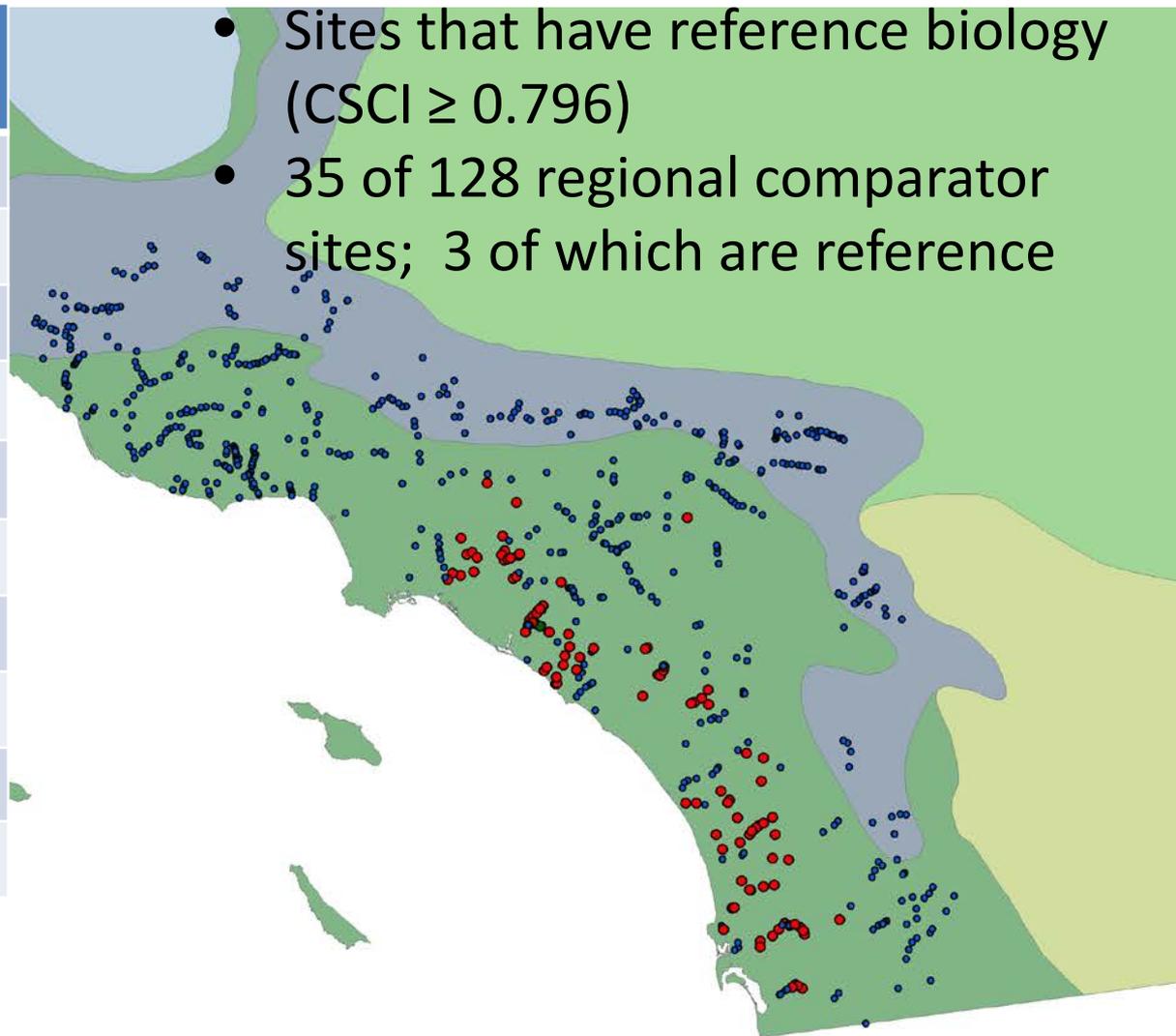


San Diego Creek Causal  
Assessment Reference  
Comparison  
Line-of-Evidence

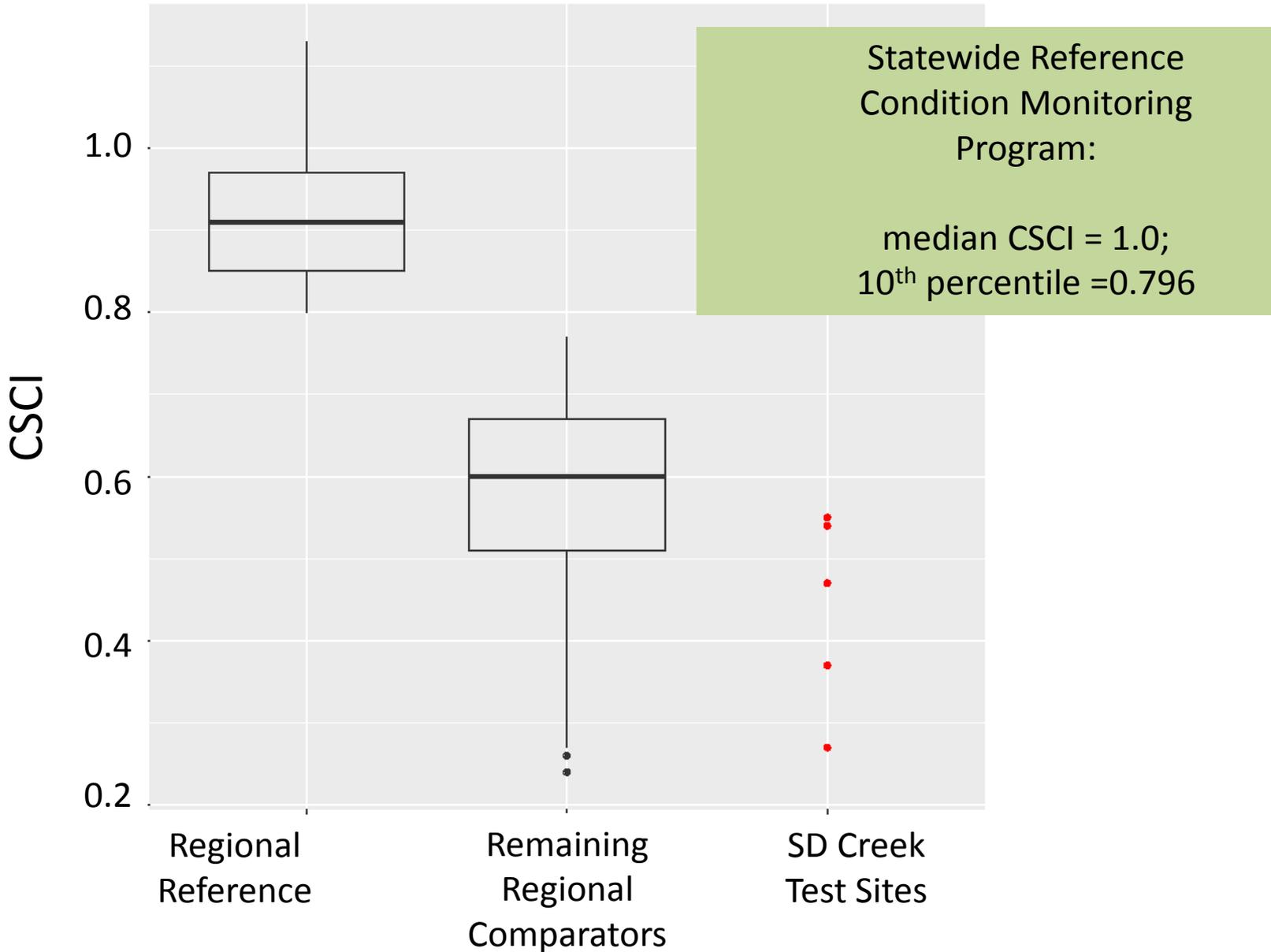
February 11, 2016

# Regional Comparators that have Reference Biology

Selection Criteria: Natural Gradients	
Site	Lat./Long
	Elevation
Watershed	Area
	Elev. Range
Climate	Air Temp.
	Annual Precip.
	Summer Precip.
Geology	Soil erodibility
	Soil bulk density
	Soil phosphorus



# CSCI Comparison



# Missing Data

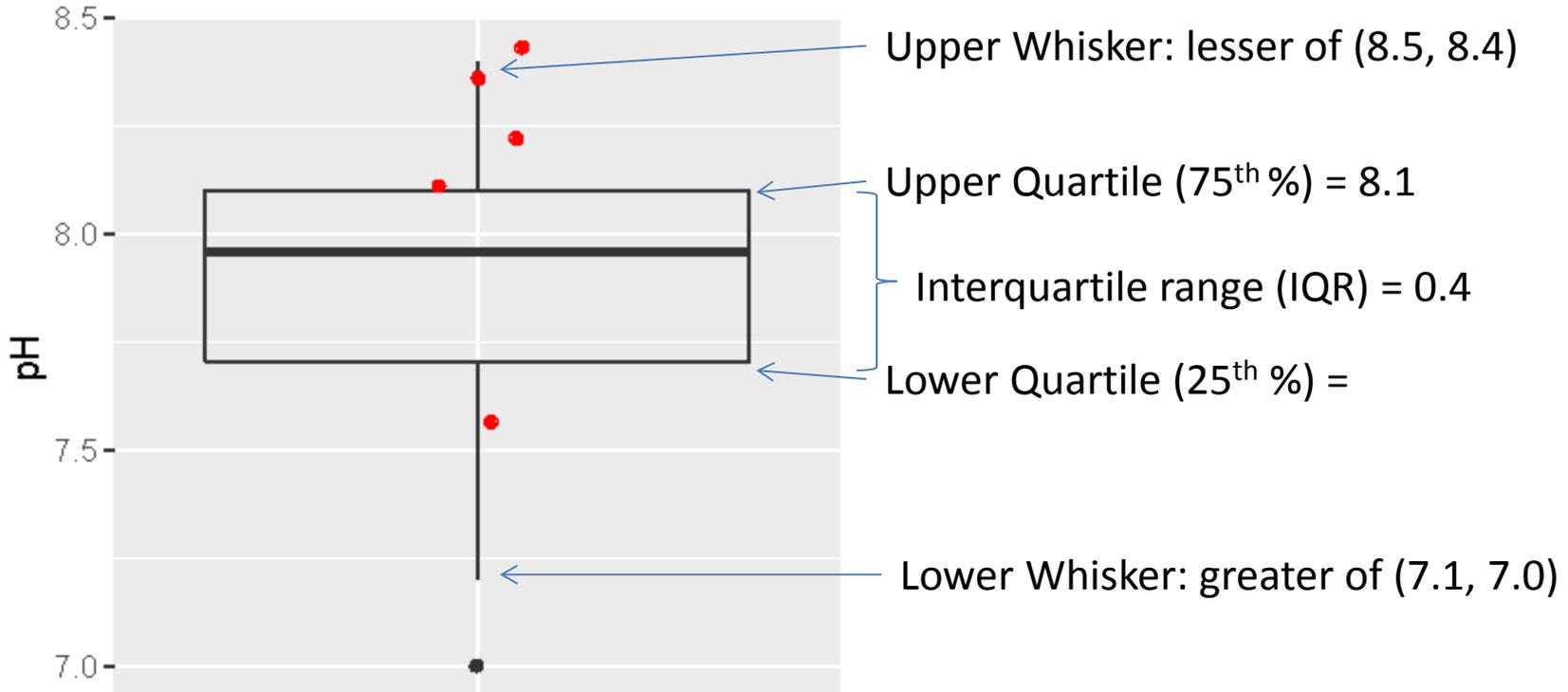
Cause	Stressor	Count* Reference	Count* Test
Sediment & Channel Engineering	Cobble Embed %	0/32	0/5
Channel Engineering	Slope	0/32	4/5
Pesticides	Vector Control Events	0/32	5/5
Nutrients	Algal Dissimilarity	0/32	NA
	Hypoxia	0/32	5/5 *
	Super-saturation	0/32	5/5
Conductivity	Chloride	0/32	2/5

*\*No night-time or early morning data dissolved oxygen data*

*\* Eliminated replicates: 1 test , 3 reference*

# Sample Boxplot (pH)

## Test Site Data = red points



Upper Whisker = lesser of (Upper Quartile +1.5\*IQR) or (max result)

Lower Whisker = greater of (Lower Quartile -1.5\*IQR) or (min result)

# Scoring/Interpretation Guidance

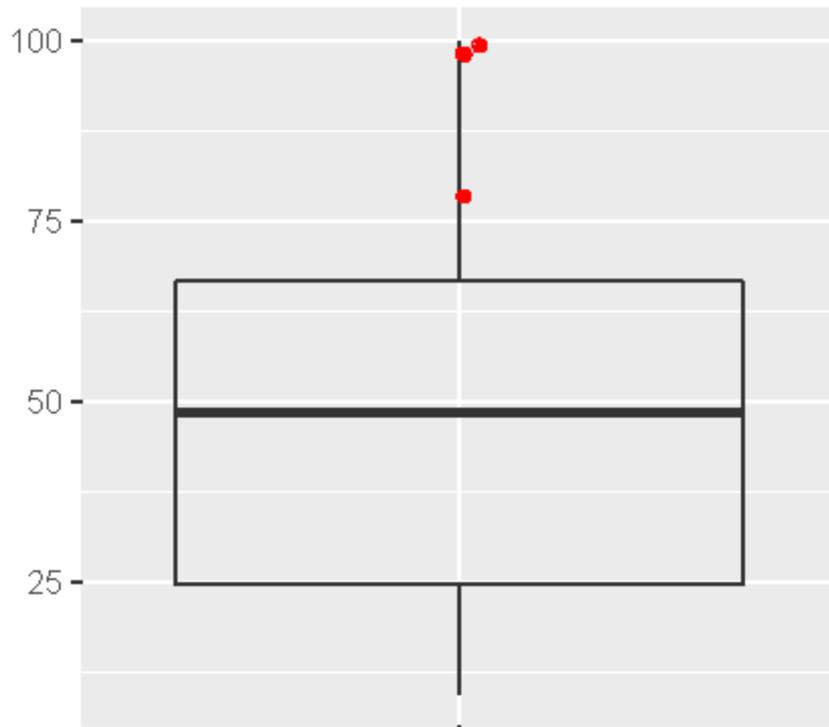
Finding	Interpretation	Score
The stressor value observed at the test site is similar (within 25th – 75th percentile) to the central distribution of values from environmentally similar reference sites where there is no biological impairment	Stressor levels are similar to that at reference sites, so therefore that stressor is likely not causing the biological impairment at the test site	-
The stressor value observed at the test site is outside of the central distribution of values (<25th or >75th percentile) from environmentally similar reference sites where there is no biological impairment	Stressor levels are not similar, but not distinctly different than at reference sites, so therefore it is unclear if that stressor is causing the biological impairment at the test site	0
The stressor value observed at the test site is distinctly different from environmentally similar reference sites where there is no biological impairment	Stressor levels are distinctly elevated or depressed than at environmentally similar reference sites, so that stressor <i>may</i> be causing the biological impairment at the test site	+

# Scoring Rules

Expected Effect on Biology	Site result compared to reference boxplot	Score
negative (e.g. Sands & Fines)	greater than the upper whisker	"+"
	between upper quartile and upper whisker	"0"
	less than the upper quartile	"-"
positive (e.g. habitat diversity)	greater than the lower quartile	"-"
	between lower quartile and lower whisker	"0"
	lower than the lower whisker	"+"

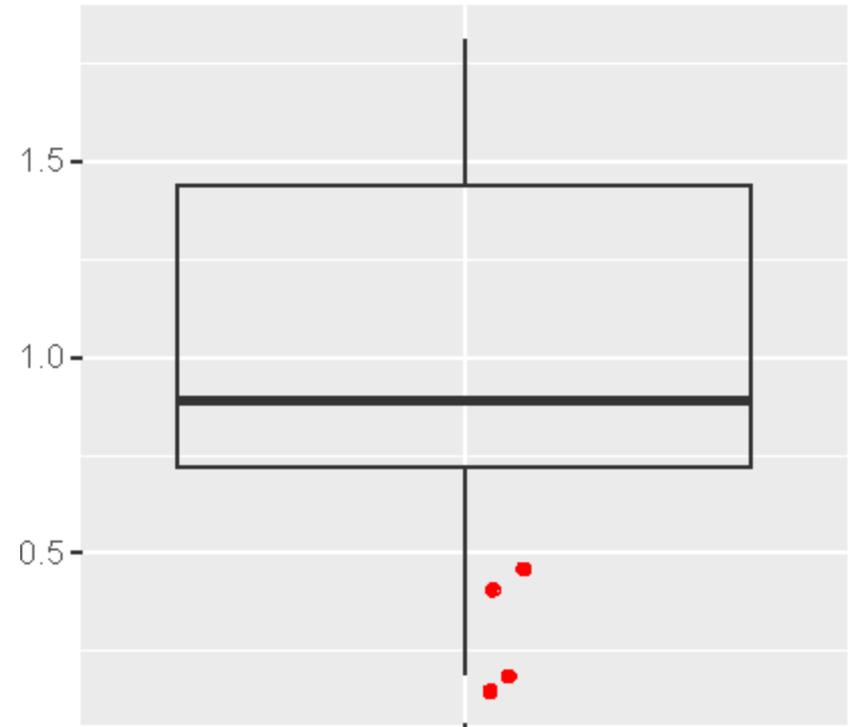
# Boxplots – Sediment Cause

Sands and Fines  
(%)



Reference=boxplot; Test=red points

Substrate Diversity  
(H<sub>nat</sub>)



Reference=boxplot; Test=red points

# Scores - Sediment

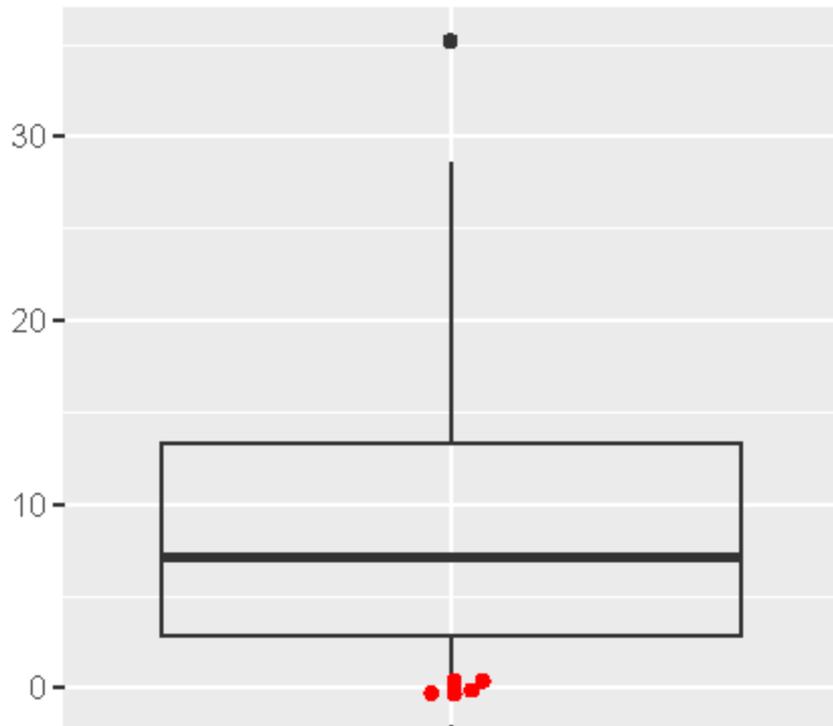
Proximate Stressor	Stressor Parameter	Test Site Scores				
		180 2006	418 2009	418 2011	1923 2011	13187 2013
Burial of Fauna	Sands and Fines (%)	NE	0	0	0	0
	TSS (mg/L)	-	0	-	-	-
	Turbidity (NTU)	-	0	-	-	-
Loss of Complex Habitat	Cobble Embed (%) *	NE	NE	NE	NE	NE
	Substrate Diversity (H)	NE	+	0	0	+

*\*No cobbles at test sites*

*NE = no evidence because no data available (NA)*

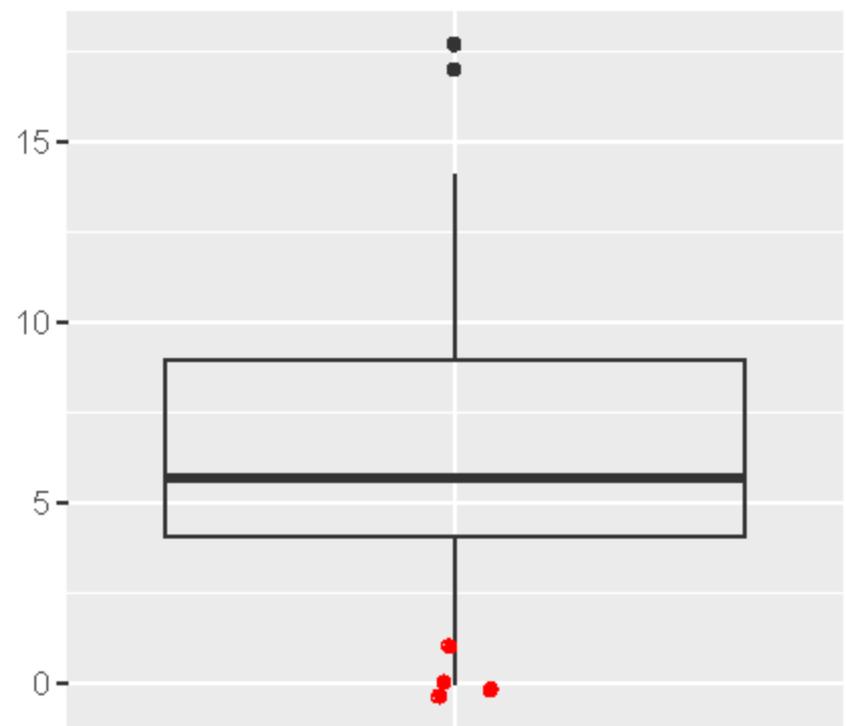
# Boxplots – Channel Engineering

Cobbles  
(%)



Reference=boxplot, Test=red points

Small Woody Debris  
(%)



Reference=boxplot, Test=red points

# Scores - Channel Engineering

Proximate Stressor	Stressor Parameter	Test Site Scores				
		180 2006	418 2009	418 2011	1923 2011	13187 2013
Loss of Streambed Complexity	Cobbles (%)	0	0	0	0	0
	Cobble Embeddedness (%)	NE	NE	NE	NE	NE
	Small Woody Debris (%)	NE	0	0	0	0
	Large Woody Debris (%)	NE	-	0	0	0
	Substrate Diversity (H)	NE	+	0	0	+
Loss of Stream Gradient	Slope	NE	NE	NE	NE	NE
Burial of Fauna	Sands and Fines (%)	NE	0	0	0	0
Episodic Flows	Incised Banks (%)	NE	-	-	NE	NE

*NE = no evidence because no data available (NA)*

# Pesticides – not enough data

## Pyrethroids (sediment) & Organophosphates (water)

- No reference data
- Two test sites with data (all < reporting limit)

## Pyrethroids (water)

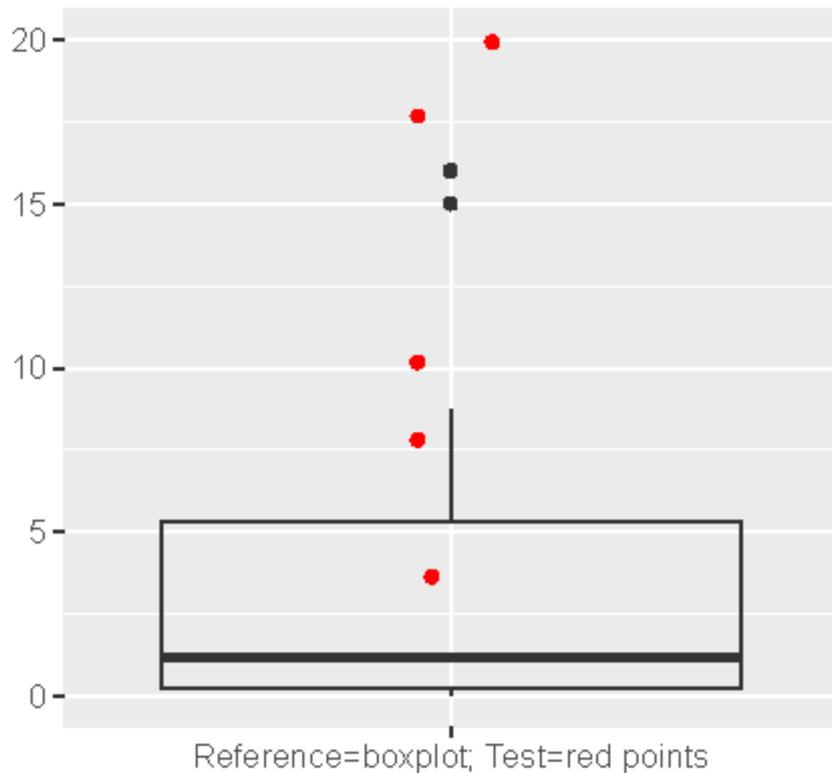
- Either 0 or NA for all but 4 reference sites
- Two test sites with data (all < reporting limit)

## Vector Control

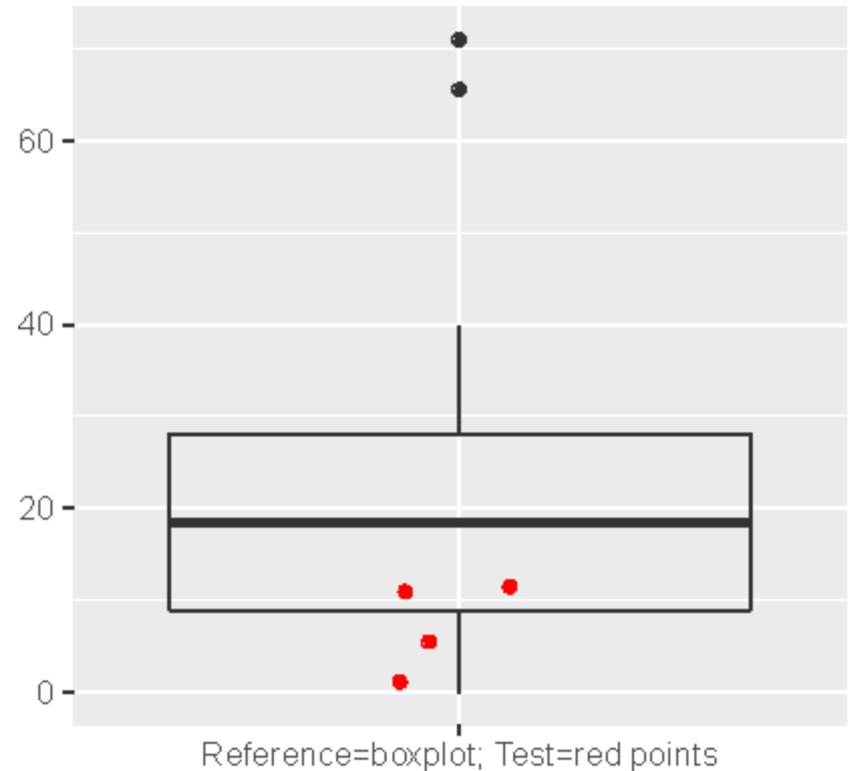
- No data from reference sites

# Boxplots – Nutrients

Total Nitrogen  
(mg/L)



Filamentous Algae  
(mean % coverage)

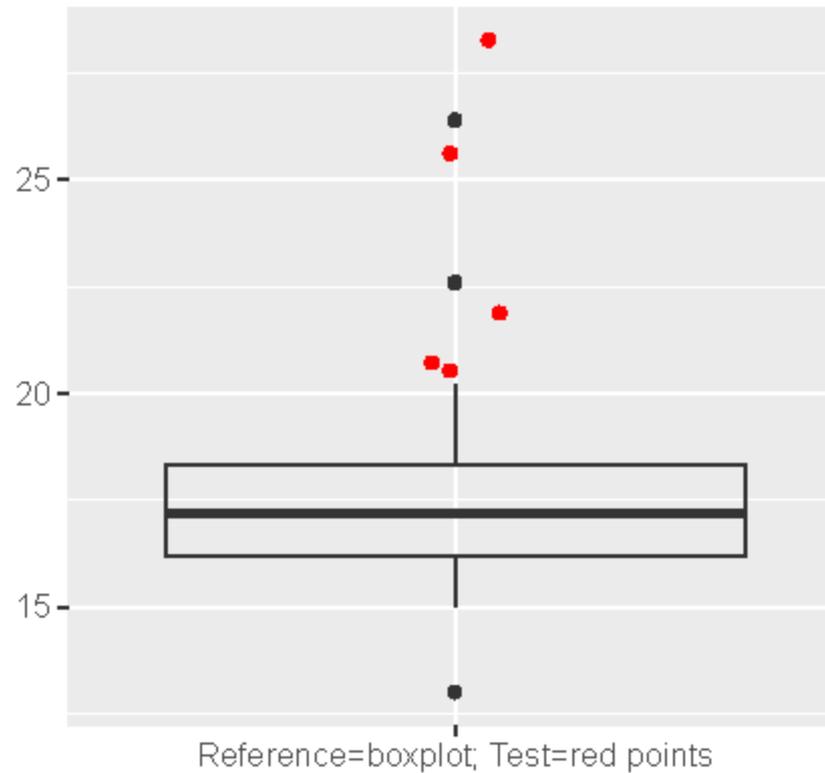


# Scores - Nutrients

Proximate Stressor	Stressor Parameter	Test Site Scores				
		180 2006	418 2009	418 2011	1923 2011	13187 2013
Elevated Concentrations	TN (mg/L)	-	+	0	+	0
	TP (mg/L)	0	-	-	0	-
Excessive Algal Mats	Algal Mat Thickness (mm)	-	-	-	-	-
	Filamentous Algae (mean % coverage)	NE	-	-	-	-
	Chlorophyll-a (mg/m <sup>2</sup> )	NE	NE	NE	-	-
Altered Algal Community	Algal Dissimilarity (vs SMC13187 and 801S0192)	NE				
Low Dissolved Oxygen	Hypoxia/Supersaturation (# of observations)	NE				
Altered pH	pH	-	0	+	-	0

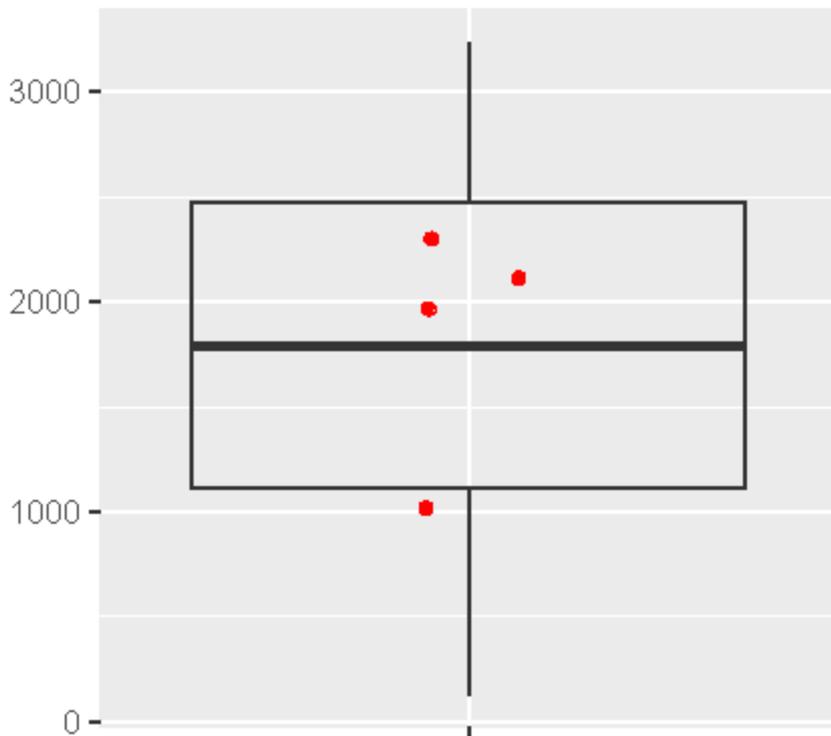
# Boxplot & Scores - Temperature

Proximate Stressor	Stressor Parameter	Test Site Scores				
		180 2006	418 2009	418 2011	1923 2011	13187 2013
Increased Temperature	Temperature (C)	+	+	+	0	0



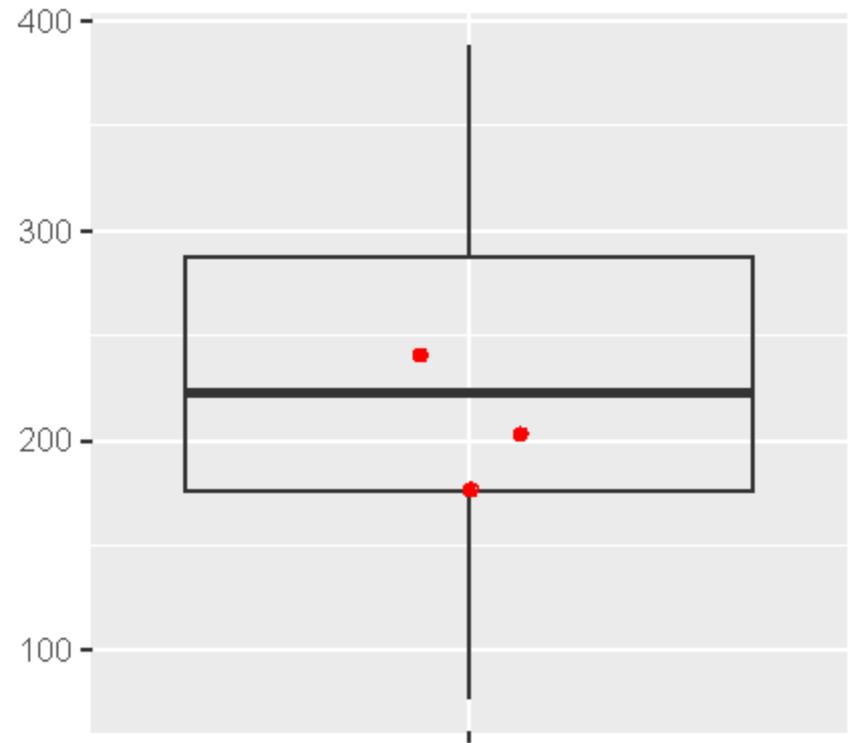
# Boxplots – Conductivity

Conductivity  
( $\mu\text{S}/\text{cm}$ )



Reference=boxplot; Test=red points

Alkalinity as  $\text{CaCO}_3$   
( $\text{mg}/\text{L}$ )



Reference=boxplot; Test=red points

# Scores - Conductivity

Proximate Stressor	Stressor Parameter	Test Site Scores				
		180 2006	418 2009	418 2011	1923 2011	13187 2013
Elevated Conductivity	Conductivity (uS/cm)	NE	-	-	-	-
Increased Ions	Hardness as CaCO <sub>3</sub> (mg/L)	NE	NE	NE	-	-
	Alkalinity as CaCO <sub>3</sub> (mg/L)	-	-	-	NE	NE
	Chloride (mg/L)			NE		
	Sulfate (mg/L)	NE	NE	NE	0	0
Increased TDS	TDS (mg/L)	NE	NE	NE	0	0

*NE = no evidence because no data available (NA)*