Assessment of Riparian Zones with a Naïve Bayes Classifier

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Environmental Index

Quantifiable measure of the environment

Watershed Protection Indices

- Environmental Integrity Index
- Austin Lake Index
- Index of Riparian Integrity
- Riparian Functional Assessment
- Stream Stability Index

Riparian Functional Assessment

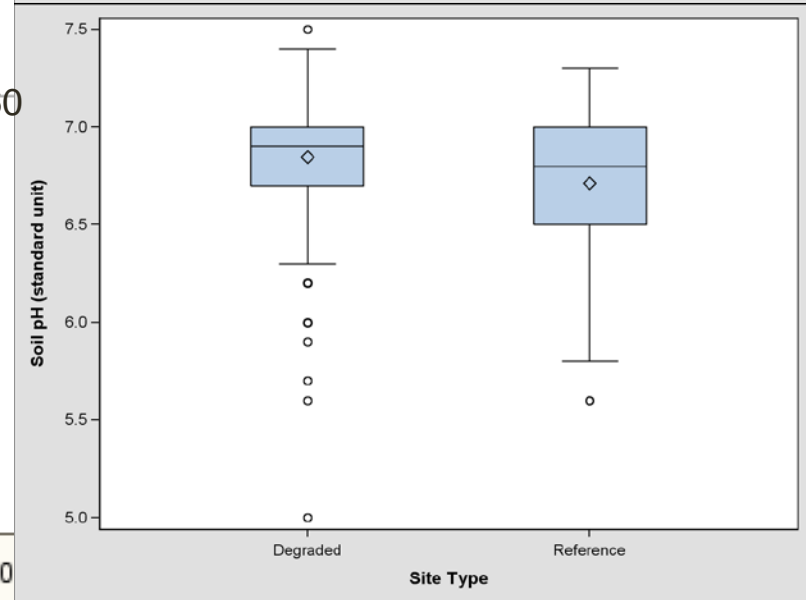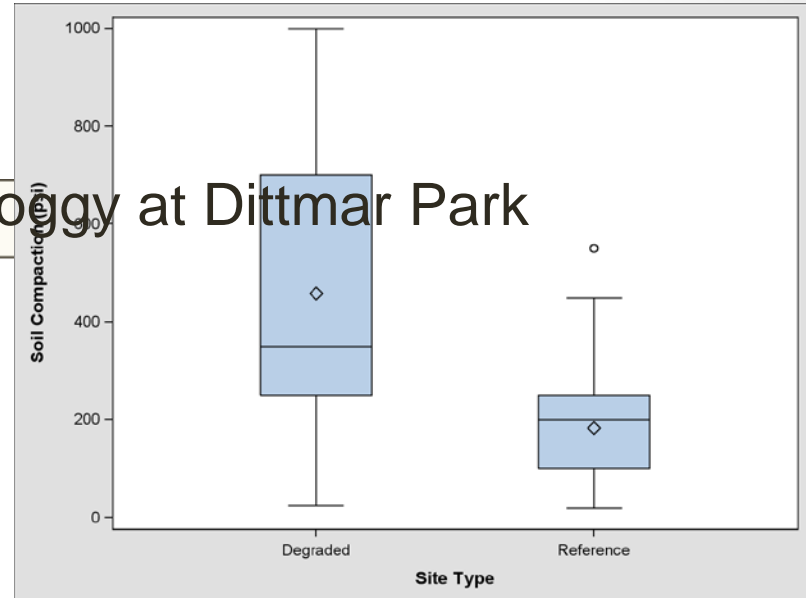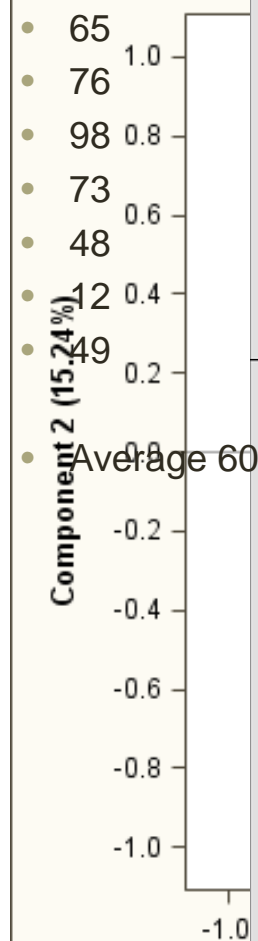**Measures the environmental functionality of a riparian zone**

RFA 2012

Parameters

- Soil Compaction
- Soil Moisture
- In-stream Canopy Cover
- Plant Cover & Structural Diversity
- Recruitment & Succession
- Riparian Zone Width
- Hardwood Demography
- Large Woody Debris
- Bank Stability
- Diatom Taxonomy
- Entrenchment Ratio
- Macroalgae cover
- Rip Zone Width/ Potential Tree Height
- Soil pH
- Vegetation Gaps

South Boggy at Dittmar Park

- 65
- 76
- 98
- 73
- 48
- 12
- 49

- Average 60

Problems with Indices

Multiple Metric Averaging

Compaction 95
Moisture 50
Instream Cover 5

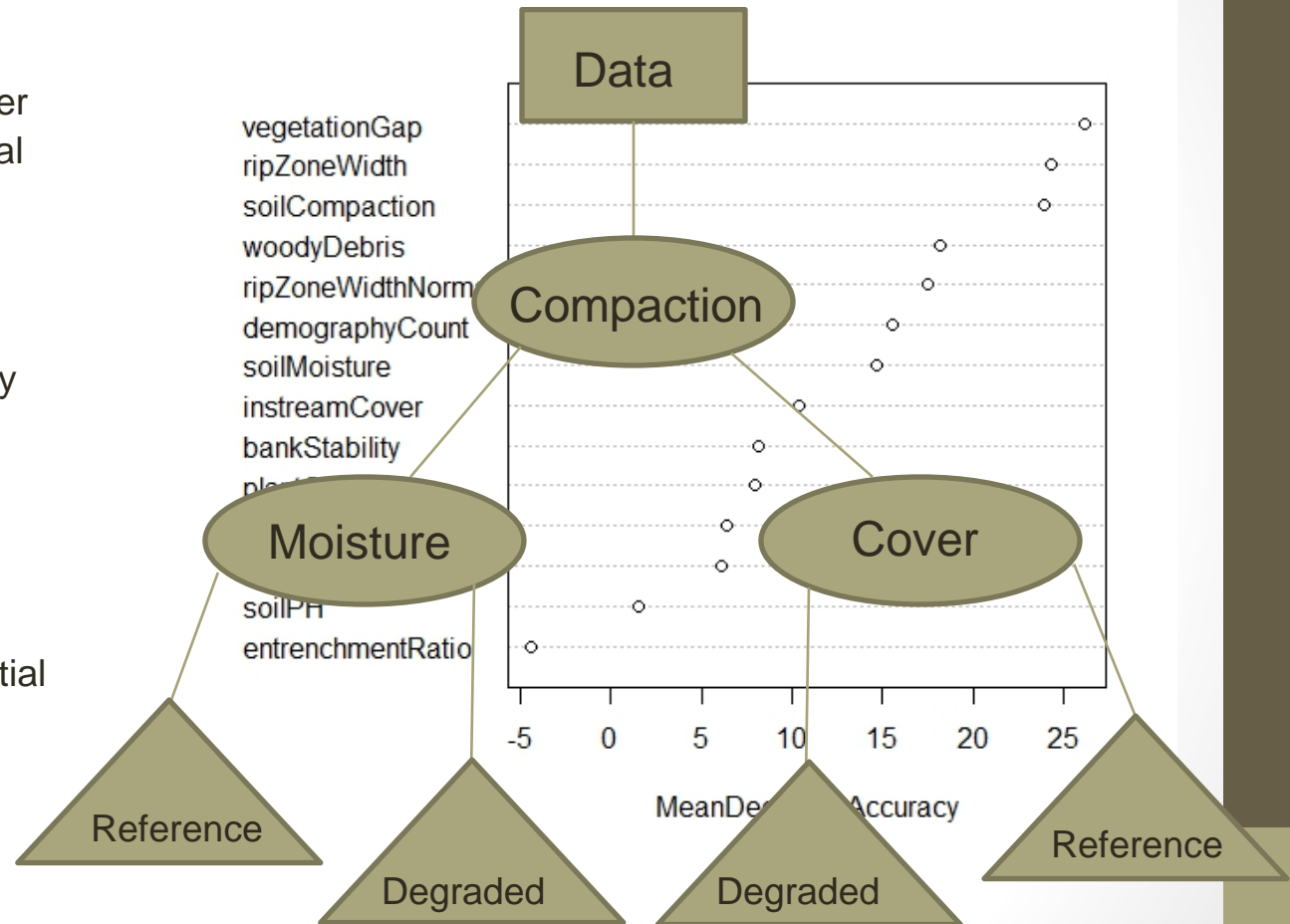Defining "Environmental Health"

Interpretation is Difficult

Compaction 55
Moisture 50
Instream Cover 45

RFA (version2.0) 2014

Parameters

- Soil Compaction
- Soil Moisture
- In-stream Canopy Cover
- Plant Cover & Structural Diversity
- Recruitment & Succession
- Riparian Zone Width
- Hardwood Demography
- Large Woody Debris
- Bank Stability
- Diatom Taxonomy
- Entrenchment Ratio
- Macroalgae cover
- Rip Zone Width/ Potential Tree Height
- Soil pH
- Vegetation Gaps

Random Forest Analysis

RFA (version2.0) 2014

Parameters

- Soil Compaction
- Soil Organic Carbon
- In-stream Canopy Cover
- Plant Cover & Structural Diversity
- Riparian Zone Width
- Large Woody Debris
- Snags wood Demography
- Woody Species Richness Succession
- Structure Richness
- Bank Stability
- Hydrophytic Vegetation
- Diatom Taxonomy
- Wetland Forest Affinity
- Entrenchment Ratio
- Macroalgae cover
- Rip Zone Width/ Potential Tree Height
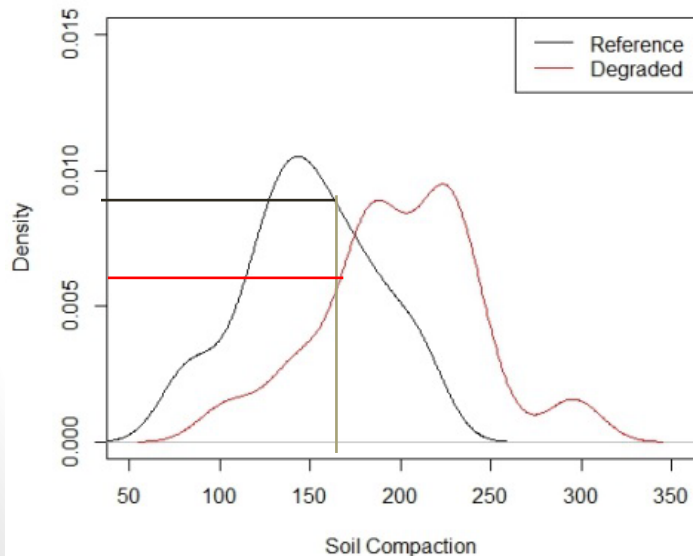- Soil pH
- Vegetation Gaps
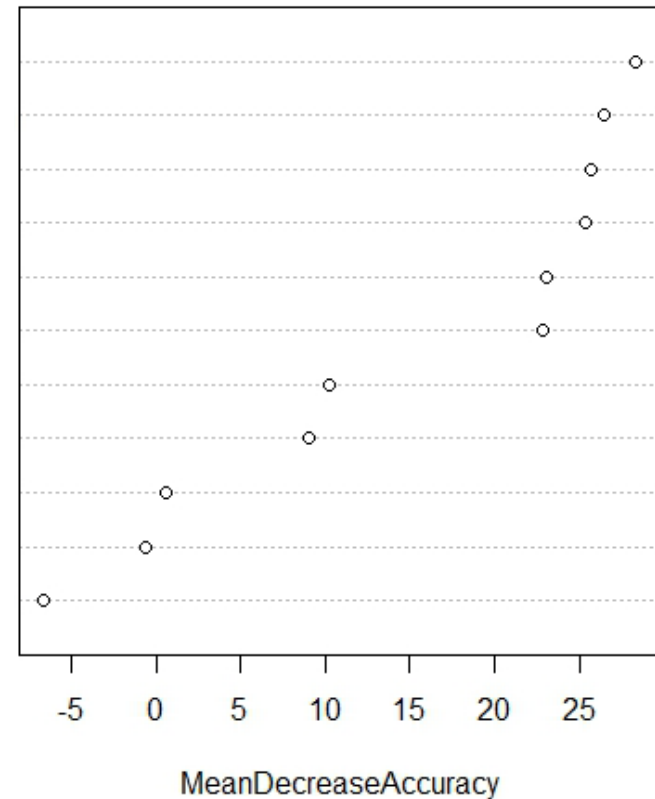
Naïve Bayes Classifier

How do we define "Environmental Health":

Probability of a site to be classified as 'Reference' given the environmental parameters measured.

$$P(c_{ref}|x) = \frac{\prod_{j=1}^{N} P(x_j|c_{ref})}{\prod_{j=1}^{N} P(x_j|c_{ref}) + \prod_{j=1}^{N} P(x_j|c_{deg})}$$

Soil Compaction = 164
$P(x|c_{ref})$ = 0.00883
$P(x|c_{deg})$ = 0.00552
$P(c_{ref}|x)$ = 0.615

Naïve Bayes Classifier

No more Multiple Metric Averaging

	Log(Reference)	Log(Degraded)	Sum	RFA
Compaction	-2.452	-2.042		
Structure Richness	-0.566	-0.212		
PCSD	-2.064	-1.977		
Snags	-1.825	-0.791		
Woody Species Richness	-1.042	-1.017		
Exp(Sum)	0.000353	0.00239	0.00274	0.13

Buttermilk Creek at Buttermilk Park

Old Score 29   New Score 0

South Boggy Creek at Dittmar Park

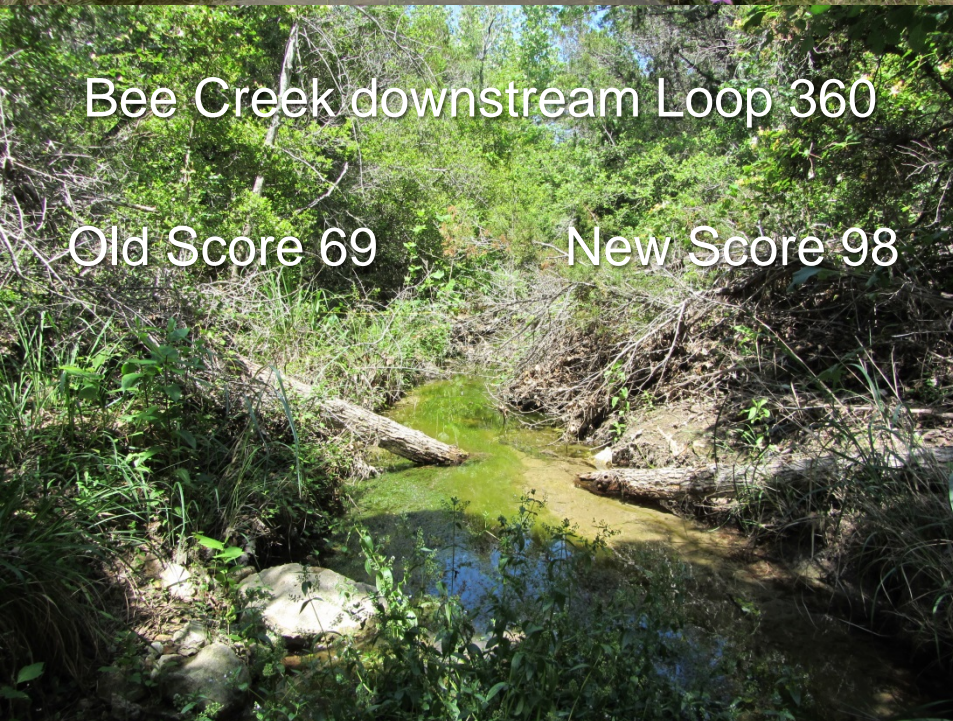Old Score 60   New Score 12

Bee Creek downstream Loop 360

Old Score 69   New Score 98

Taylor Slough North at Mayfield Park

Old Score 65   New Score 73

Buttermilk Creek at Buttermilk Park 2012
Score 0

Buttermilk Creek at Buttermilk Park 2014
Score 1

Taylor Slough South at Reed Park 2012
Score 0

Taylor Slough South at Reed Park 2014
Score 31