

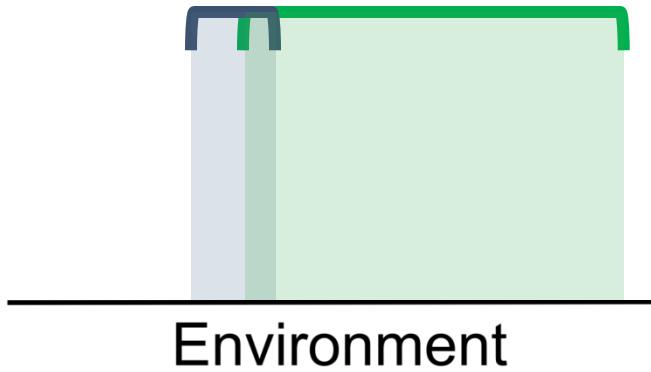
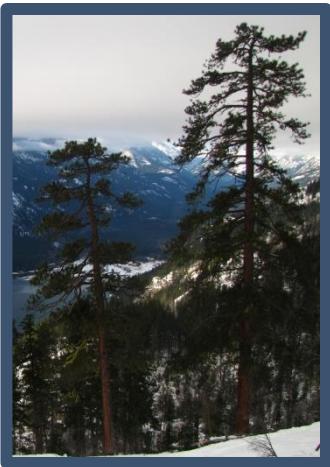
**Environmental
optimality, not
heterogeneity,
drives regional
and local species
richness in lichen
epiphytes**



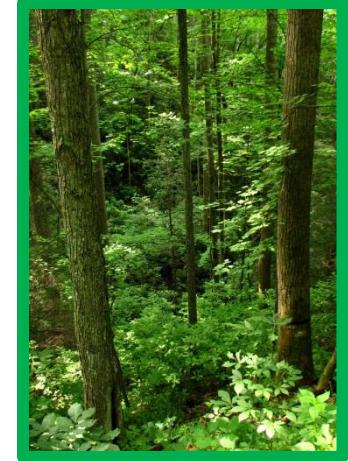
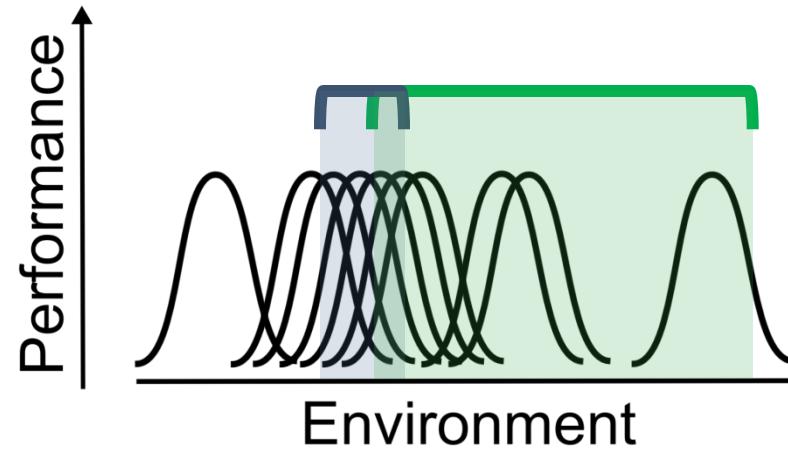
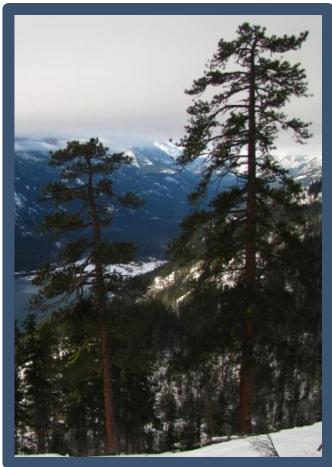
**Jes Coyle & Allen Hurlbert
Dept. of Biology, University of North Carolina at Chapel Hill**

In which environments do we find more species?

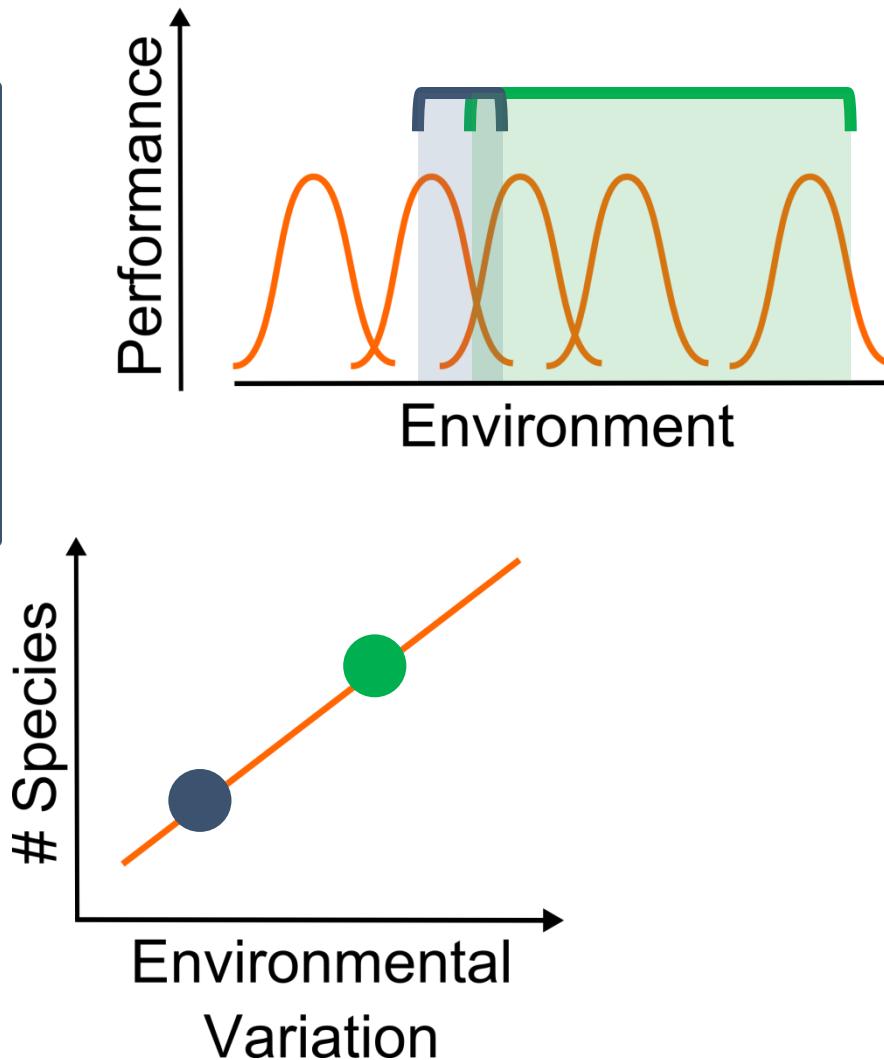
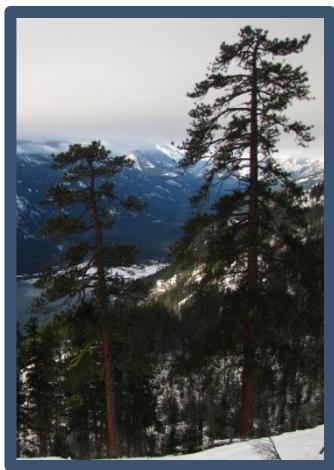
In which environments do we find more species?



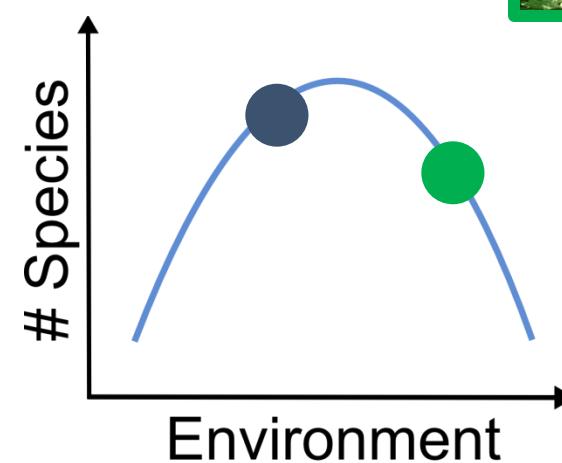
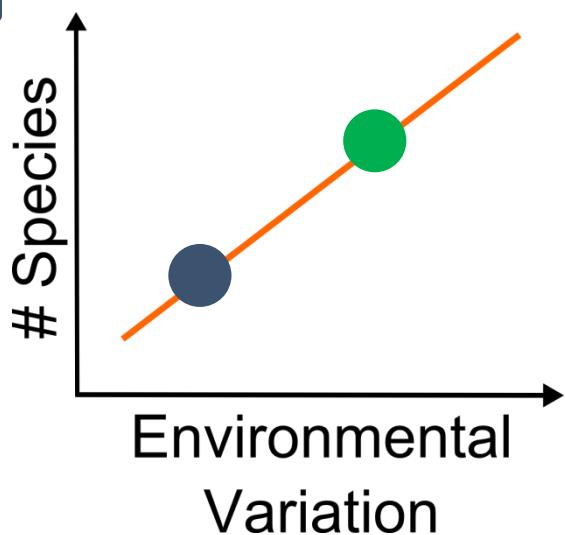
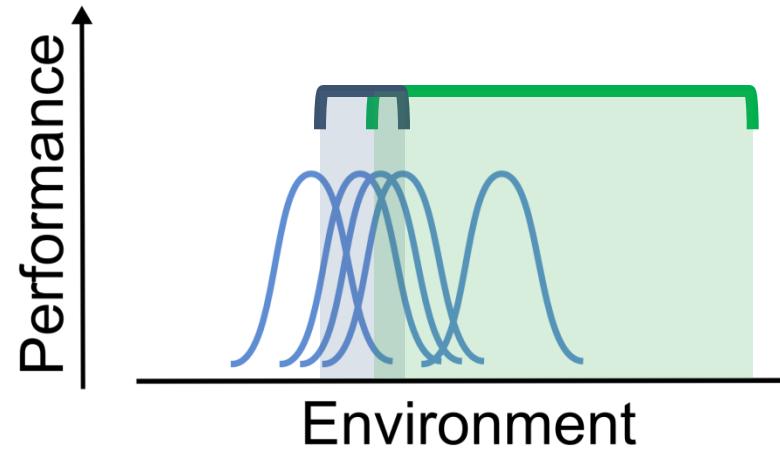
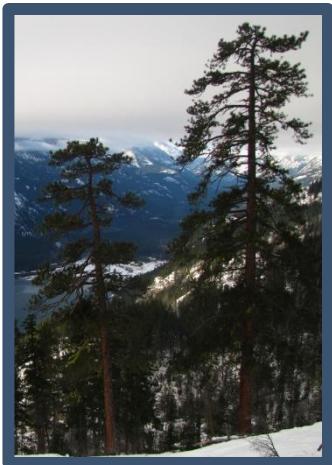
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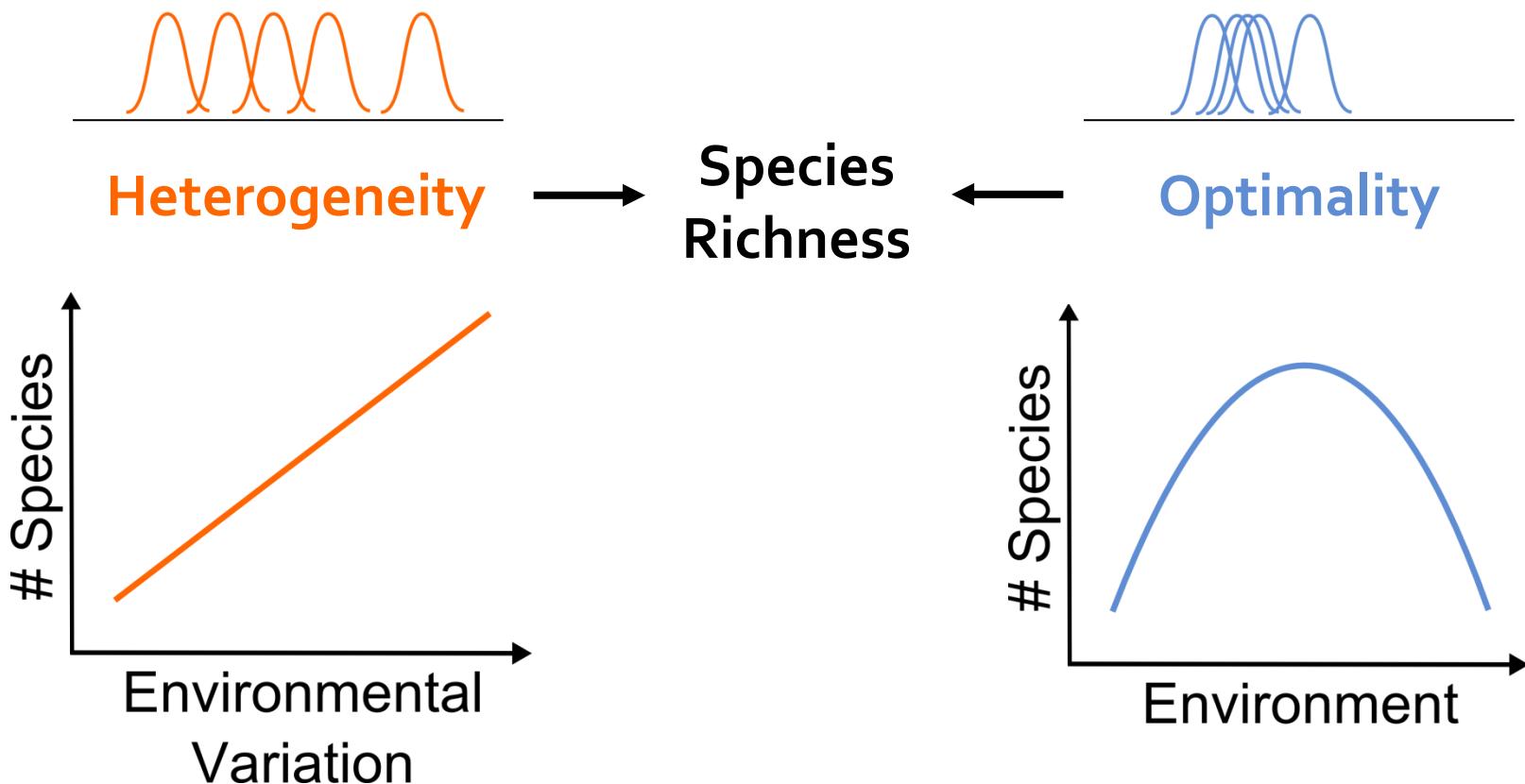


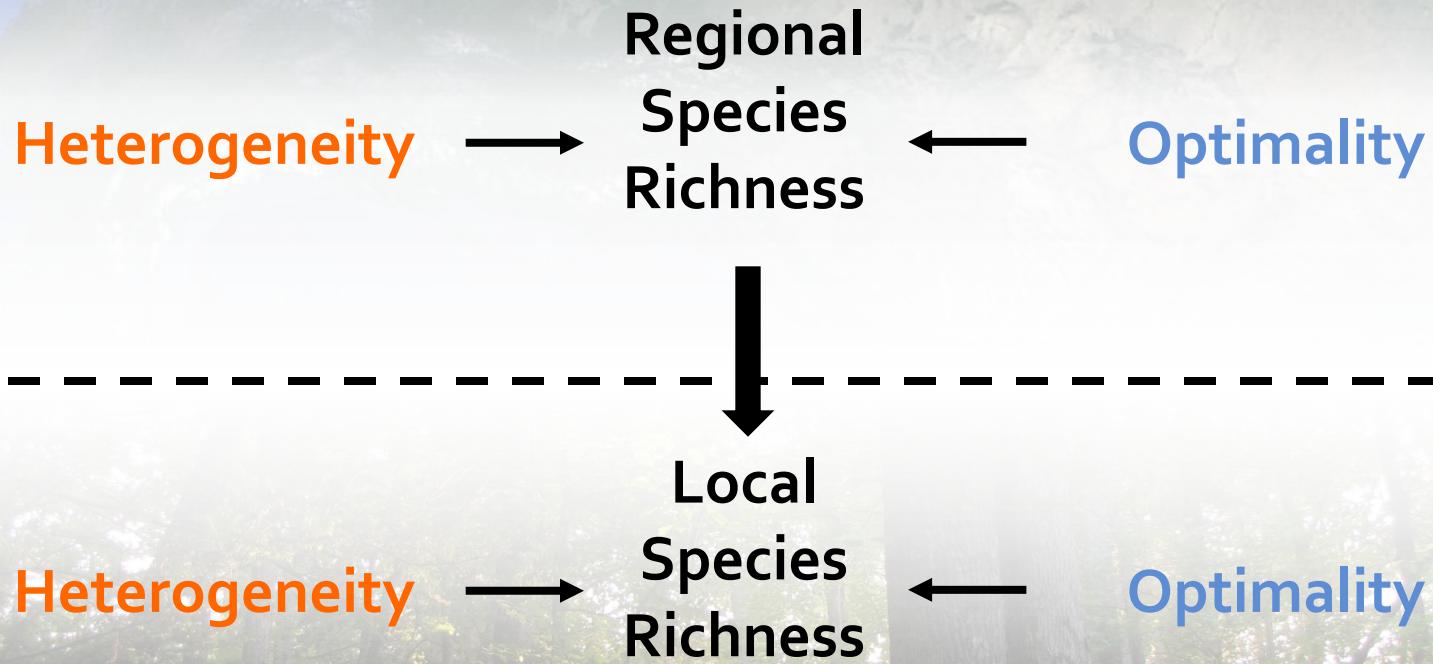
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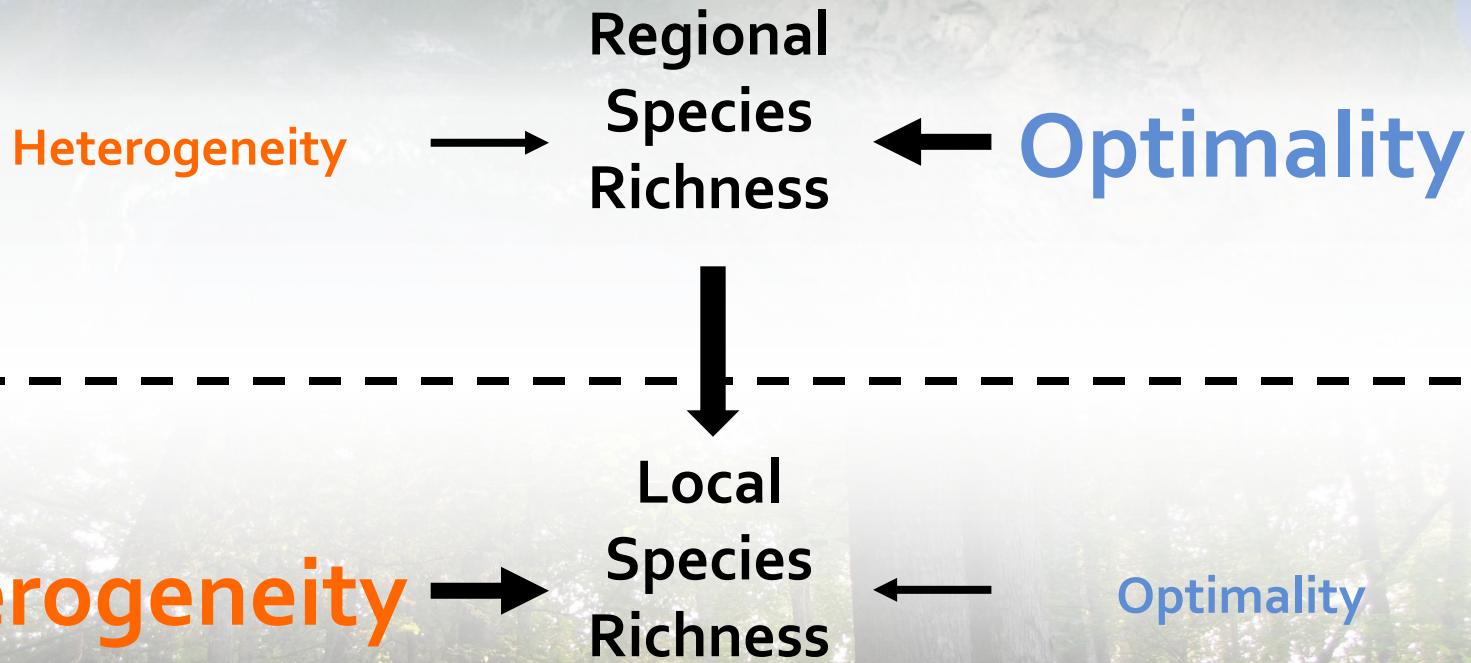


In which environments do we find more species?





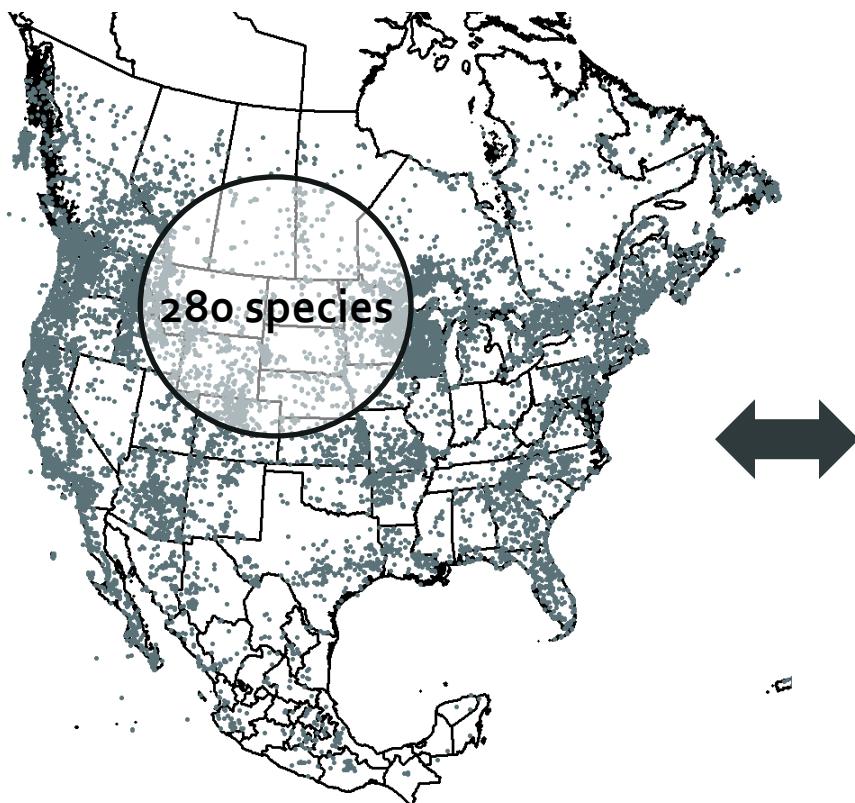






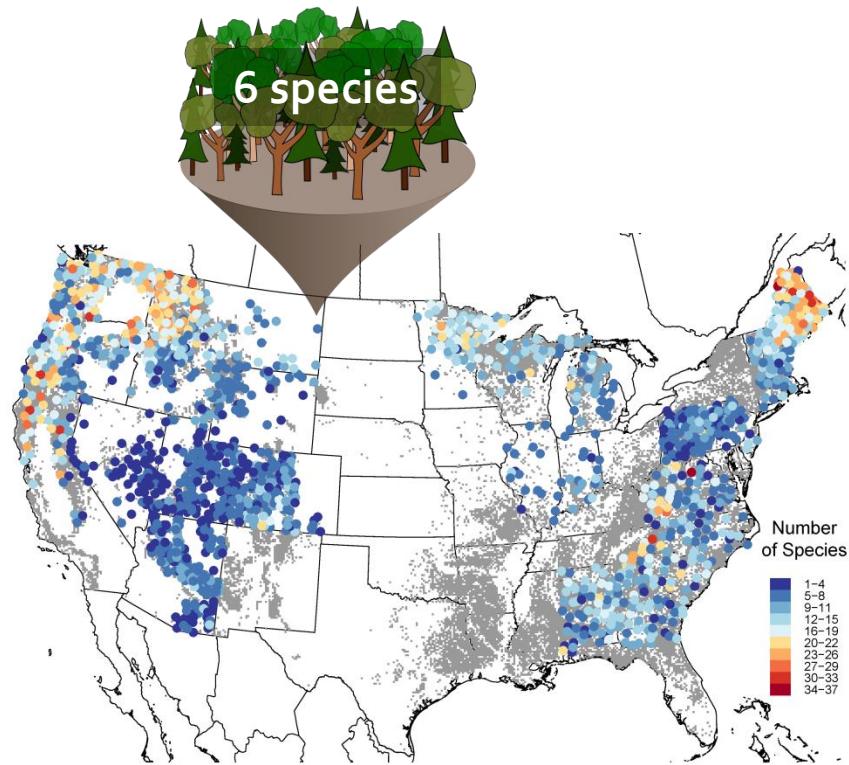
Species Richness = Heterogeneity + Optimality ?

Regional



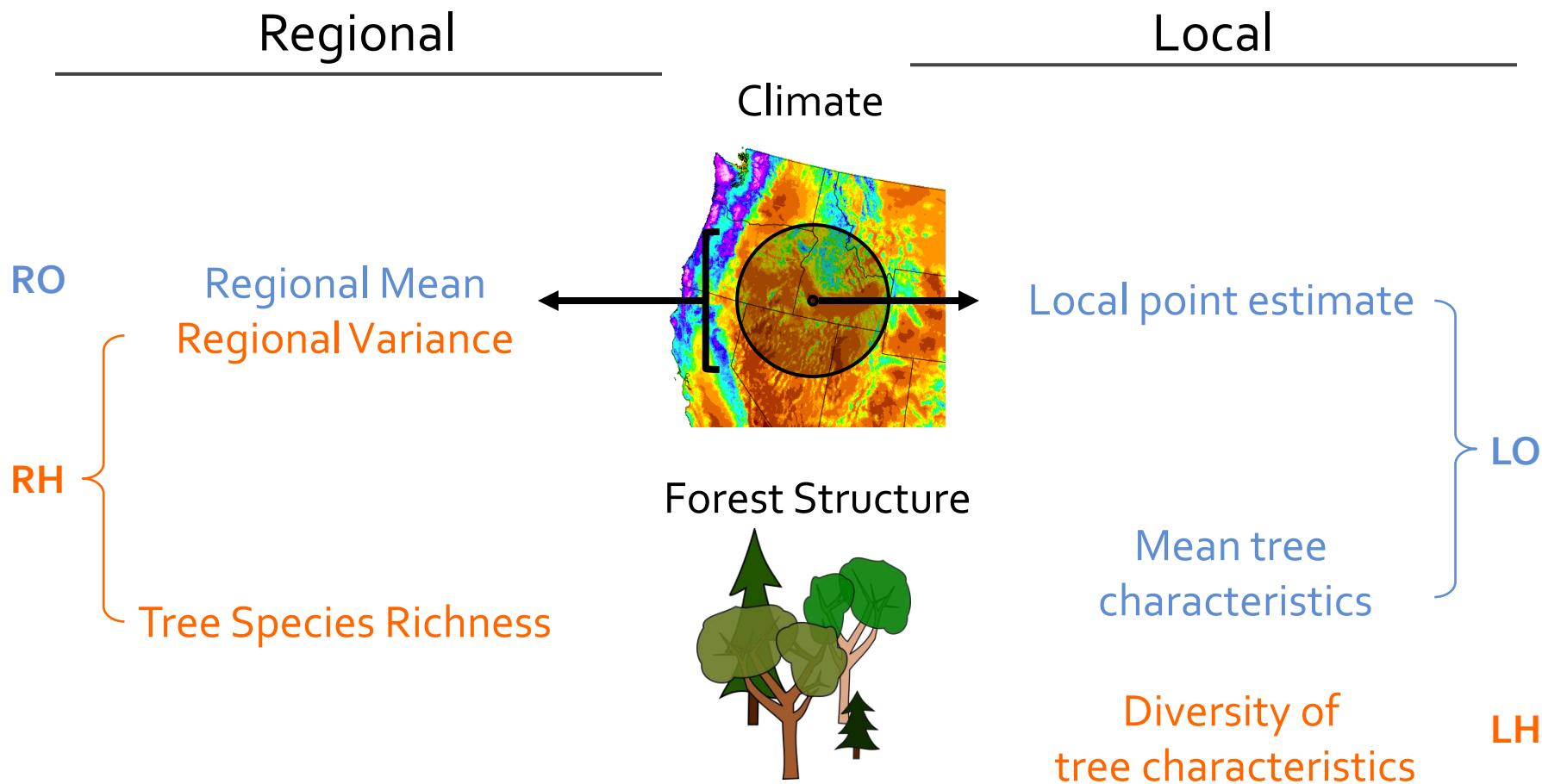
Collection Records
(148,161)

Local



Forest Surveys
(1,923)

Species Richness = Heterogeneity + Optimality ?



Species Richness = Heterogeneity + Optimality ?

Regional

SAR Models:

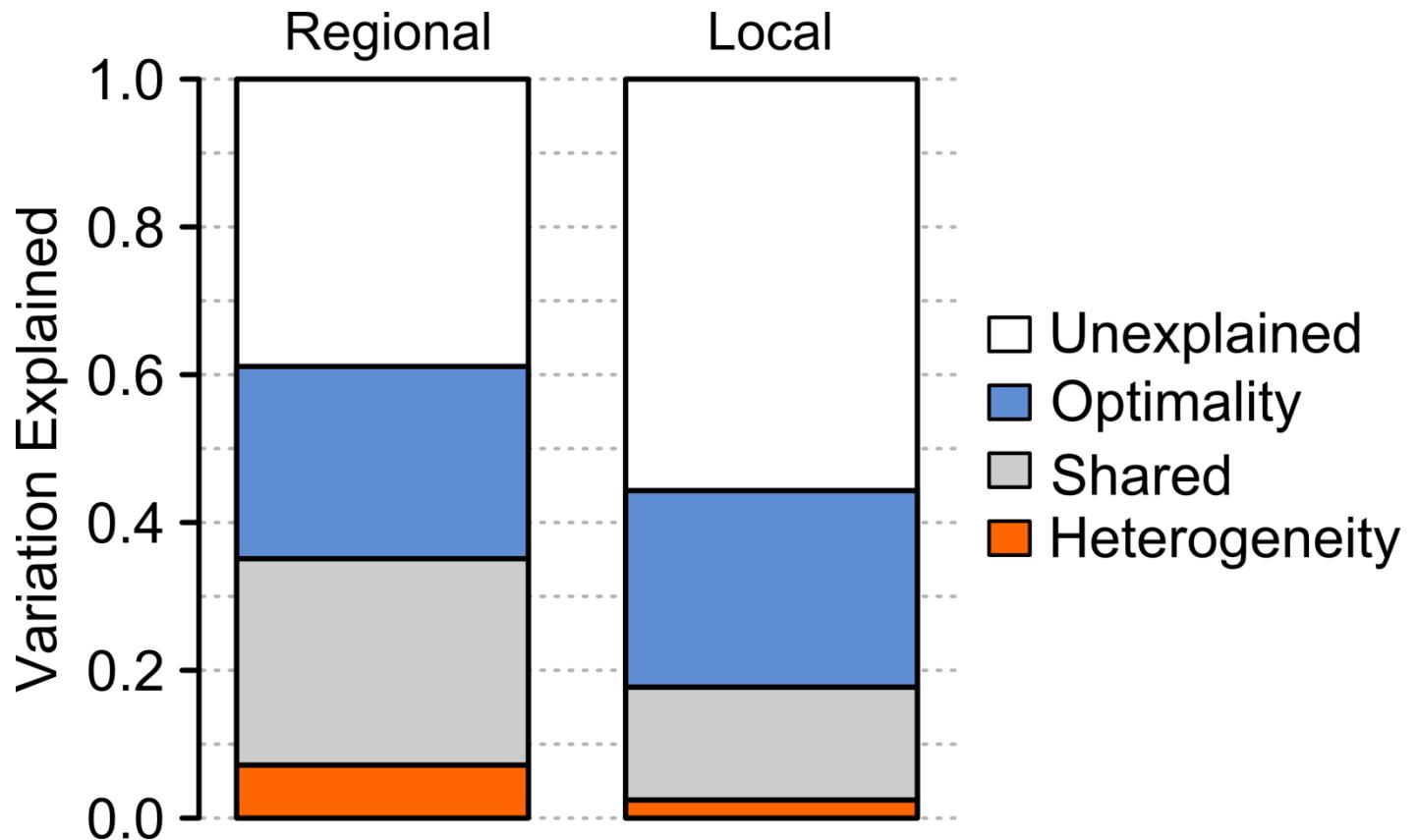
$$S_R = RH + RO$$

Local

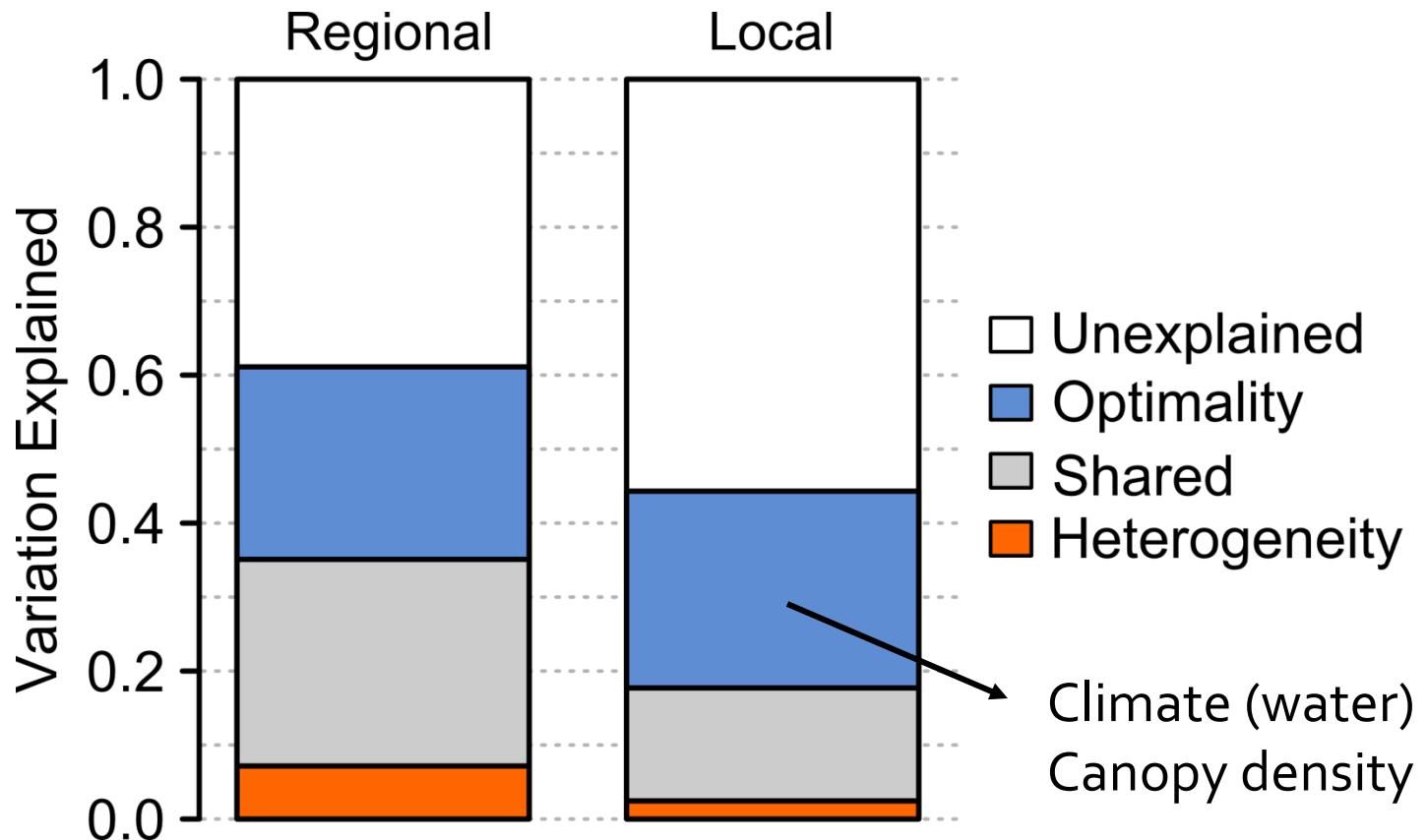
GLMs:

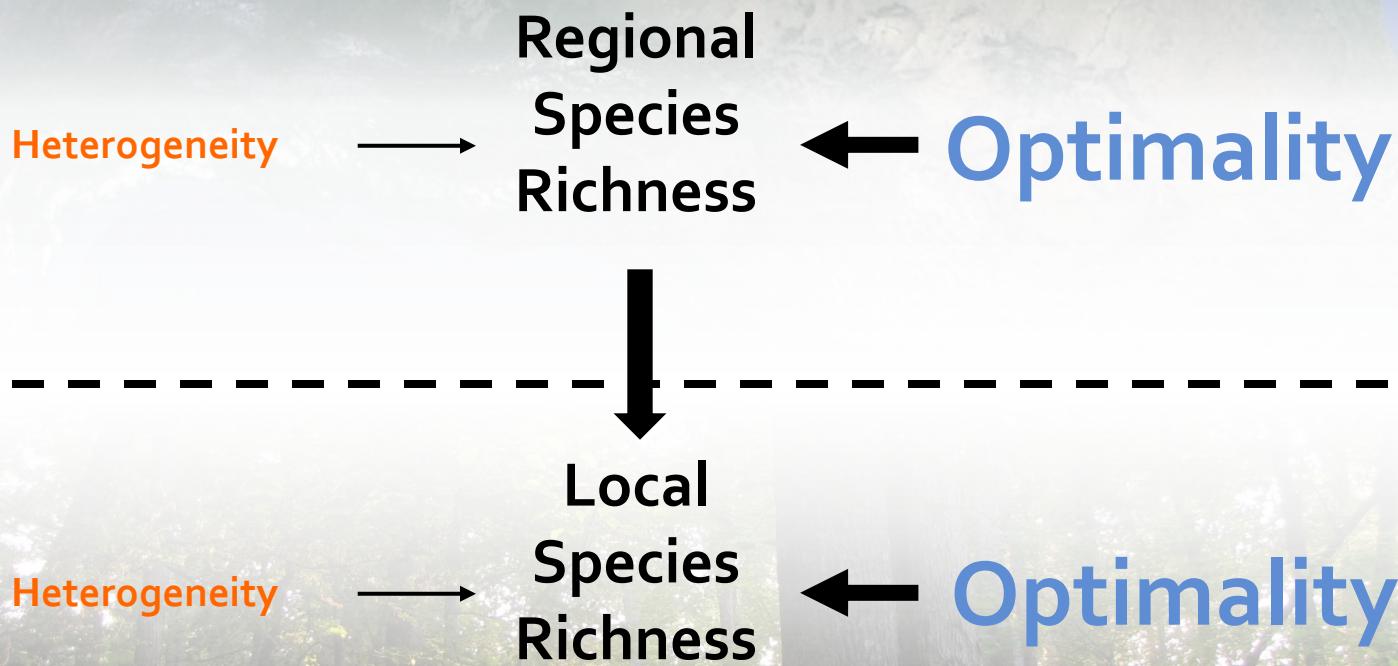
$$S_L = LH + LO$$

Species Richness = Heterogeneity + Optimality ?

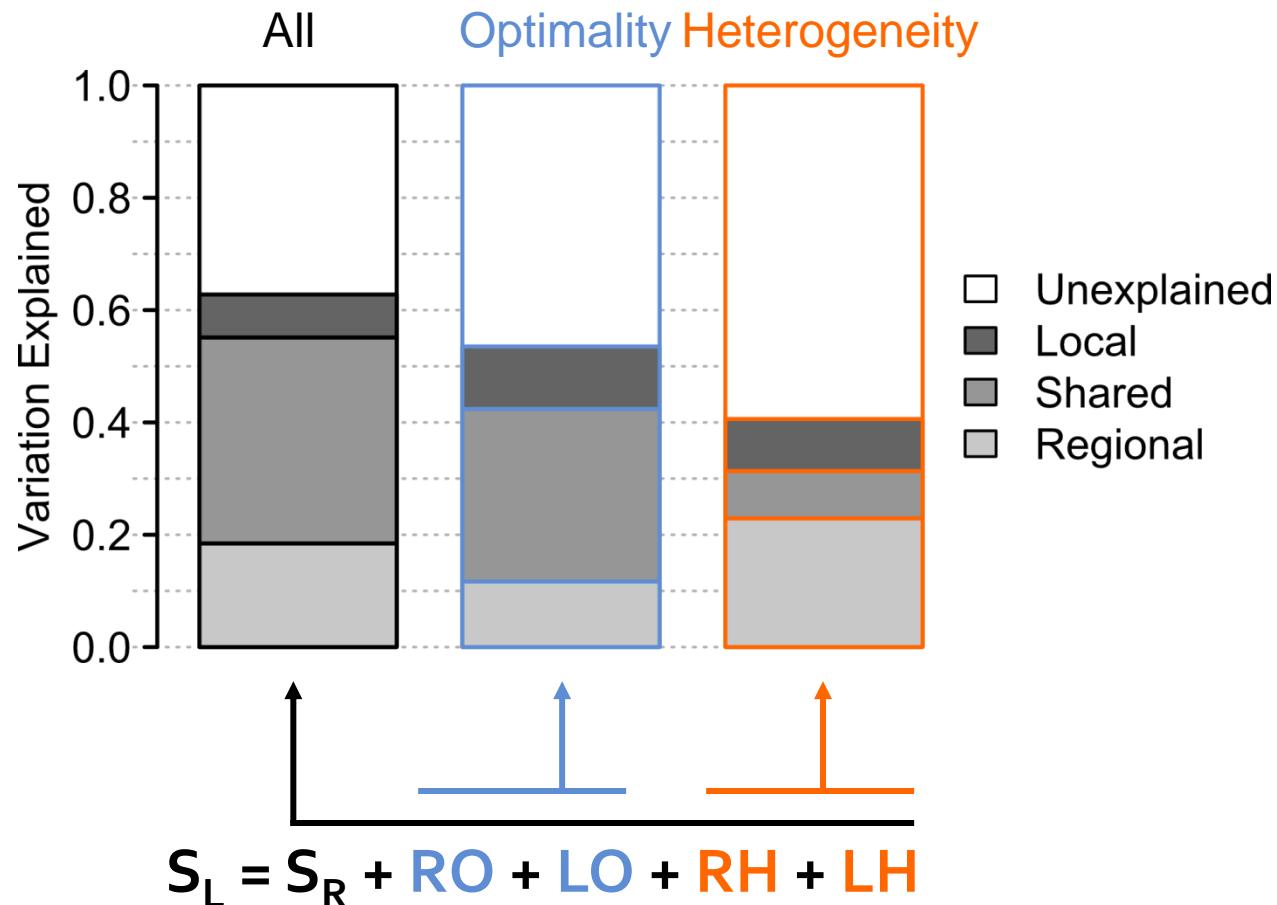


Species Richness = Heterogeneity + Optimality ?

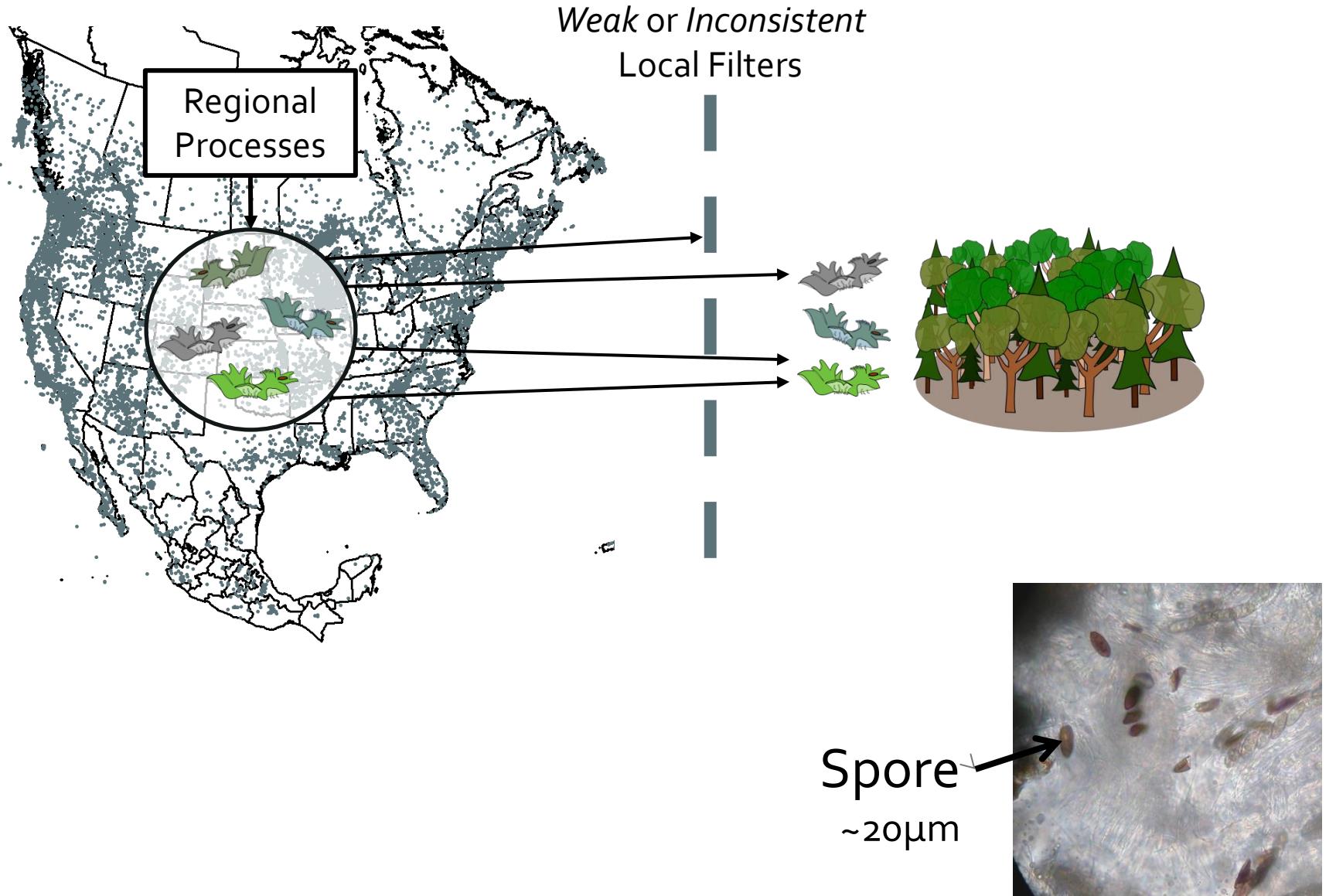




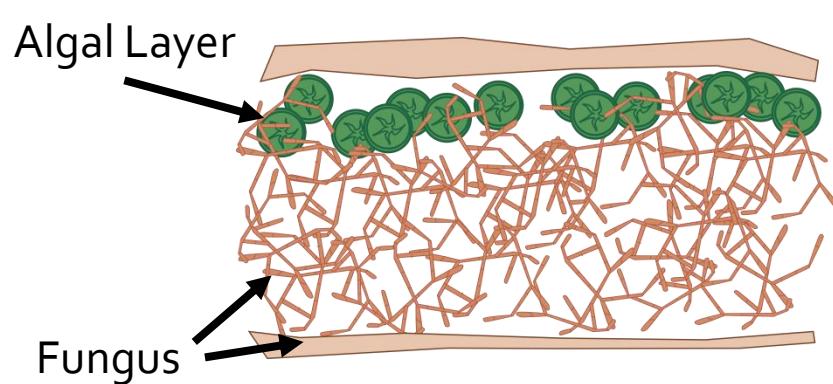
Regional processes \geq Local processes

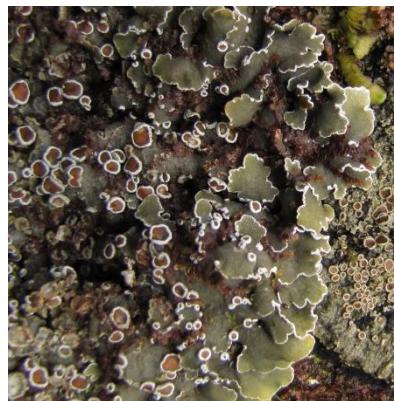
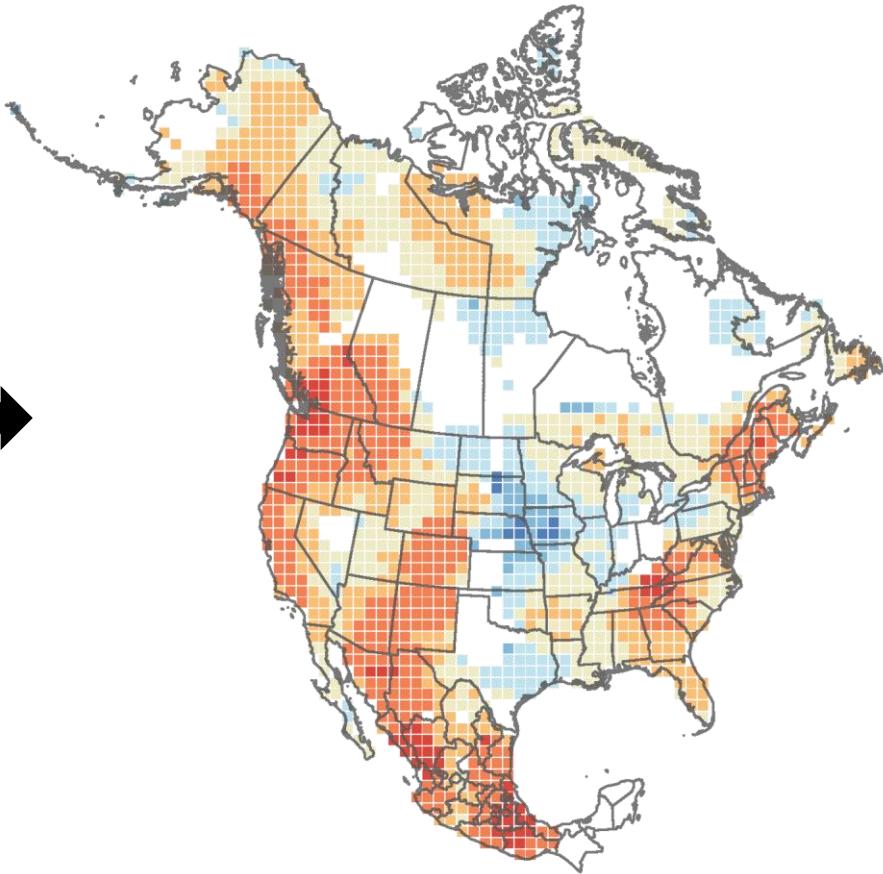
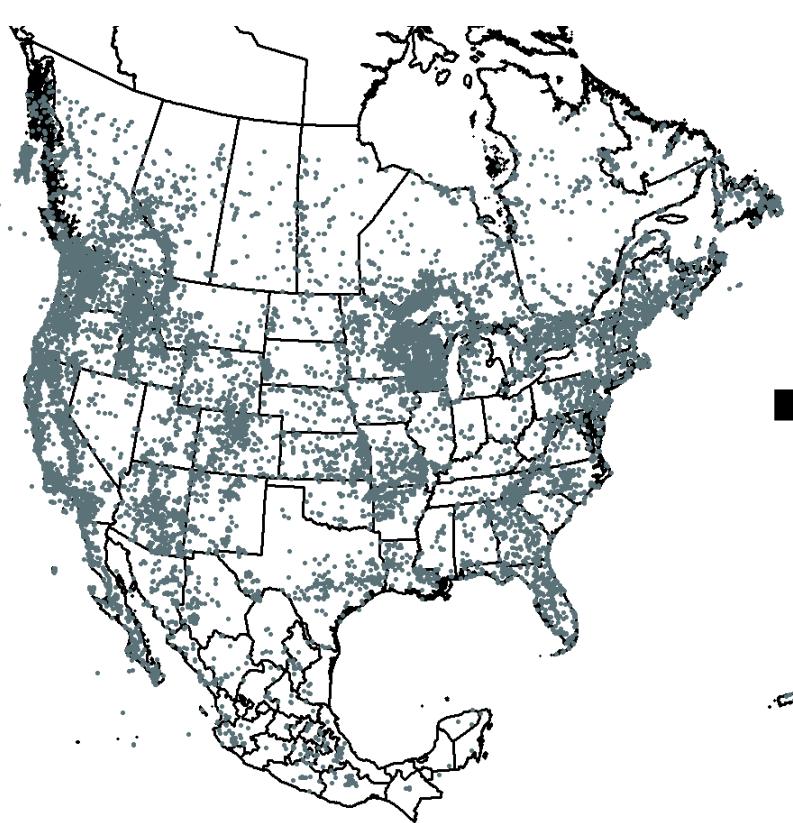


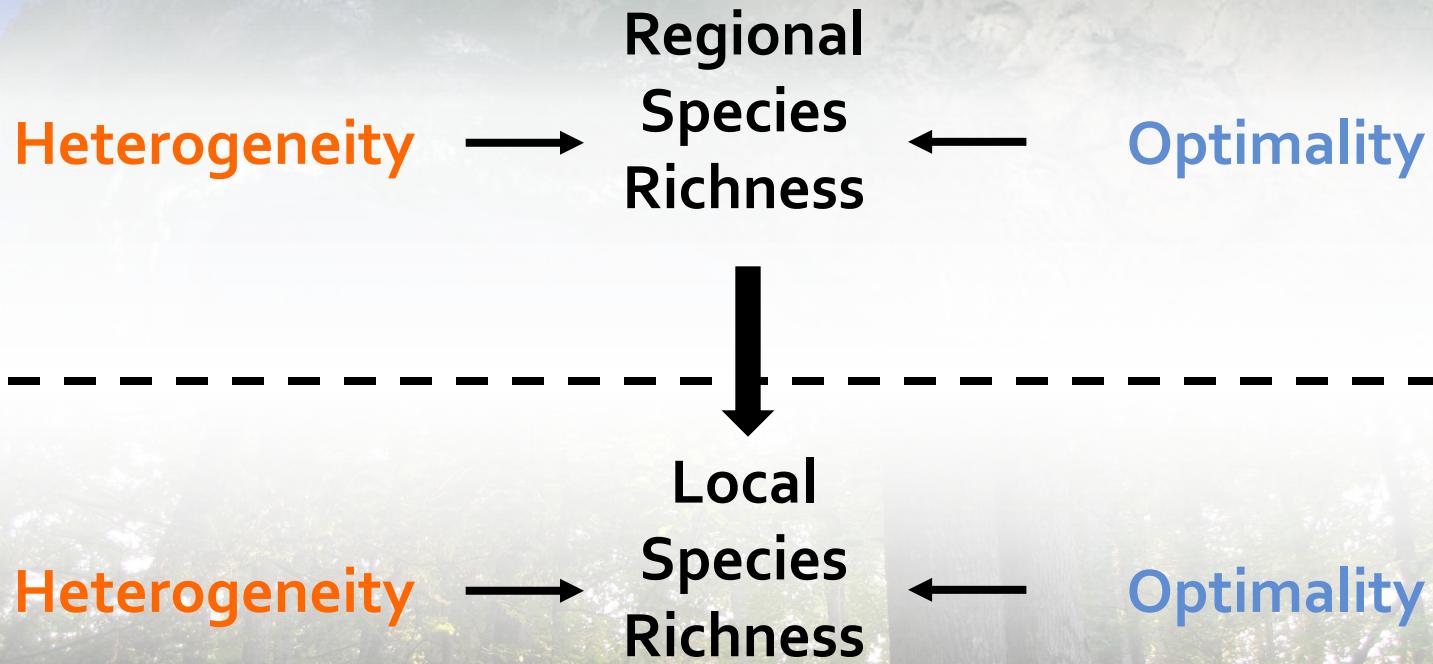
Conclusions



Conclusions









Acknowledging

Data Providers

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Sarah Jovan

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PRISM, WorldClim

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UNC Royster Fellows

NSF GRFP

Slides: doi: 10.6084/m9.figshare.2061912

Paper: doi: 10.1111/geb.12420

Regional Optimality

High precipitation-high RH (mean)
High precipitation-low RH (mean)
Precipitation seasonality (mean)
Isothermality (mean)
Mean annual temperature (mean)

Regional Heterogeneity

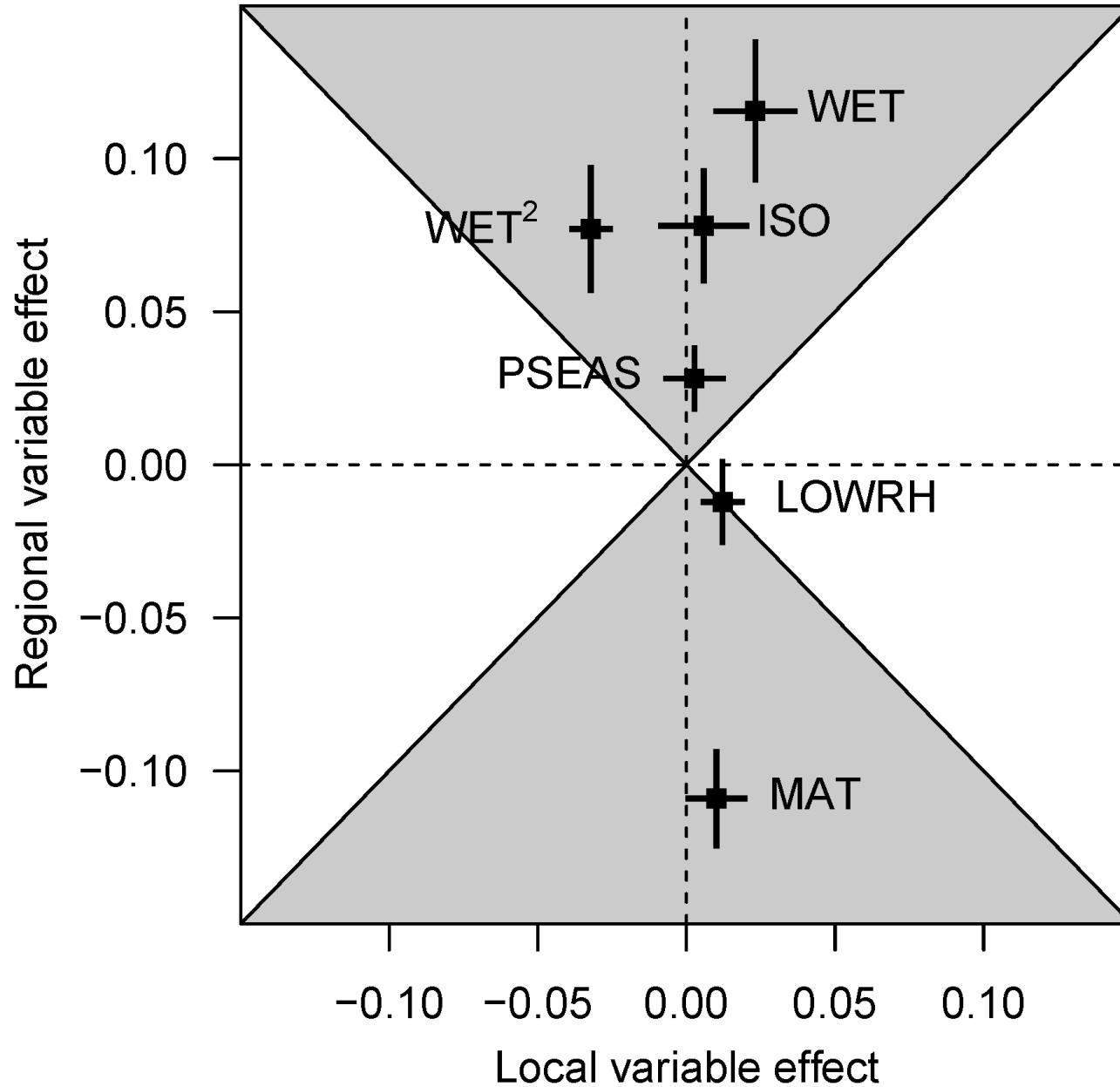
High precipitation-high RH (var)
High precipitation-low RH (var)
Precipitation seasonality (var)
Isothermality (var)
Mean annual temperature (var)
Regional tree species richness

Local Optimality

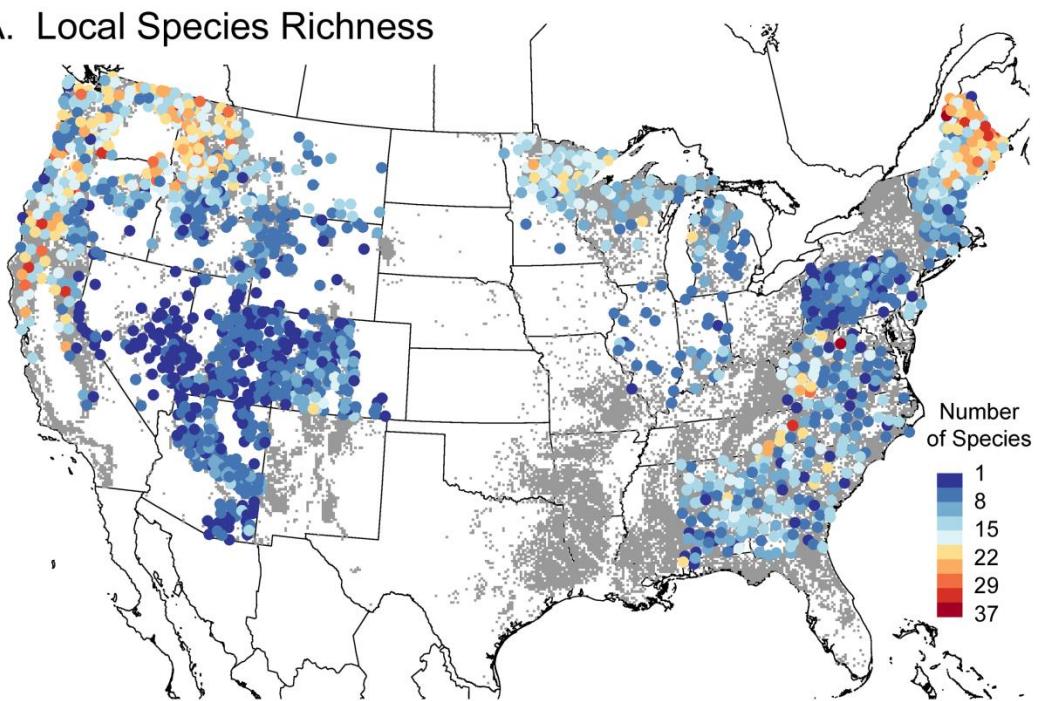
Mean bark moisture
Mean wood density
Large trees
Tree species diversity
Mean canopy density
Solar radiation
High precipitation-high RH
High precipitation-low RH
Precipitation seasonality
Isothermality
Mean annual temperature

Local Heterogeneity

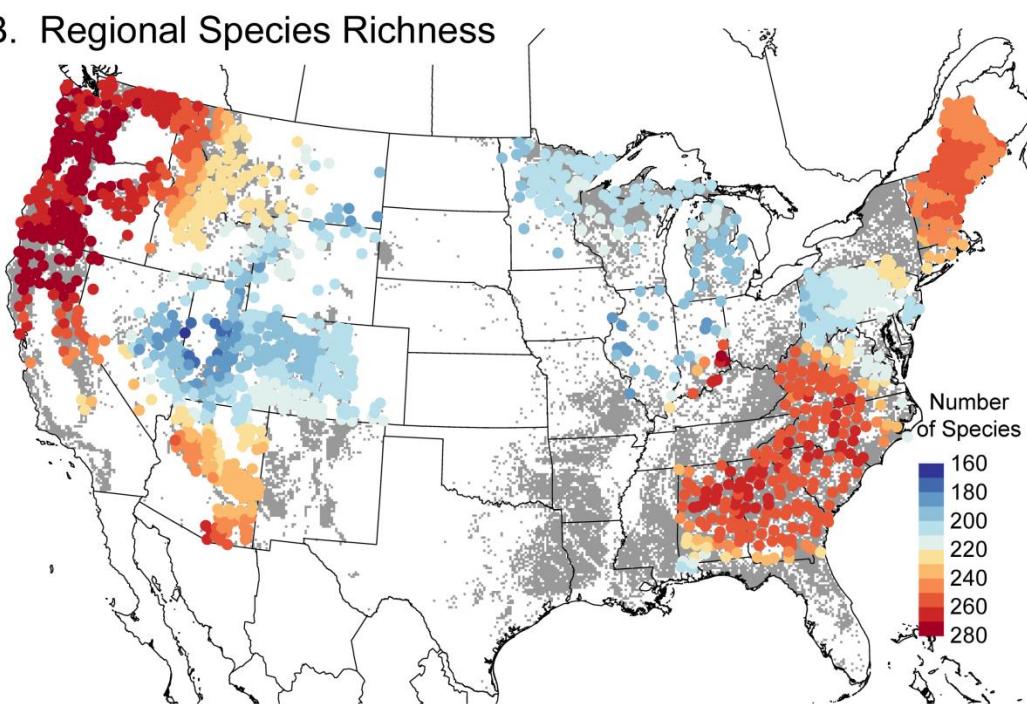
Bark moisture diversity
Wood density diversity
Tree size variation
Tree species composition
Canopy variability
% Trees dead



A. Local Species Richness



B. Regional Species Richness



Model-averaged effects of local variables on local richness

Predictor	Mode	Importance	Models	Estimate	SE
Mean canopy density	O	0.998	1539/1545	0.0528	0.0176
High precip - high RH	O	1.000	1545/1545	0.0380	0.0040
Solar radiation	O	1.000	1545/1545	0.0259	0.0149
Precip. seasonality	O	1.000	1545/1545	0.0229	0.0028
Wood density diversity	H	0.782	1181/1545	0.0211	0.0119
Bark moisture diversity	H	0.838	1266/1545	0.0188	0.0110
Mean wood density	O	1.000	1545/1545	-0.0172	0.0114
Mean annual temp.	O	1.000	1544/1545	-0.0111	0.0036
Tree diversity	H	0.581	949/1545	0.0081	0.0051
Tree composition	O	1.000	1545/1545	-0.0075	0.0027
Isothermality	O	0.597	882/1545	0.0064	0.0038
High precip - low RH	O	0.550	872/1545	0.0053	0.0035
Canopy variability	H	0.464	725/1545	0.0036	0.0026
Mean bark moisture	O	0.341	602/1545	-0.0033	0.0031
Large trees	O	0.269	487/1545	-0.0022	0.0025
Tree size variation	H	0.266	497/1545	0.0020	0.0024
% Trees dead	H	0.310	610/1545	0.0012	0.0039

Model-averaged effects of regional variables on regional richness

Predictor	Mode	Importance	Models	Estimate	SE
Isothermality (mean)	O	1.00	14/14	1.193	0.091
Mean annual temp. (mean)	O	1.00	14/14	-1.059	0.115
Precip. seasonality (mean)	O	1.00	14/14	0.580	0.103
High precip. - high RH (mean)	O	1.00	14/14	0.506	0.114
High precip. - low RH (mean)	O	1.00	14/14	0.403	0.080
High precip. - high RH (var.)	H	1.00	14/14	0.345	0.100
Reg. tree richness	H	1.00	14/14	0.320	0.091
Mean annual temp. (var.)	H	1.00	14/14	0.302	0.062
High precip. - low RH (var.)	H	1.00	14/14	-0.281	0.072
Isothermality (var.)	H	0.74	8/14	0.065	0.033
Precip. seasonality (var.)	H	0.33	7/14	0.021	0.074