Functional Traits: An Overview

Brad Butterfield and NAU/USGS Dryland Ecology Lab Group

Trait: An Ambiguous Term

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Trait x Environment = Performance

SLA x Soil Moisture = Performance
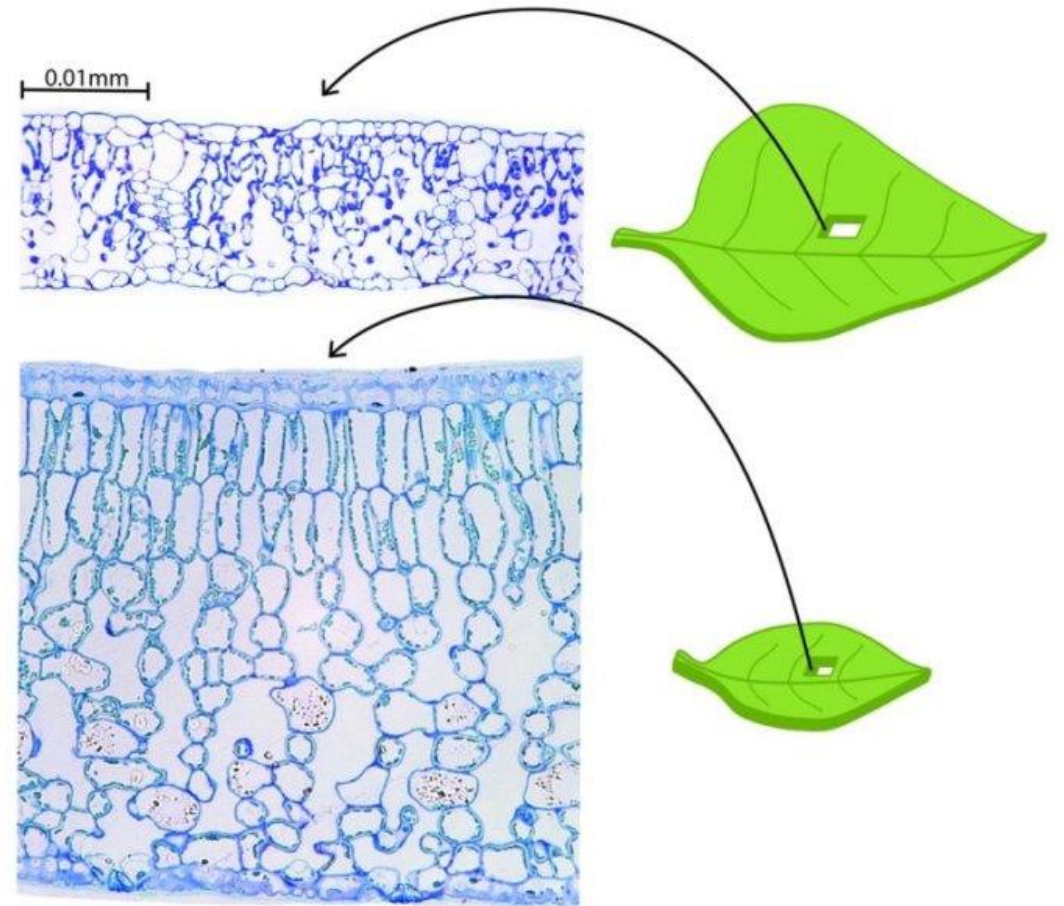
Specific leaf area = Area per dry mass
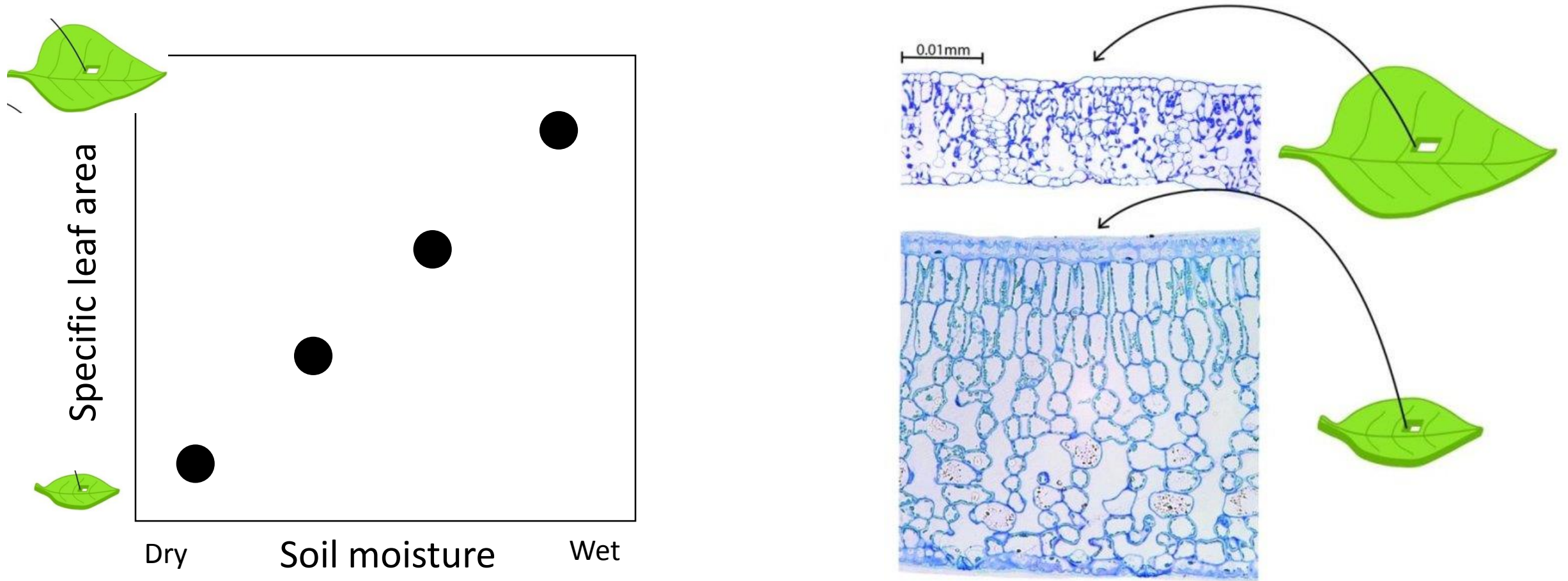
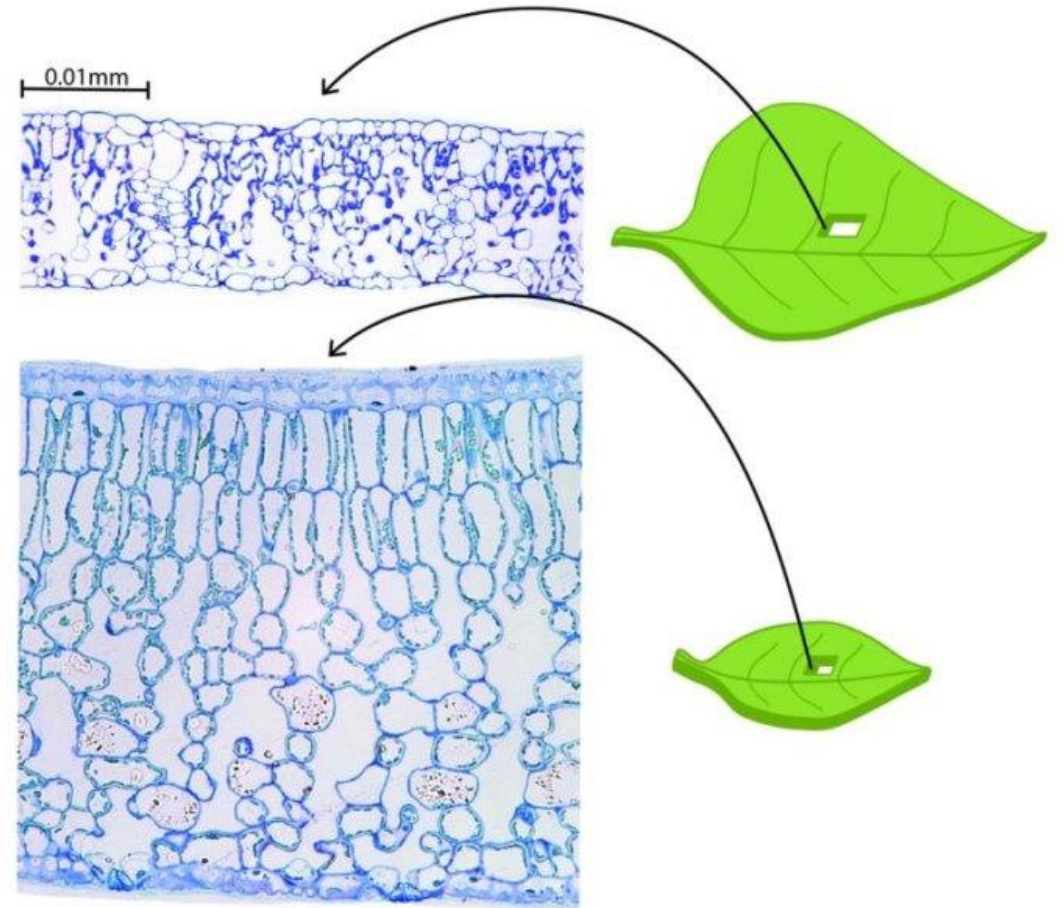Mediates responses to:
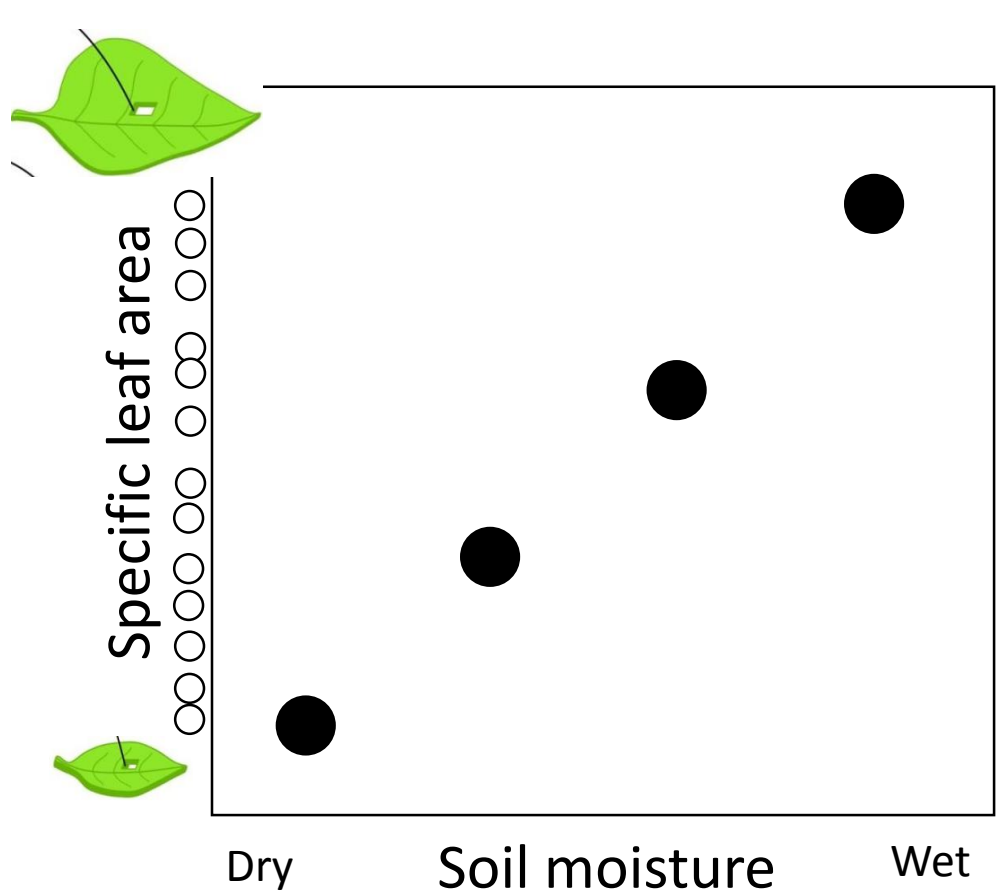Soil moisture
Growing season length
Herbivory
Shade

0.01mm
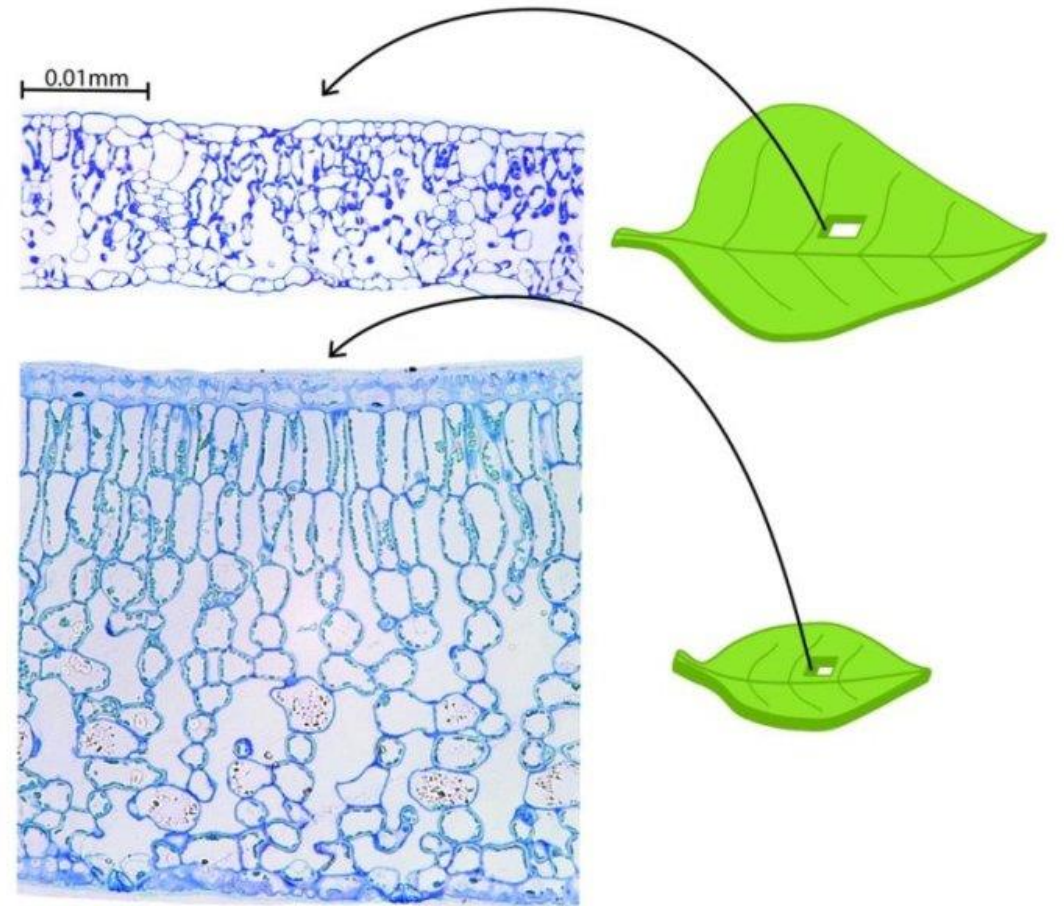
SLA x Soil Moisture = Performance

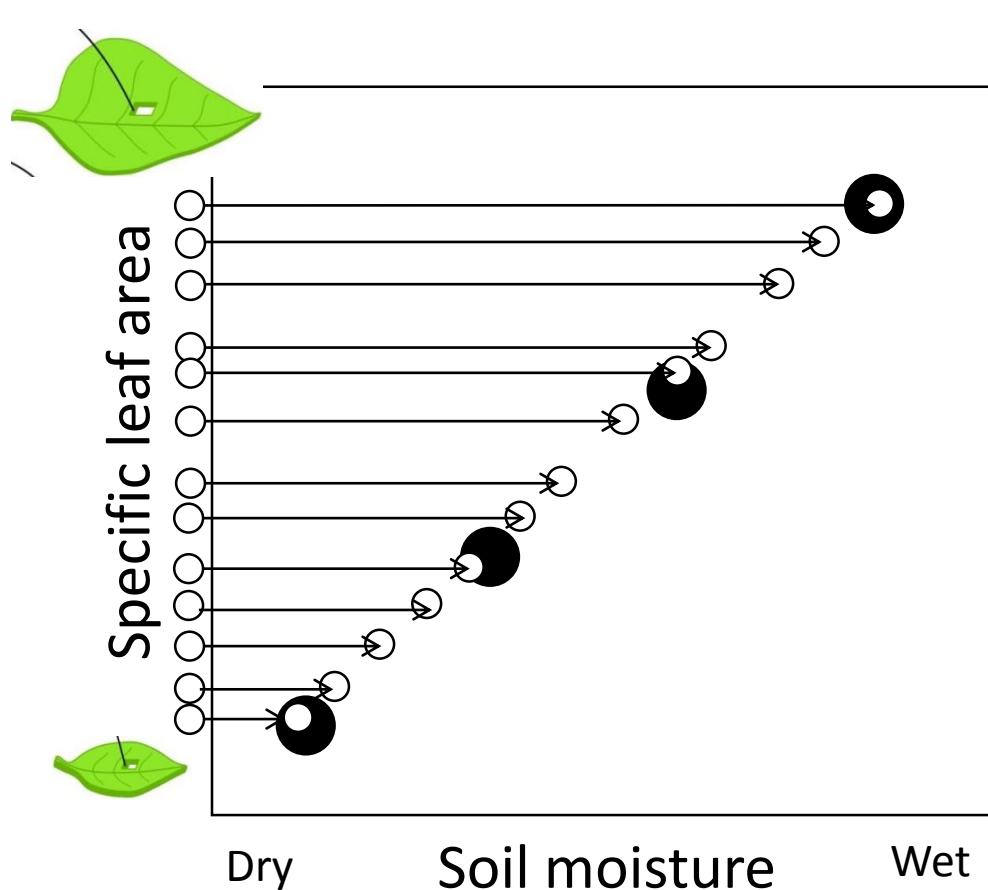# SLA x Soil Moisture = Performance

Specific leaf area

Dry   Soil moisture   Wet

0.01mm

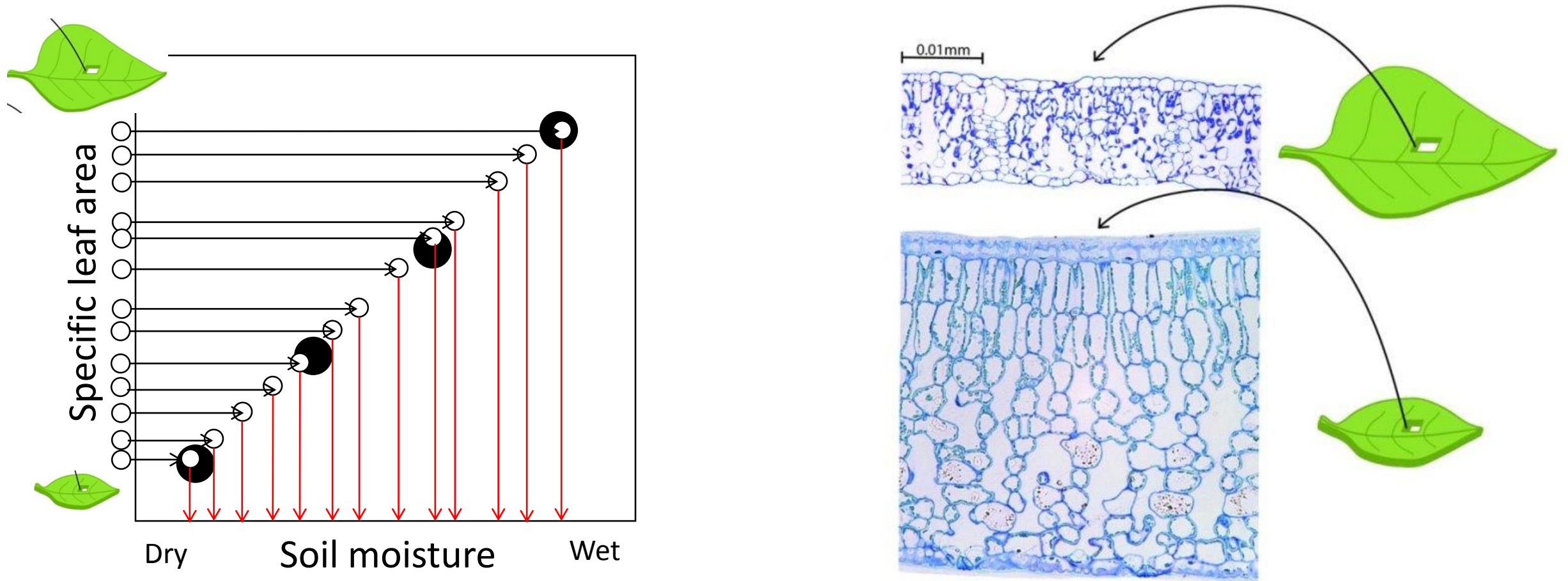# SLA x Soil Moisture
= Performance

SLA x Soil Moisture = Performance

Putting the Function in Trait

- An organismal characteristic that mediates **responses** to, or **effects** on, the environment
- Responses to:
  - Environmental variation
  - Disturbances
  - Effects of other species
- Effects on:
  - Ecosystem structure and function
  - Other organisms
- Response and effect are often linked

Implications for Restoration

- Predict plant performance (Kathleen Balazs)
  - "The right TRAIT VALUE, in the right place, at the right time"
- Predict effects on ecosystem services of interest
  - Forage production
  - Erosion control and soil development
  - Nutrient retention

What Traits Should We Measure?

- Intensive physiological traits (Alix Pfennigwerth)
  - Proximate predictors of plant response to the environment
  - A lot of work!
- Morphological traits (Kathleen Balazs, Carla Roybal and Magda Garbowski)
  - Reasonable surrogates for physiology and life history
  - Easier to collect for many species and seed sources
- Let's think outside the box! (Sasha Reed)
  - Recent advances in microbial functional traits
  - Why not biological soil crusts?

What Drives Variation in Traits?

- Environmental variation (Carla Roybal, Alix Pfennigwerth, Magda Garbowski)
  - Among species
  - Among populations within species; speaks to seed transfer zones
- Developmental stages (Magda Garbowski)
  - Seedlings and mature traits can be very different
  - Important of regeneration phase to restoration success

What To Do With The Data????

- CPNPP Functional Trait Database (Jessica DaBell)
  - Synthesis
  - Identifying research needs
  - Development of decision support tools