeliness / Currency	How recent the data need to be to be considered valid for their intended use. Data represents conditions and/or is available and in a format for use at the appropriate time in the decision-making process.	Certification of data occurs on an annual basis. Where certified data cannot be provided for resource management decisions in a timely manner, requirements for provisional use of data are defined and documented prior to data dissemination and use.

Table 4 (continued). Data Quality Values (DQVs) for Spring Vegetation Protocol (Hupp et al. 2018).

Category	Data Quality Value	Definition	Protocol Considerations
Contextual Data Quality (continued)	Completeness	All data/ measures required to evaluate accuracy representativeness are present; incomplete data sets (either at a location, across sampling locations, or over time) lose utility or relevance. Data records contain values as planned across the period of record.	Every effort will be made to achieve 100% completion of data collection at all springs in this protocol. Monitoring visits will be scheduled so as to minimize the chance that weather conditions will interfere with field work and site access. In the event that data collection cannot be completed at a single visit, the field crew will attempt to return as soon as possible that season unless there are safety concerns.
Representational Data Quality	Consistent Representation	Use of standard definitions when describing data quality or resource quality based on data	The Data Processing Level of all data will be tracked using the nomenclature described in "Certification Guidelines for Inventory and Monitoring Data Products" (2016). The protected status of data will be tracked using the nomenclature described in "Minimum Implementation Standards for Network Projects Version 3.0" (2017). Plant species data will be stored in the database using USDA Plants codes, and will include the taxonomic reference used in plant identification.
Data Accessibility	Secure	Access to data, products, and systems limited to appropriate audiences.	MOJN will identify and ensure that potentially protected data, including sensitive species location data, sensitive spring locations, and other data as protected by DO#66 are not released to the public. Protected data may be released in limited cases only with park Superintendent approval following park procedures. For protected data, MOJN will collaborate with parks to determine the appropriate method of redaction.

Table 5. Measurement Quality Objectives for Spring Vegetation Protocol (Hupp et al. 2018).

Measure	Quality Indicator	Quality Objective
Site Establishment & Maintenance	Location accuracy	Sample location within +/- 2m of established waypoint.
	Location range	All UTM locations associated with this protocol, regardless of UTM Zone, will fall in the following ranges Easting (X): >200,000 and <900,000 and Northing (Y): >3,500,000 and <4,350,000
	Site maintenance log	Enough information is provided to construct a full history of photopoint locations and transect marker loss/removal/replacement.

Table 6 (continued). Measurement Quality Objectives for Spring Vegetation Protocol (Hupp et al. 2018).

Measure	Quality Indicator	Quality Objective
Vegetation Transect Measurements	Taxonomic resolution	Identifications made to the species level (see taxonomic standards)
	Plant identification	95% accuracy
	Tree count	95% accuracy
	Tree classification (live/dead, seedling/adult)	95% accuracy
Non-Vegetation Line Point Intercept Transect Measurements	Soil surface class accuracy	95% accuracy
	Disturbance type accuracy	95% accuracy
Photopoints	Image resolution	8 megapixel or greater
	Image format	JPEG w/ embedded EXIF metadata
	Location accuracy	±2 m. Original repeat photos include recognizable landmarks that can be used to match subsequent repeat photos to the original as closely as possible.
Identification of Unknown Species	Taxonomic resolution	Identifications made to the species level (see taxonomic standards)
	Identification accuracy	100% accuracy

Table 5. Taxonomic standards to be used in Spring Vegetation Protocol (Hupp et al. 2018).

Category	Activity Number	Activity	Standard to be Used	Reference / Authority
Collection of Observational Data	3, 4, 5	Vegetation Transects	Scientific Publication	The Jepson Desert Manual (2002)
	7	Vegetation Specimens	Scientific Publication	The Jepson Desert Manual (2002)
Reporting of Observational Data	3, 4, 5	Vegetation Transects	Scientific Publication	The Jepson Desert Manual (2002)
	7	Vegetation Specimens	Scientific Publication	The Jepson Desert Manual (2002)

Table 6. Data Protection standards for Spring Vegetation Protocol (Hupp et al. 2018). With the exceptions noted, all data collected are to be made publicly available in a timely fashion.

Category	Type of Data	Level of Protection	Rules for Dissemination
Resource Data and Information	State or federally listed T&E species locations	Legally Protected	Observations redacted from public release by default; may be disseminated more widely only upon park request
Personally Identifiable Information	Non-NPS Staff Information	Legally Protected	All but first name and last initial redacted from public release

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