



# Sources of variation and climatic drivers of grass functional traits

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# Restoration: The applied framework

- **Can we predict the best source of seeds easily?**
- Evaluating performance in many different environments is expensive when dealing with many seed sources.



# Functional traits and local adaptation

- If easy-to-measure traits correlate strongly with climate among populations, we put the **right seed in the right place** based on their trait values.

# Two scenarios for trait-based seed sourcing:

1) Trait climate relationships are the same among all species (seed selection is really easy!)

OR

2) Species exhibit individualistic trait-environment relationships (Life is hard. But possible).

The Punch line:  
We found support for #2.

Trait-climate relationships are strong in many cases

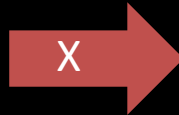
BUT

Those relationships vary among species.

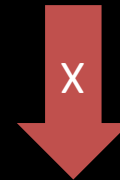
(Life is hard).

# Experimental Set up

- *Koeleria macrantha* (prairie junegrass)
- *Poa secunda* (Sandberg bluegrass)
- *Pseudorogeneria spicata* (bluebunch wheatgrass)
- *Leymus cinereus* (basin wildrye)
- *Elymus elymoides* (squirreltail)
- *Poa fendleriana* (muttongrass)
- *Aristida purpurea* (purple threeawn)
- *Pleuraphis jamesii* (galleta grass)
- *Bouteloua gracilis* (blue grama)

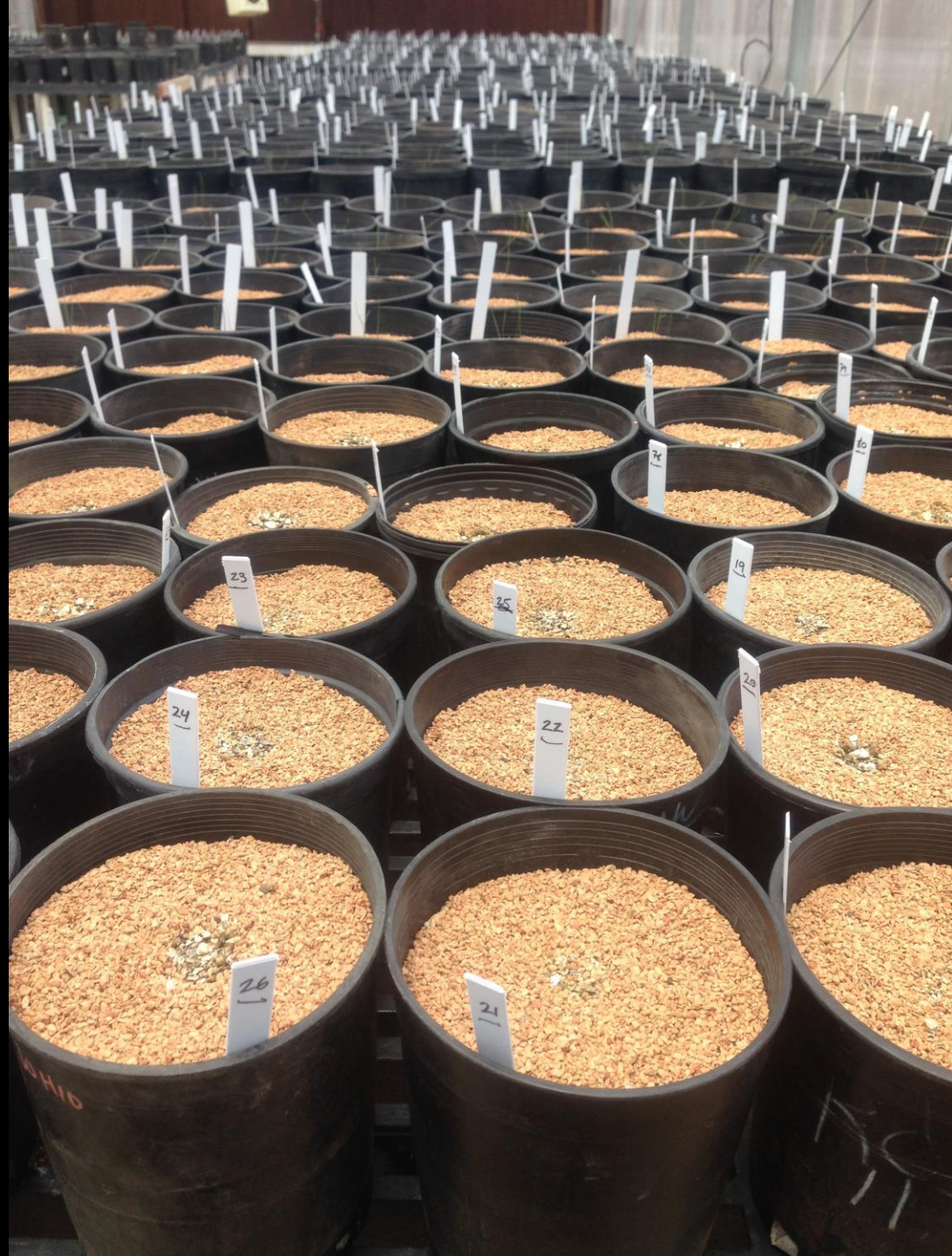


Ten Populations, each from climatically different points within range



Ten Reps in each population











# Seeds of Success!

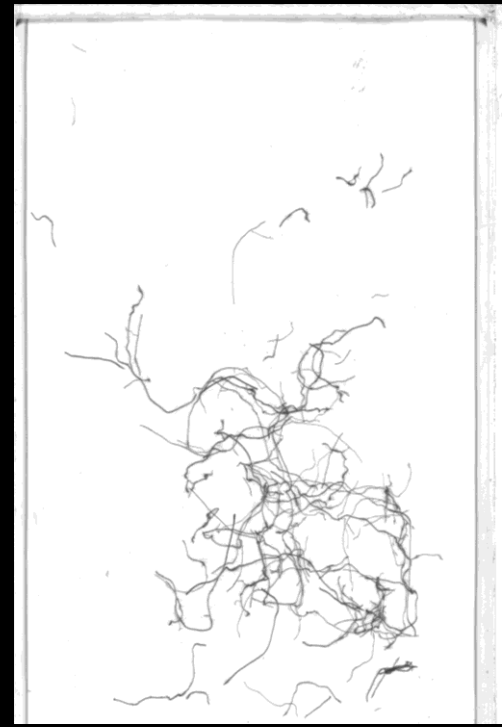
All accessions were from  
Seeds of Success  
collections.

This is a great resource for  
researchers working on  
these sorts of questions!



# Traits we measured

- Specific Leaf Area (SLA)
- Fine and coarse Specific Root Length (SRL)
- Fine and coarse Root Dry Matter Content (RDMC) proxy for tissue density
- Root to Shoot ratio
- Relative Growth Rate
- Height
- Above and belowground biomass



# Results

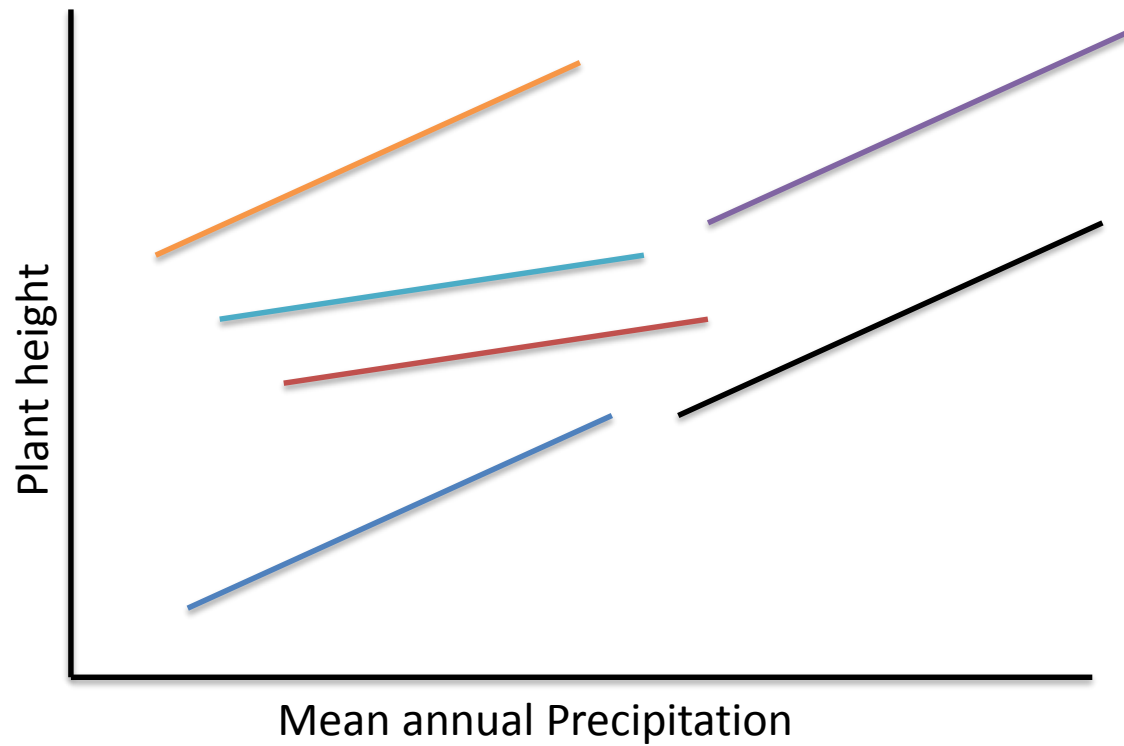


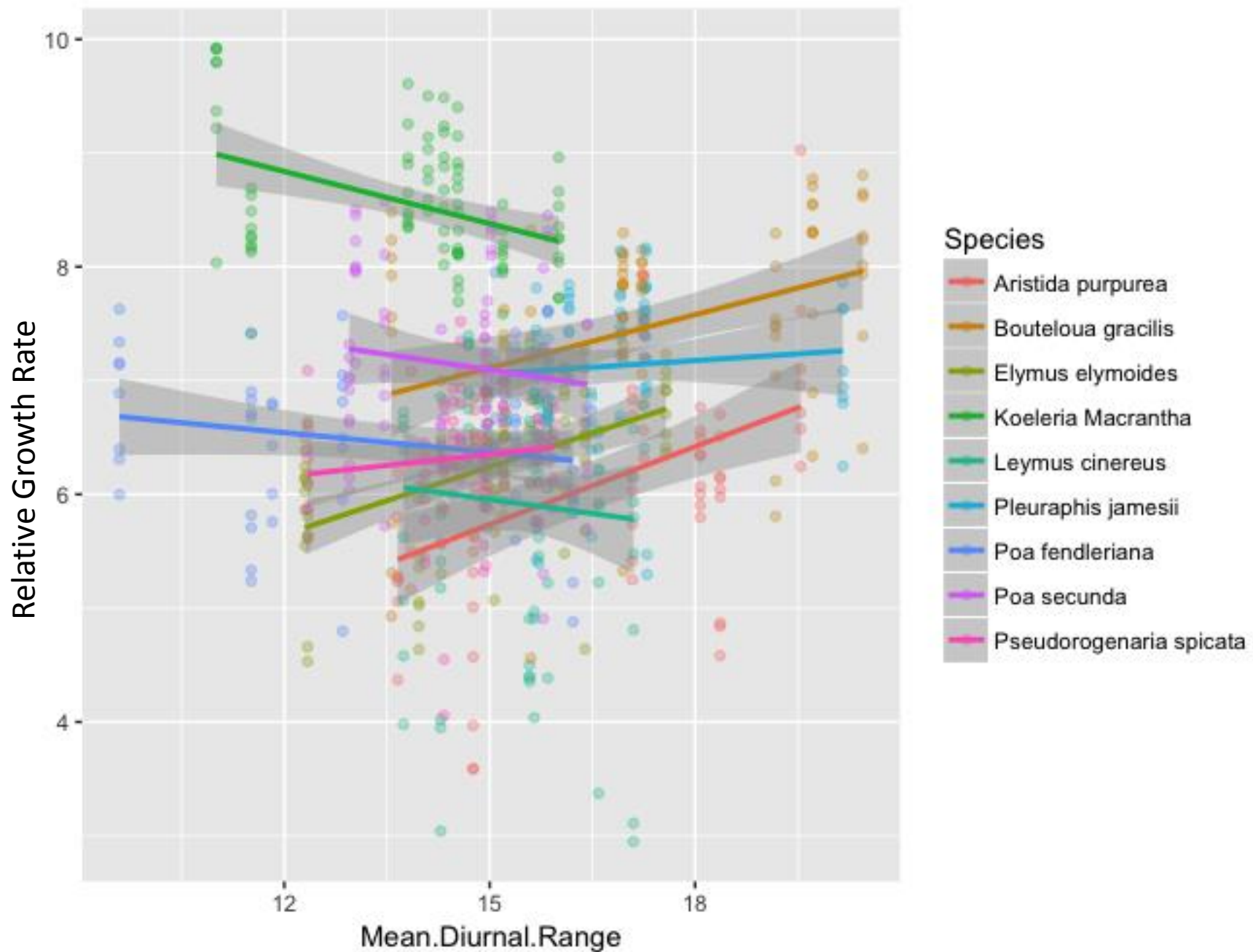


Some dimensions of climate are better predictors of functional traits than others.

Response can be species specific.

# Life is easy scenario:







# Mean Diurnal Range is a consistently good predictor!

	MAT	MDR	T.seas	P.Seas	MAP	PDQ	Avg.VPD	warmdry15	warmdry25	warmwet15	AET_toPET
Coarse RDMC	x	x	x	x			x	x	x		x
Coarse SRL	x	x							x		
Fine RDMC		x		x		x	x	x		x	x
Fine SRL	x	x	x			x		x	x		x
SLA		x	x	x		x					
Height		x			x						
RGR	x	x		x		x	x			x	
Root:Shoot	x	x				x					

# Conclusions and Implications

- We need to better understand what drives local adaptation in different species
- Species exhibit unique relationships with climate that need to be explored on a species-by-species basis.



Kathleen Balazs

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