

Data Synthesis for Restoration Practitioners and Ecologists:

A Plant Trait Database for the Colorado Plateau Native Plant Program

Jessica DaBell¹, Daniel Winkler², John Bradford², Brad Butterfield¹

1 – Merriam-Powell Center for Environmental Research, 2 – United States Geological Survey



The Colorado Plateau regional plant trait database will allow identification of species-specific knowledge gaps, and enable data synthesis to improve decision support tools for seed producers and resource managers.



Why do we need trait databases?

Plant Performance

Trait

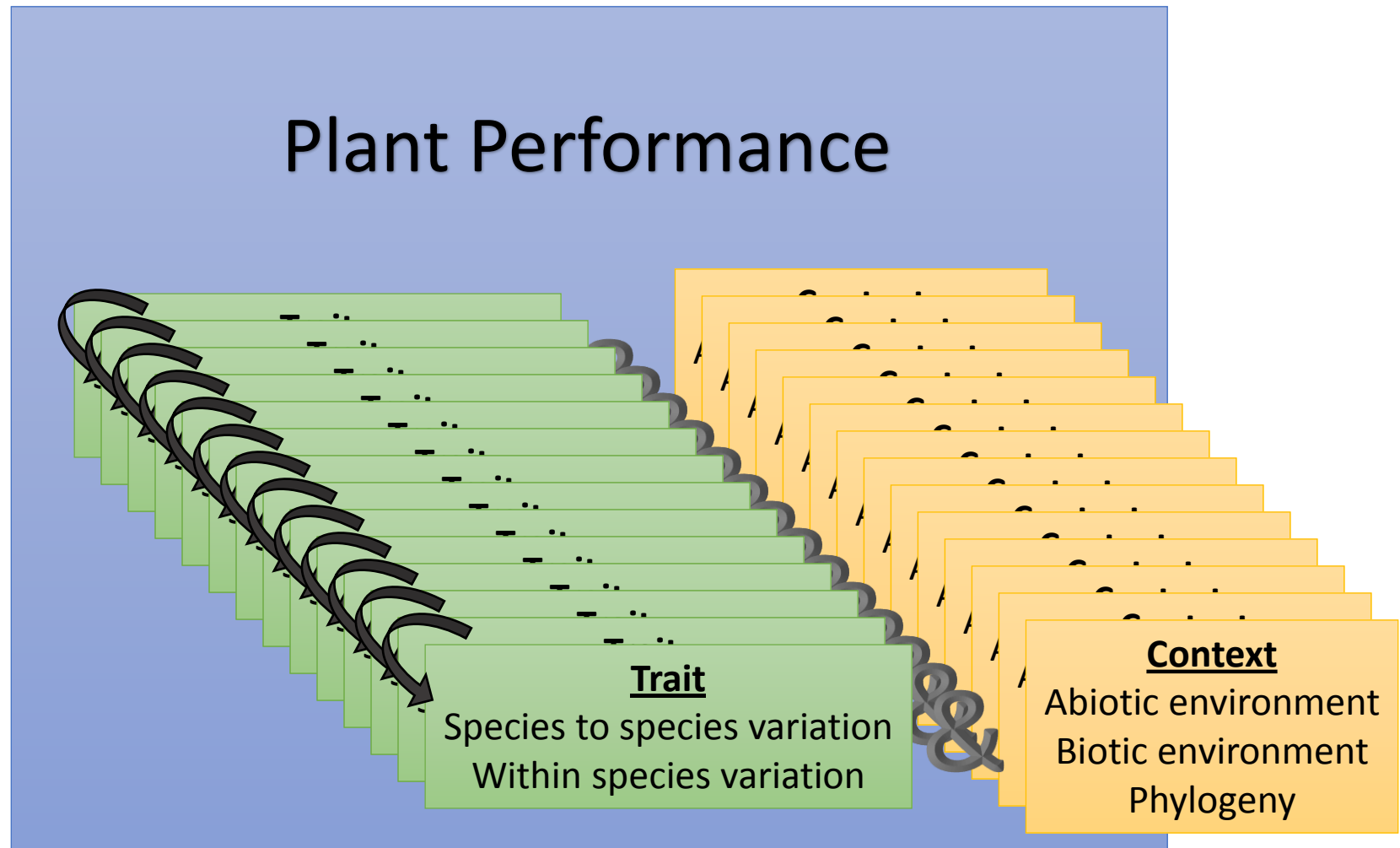
Species to species variation
Within species variation

&

Context

Abiotic environment
Biotic environment
Phylogeny

Why do we need trait databases?



Why is a Colorado Plateau database needed?



Schoenocrambe argillacea, a Colorado Plateau endemic

Other databases just don't cut it!

- Not all data publicly available
- Lack context
 - Environmental
 - Experimental
- Not inclusive of Colorado Plateau settings
 - SOS collections
 - Cultivars
 - Seed increase
 - Restoration efforts and successes
 - Undisturbed communities

Database Objectives

1. Synthesis of data on Colorado Plateau native plant traits
2. Opportunity for meta-analysis
3. Improving decision support tools for managers through synthesis of data



Cerastium arvense, Mount Ellen

Who will benefit?

- Regional managers
 - Best possible recommendations can be made through using synthesized information
- Seed producers
 - Identification of seed resource needs
- Researchers
 - Identification of knowledge gaps
 - Reduction in duplicated research efforts



Agave utahensis on the Nankoweap trail

Challenges

- “Plant traits are a heterogeneous group of data with a low degree of standardization” – Kattge et al. 2011
 - TOP – Thesaurus of Plant characteristics
 - Standardize plant trait and environmental association definitions
 - Top-thesaurus.org
- Plant names are not static!
 - Original spp. Name → Accepted spp. Name index
- Large amount of data to collect and dig out of papers



Chamaechaenactis scaposa, Uinta Basin

Moving Forward



Shepherdia rotundifolia detail, GSENM

- *Pleuraphis jamesii* case study
 - Data for genetics, traits, phylogeny etc. available
 - Can test initial structure of database
- Priority species
 - Will test scalability of database
- Inclusion of CPNPP projects
- Collaboration with partners who have collected or are considering collecting trait data

Thank you!

- Colorado Plateau Native Plant Program (CPNPP)
- Restoration Assessment & Monitoring Program for the Southwest (RAMPS)



Fallugia paradoxa, Sunset Crater National Monument

Questions?



A crested *Sclerocactus wetlandicus*

Structure for the CPNPP Traits Database

Dataset Characteristics

DatasetCharacteristic.ID

Site.ID

Dates

Frequency

Duration

Seed Source

Temperature

Nutrients

Light

Moisture

CO2

Other treatment vars

Control definition

References

Reference.ID

DatasetCharacteristic.ID

Citation

Data Source

Funding

Type of Data

-Many columns with

Checkboxes

Record keeping

- Data entered?

- PDF filename

Site

Site.ID

Latitude

Longitude

Landowner

Observation

Observation.ID

Reference.ID

Species.ID

Species

Species.ID

Original Sp.

Accepted Sp.

Priority Level

Values

Values.ID

Observation.ID

Measurement.ID

Value

Sample size

Mean

Precision

Unit

SE

Measurement

Measurement.ID

Entity

Quality

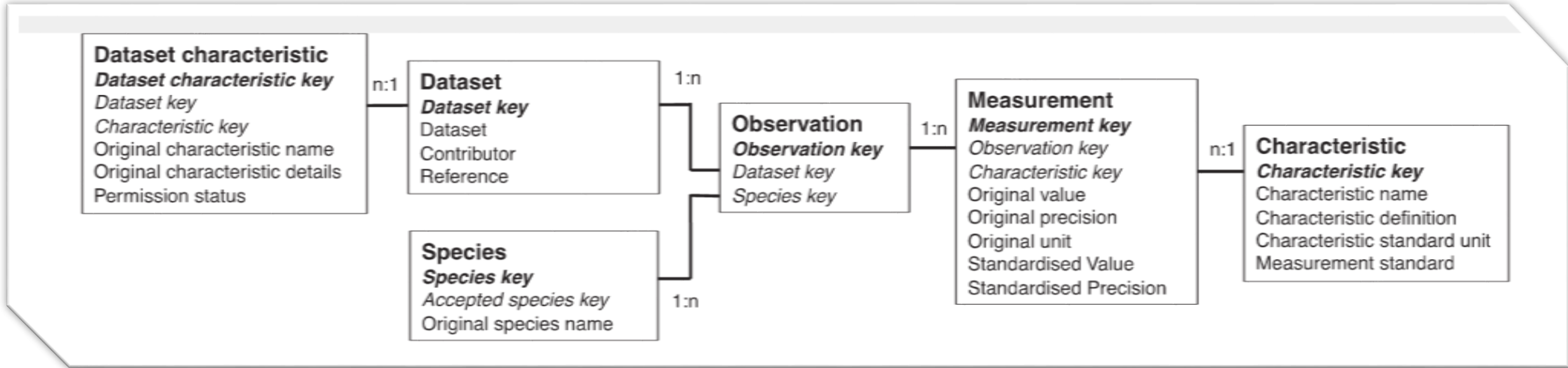
Definition

Standard unit

Measurement standard

- Each box is a table
- Underlined words are primary keys
- *Italicized* words are foreign keys
- Relationships are 1 to many (1:n) or many to one (n:1)

Example Databases and Inspiration



- Kattge et al 2011. A generic structure for plant trait databases. *Methods in Ecology and Evolution*.
- try-db.org
- 6.9 million records – 148,333 taxa – 1832 traits