

2022 Southeast Utah Group Long-term Vegetation Monitoring Weather 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. Small weather stations consisting of a tipping bucket rain gauge and an air temperature logger were installed at a subset of the sampling plots in 2000. The data in this data package are from 2000 through 2022. A priori site selection was used to select sampling plots and establish weather stations; a stratified sampling frame was not used for sampling plot or weather station selection. The data proved here are hourly precipitation totals, and the raw (unprocessed) precipitation, relative humidity, and air temperature data.

Data Records

Summary of datasets created

This Data Release Report describes the data package *Southeast Utah Group Long-term Vegetation Monitoring Weather Data, Utah, USA: 1998-2022* which contains a metadata file and 6 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/10.57830/2299128> (see Table 1).

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

File Name	Size	Description
SEUG_prcpData_hourlyTotals.csv	427.2 MB	Hourly precipitation totals.
SEUG_prcpData_raw.csv	25.7 MB	Raw (event) precipitation data from tipping bucket rain gauges.
SEUG_rhData_raw.csv	24 MB	Relative humidity measurements from HOBO temp/RH loggers.
SEUG_tempData_raw.csv	286.6 MB	Temperature measurements from HOBO temperature loggers.
SEUG_vegPlotAttributes.csv	6.3 KB	Sampling plot attributes.
SEUG_wxStationCoordinates.csv	5.4 KB	Spatial data for weather stations.

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 Weather 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	Usage
A	Accepted	columns ending “_flag”
AE	Accepted, estimated	columns ending “_flag”
R	Rejected	columns ending “_flag”

Usage Notes

A priori site selection was used to select sampling plots and establish weather stations; that is, a stratified sampling frame was not used for plot selection or weather station locations. All vegetation plots contain 100 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. See spatial data in Southeast Utah Group Long-term Vegetation Monitoring Data, Utah, USA: 1998 - 2022 data package for details (<https://doi.org/10.57830/2297390>).

Weather stations are located within or immediately adjacent to the vegetation sampling plots and consist of a tipping bucket rain gauge and an air temperature or air temperature-relative humidity logger. The tipping bucket rain gauge includes a RainWise tipping bucket rain gauge and an event logger. All temperature loggers are housed in a solar radiation shield and are placed 3-6’ off the ground depending on the vegetation community and access to suitable structure from which to hang the logger.

HOB0 H07 event loggers were used to record precipitation (PRCP) from 2000-2019 and were replaced by HOB0 UA-003-64 Pendant (temperature and event) loggers in spring of 2019. HOB0 H08 loggers were used to record air temperature (TEMP) from 2000-2019 and were replaced by HOB0 UA-001-64 Pendant temperature loggers or HOB0 U23-001 temperature and relative humidity (TEMP & RH) loggers in spring 2019. TEMP and TEMP/RH loggers are set to acquire data such that the battery will last 13 months. In most cases this setting will log a record every 72 minutes for the H08’s and every 120 minutes for the UA-003-64’s, UA-001-64’s, and U23-001’s. The weather stations are maintained and the data are downloaded annually, usually in the spring.

Table 3. *List of loggers, measurement, and time frame they were used.*

Model	Measurement	Years in Use
HOB0 H07 Logger	PRCP (event)	2000-2019
HOB0 H08 Logger	TEMP	2000-2019
HOB0 UA-003-64 Pendant	PRCP (event) & TEMP	2019-present
HOB0 UA-001-64 Pendant	TEMP	2019- present
HOB0 U23-001	TEMP & RH	2019-present

Methods

Data Processing

The data are downloaded using ONSET HOB0 software and exported to text files. The text files are processed and the data are uploaded to a Microsoft Access database using the raindancer (Van Scoyoc,

2023b. Available at <https://github.com/scoyoc/raindancer>) and `dataprocessR` (Van Scoyoc, 2023a. Available at <https://github.com/scoyoc/dataprocessR>) packages in R (R Core Team, 2023). The R scripts developed to produce this data package are available on the NPS DataStore at <https://doi.org/10.57830/2299130>.

Precipitation Data

The raw, unprocessed data are available in the `SEUG_prdpData_raw.txt` file, and hourly totals and hourly maximum intensity data are available in the `SEUG_prdpData_hourlyTotals.txt` file. Each event from a tipping bucket rain gauge is 0.254 mm of precipitation. Hourly totals were calculated by summing the number of events that recorded per hour and multiplying that number by 0.245 mm: $n(\text{events}) * 0.254 \text{ mm}$. Maximum intensity is was calculated by determining the maximum number of events per minute, multiplying that by 0.254 mm, and then scaling it to seconds: $\max(\text{events}/\text{min}) * 0.254 \text{ mm} / 60 \text{ sec}$. The R code developed to calculate hourly totals and maximum intensity can are available on the DataStore, <https://doi.org/10.57830/2299130>, in the `dataPackage_wxData.Rmd` file.

Relative Humidity Data

The raw, unprocessed relative humidity data are included in this data package. No corrections or manipulations were made to these data prior to publication.

Temperature Data

The raw, unprocessed temperature data are included in this data package. In some instance, Fahrenheit was set as the recorded temperature scale on the temperature logger. These records were converted to Celsius to maintain consistency within the published data set. These records are noted in the `measurementQC` column using the “CONVERTED” flag.

Code Availability

The `randancer` package is available on GitHub at <https://github.com/scoyoc/raindancer>.

The `dataprocessR` package is available on GitHub at <https://github.com/scoyoc/dataprocessR>.

The R scripts used to QC the data can be found on the NPS DataStore at <https://doi.org/10.57830/2299130>.

References

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