A Trait Assessment of 40 Commonly used Species in Restoration on the Colorado Plateau

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Species list divided into functional groups

Native Perennial Grass (18)			
scientific name	**common name**	**Cultivar**	**n**
Achnatherum hymenoides	indian ricegrass	Paloma	9
Aristida purpurea	purple three-awn grass	VNS	10
Bouteloua curtipendula	sideoats grama	Niner	10
Bouteloua eripoda	black grama	VNS	10
Bouteloua gracilis	blue grama	Bird's Eye	10
Bromus marginatus	mountain bromegrass	UP Cold Springs	10
Elymus elymoides	bottlebrush squirreltail grass	Pueblo	10
Elymus trachycaulus	slender wheatgrass	San Luis	10
Elymus wawawaiensis	snake river wheatgrass	Discovery	10
Hesperostipa comata	needle and thread grass	VNS	10
Leymus cinereus	great basin wildrye	Trailhead	10
Nassella viridula	green needlegrass	Lodorm	10
Pascopyrum smithii	western wheatgrass	Arriba	10
Pleuraphis jamesii	james' galleta	Viva	10
Pleuraphis mutica	tobosa	VNS	5
Poa secunda	sandberg bluegrass	UP Colorado Plateau	10
Pseudoroegneria spicata	bluebunch wheatgrass	Goldar	10
Sporobolus cryptandrus	sand dropseed	VNS	10

Native Perennial Forb (7)			
scientific name	**common name**	**Cultivar**	**n**
Achillea millefolium	western yarrow	Western Yakima	10
Helianthus annus	annual sunflower	VMS	7
Heliomeris multiflora	showy goldeneye	VNS	3
Krascheninnikovia lanata	winterfat	VNS	10
Linum lewisii	lewis blue flax	Appar	10
Penstemon palmeri	palmer penstemon	VNS	10
Sphaeralcea grossulariifolia	gooseberry leaf globemallow	VNS	10

Introduced Perennial Grass (7)			
scientific name	**common name**	**Cultivar**	**n**
Agropyron cristatum	crested wheatgrass	Ephraim	10
Agropyron fragile	siberian wheatgrass	Vavilov II	10
Dactylis glomerata	orchardgrass	Profile	10
Festuca ovina	sheep fescue	VNS	10
Psathyrostachys juncea	russian wildrye	Bozoisky	10
Thinopyrum intermedium	intermediate wheatgrass	Oahe	10
Thinopyrum ponticum	tall wheatgrass	Jose	10

Introduced Perennial Forb (2)			
scientific name	**common name**	**Cultivar**	**n**
Kochia prostrata	forage Kochia	VNS	6
Sanguisorba minor	small burnet	Delar	10

Introduced Legume (6)			
scientific name	**common name**	**Cultivar**	**n**
Astragalus cicer	cicer milkvetch	Lutana	10
Hedysarum boreale	utah northern sweetvetch	Timp	10
Melilotus officianale	sweetclover	Yellow Blossom	10
Medicago sativa	alfalfa	Ladak	10
Onobrychis vicilfolia	sainfoin	Eski	10
Trifolium fragiferum	strawberry clover	Palestine	10

Research Questions:

Q1. How many traits do we need to measure?

Q2. How much variability do we see within versus among functional groups?

Q3. How do traits impact performance?

Q2. How many traits do we need to measure?

Traits (9)
Seed Mass
Height
Root:Shoot
Specific Leaf Area
Leaf Dry Matter Content
Coarse Root Specific Root Length
Coarse Root Dry Matter Content
Fine Root Specific Root Length
Fine Root Dry Matter Content

Q1. How many traits do we need to measure?

A1. The 9 traits we measured each tell a different part of the story.

Take home: You cannot predict belowground characteristics based on aboveground traits, root traits are important to measure.

Research Questions:

Q1. How many traits do we need to measure?

Q2. How much variability do we see within versus among functional groups?

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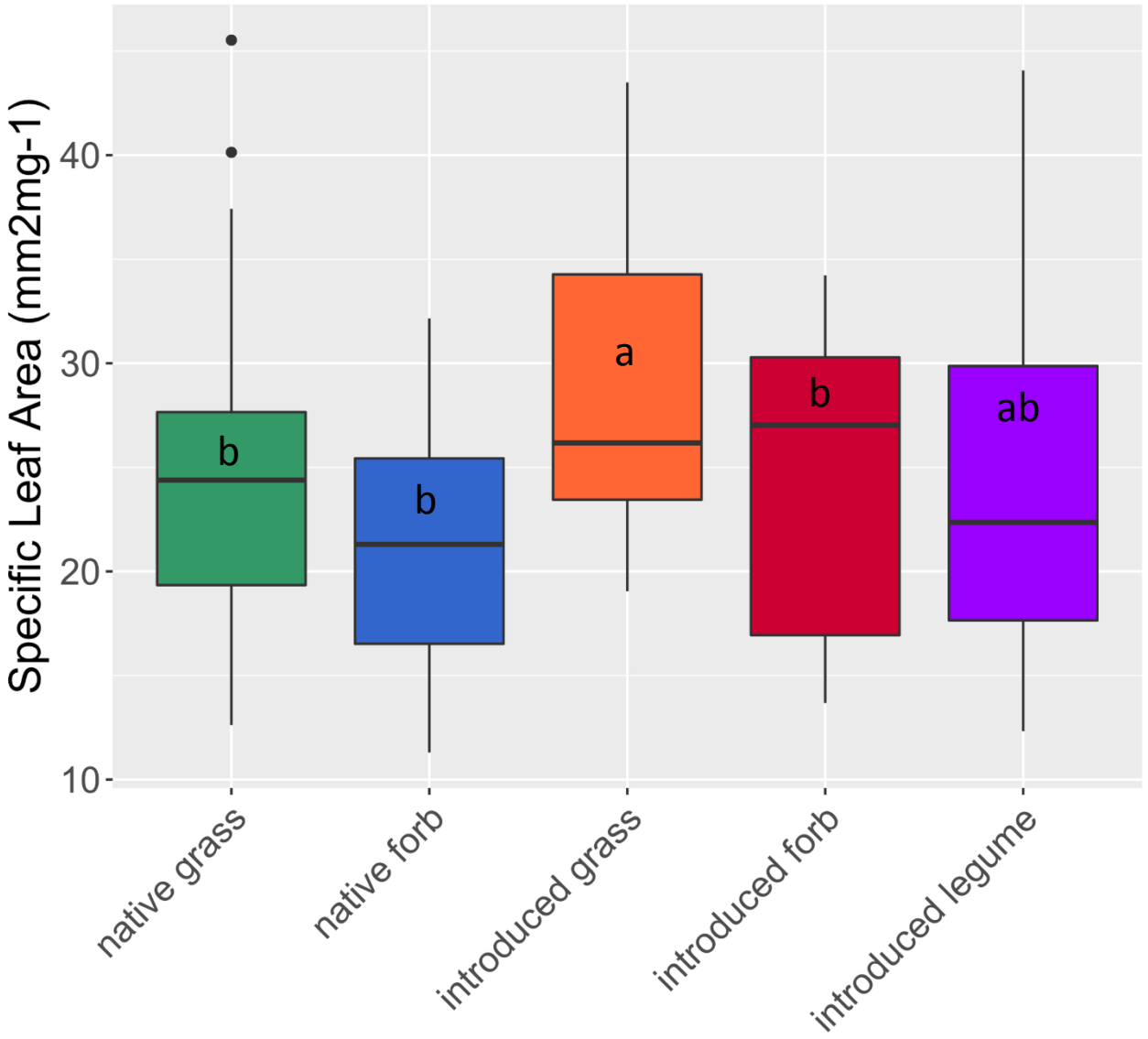
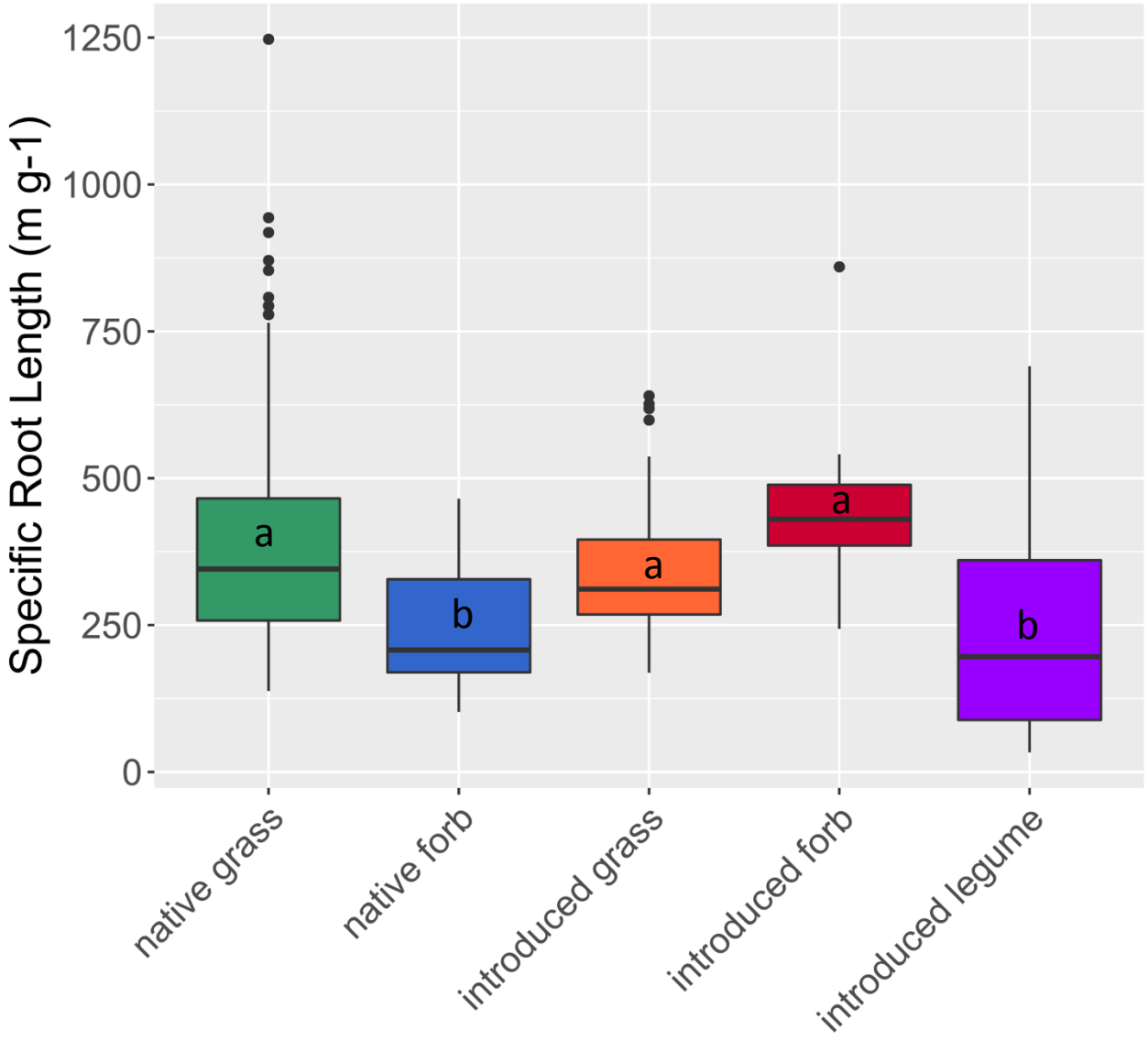
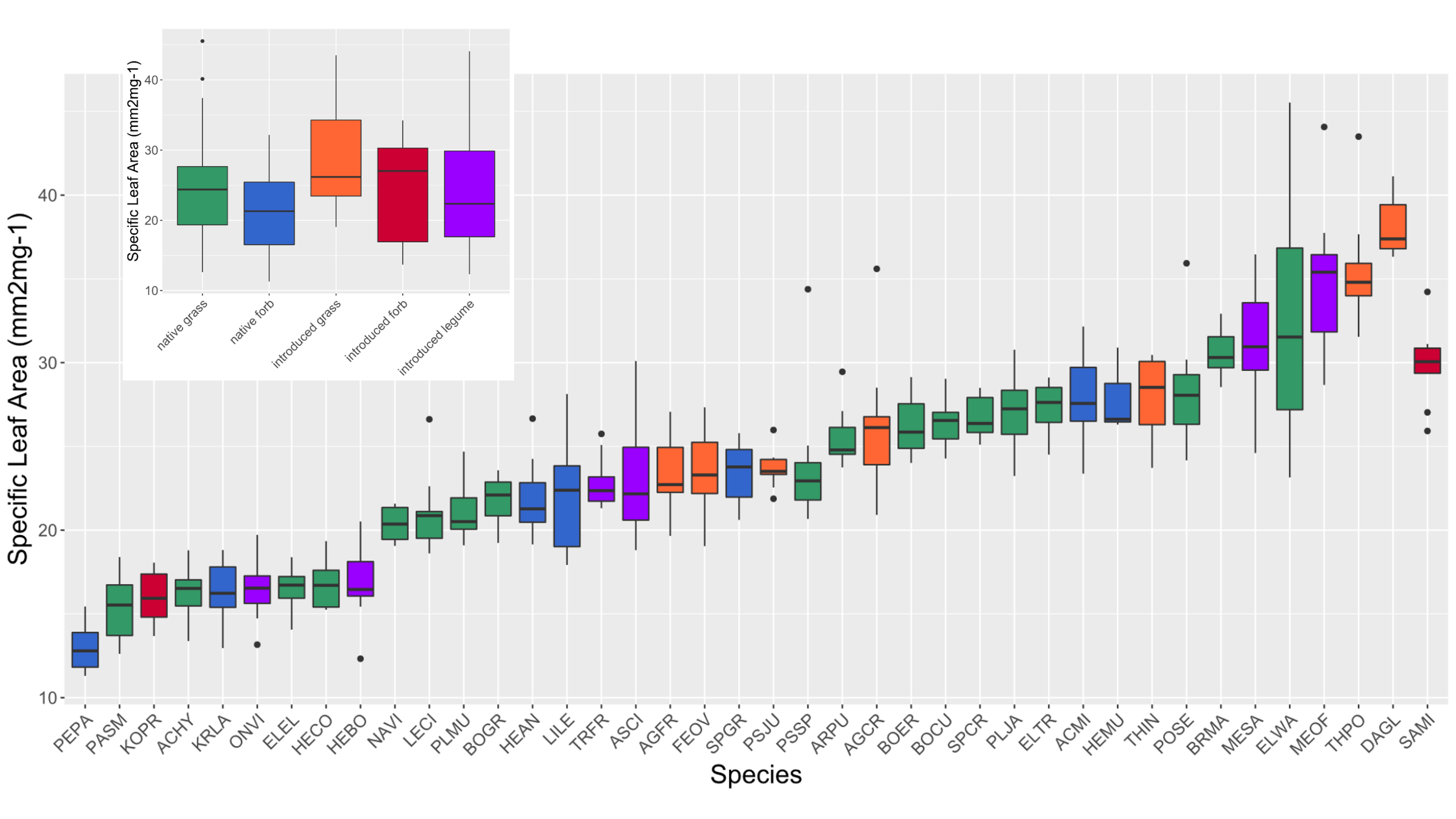
Q2. How much variability do we see within versus among functional groups?



Q2. How much variability do we see within versus among functional groups?




Specific Leaf Area (mm2mg-1)
10
20
30
40
PEPA
PASM
KOPR
ACHY
KRLA
ONVI
ELEL
HECO
HEBO
NAVI
LECI
PLMU
BOGR
HEAN
LILE
TRFR
ASCI
AGFR
FEOV
SPGR
PSJU
PSSP
ARPU
AGCR
BOER
BOCU
SPCR
PLJA
ELTR
ACMI
HEMU
THIN
POSE
BRMA
MESA
ELWA
MEOF
THPO
DAGL
SAMI
Species
Specific Leaf Area (mm2mg-1)
10
20
30
40
native grass
native forb
introduced grass
introduced forb
introduced legume

Q2. How much variability do we see within versus among functional groups?

A2. We see broad trends differentiating native and introduced species, however there is quite a bit of variation within functional groups. Trait values of individual species may be more informative.

Take home: Functional groupings are an oversimplification.

Research Questions:

Q1. How many traits do we need to measure?

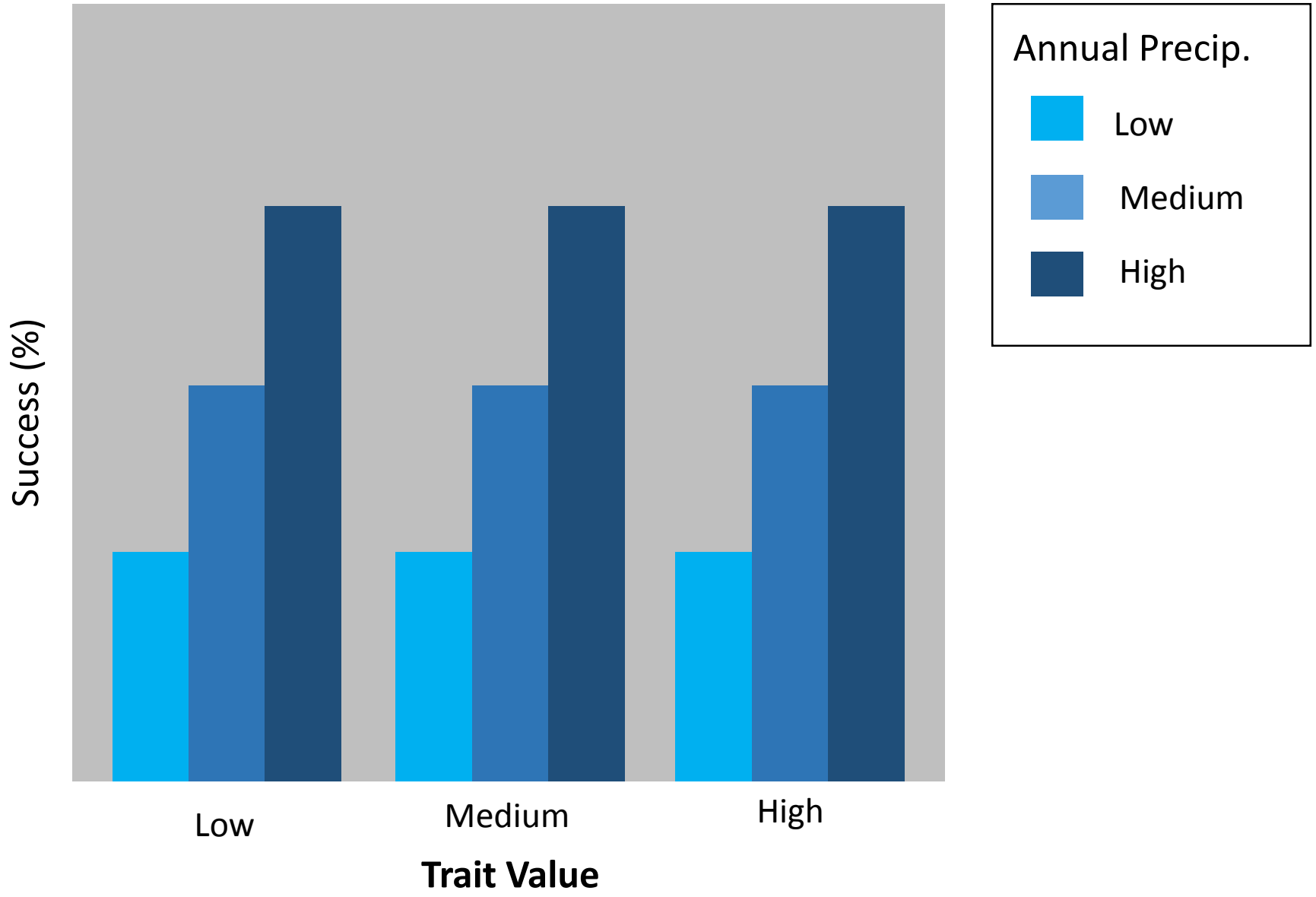
Q2. How much variability do we see within versus among functional groups?

Q3. How do traits impact performance?

Q3. How do traits impact performance?

Here we see NO interaction between climate and trait values

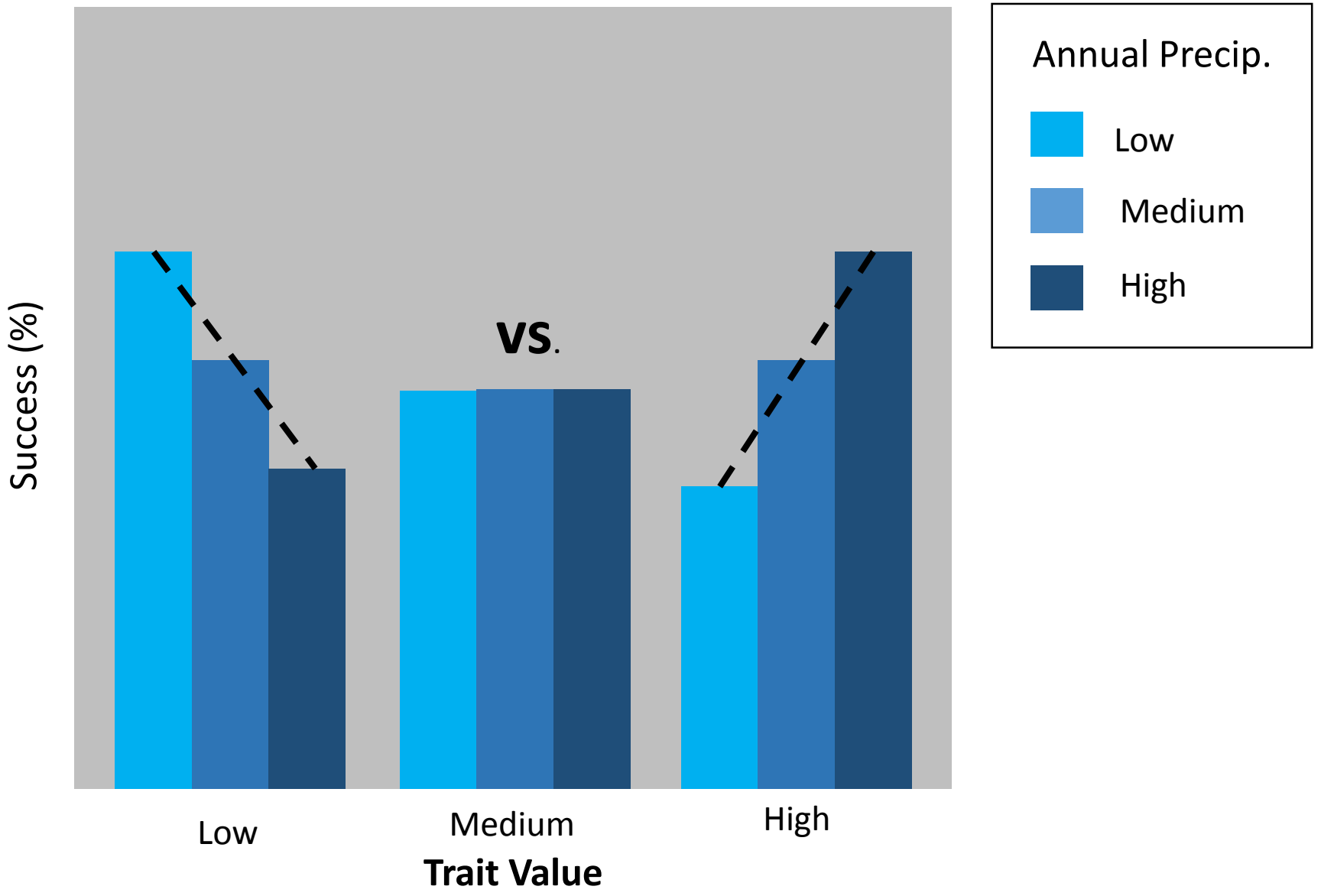
Only the climate variable is playing a role in success



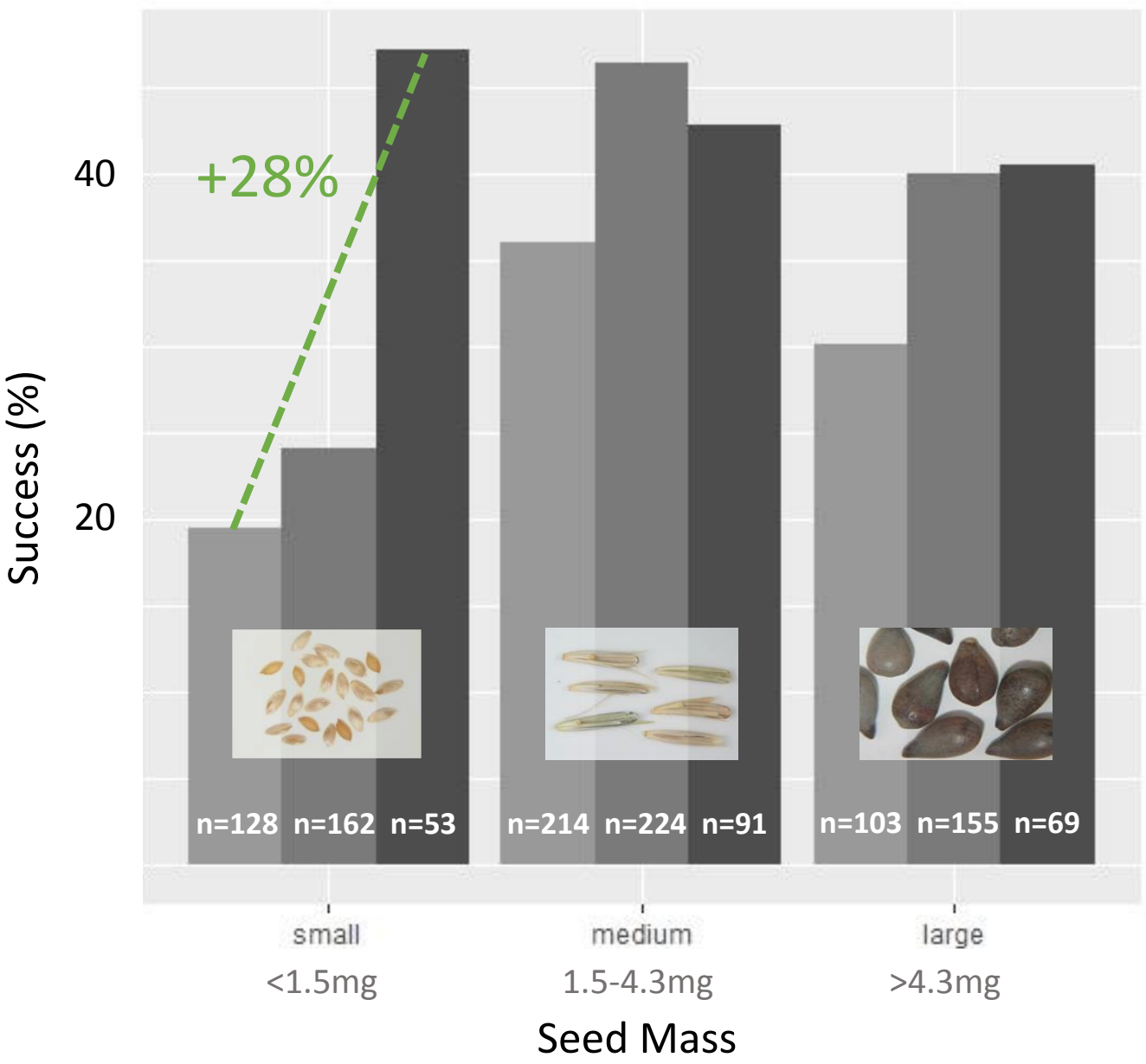
Q3. How do traits impact performance?

Here we do see an interaction between climate and trait values

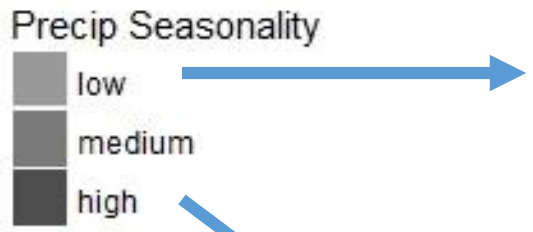
The effect of each level of precip. changes with each different trait value



Q3. How do traits impact performance?



Seed Mass x Climate

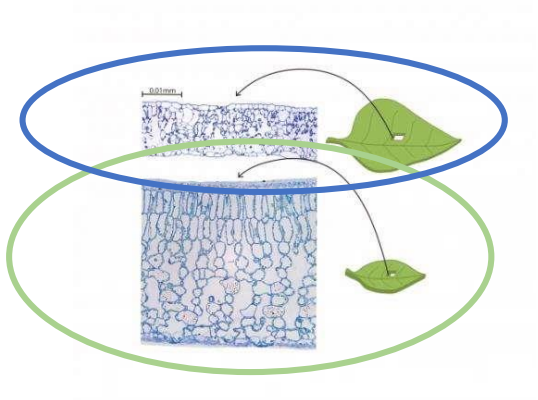


Primarily winter precipitation

Bimodal precipitation

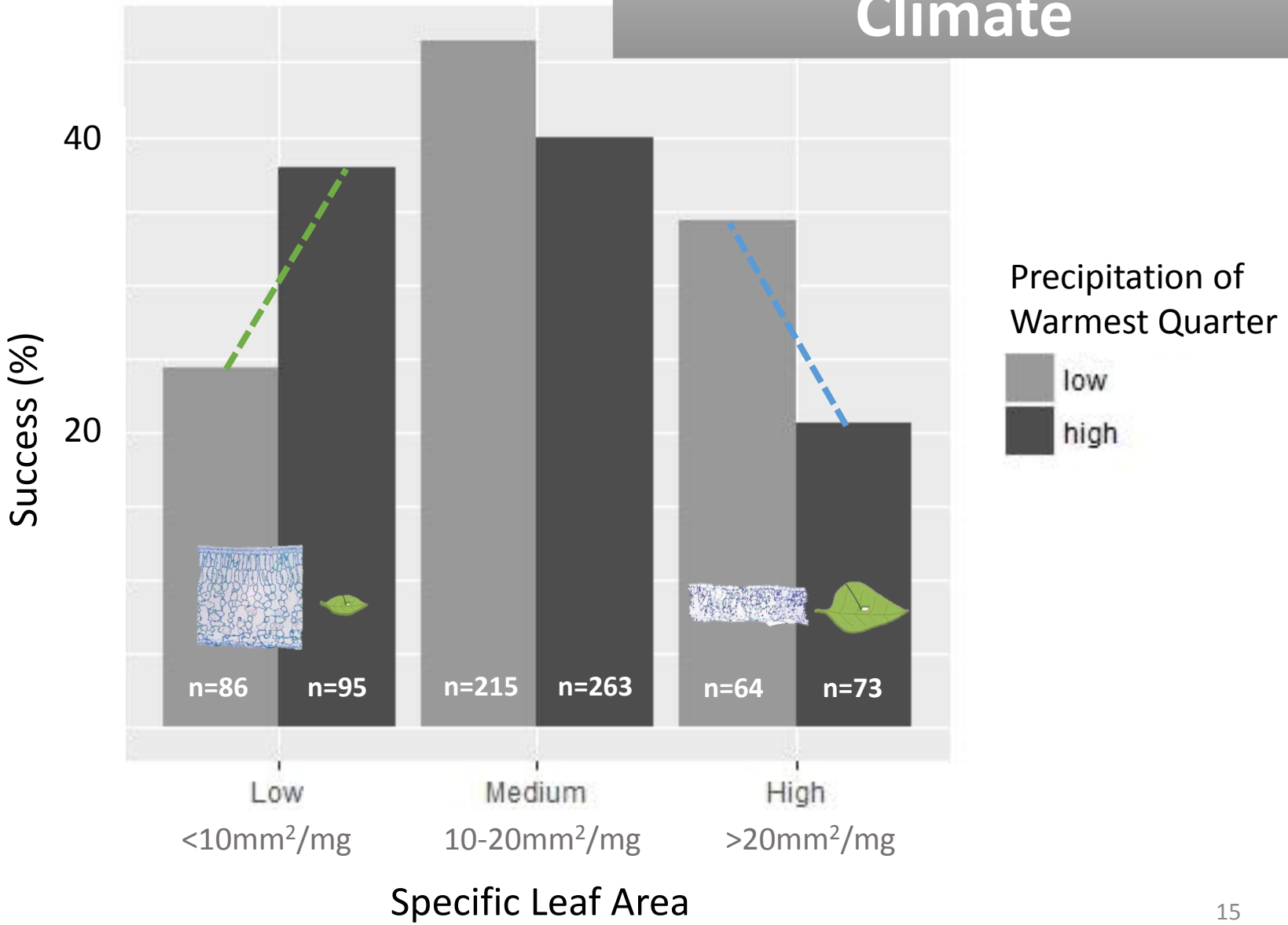
Q3. How do traits impact performance?

Higher SLA species competitively excluded



Lower SLA species adapted to longer growing season

Specific Leaf Area x Climate



Q3. How do traits impact performance?

A3. Trait values and climate show strong interactions that can help us optimize success in restoration

Take home: The right TRAIT VALUE at the right place at the right time

Acknowledgements

Greenhouse Harvest:
Carla Roybal
Aleydis Estrada
Arcelia Isais-Gastelum
Monica Long
Phil Patterson
Katie Lauschman
Caitlin Andrews
Bob Shriver

Funding and Support:
Brad Butterfield
Adrienne Pilmanis
Seth Munson
John Bradford

CPROD analysis:
Andrea Kramer
Nora Talkington
Stella Copeland
Troy Wood
Shannon Still
The TRY Initiative