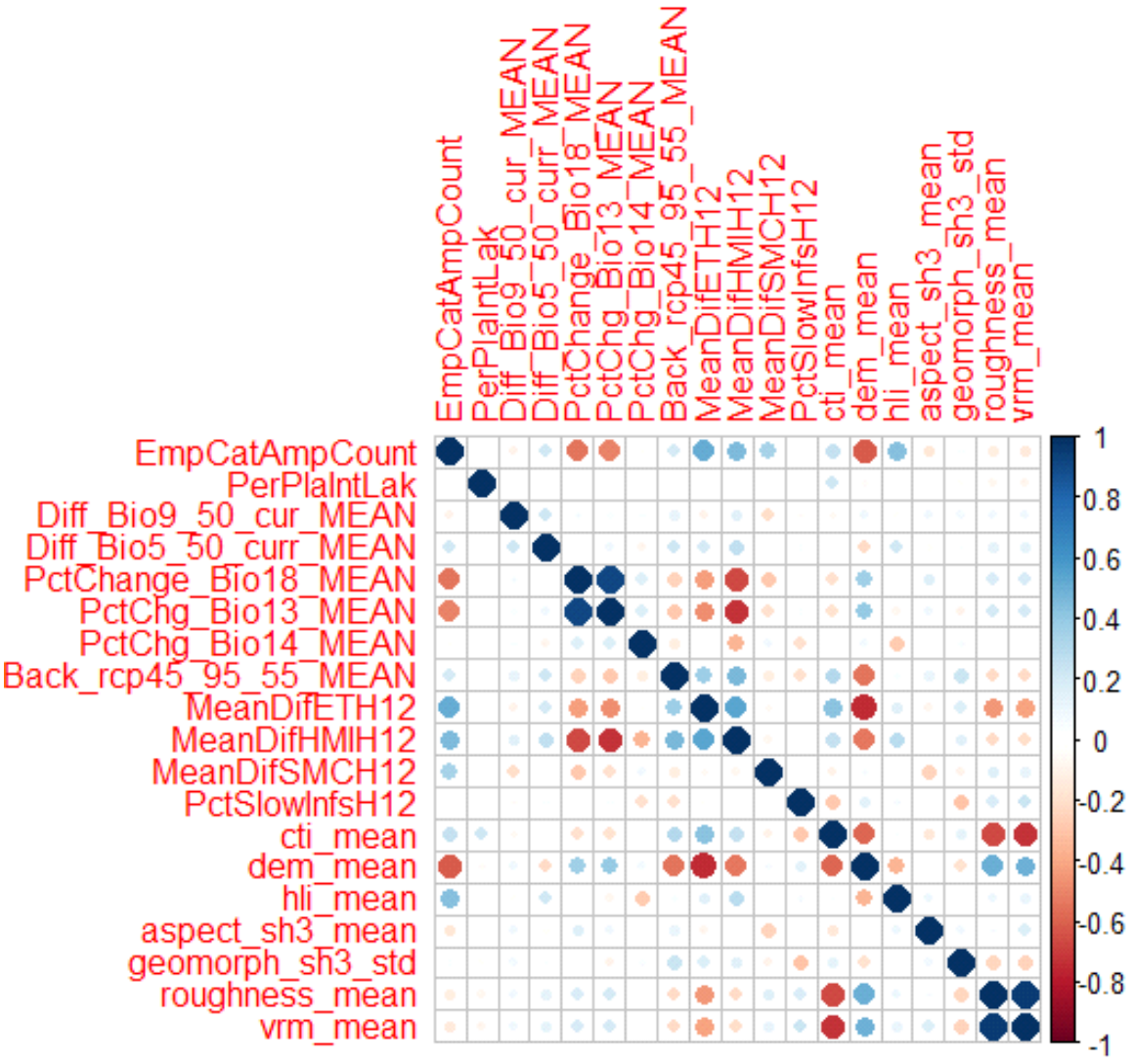
Correlations

Monday, January 6, 2025 3:50 PM

Pearson correlations between variables considered for assessment of ephemeral catchments



HMI, CTI, and DEM are correlated with other indicators. CTI seems the most important of these to keep.

FBBC

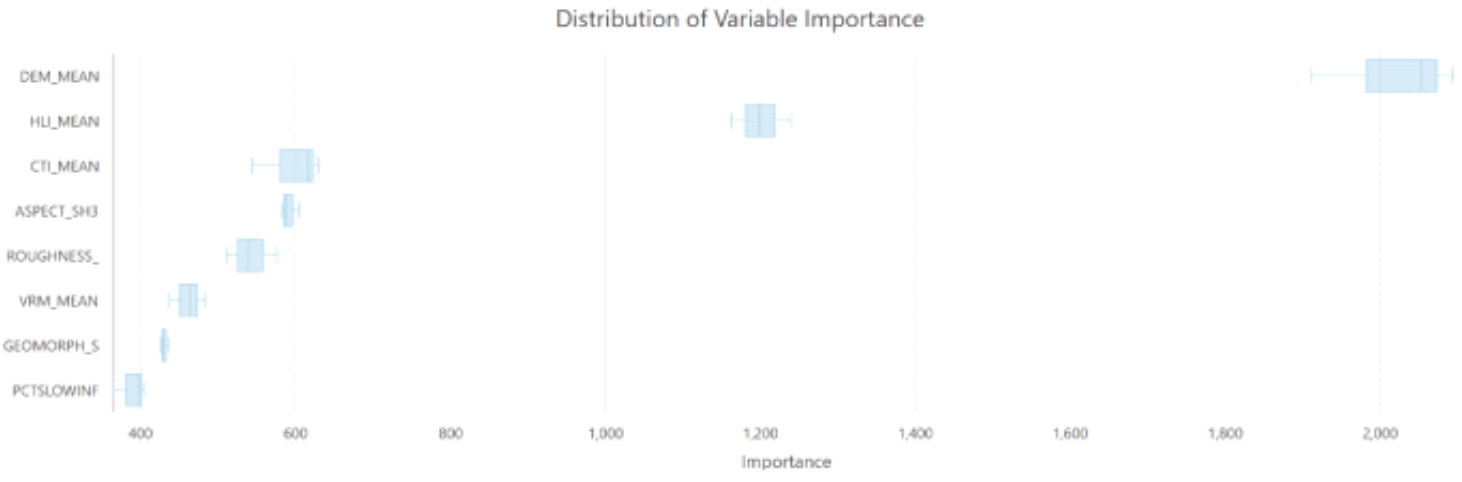
Monday, April 7, 2025 3:01 PM

Forest-Based and Boosted Classification results for ephemeral catchments. Lithology, soil, and topography variables were assessed for their ability to predict species richness and playa/intermittent lake coverage.

Predicting ephemeral-dependent amphibian species richness:

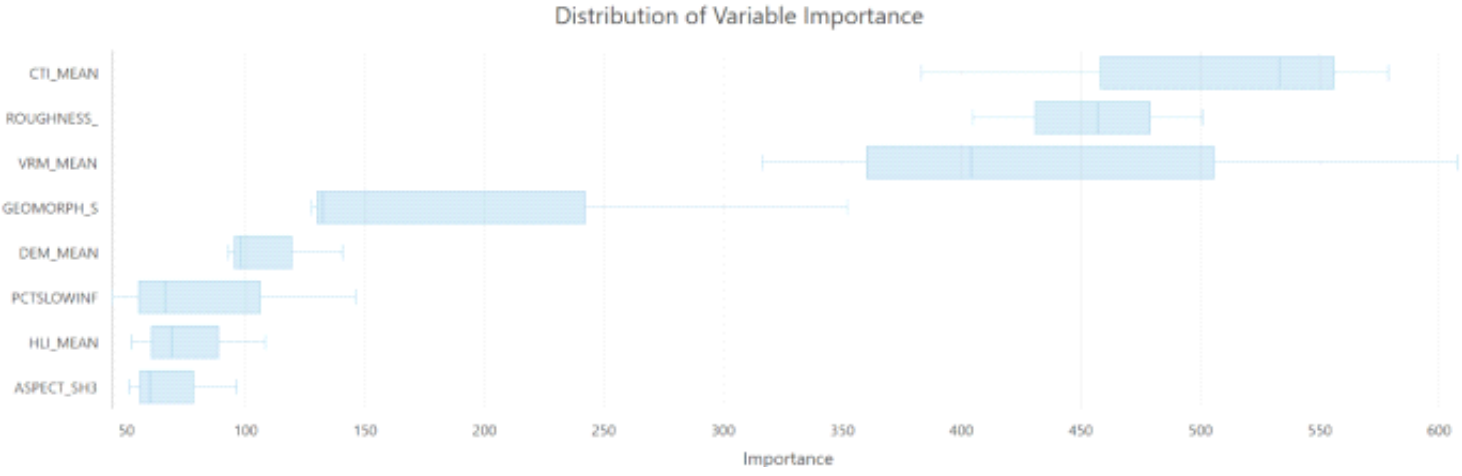
Top Variable Importance

Variable	Importance	%
dem_mean	2093.70	34
hli_mean	1162.08	19
aspect_sh3_mean	604.30	10
cti_mean	543.76	9
roughness_mean	538.86	9
vrm_mean	463.95	7
geomorph_sh3_std	425.92	7
PctSlowInfsH12	365.04	6



Predicting playa/intermittent lake coverage

Variable	Importance	%
vrm_mean	607.57	30
cti_mean	533.16	27
roughness_mean	456.93	23
geomorph_sh3_std	132.27	7
dem_mean	92.76	5
hli_mean	69.01	3
PctSlowInfsH12	66.17	3
aspect_sh3_mean	51.24	3



Exploratory Regression

Sunday, January 5, 2025 4:07 PM

Assessment of climate variables
Response variable: ephemeral catchment-dependent amphibian species richness

Choose 1 of 9 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.30	10850.67	0.00	0.00	1.00	0.00	-PCTCHANGE_BIO18_MEAN***
0.26	11017.67	0.00	0.00	1.00	0.00	+MEANDIFETH12***
0.25	11053.38	0.00	0.00	1.00	0.00	-PCTCHG_BIO13_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 2 of 9 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.40	10333.66	0.00	0.00	1.00	0.00	+MEANDIFETH12*** +MEANDIFSMCH12***
0.39	10391.31	0.00	0.00	1.22	0.00	-PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12***
0.35	10594.70	0.00	0.00	1.01	0.00	+MEANDIFHMIH12*** +MEANDIFSMCH12***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 3 of 9 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.47	9984.15	0.00	0.00	1.38	0.00	-PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***
0.46	10038.39	0.00	0.00	1.43	0.00	+MEANDIFETH12*** +MEANDIFHMIH12*** +MEANDIFSMCH12***
0.45	10098.56	0.00	0.00	1.38	0.00	-PCTCHG_BIO13_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 4 of 9 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.49	9859.10	0.00	0.00	1.41	0.00	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***
0.48	9933.19	0.00	0.00	2.38	0.00	-PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFHMIH12*** +MEANDIFSMCH12***
0.47	9947.80	0.00	0.00	1.46	0.00	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHG_BIO13_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 5 of 9 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.49	9848.26	0.00	0.00	2.73	0.00	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFHMIH12*** +MEANDIFSMCH12***
0.49	9858.69	0.00	0.00	1.42	0.00	-DIFF_BIO9_50_CUR_MEAN* +DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***
0.49	9859.01	0.00	0.00	1.49	0.00	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +PCTCHG_BIO14_MEAN +MEANDIFETH12*** +MEANDIFSMCH12***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Writing Results to Output Table....

Exploratory Regression Global Summary (EMPCATAMPCOUNT)

Percentage of Search Criteria Passed

Search Criterion	Cutoff	Trials	# Passed	% Passed
Min Adjusted R-Squared	> 0.50	381	0	0.00
Max Coefficient p-value	< 0.05	381	246	64.57
Max VIF Value	< 7.50	381	375	98.43
Min Jarque-Bera p-value	> 0.10	381	0	0.00
Min Spatial Autocorrelation p-value	> 0.10	18	0	0.00

Summary of Variable Significance

Variable	% Significant	% Negative	% Positive
DIFF_BIO5_50_CURR_MEAN	100.00	0.00	100.00
PCTCHANGE_BIO18_MEAN	100.00	100.00	0.00
MEANDIFETH12	100.00	0.00	100.00
MEANDIFSMCH12	100.00	0.00	100.00
MEANDIFHMIH12	92.02	5.52	94.48
PCTCHG_BIO13_MEAN	90.18	79.14	20.86
DIFF_BIO9_50_CUR_MEAN	86.50	92.02	7.98
PCTCHG_BIO14_MEAN	82.82	19.02	80.98
BACK_RCP45_95_55_MEAN	55.21	33.74	66.26

Summary of Multicollinearity

Variable	VIF	Violations	Covariates
DIFF_BIO9_50_CUR_MEAN	1.18	0	--------
DIFF_BIO5_50_CURR_MEAN	1.42	0	--------
PCTCHANGE_BIO18_MEAN	6.58	0	--------
PCTCHG_BIO13_MEAN	8.34	6	--------
PCTCHG_BIO14_MEAN	1.26	0	--------
BACK_RCP45_95_55_MEAN	1.34	0	--------
MEANDIFETH12	1.64	0	--------
MEANDIFHMIH12	3.58	0	--------
MEANDIFSMCH12	1.32	0	--------

Summary of Residual Normality (JB)

JB	AdjR2	AICc	K(BP)	VIF	SA	Model
0.000001	0.398867	10369.006193	0.000000	7.079497	0.000000	-PCTCHANGE_BIO18_MEAN*** +PCTCHG_BIO13_MEAN*** -BACK_RCP45_95_55_MEAN** +MEANDIFETH12*** +MEANDIFHMIH12**
0.000000	0.398415	10370.386572	0.000000	7.074590	0.000000	-PCTCHANGE_BIO18_MEAN*** +PCTCHG_BIO13_MEAN*** +MEANDIFETH12*** +MEANDIFHMIH12
0.000000	0.398080	10372.158244	0.000000	6.358657	0.000000	-PCTCHANGE_BIO18_MEAN*** +PCTCHG_BIO13_MEAN*** -BACK_RCP45_95_55_MEAN +MEANDIFETH12***

Summary of Residual Spatial Autocorrelation (SA)

SA	AdjR2	AICc	JB	K(BP)	VIF	Model
0.000000	0.489748	9848.259831	0.000000	0.000000	2.728427	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFHMIH12*** +MEANDIFSMCH12***
0.000000	0.488070	9858.693831	0.000000	0.000000	1.421514	-DIFF_BIO9_50_CUR_MEAN* +DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +MEANDIFETH12*** +MEANDIFSMCH12***
0.000000	0.488019	9859.005765	0.000000	0.000000	1.490374	+DIFF_BIO5_50_CURR_MEAN*** -PCTCHANGE_BIO18_MEAN*** +PCTCHG_BIO14_MEAN +MEANDIFETH12*** +MEANDIFSMCH12***

Table Abbreviations

AdjR2	Adjusted R-Squared
AICc	Akaike's Information Criterion
JB	Jarque-Bera p-value
K(BP)	Koenker (BP) Statistic p-value
VIF	Max Variance Inflation Factor
SA	Global Moran's I p-value
Model	Variable sign (+/-)

Assessment of lithology/soil/topography variables
Response variable: ephemeral catchment-dependent amphibian species richness

Choose 1 of 8 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.38	10461.56	0.00	0.00	1.00	0.00	-DEM_MEAN***
0.19	11311.47	0.00	0.00	1.00	0.00	+HLI_MEAN***
0.06	11771.34	0.00	0.16	1.00	0.00	+CTI_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 2 of 8 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.44	10169.01	0.00	0.00	1.14	0.00	-DEM_MEAN*** +HLI_MEAN***
0.43	10216.15	0.00	0.00	1.35	0.00	-DEM_MEAN*** +ROUGHNESS_MEAN***
0.41	10300.36	0.00	0.00	1.32	0.00	-DEM_MEAN*** +VRM_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 3 of 8 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.47	9962.23	0.00	0.00	1.16	0.00	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN***
0.46	10038.86	0.00	0.00	1.35	0.00	-DEM_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.46	10053.14	0.00	0.00	1.73	0.00	-DEM_MEAN*** +HLI_MEAN*** +ROUGHNESS_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 4 of 8 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.49	9827.56	0.00	0.00	1.73	0.00	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.49	9851.08	0.00	0.00	1.70	0.00	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +VRM_MEAN***
0.48	9877.15	0.00	0.00	1.82	0.00	-CTI_MEAN*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Choose 5 of 8 Summary

Highest Adjusted R-Squared Results

AdjR2	AICc	JB	K(BP)	VIF	SA	Model
0.50	9811.99	0.00	0.00	2.17	0.00	-CTI_MEAN*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.49	9816.52	0.00	0.00	1.74	0.00	+PCTSLOWINFSH12*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.49	9826.79	0.00	0.00	1.74	0.00	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** -GEOMORPH_SH3_STD** +ROUGHNESS_MEAN***

Passing Models

AdjR2	AICc	JB	K(BP)	VIF	SA	Model

Writing Results to Output Table....

Exploratory Regression Global Summary (EMPCATAMPCOUNT)

Percentage of Search Criteria Passed

Search Criterion	Cutoff	Trials	# Passed	% Passed
Min Adjusted R-Squared	> 0.50	218	0	0.00
Max Coefficient p-value	< 0.05	218	133	61.01
Max VIF Value	< 7.50	218	176	80.73
Min Jarque-Bera p-value	> 0.10	218	0	0.00
Min Spatial Autocorrelation p-value	> 0.10	18	0	0.00

Summary of Variable Significance

Variable	% Significant	% Negative	% Positive
DEM_MEAN	100.00	100.00	0.00
HLI_MEAN	100.00	0.00	100.00
ASPECT_SH3_MEAN	100.00	100.00	0.00
CTI_MEAN	92.93	42.42	57.58
VRM_MEAN	85.86	60.61	39.39
ROUGHNESS_MEAN	81.82	31.31	68.69
PCTSLOWINFSH12	69.70	9.09	90.91
GEOMORPH_SH3_STD	56.57	48.48	51.52

Summary of Multicollinearity

Variable	VIF	Violations	Covariates
PCTSLOWINFSH12	1.20	0	--------
CTI_MEAN	2.65	0	--------
DEM_MEAN	2.01	0	--------
HLI_MEAN	1.32	0	--------
ASPECT_SH3_MEAN	1.26	0	--------
GEOMORPH_SH3_STD	1.18	0	--------
ROUGHNESS_MEAN	14.71	42	VRM_MEAN (97.67)
VRM_MEAN	17.23	42	ROUGHNESS_MEAN (97.67)

Summary of Residual Normality (JB)

JB	AdjR2	AICc	K(BP)	VIF	SA	Model
0.000000	0.474708	9940.550039	0.000000	1.216772	0.000000	+PCTSLOWINFSM12*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** -GEOMORPH_SH3_STD***
0.000000	0.472455	9953.138958	0.000000	1.196375	0.000000	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** -GEOMORPH_SH3_STD***
0.000000	0.474123	9943.078104	0.000000	1.183929	0.000000	+PCTSLOWINFSM12*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN***

Summary of Residual Spatial Autocorrelation (SA)

SA	AdjR2	AICc	JB	K(BP)	VIF	Model
0.000000	0.495540	9811.992116	0.000000	0.000000	2.168325	-CTI_MEAN*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.000000	0.494821	9816.517374	0.000000	0.000000	1.743373	+PCTSLOWINFSM12*** -DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** +ROUGHNESS_MEAN***
0.000000	0.493185	9826.786263	0.000000	0.000000	1.740200	-DEM_MEAN*** +HLI_MEAN*** -ASPECT_SH3_MEAN*** -GEOMORPH_SH3_STD** +ROUGHNESS_MEAN***

Table Abbreviations

AdjR2	Adjusted R-Squared
AICc	Akaike's Information Criterion
JB	Jarque-Bera p-value
K(BP)	Koenker (BP) Statistic p-value
VIF	Max Variance Inflation Factor
SA	Global Moran's I p-value
Model	Variable sign (+/-)
Model	Variable significance (* = 0.10; ** = 0.05; *** = 0.01)

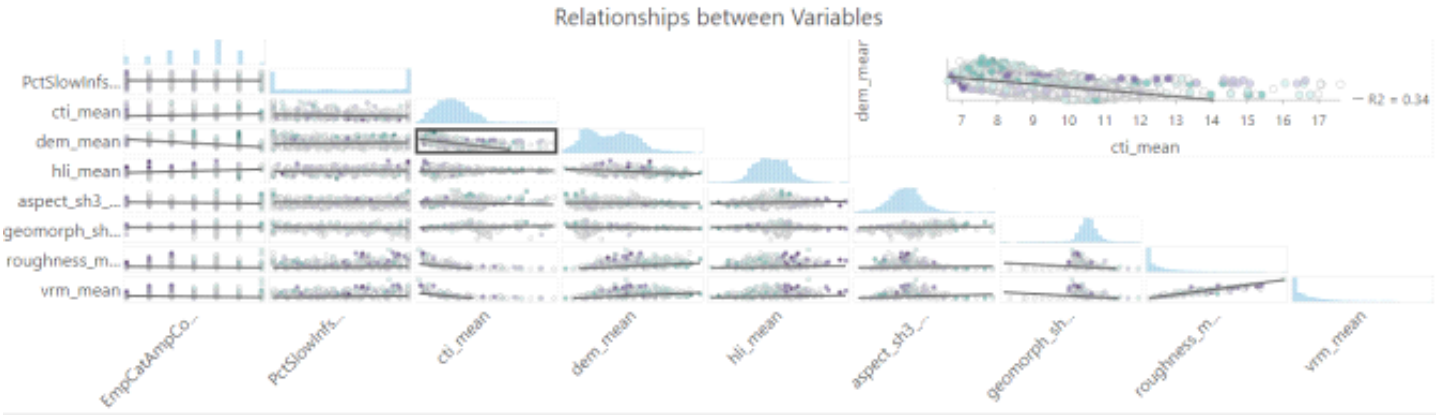
Generalized Linear Regression assessment of soil and topography variables
Response variable: ephemeral catchment-dependent amphibian species richness

Summary of GLR Results [Model Type: Continuous (Gaussian/OLS)]

Variable	Coefficient[a]	StdError	t-Statistic	Probability[b]	Robust_SE	Robust_t	Robust_Pr[b]	VIF[c]
Intercept	2.783571	0.842691	3.303192	0.000983*	1.010043	2.755893	0.005887*	--------
PCTSLOWINFSH12	0.001601	0.000604	2.652420	0.008027*	0.000590	2.712892	0.006705*	1.202592
CTI_MEAN	-0.116293	0.024253	-4.795001	0.000003*	0.023297	-4.991745	0.000001*	2.713782
DEM_MEAN	-0.002437	0.000065	-37.509284	0.000000*	0.000070	-34.587962	0.000000*	2.039322
HLI_MEAN	12.729785	0.869938	14.632983	0.000000*	1.098588	11.587405	0.000000*	1.320437
ASPECT_SH3_MEAN	-2.379449	0.185717	-12.812198	0.000000*	0.166560	-14.285860	0.000000*	1.263979
GEOMORPH_SH3_STD	-0.766106	0.477325	-1.604997	0.108608	0.342636	-2.235920	0.025410*	1.200702
ROUGHNESS_MEAN	0.020870	0.003248	6.425238	0.000000*	0.003920	5.324672	0.000000*	15.047998
VRM_MEAN	-135.292201	36.470496	-3.709634	0.000224*	41.213703	-3.282699	0.001056*	17.758709

GLR Diagnostics

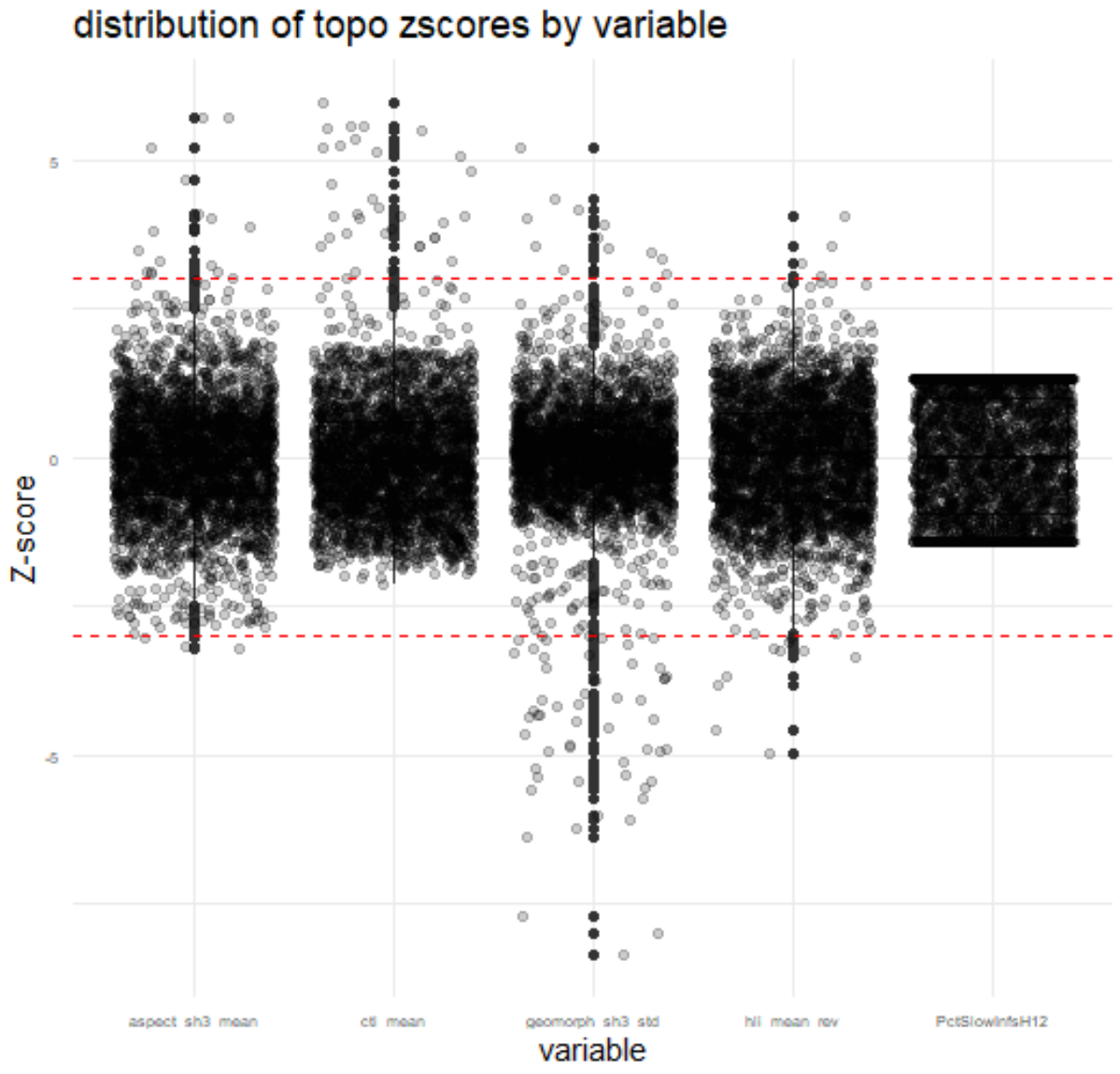
Input Features	HUC12sEphCatAmphs20250103	Dependent Variable	EMPCATAMPCOUNT
Number of Observations	3177	Akaike's Information Criterion (AICc)[d]	9795.163993
Multiple R-Squared[d]	0.499945	Adjusted R-Squared[d]	0.498683
Joint F-Statistic[e]	395.913651	Prob(>F), (8,3168) degrees of freedom	0.000000*
Joint Wald Statistic[e]	3301.913563	Prob(>chi-squared), (8) degrees of freedom	0.000000*
Koenker (BP) Statistic[f]	350.502329	Prob(>chi-squared), (8) degrees of freedom	0.000000*
Jarque-Bera Statistic[g]	63.928502	Prob(>chi-squared), (2) degrees of freedom	0.000000*

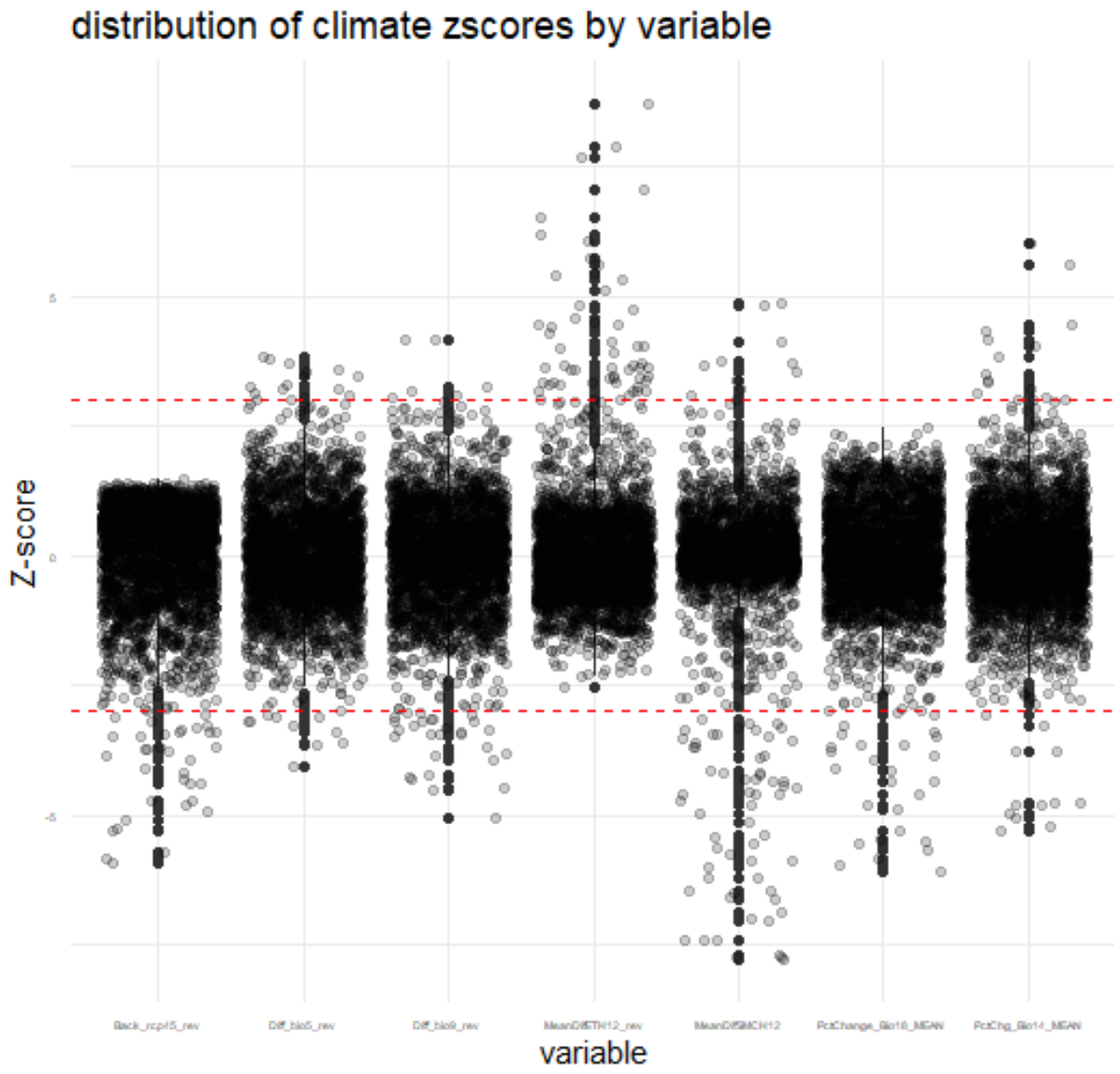


Z Scores

Monday, January 6, 2025 4:22 PM

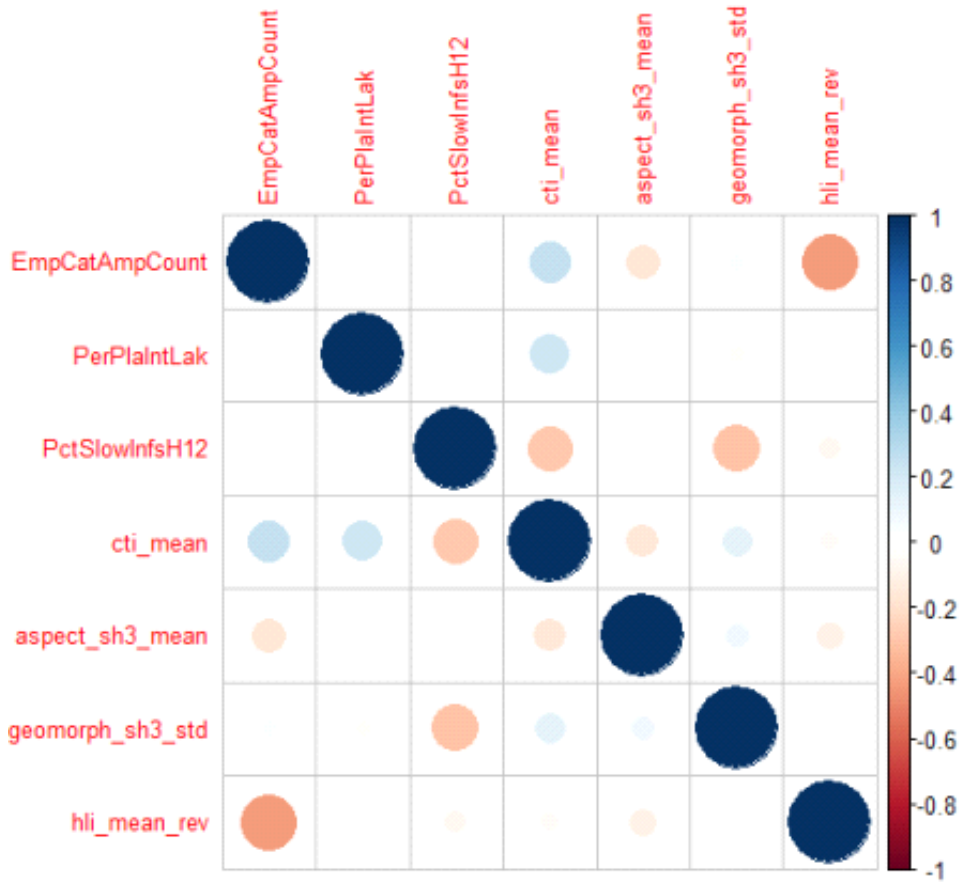
Distribution of Z scores calculated for lithology, soil, and topography indicators of refugia for ephemeral catchments

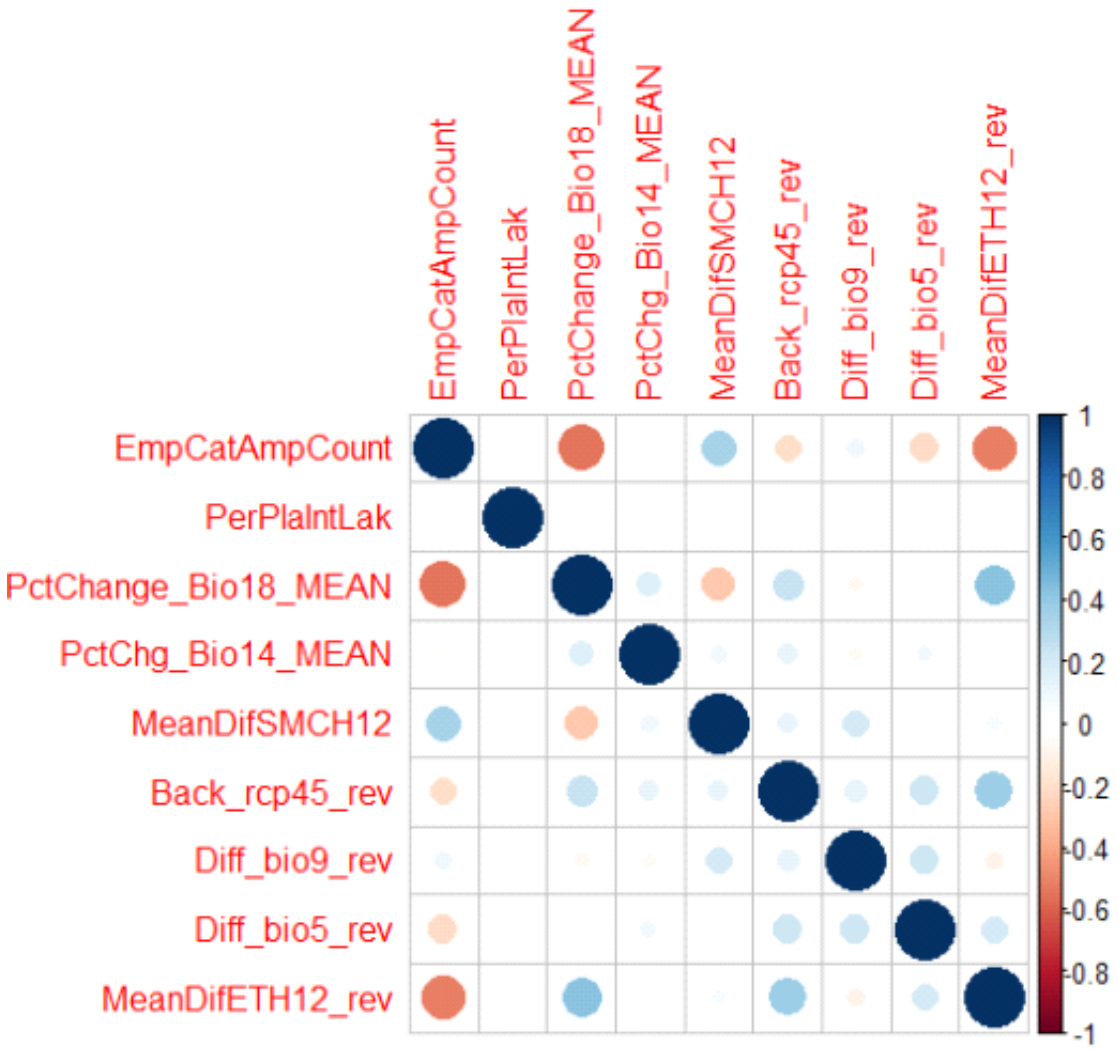




Distribution of Z scores calculated for climate indicators of refugia for ephemeral catchments

Pearson correlations among indicator Z scores


EmpCatAmpCount
PerPlaIntLak
PctSlowInfsH12
cti_mean
aspect_sh3_mean
geomorph_sh3_std
hli_mean_rev
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


EmpCatAmpCount
PerPlaIntLak
PctChange_Bio18_MEAN
PctChg_Bio14_MEAN
MeanDifSMCH12
Back_rcp45_rev
Diff_bio9_rev
Diff_bio5_rev
MeanDifETH12_rev
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1

Indicator Weights

Tuesday, January 21, 2025 12:30 PM

```
Weights calculated for lithology, soil, and topography indicators
Weights and Z scores were multiplied and then summed to calculate a composite index for each
HUC12 watershed.


Optimization Parameters:
Number of variables: 5
Minimum weight: 0.05
Maximum weight: 0.3
Initial weights check:
Min weight: 0.1252665
Max weight: 0.2186834
Sum of weights: 1
Optimized Weights and Variable Characteristics:
                        variable    weight variance mean_correlation        cv
PctSlowInfsH12     PctSlowInfsH12 0.1663874     0.25        1.0000000 0.0000000
cti_mean                 cti_mean 0.3000000     1.00        0.8967737 0.4257952
aspect_sh3_mean   aspect_sh3_mean 0.1883041     0.50        0.2665578 0.4265768
geomorph_sh3_std geomorph_sh3_std 0.2953086     0.00        0.7234611 1.0000000
hli_mean_rev         hli_mean_rev 0.0500000     0.25        0.0000000 0.2655391
Weight Statistics:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 0.0500  0.1664  0.1883  0.2000  0.2953  0.3000
```

From <http://127.0.0.1:38671/>

```
Weights calculated for climate indicators
Weights and Z scores were multiplied and then summed to calculate a composite index for each
HUC12 watershed.

Optimization Parameters:
Number of variables: 7
Minimum weight: 0.05
Maximum weight: 0.3
Initial weights check:
Min weight: 0.07169999
Max weight: 0.1649569
Sum of weights: 1
Optimized Weights and Variable Characteristics:
                              variable    weight variance mean_correlation          cv
PctChange_Bio18_MEAN PctChange_Bio18_MEAN 0.1293785     0.25        0.9890790 0.048481600
PctChg_Bio14_MEAN       PctChg_Bio14_MEAN 0.1376547     1.00        0.0000000 0.079618661
MeanDifSMCH12               MeanDifSMCH12 0.2395582     0.25        0.3135663 1.000000000
Back_rcp45_rev             Back_rcp45_rev 0.1363291     0.25        1.0000000 0.000000000
Diff_bio9_rev               Diff_bio9_rev 0.0500000     0.00        0.3221011 0.069091936
Diff_bio5_rev               Diff_bio5_rev 0.0500000     0.25        0.3133131 0.001463874
MeanDifETH12_rev         MeanDifETH12_rev 0.2570795     0.50        0.9498793 0.265094139
Weight Statistics:
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.05000 0.08969 0.13633 0.14286 0.18861 0.25708
```

From <http://127.0.0.1:38671/>