

2022 Southeast Utah Group Long-term Vegetation Monitoring Data Release Report

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Abstract

The Southeast Utah Group of National Parks (Arches and Canyonlands national Parks and Hovenweep and Natural Bridges national monuments) established a long-term upland vegetation monitoring program in 1983. The data in this data package are from 1998 through 2022. Data collected prior to 1998 are not available at this time. From 1983 through 2010 all plots were sampled annually. Starting in 2011, a seven-year rotating panel was initiated as natural resource objectives changed. Sampling is currently conducted two years in a row and then a plot is rested for five years. A priori site selection was used to select sampling plots; a stratified sampling frame was not used for sampling plot selection. Most sampling plots consist of two transects of 50 0.5m x 0.5m Daubenmire quadrats (100 quadrats per plot), although the layout of transects can vary. Each quadrat is approximately 2-3 meters apart. The data proved here are plant and ground frequency and cover class estimates from visual observations.

Data Records

Summary of datasets created

This DRR describes the data package *Southeast Utah Group Long-term Vegetation Monitoring Data, Utah, USA: 1998 - 2022* which contains a metadata file and 7 data files. These data were compiled by the Southeast Utah Group of National Parks (SEUG; Arches and Canyonlands national parks and Hovenweep and Natural Bridges national monuments), National Park Service and are available at <https://doi.org/10.57830/2297390> (see Table 1).

Table 1: **Table 1. Southeast Utah Group Long-term Vegetation Monitoring Data, Utah, USA: 1998 - 2022: List of data files**

File Name	Size	Description
SEUG_crustClassData.csv	2 MB	Biological soil crust development class data.
SEUG_soilSurfaceData.csv	10.5 MB	Biological soil crust and soil surface frequency and cover data.
SEUG_vegData.csv	9.1 MB	Plant frequency and cover data.
SEUG_vegPlotAttributes.csv	8.6 KB	Sampling plot attributes.
SEUG_vegPlotCoordinates.csv	18.7 KB	Spatial data for sampling plots.
soilSurfaceList.csv	954 B	Biocrust and soil surface codes.
taxaList.csv	54.8 KB	Validated taxa list with codes.

Data Quality Evaluation

The data within the data records listed above have been reviewed by staff in the NPS Inventory and Monitoring Division to ensure accuracy, completeness, and consistency with documented data quality standards, as well as for usability and reproducibility. The *Southeast Utah Group Long-term Vegetation Monitoring Data, Utah, USA: 1998 - 2022* is suitable for its intended use as of the date of processing (2023-05-03). Below is a table of data quality flag definitions (see Table 2).

Table 2: **Table 2. Description of data quality flags**

Flag	Definition	Useage
A	Accepted	columns ending “_flag”
AE	Accepted, estimated	columns ending “_flag”
R	Rejected	columns ending “_flag”

Usage Notes

A priori site selection based on professional opinion was used to select sampling plots. A stratified sampling frame was not used to select plot locations. Therefore, no inference should be made to similar plant community or soil type polygons.

The taxa list (taxaList.csv) and the soil surface code list (soilSurfaceList.csv) can be referred to for code definitions in the plant data (SEUG_vegData.csv) and soil surface data (SEUG_soilSurfaceData.csv) respectively.

The cover class data are categorical, not quantitative, and represent a range of foliar plant or ground cover. The mean of the cover class range, $(max-min)/2+min$, is often used as a quantitative value in statistical analyses (see Table 3). The frequency data are categorical, not quantitative, and describe the location of the first rooted occurrence of a species or soil surface category. See Daubenmire (1959) for information on how to use frequency categories. The crust class data are categorical, not quantitative, and describe general biological soil crust (hereafter biocrust) development stages.

Table 3. Cover class categories, ranges and means.

Cover Class	Range	Mean
1	0-5%	2.5%
2	6-25%	15.5%
3	26-50%	38%
4	51-75%	63%
5	76-95%	85.5%
6	96-100%	98%

Methods

Project History

The SEUG established a long-term upland vegetation monitoring program in 1983. The data in this data package are from 1998 through 2022. Data collected prior to 1998 are in another format and not available at this time. From 1983 through 2010 all plots were sampled annually. Starting in 2011, a seven-year rotating panel was initiated as natural resource objectives changed. Currently, sampling is conducted two years in a row and then a plot is rested (i.e., not sampled) for five years.

Sampling Plot Selection

A priori site selection based on professional opinion was used to select sampling plots. A stratified sampling frame was not used to select plot locations.

Sampling Plot Layout

All vegetation plots contain 100 Daubenmire-style (1959) quadrats, 0.5m x 0.5m (0.25m²) in size, spaced approximately 2-3m apart. On most plots, the quadrats are arranged in two lines of 50 quadrats each. A few plots have other arrangements due to limited shape and size of the vegetation community patch sampled. These variations include as many as five lines of 17-25 quadrats, or just one line of 100 quadrats. Every quadrat has nails marking two corners so the quadrat can be repeated.

Sampling Procedures

All plants are identified to species when possible. In limited situations, plants are identified to genus or family when diagnostic characterizes do not allow identification to species. Ground cover includes biocrust, plant and animal litter, and soil surface substrate. Only lichens that are components of biological soil crust are included in the lichen category. Lichens on rock or wood are not included as lichens. Litter includes all organic material, loose on the ground or standing dead, that was not alive in the current year. Plants that were alive during the current growing year are not included as litter; they are included as that plant species. Rock is defined as bedrock to cobble-sized rocks that are greater than five percent of the quadrat frame area, gravel is <5 mm and >2 mm in diameter, and sand <2 mm diameter.

Frequency is determined by dividing the quadrat into four quadrants and searching each quadrant of a quadrat for the first occurrence of a rooted plant species, biocrust, litter, or soil substrate type. The number of that quadrant is the frequency. Frequency are defined as 0 = not rooted in (overhanging) the quadrat, 1 = lower right quadrant of the quadrat, 2 = upper right quadrant, 3 = lower left quadrant, 4 = upper left quadrant of the quadrat.

Cover classes range from 1 to 6: 1=0-5%, 2=6-25%, 3=26-50%, 4=51-75%, 5=76-95%, 6=96-100% (see Table 3). For plants, tight plant canopies are estimated, defined as some open-air space between branches/blades will be included, though larger spaces extending to the outside of the canopy will not. For litter, no spaces are included, and all litter is virtually scrunched together.

Crust Class is an index of crust development (see Table 4). Crust Class is recorded for the most mature crust class that takes up at greater than or equal to 5% of the quadrat frame. This amount can be scattered throughout the quadrat frame.

Table 4. Cover class categories and definitions.

Crust Class	Definition
0	No biocrust development. E.g., bare ground.
1	Very little biocrust development. Thin light cyano crust.
2	Very little biocrust development. Textured, bumpy surface with abundant light cyano. No moss or lichens.
3	Little biocrust development. Textured, bumpy surface with abundant light cyano and few moss and/or Collema lichens.
4	Moderate biocrust development. Small, irregular pinnacles with small amounts of dark cyano, moss, and lichens.
5	Moderate biocrust development. Small, irregular pinnacles with some dark cyano, moss, and lichens.
6	Moderate biocrust development. Moderate, regular pinnacles with moderate dark cyano, moss, and lichens.

Crust Class	Definition
10	Very well developed biocrust. Highly pinnacled with abundant dark cyano, moss, and lichens.

Data Processing

Data are collected in the field on paper data sheets and transcribed to Microsoft Excel workbooks in the office. After the data have been transcribed and visually quality checked (QC), the Excel workbooks are exported to a Microsoft Access relational database using the `dataprocessR` package (<https://github.com/scoyoc/dataprocessR>, Van Scoyoc, 2023a). Queries were built in the database to examine erroneous data, including data that are outside the cover classes (1-6), frequency classes (0-4), and find incorrect or misspelled species codes. Additional, R scripts have been authored to further QC cover and frequency data, and validate plant names (Van Scoyoc, 2023c).

Code Availability

The `dataprocessR` package can be found on GitHub at <https://github.com/scoyoc/dataprocessR>.

The R scripts used to QC the data can be found on the DataStore at <https://doi.org/10.57830/2297327>.

Citing Literature

Munson, S. M., J. Belnap, C. D. Schelz, M. Moran, and T. W. Carolin. 2011. On the Brink of Change: Plant Responses to Climate on the Colorado Plateau. *Ecosphere* 2: art68. DOI: <https://doi.org/10.1890/ES11-00059.1>

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- Van Scoyoc, M.W. 2023c. Southeast Utah Group Long-term Vegetation Monitoring Data Processing R Scripts. Script. Southeast Utah Group Parks, National Park Service <https://doi.org/10.57830/2297327>

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