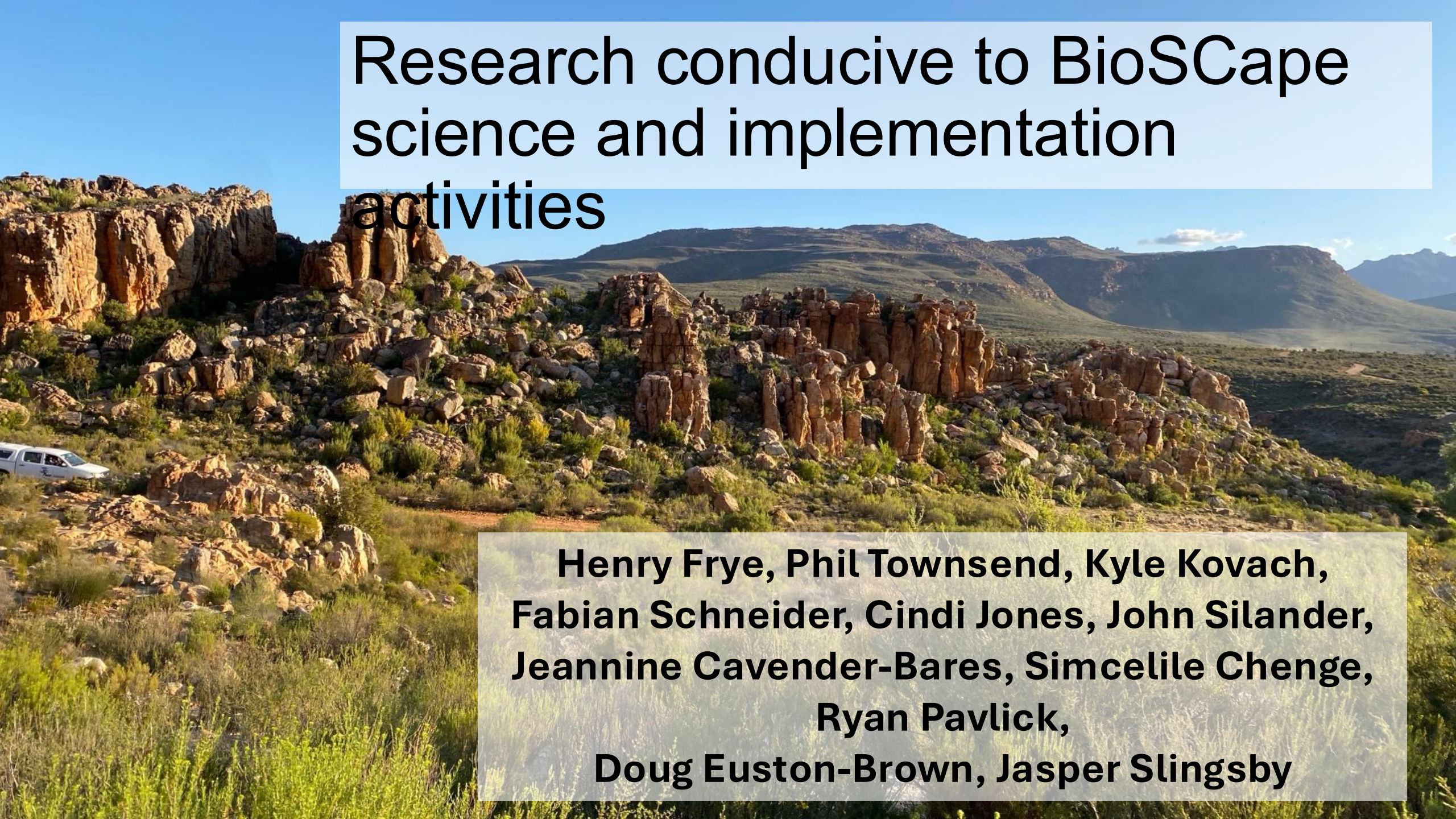
Research conducive to BioSCape science and implementation activities



Henry Frye, Phil Townsend, Kyle Kovach, Fabian Schneider, Cindi Jones, John Silander, Jeannine Cavender-Bares, Simcelile Chenge, Ryan Pavlick, Doug Euston-Brown, Jasper Slingsby

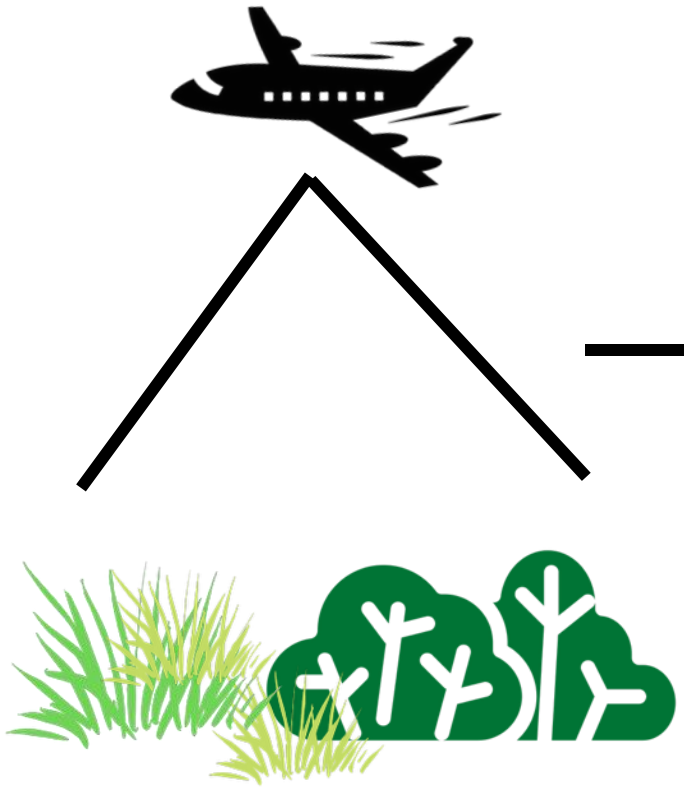
Results and forthcoming products

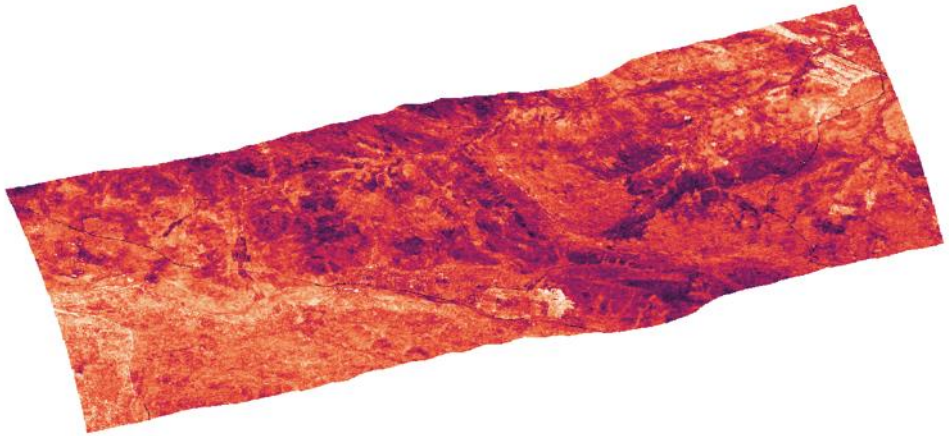
Part 1: Preliminary results from foliar dry spectral data

- Dry spectral predicted traits have patterns showing strong taxonomic affiliations between and within major plant families
- Certain traits are indicative of certain lineages

- Part 2: Anticipated ground data products

How do we get from flights to trait maps?

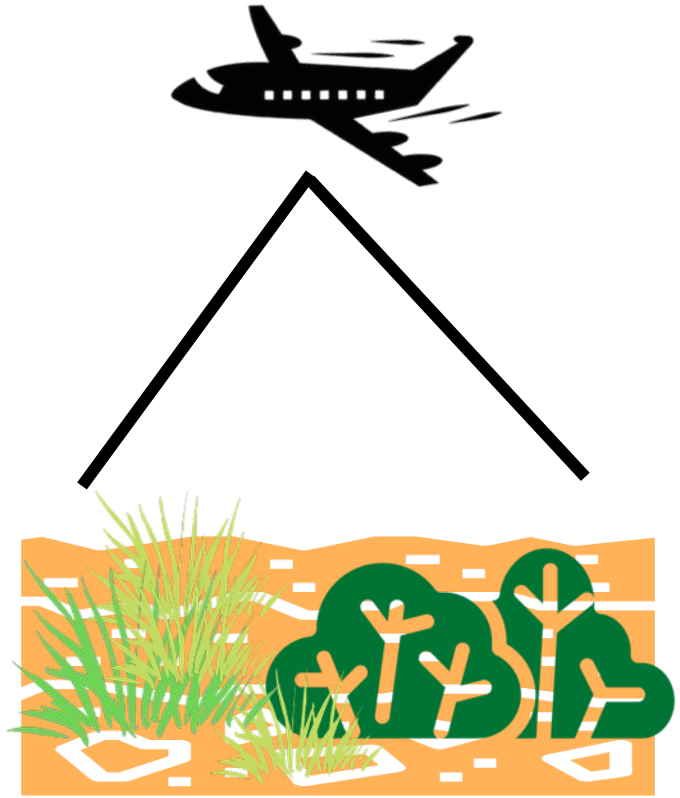




A lot of lab/field spectral measurements

Why measure foliar spectra?

What is community-weighted mean value for a pixel?



Why measure foliar spectra?

Plot Nitrogen = (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**)

Why measure foliar spectra?

Cover gets measured in the field

Plot Nitrogen = (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**)

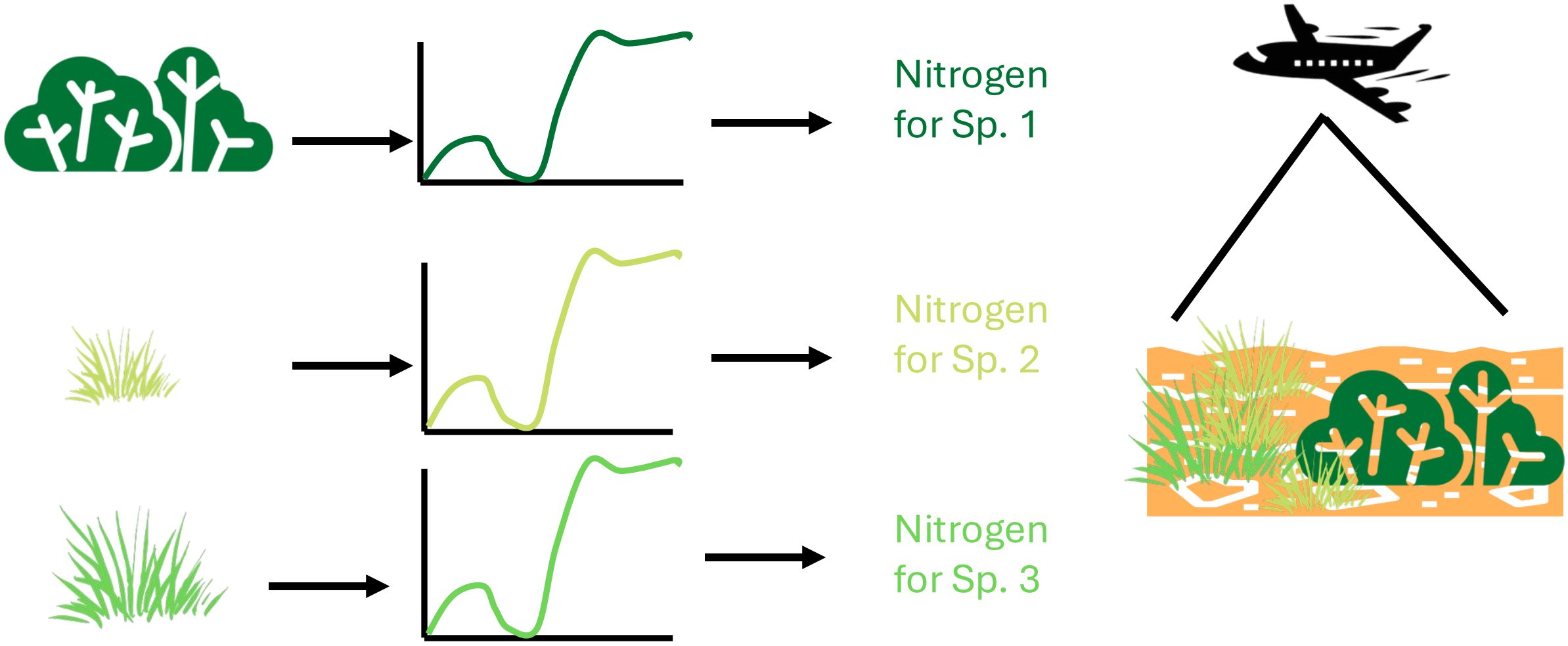
Why measure foliar spectra?

Cover gets measured in the field

Plot Nitrogen = (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**) + (**Spp. 1 cover * Spp. 1 Nitrogen**)

This part costs time and $

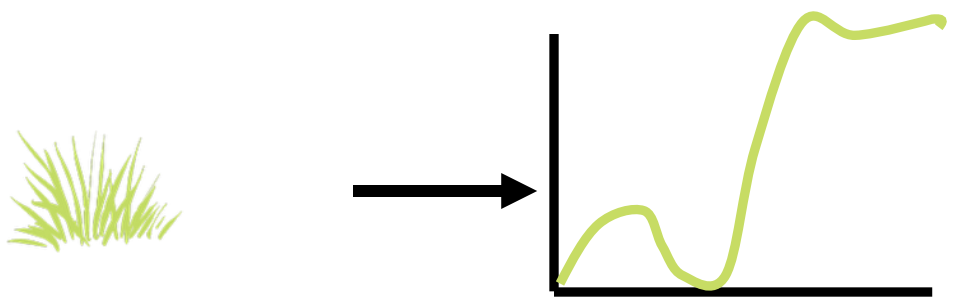
Much cheaper to collect spectra on these leaves and predict trait values



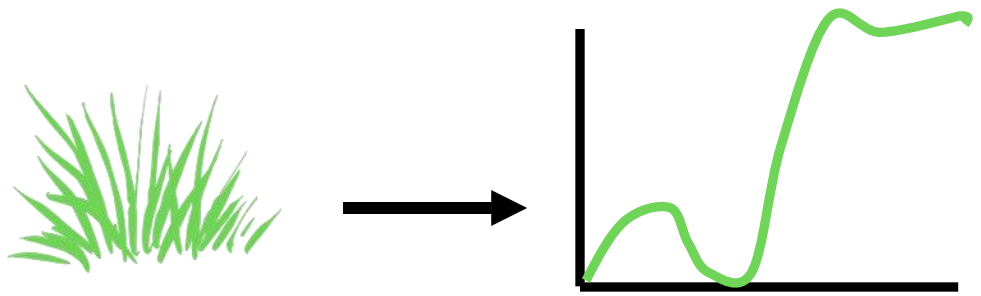
Cost effiecient to collect spectra on these leaves and predict trait values

We may only need to measure N for one of the species to validate our model

Nitrogen for Sp. 1

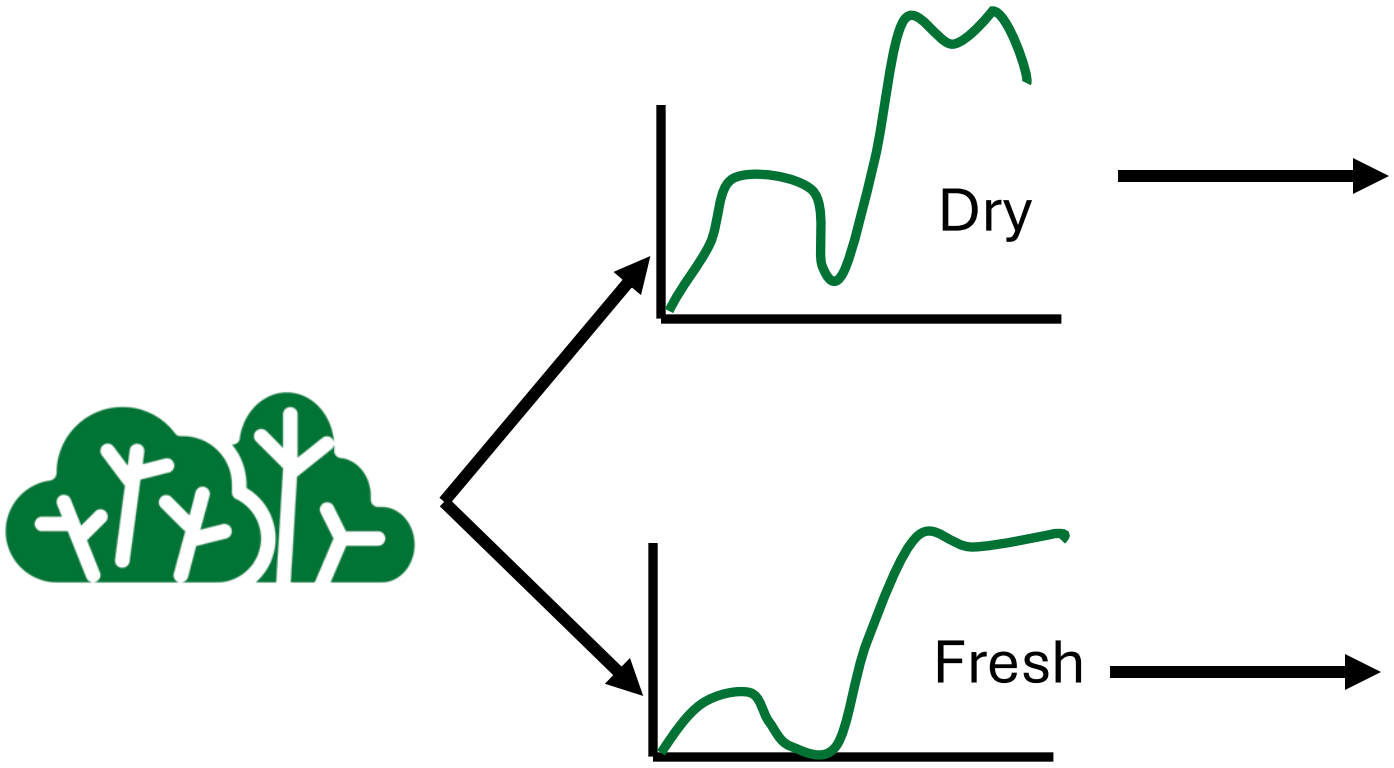


Nitrogen for Sp. 2



Nitrogen for Sp. 3

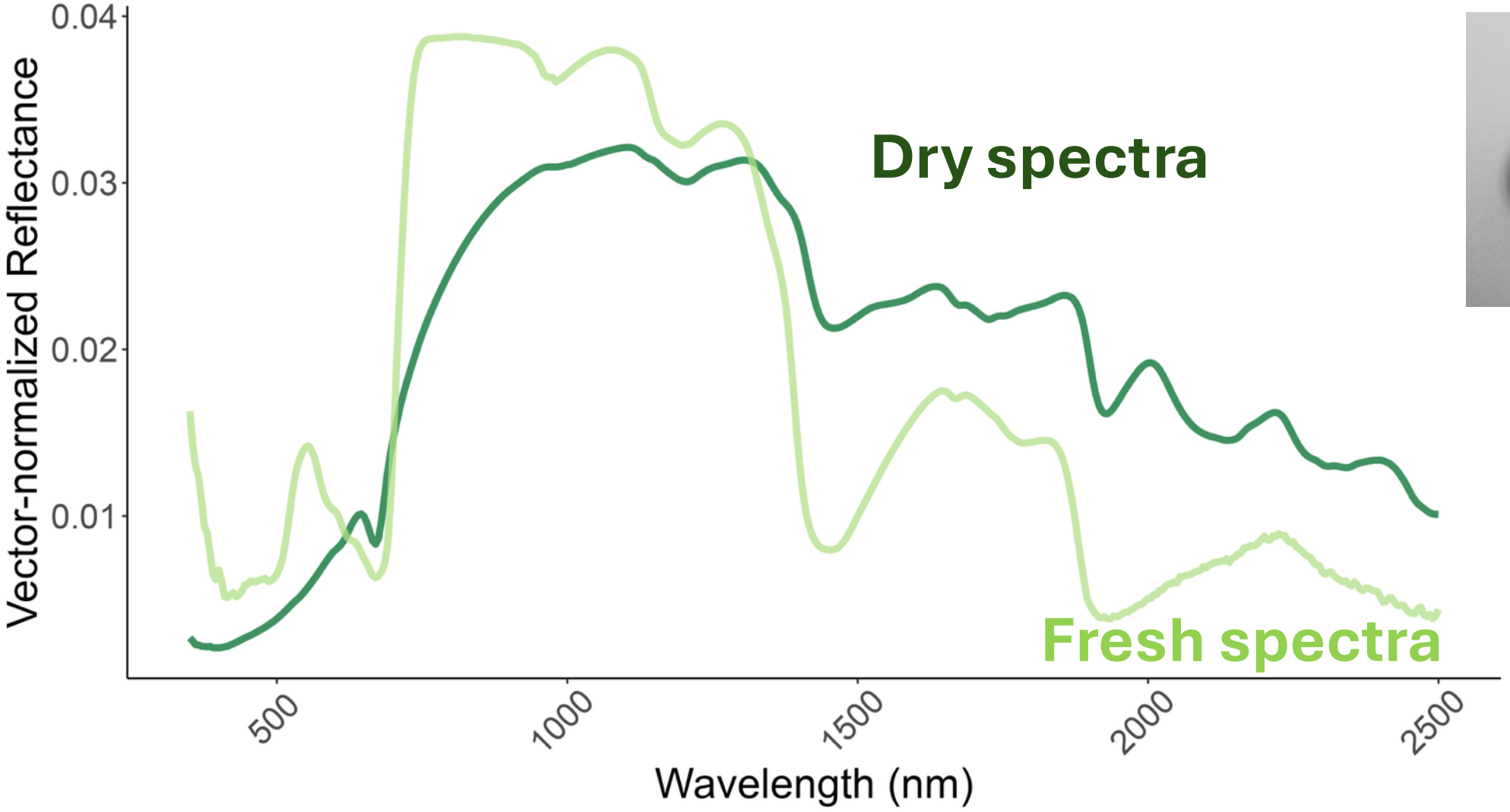
We measure both fresh and dry spectroscopy from plants to get different sets of traits



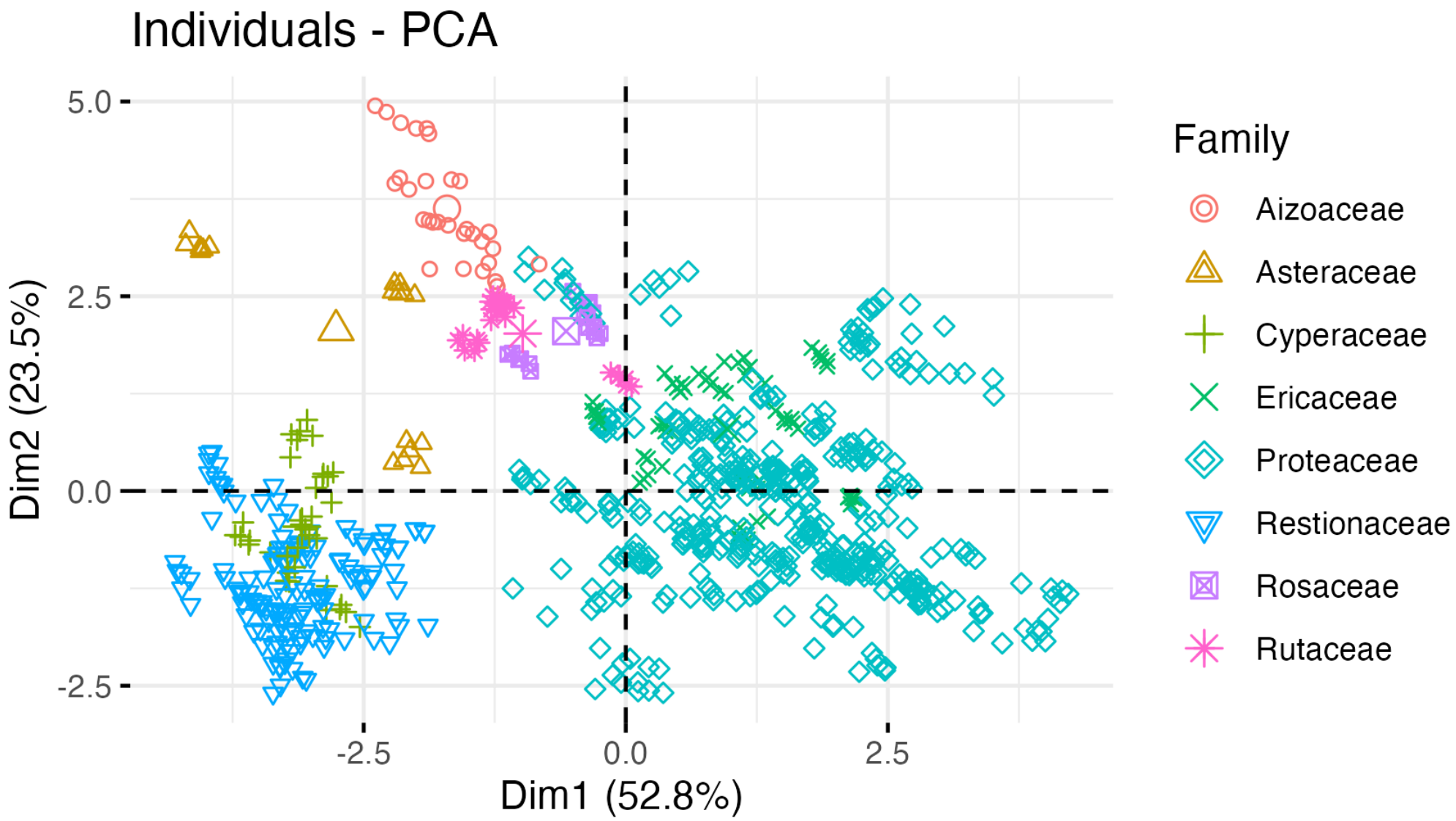
“Static” traits:
Elements
Fibers
NSCs
Total Phenolics

“Labile” traits:
Water content
LMA
Pigments

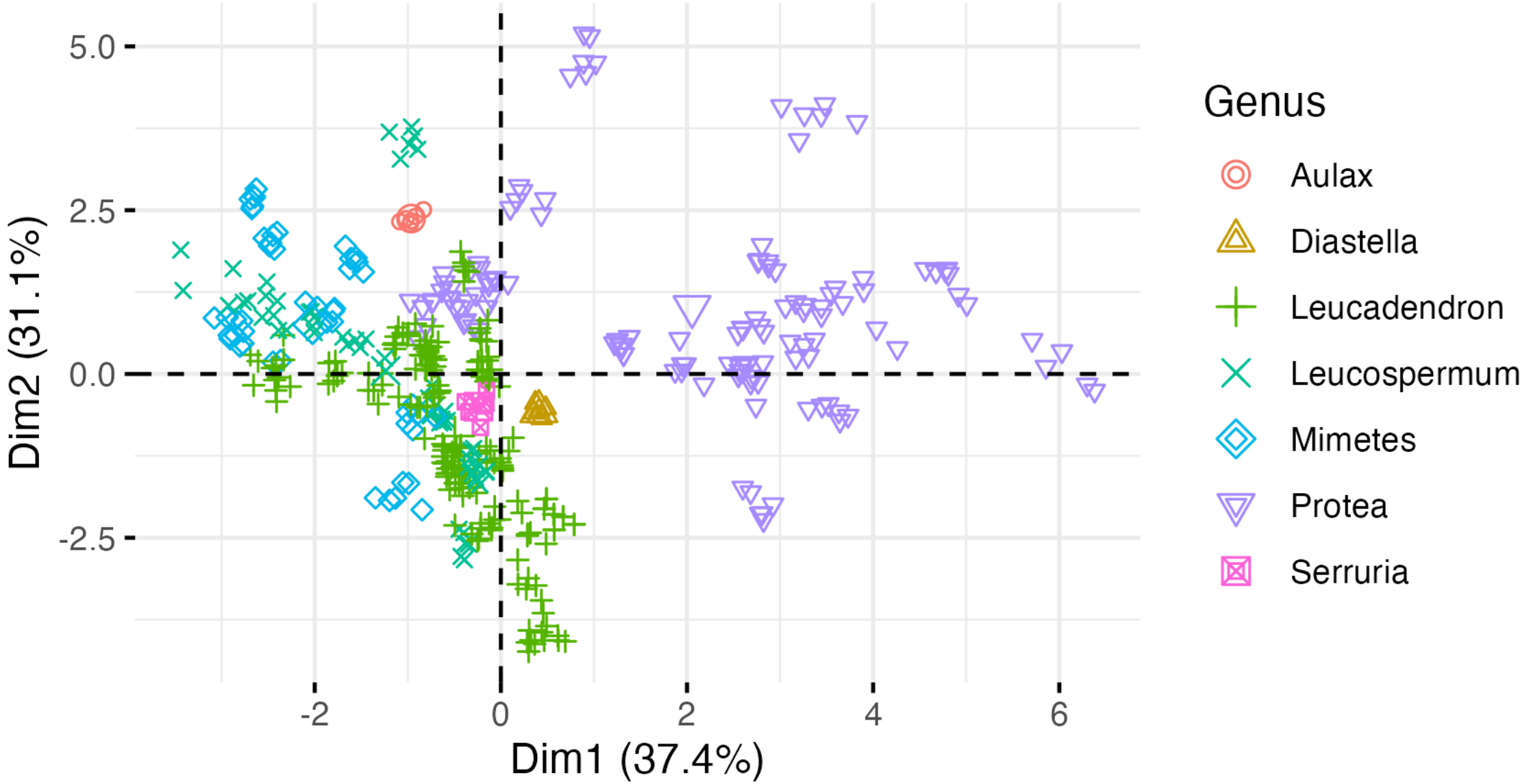
Dry vs. fresh spectra (*Protea repens*)

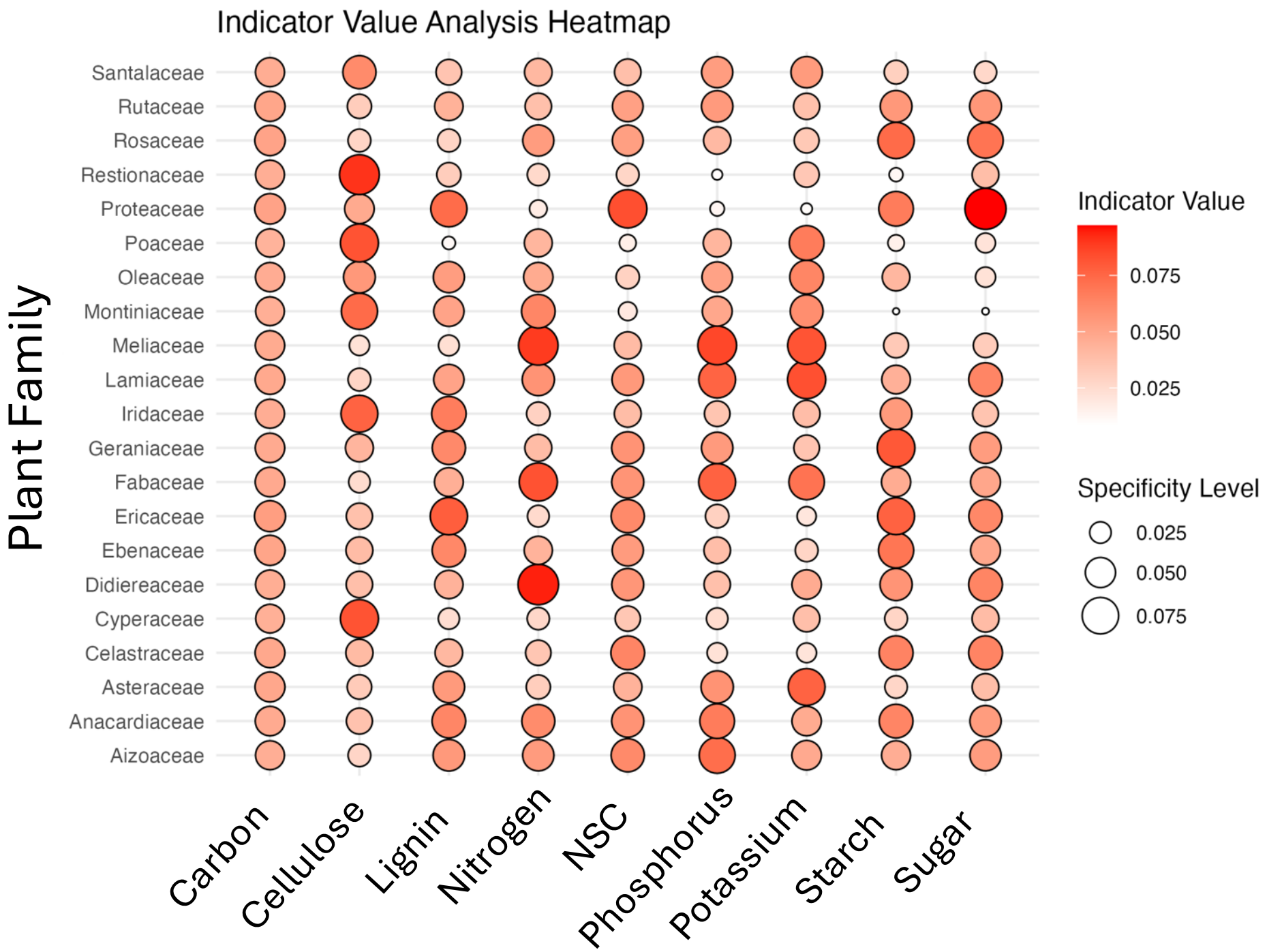


Ordination of traits predicted from dry spectra high separation **between Cape plant families**

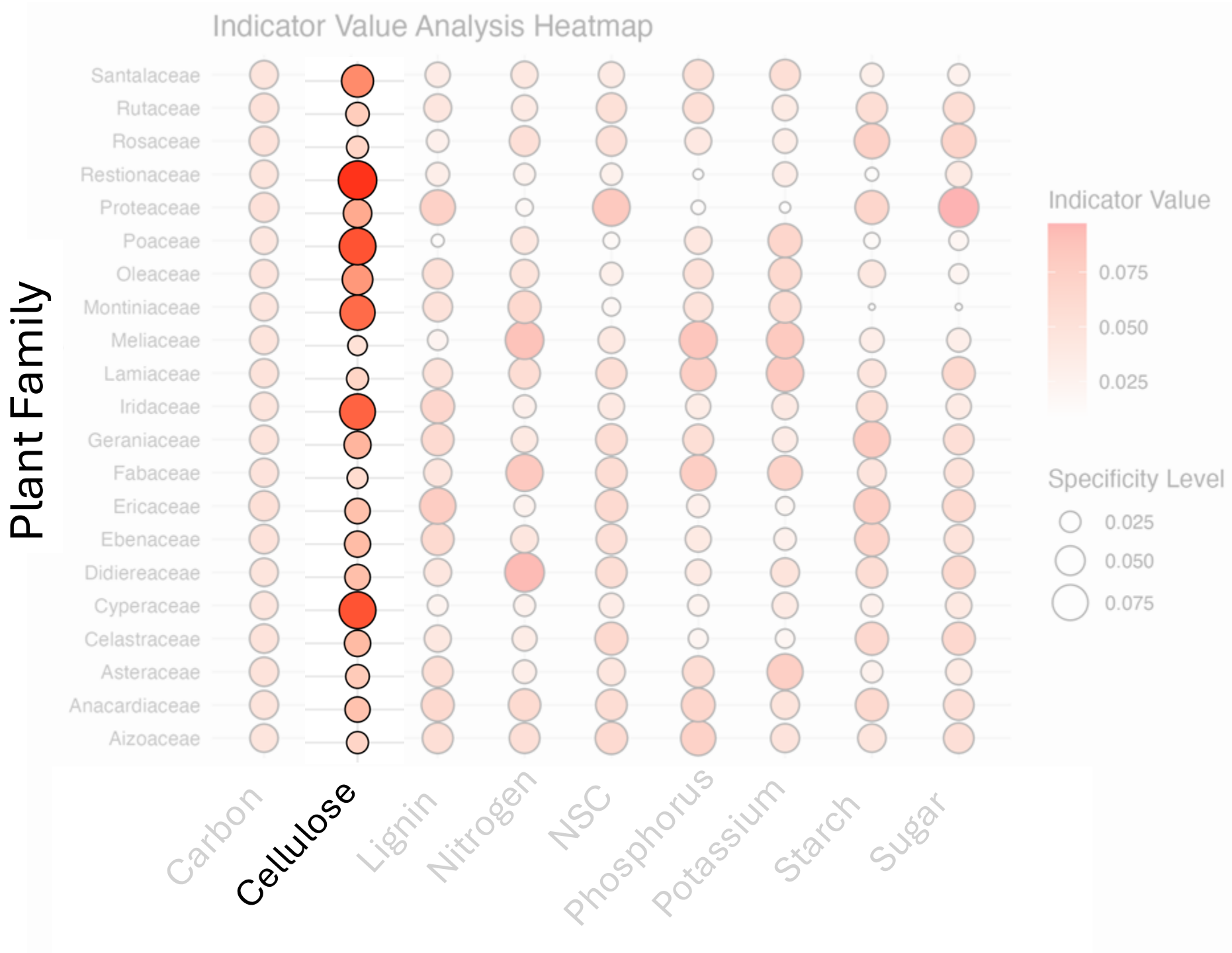


Ordination also shows high separation **between genera** (Proteaceae)

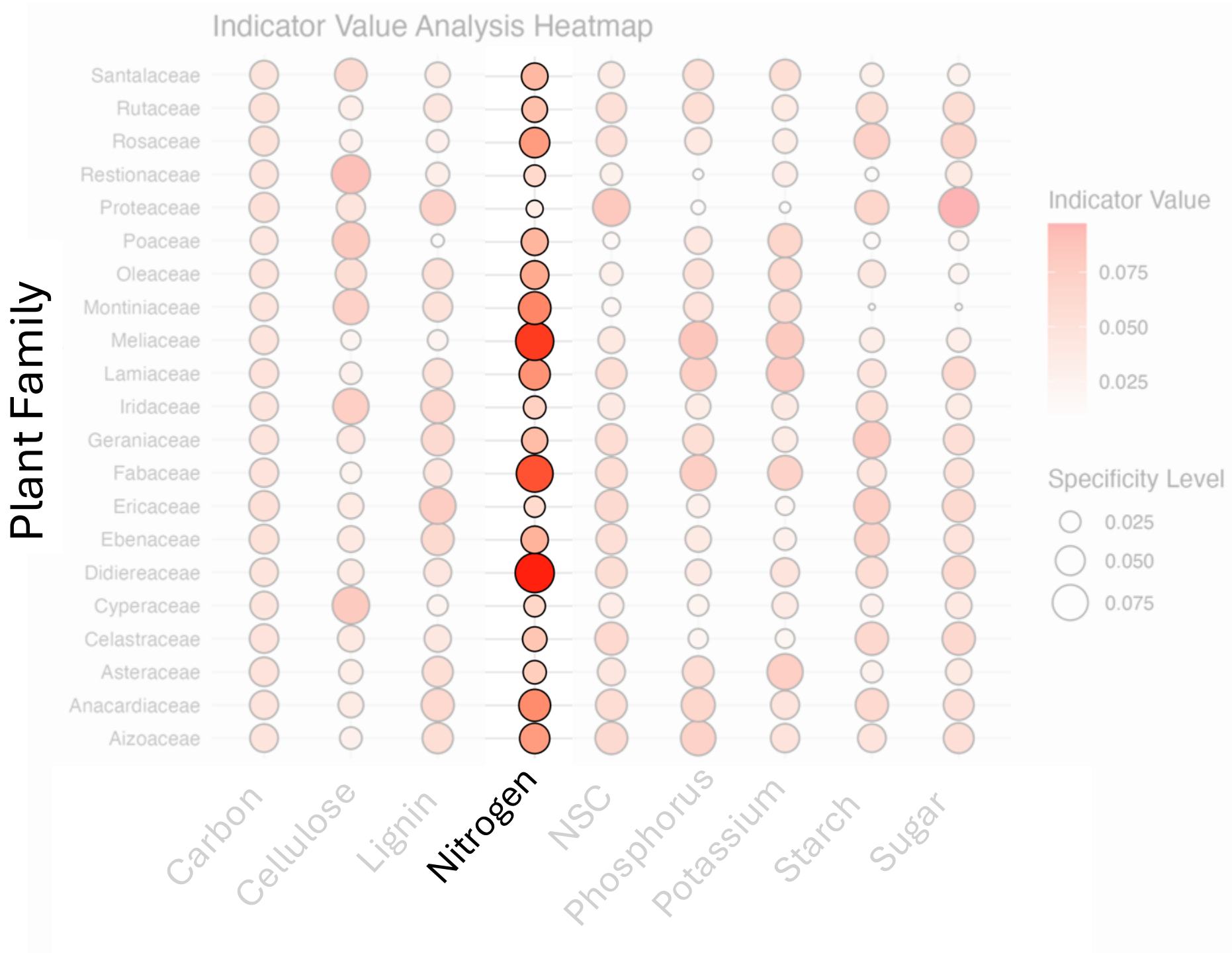



Indicator Value Analysis Heatmap
Plant Family
Santalaceae
Rutaceae
Rosaceae
Restionaceae
Proteaceae
Poaceae
Oleaceae
Montiniaceae
Meliaceae
Lamiaceae
Iridaceae
Geraniaceae
Fabaceae
Ericaceae
Ebenaceae
Didiereaceae
Cyperaceae
Celastraceae
Asteraceae
Anacardiaceae
Aizoaceae
Carbon
Cellulose
Lignin
Nitrogen
NSC
Phosphorus
Potassium
Starch
Sugar
Indicator Value
0.075
0.050
0.025
Specificity Level
0.025
0.050
0.075

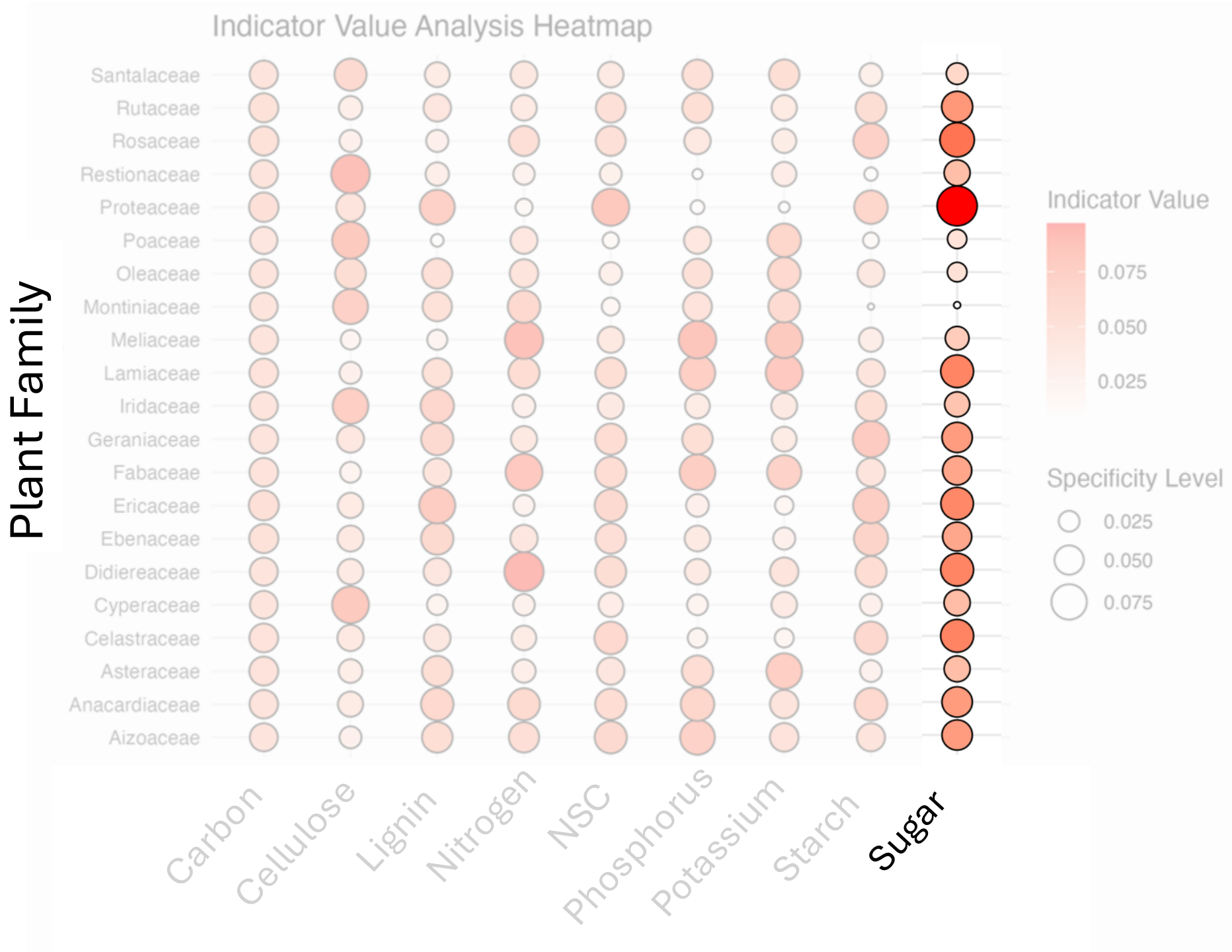
Cellulose indicative of Grasses, Sedges, Irises, and Restios



Nitrogen indicative of Fabaceae and lineages found outside of Fynbos



The Proteaceae “sugar bushes” indicated by sugar content

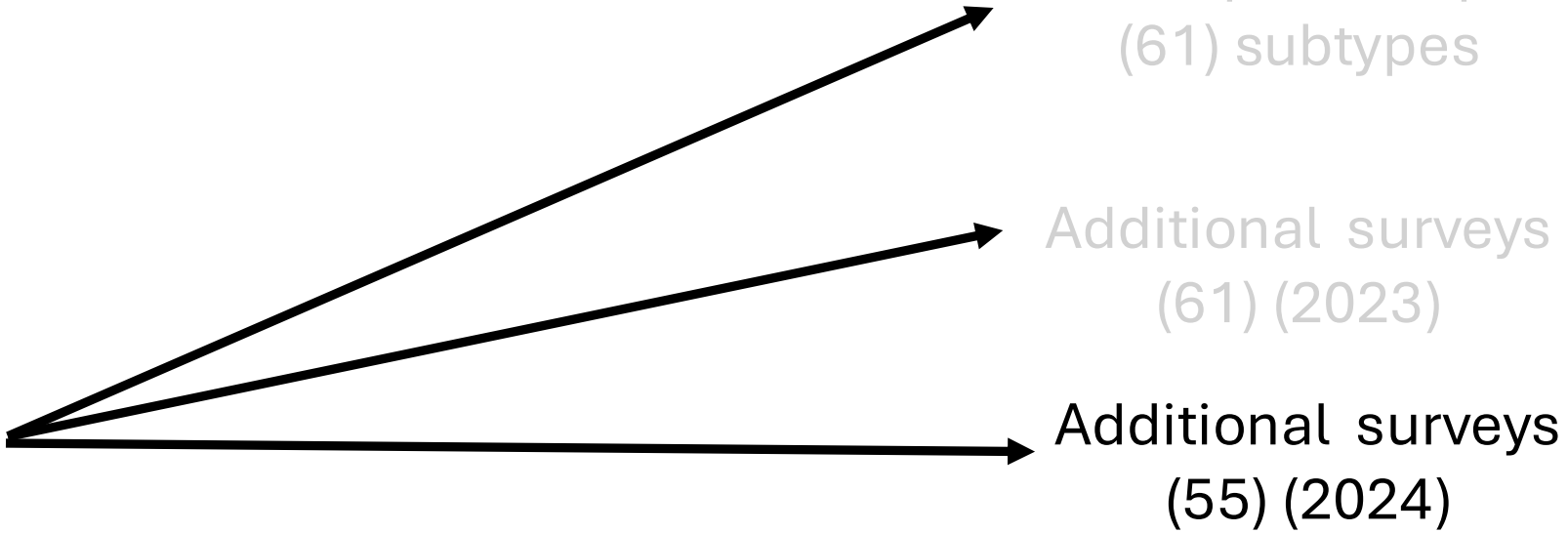


Forthcoming CapeTraits vegetation data products

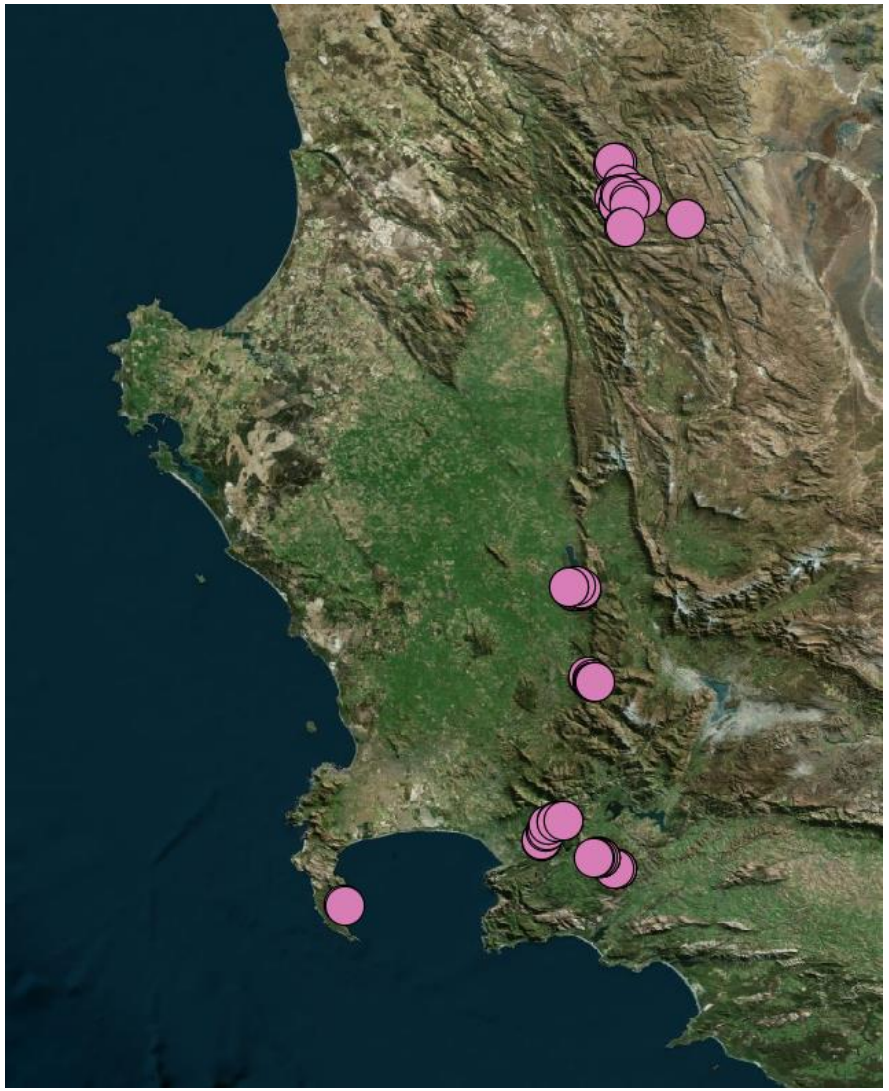
BioScape team plot subtypes (61)

Additional surveys (61) (2023)

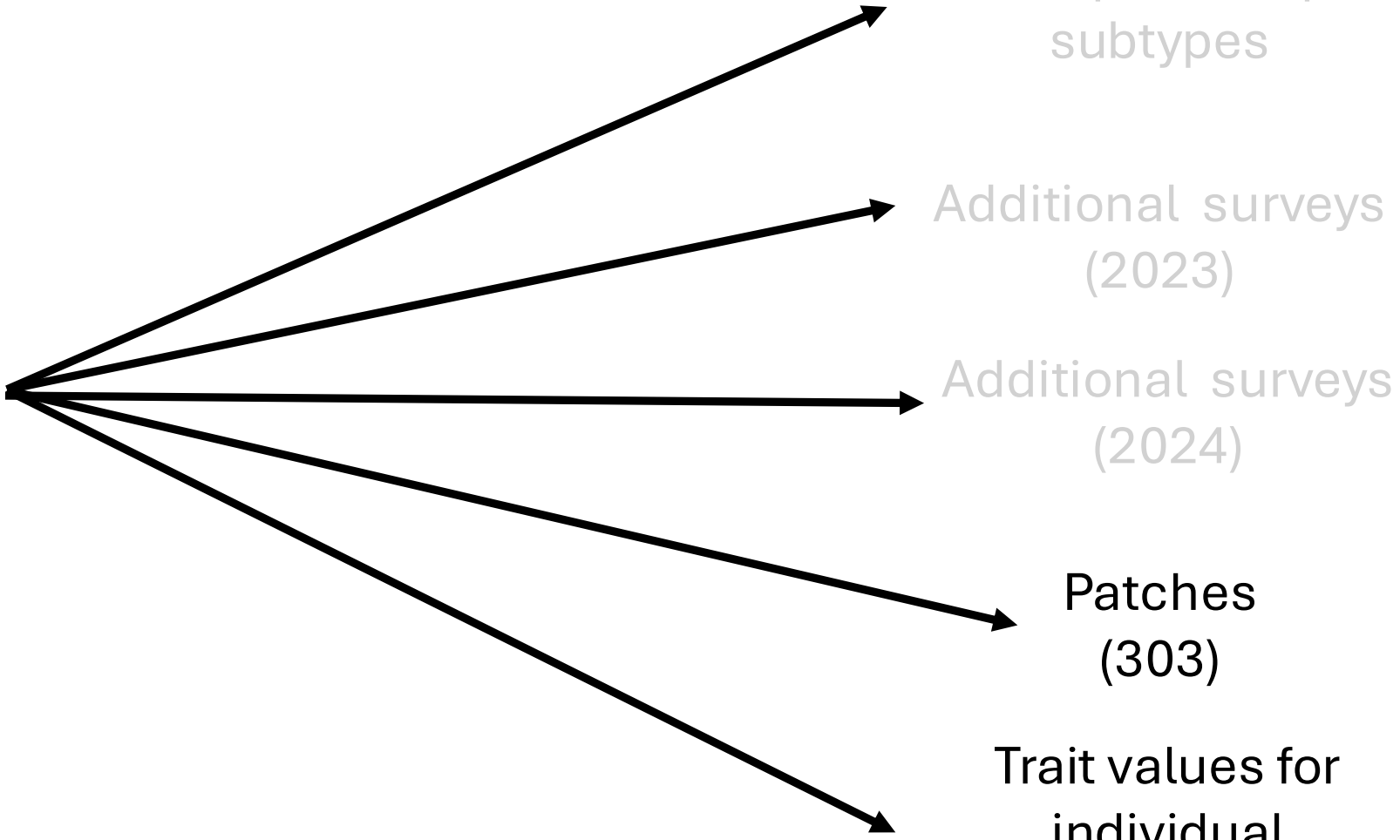
Forthcoming CapeTraits vegetation data products



2024 surveys cover high elevation moist sites



Forthcoming CapeTraits vegetation data products



Acknowledgments

Jeannine Cavender-Bares

Steven Augustine

Doug Euston-Brown

Brendan Heberlein

Andy Hueni

Cynthia Jones

Kyle Kovach

Glenn Moncrieff

Kagiso Nhlapo

Maria Santos

Fabian Schneider

John Silander

Nancy Silander

Chenge Simcelile

Jasper Slingsby

Giulia Tagliabue

Emily Townsend

Phil Townsend

Funding Institutions:

NRF National Research Foundation

NASA

NSF

Supporting Institutions:

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CapeNature

SANBI Biodiversity for Life

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