Quantifying B-IBI response to natural features

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Benthic Monitoring EPA Grant Advisory Board meeting
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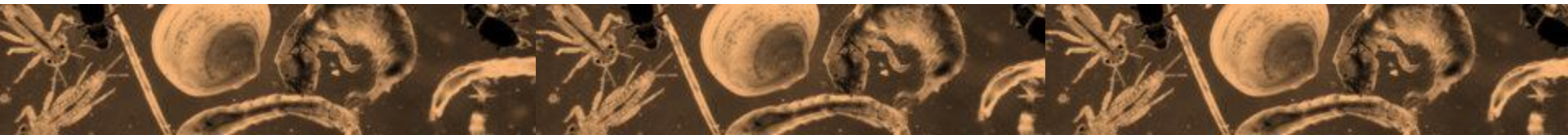
B-IBI and Biomonitoring

Measures and evaluates the condition of living systems

Relies on the ability of indicators to detect change to evaluate the condition of an ecosystem



B-IBI and Biomonitoring

Sensitive to effects we want to measure:

human disturbance = urbanization

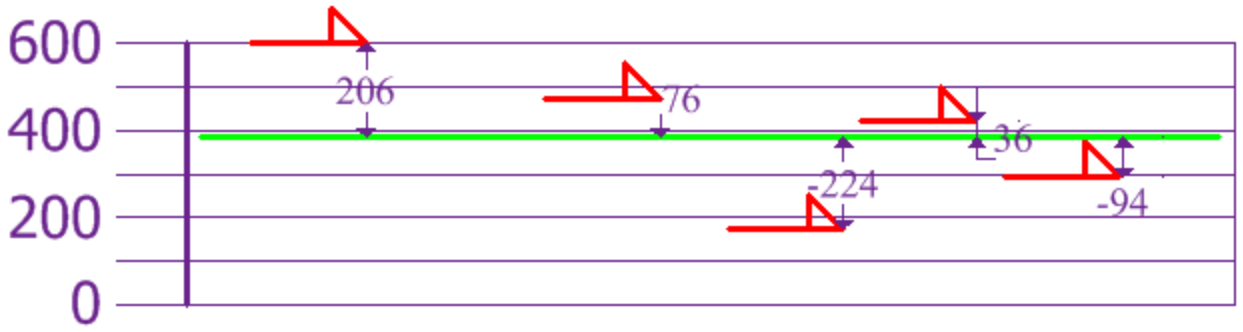
- Consistency of response
- Not influenced by natural factors

Goal of Analysis

Assess how natural features contribute to variability of B-IBI.



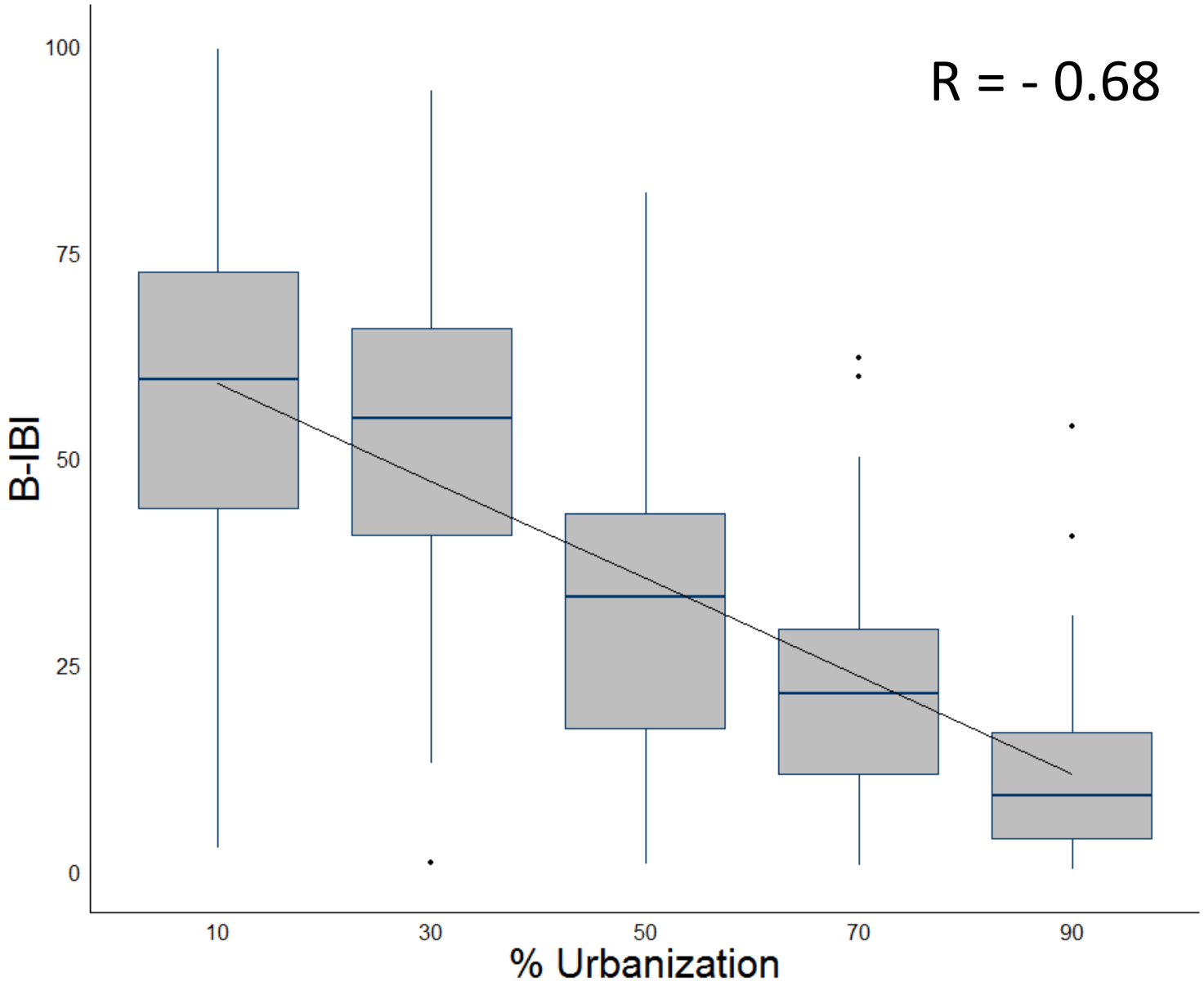

Variation: What is it?



Defined as the average of the squared differences from the mean.

Variation: Why does it matter?

- Variation lowers explanatory power
- Where does it come from?
  - Human activity
  - Natural sources
  - Unmeasured variables
- Do B-IBI adjustments need to be made?


R = - 0.68
B-IBI
100
75
50
25
0
10
30
50
70
90
% Urbanization

Variables Examined

	Variable
Human Disturbance	Agriculture
	Population
	Road Crossings
	Forest
	Road Density
Site Features	Watershed Area
	Precipitation
	Elevation
	Slope
	Stream Density
	Stream Length
	Geologic Permeability
	OpenWater
Land Cover	Wetland Cover
	Shrub Cover
	Bare Cover
	Grass Cover

To consider: multicollinearity

	Variable	Urbanization	*P*-value
Human Disturbance	Agriculture	0.15	<0.001
	Population	**0.93**	<0.001
	Road Crossings	**0.86**	<0.001
	Forest	**-0.93**	<0.001
	Road Density	**0.96**	<0.001
Site Features	Watershed Area	-0.18	<0.001
	Precipitation	**-0.64**	<0.001
	Elevation	**-0.52**	<0.001
	Slope	**-0.53**	<0.001
	Stream Density	0.09	0.03
	Stream Length	-0.17	0.006
	Geologic Permeability	0	0.974
	OpenWater	-0.06	0.1287
Land Cover	Wetland Cover	-0.25	<0.001
	Shrub Cover	**-0.51**	<0.001
	Bare Cover	-0.09	0.0198
	Grass Cover	-0.36	<0.001

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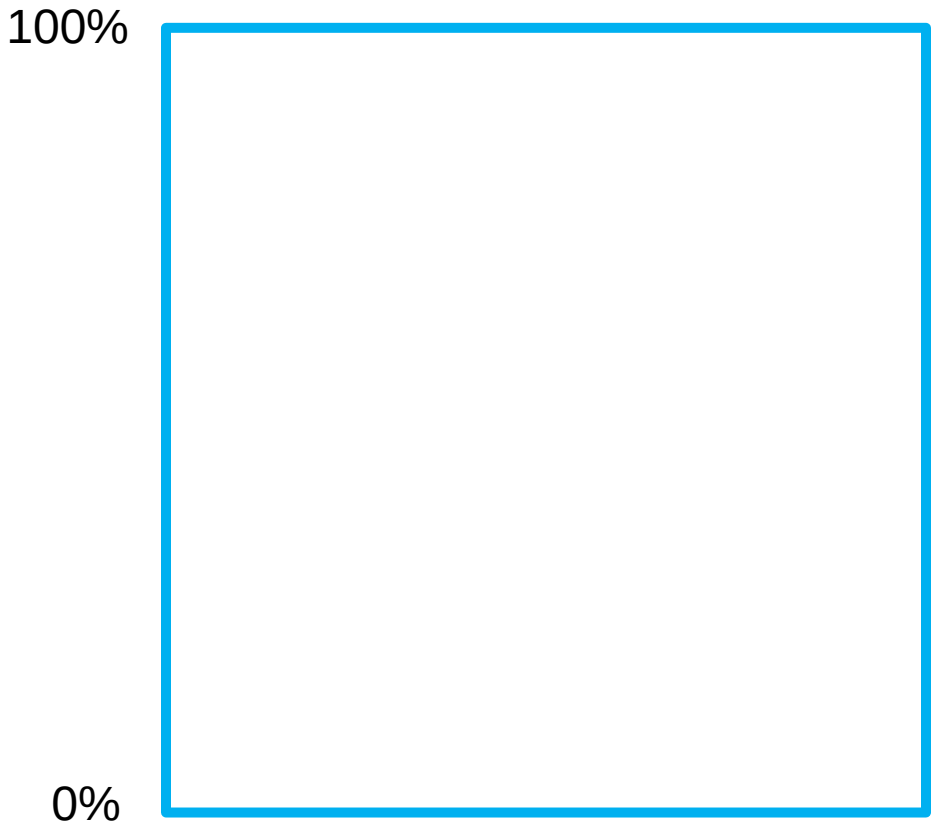
Method:
Hierarchical Multiple Regression

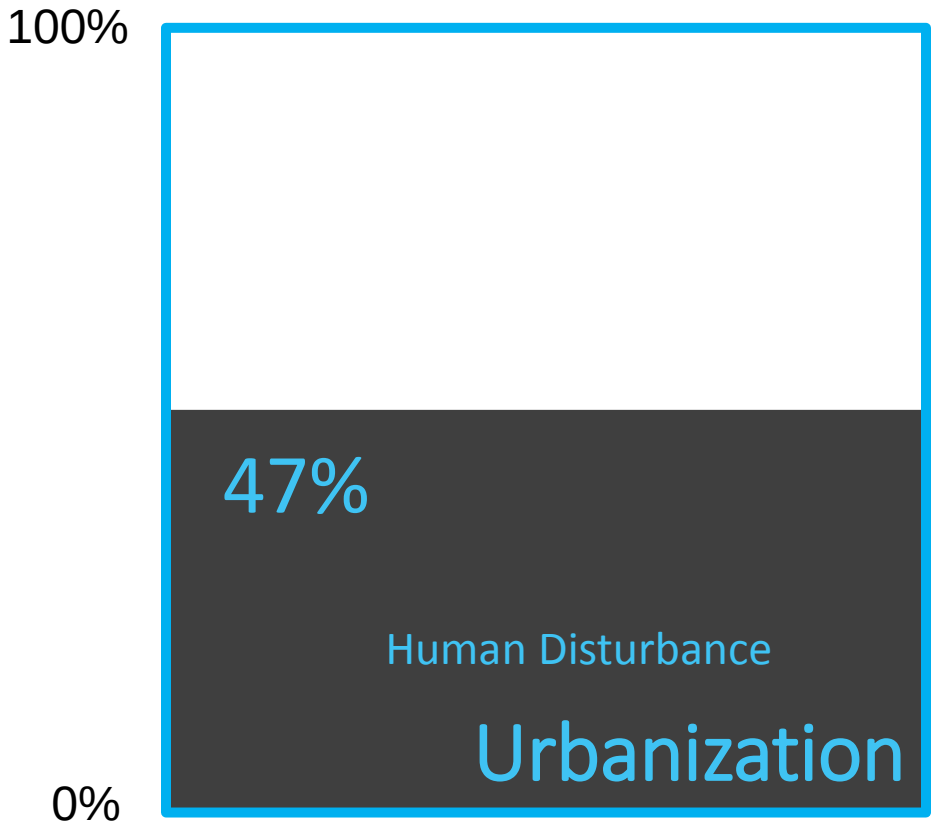
1. B-IBI ~ % Urbanization

Human	**Site**	**Land Cover**	**Geology**
Population	Elevation	Bare	Permeability
Road Density	Precipitation	Wetland	Open Water
Forest	Area	Shrub	
Agriculture	Stream Density	Grass	
2.	3.	4.	5.

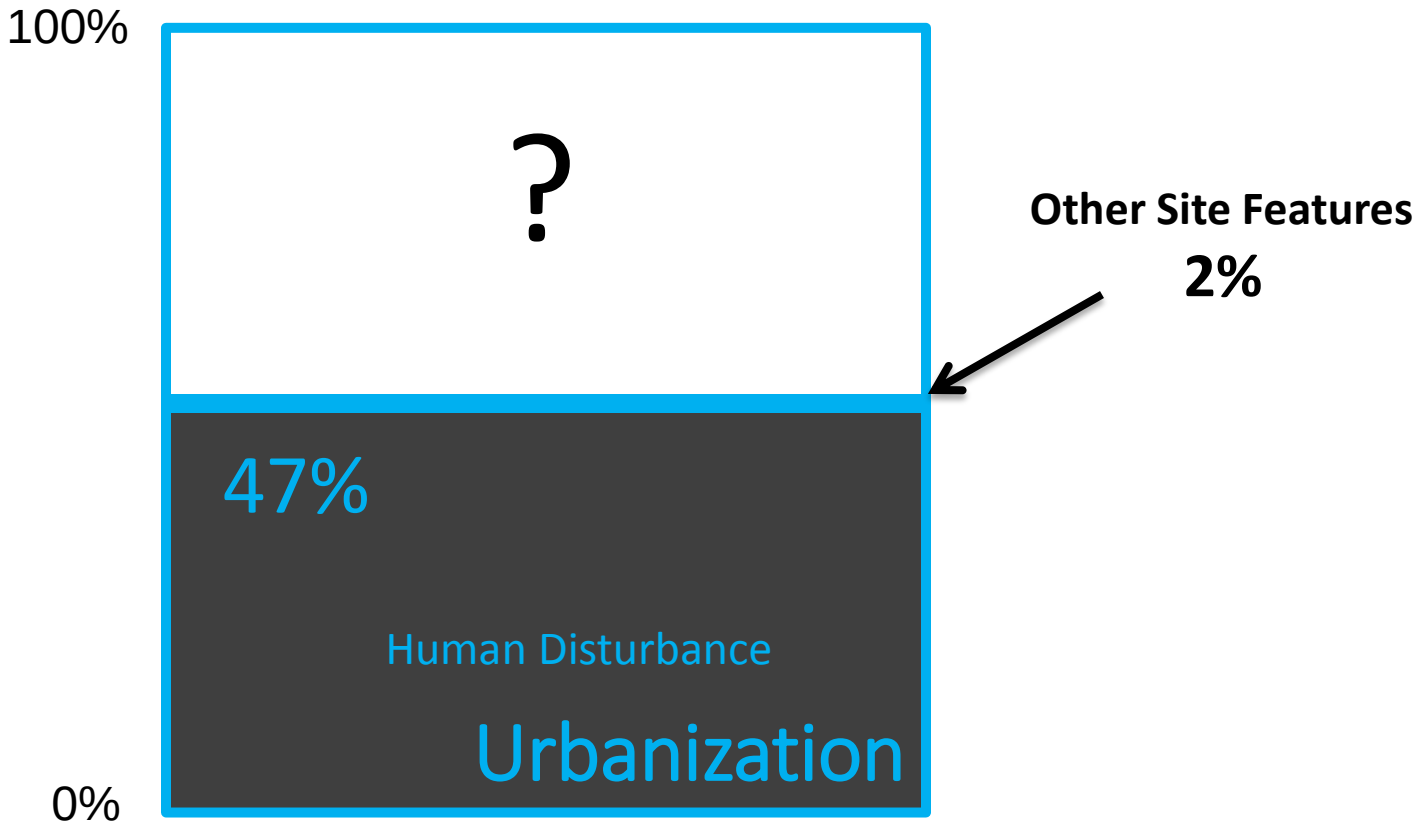
B-IBI Variability



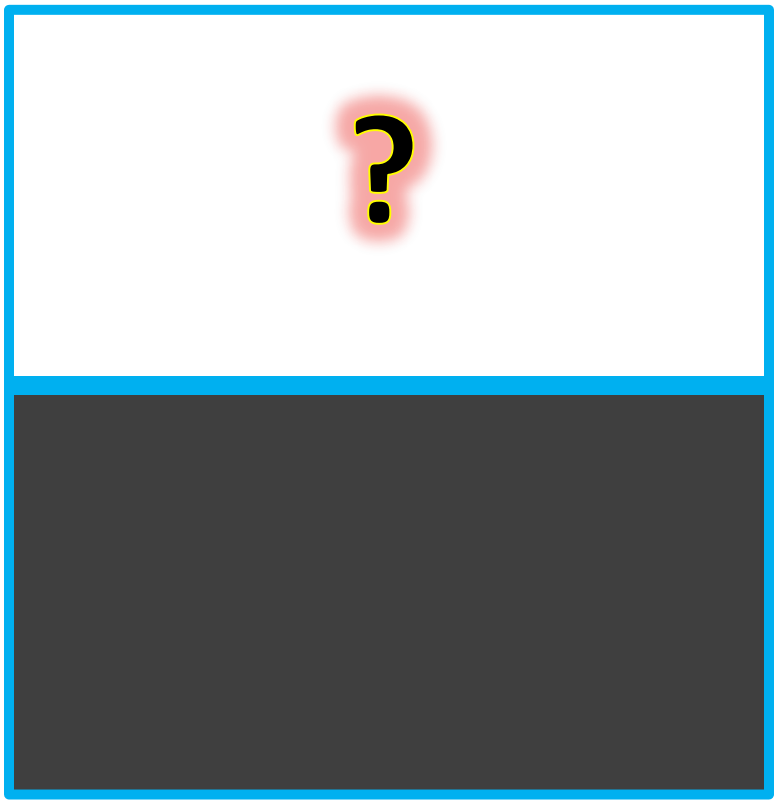
B-IBI Variability



B-IBI Variability



Contributing Variability



B-IBI Variability

Where does it come from?

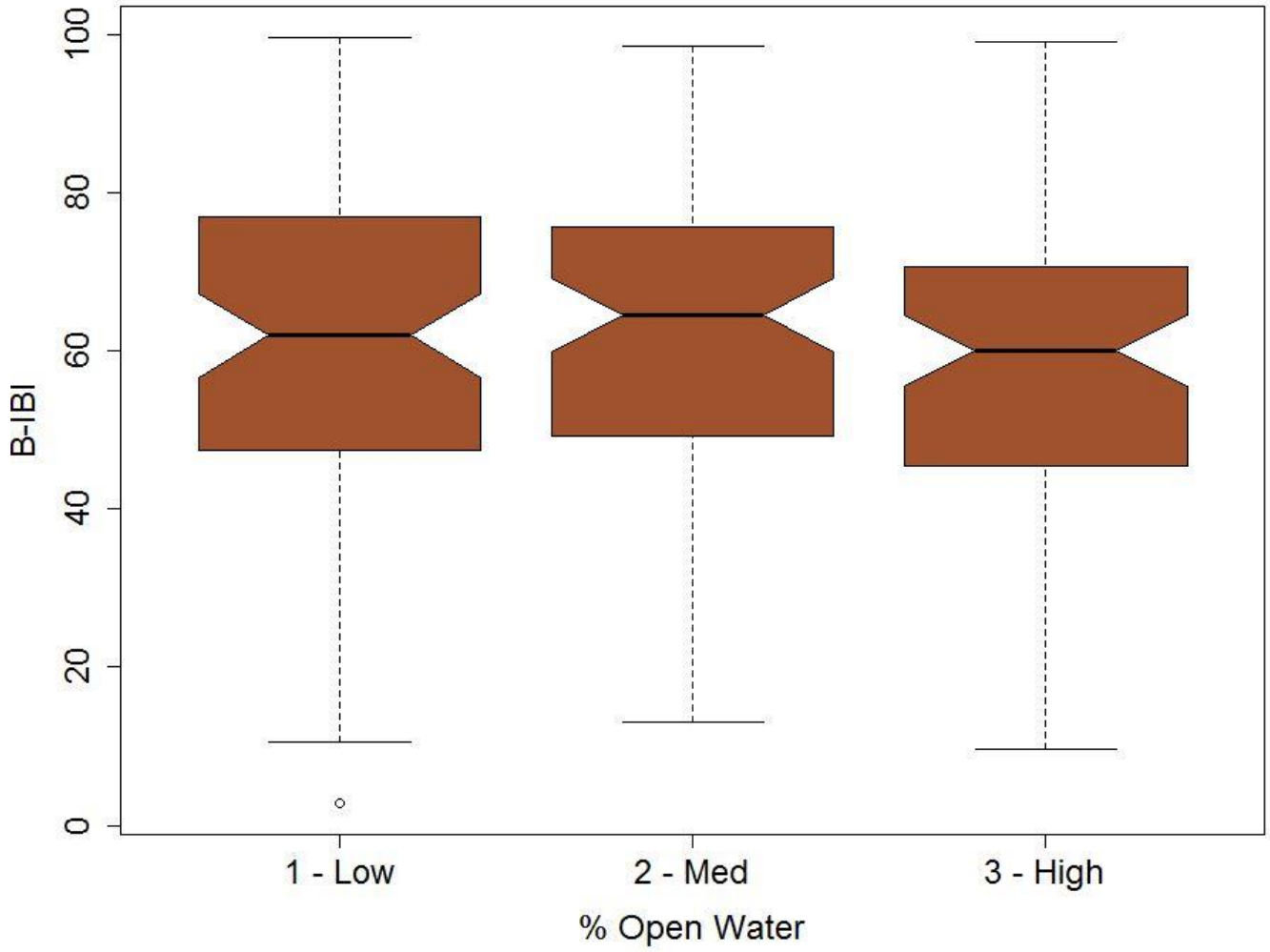
- Unmeasured human impacts
- Ecosystem complexity
- Bug community
- Sampling

Data Exploration: examining B-IBI distribution

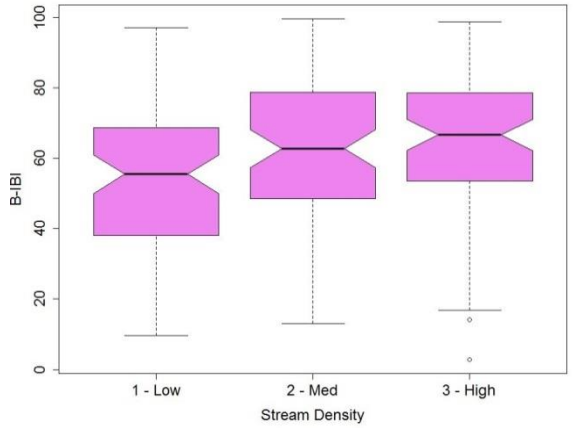
Looking for drivers of B-IBI differences:

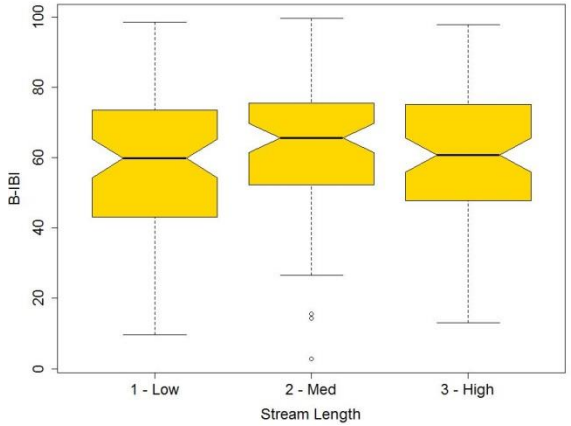
- Low urbanization, low disturbance sites
- Data split into categories
- If differences in B-IBI were evident, we can look closer

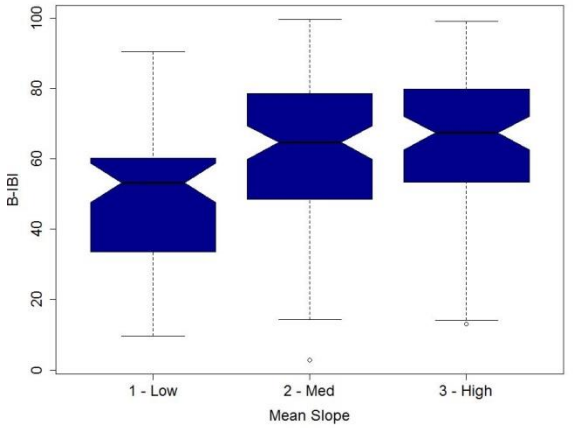
Data Distribution: Boxplots

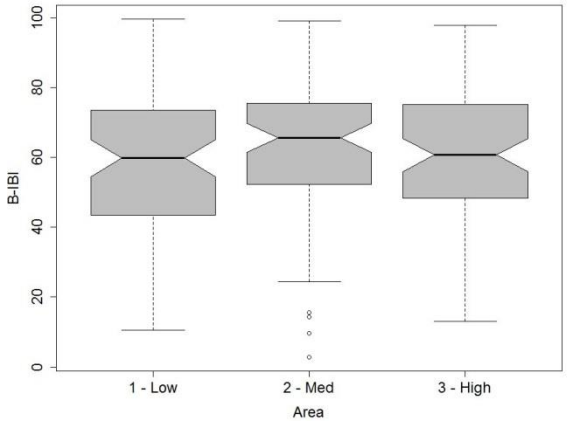


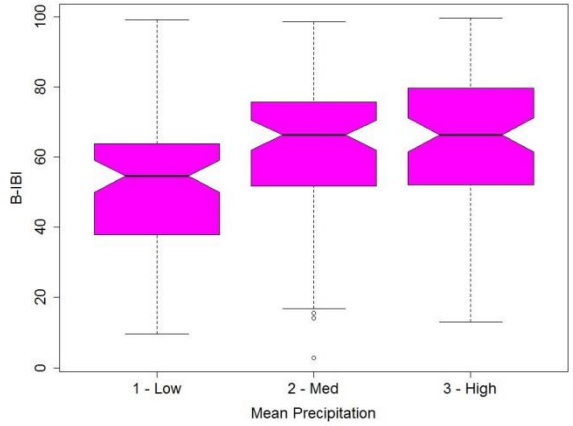
Near pristine sites (< 10% urbanization); n = 248

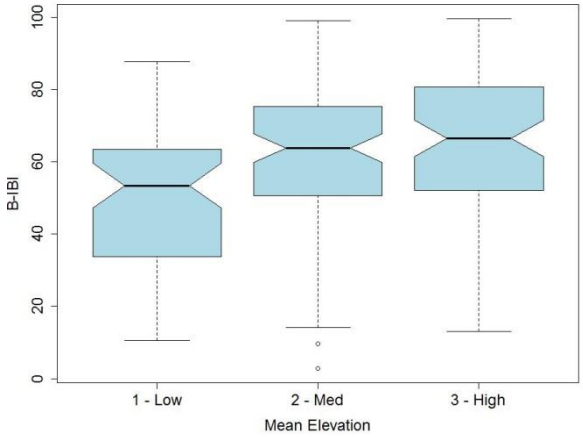


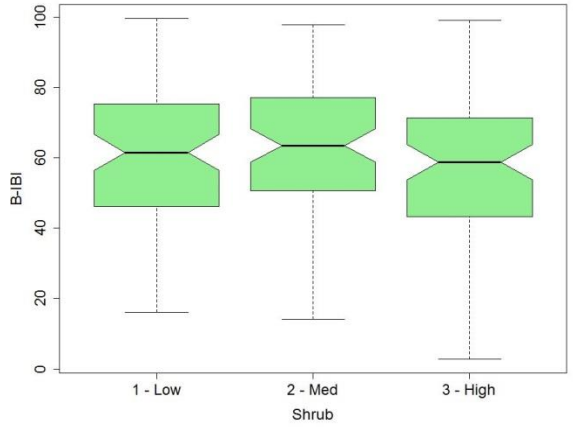


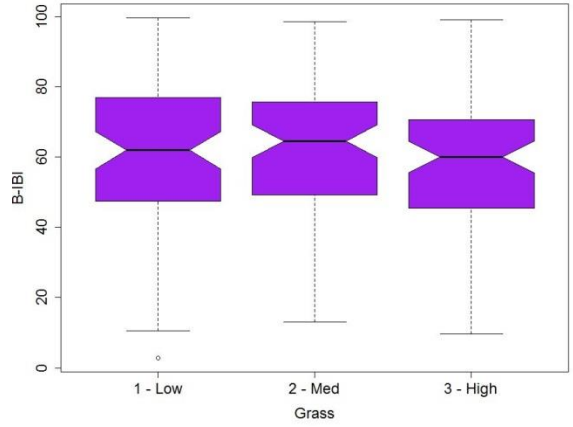


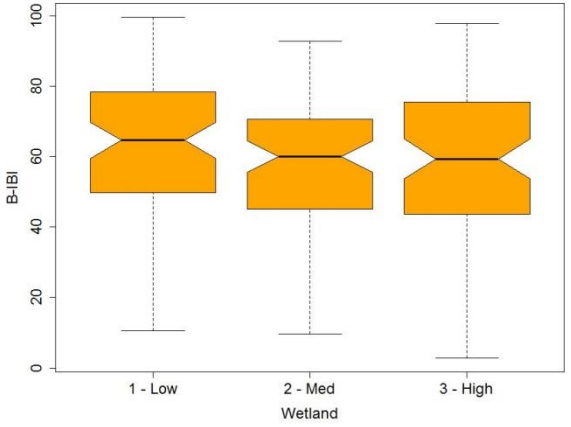












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Conclusions

No recommended adjustment to B-IBI scoring for natural features

- The primary driver and best predictor of B-IBI scores in Puget Sound is percent watershed urbanization
- Natural site features, land cover and geology were not shown to greatly influence B-IBI response

Acknowledgements

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