Equivalency of Bioassessment Protocols

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Outline

- Stream bioassessments—why & how?
- Brief History
- RBP vs SQT
- Conclusions

Stream Bioassessments

- **Why?**
  - Existing Conditions to guide Restoration Efforts
  - Success of Restoration Efforts
- **How?**
  - Accurately & Efficiently
  - Complex Environments

Brief History

Buss et al., 2014 examined global stream bioassessment protocols for *macroinvertebrates scores*

Doll et al., 2016 examined restored streams in NC using 5 different stream bioassessment protocols to test predictability of *macroinvertebrate scores*

Donatrich et al., 2020 examined SQT-assessed streams for predictability in *macroinvertebrate/biology scores*

- Our aim is to test the equivalency of two common bioassessment protocols (RBP, SQT) for:
  - **Correlation of Protocols**
  - **Relationship between Protocols & Restoration Approach**
  - **Efficiency of protocols**
- Our goal is to provide regulators and policy makers with data of common stream bioassessment protocols concerning their *correlations and effect on site development* and project objectives.

Rapid Bioassessment Protocol (RBP)

(Barbour et al., 1999)

- The primary purpose is to describe a practical technical reference for conducting **cost-effective** biological assessments of lotic systems.

- The protocols presented are not necessarily intended to replace those already in use for bioassessment nor is it intended to be used **without regional modifications.**

Category	Description
Epifaunal Substrate	Substrate suitable for colonization potential (submerged logs, undercut banks, cobble, etc)
Embeddedness	Percent of gravel, cobble, boulder particles surrounded by sediment
Velocity/Depth Regime	Presence of riffle, pool, glide, run structures
Sediment Deposition	Islands, point-bars
Channel Flow Status	Percent water fills channel
Channel Alteration	Channelization, dredging, etc
Frequency of Riffles	Occurrence of riffles
Bank Stability	Percent evidence of erosion
Vegetative Protection	Percent coverage of streambank and riparian
Riparian Vegetation Zone	Width of protected area

Rapid Bioassessment Protocol (RBP)

Qualitative Score	Quantitative Score
Poor	0-116
Average	117-159
Excellent	160+

Stream Quantification Tool (SQT)

Stream Mechanics

SQT was created to fulfill the following needs:

- Provide a calculator to determine the **numerical differences** between an **existing** (degraded) stream condition and the **proposed** (restored or enhanced) stream condition.
- This numerical difference is known as **functional lift** or uplift and is often used to determine **stream credits** as defined by the 2008 Federal Mitigation Rule.

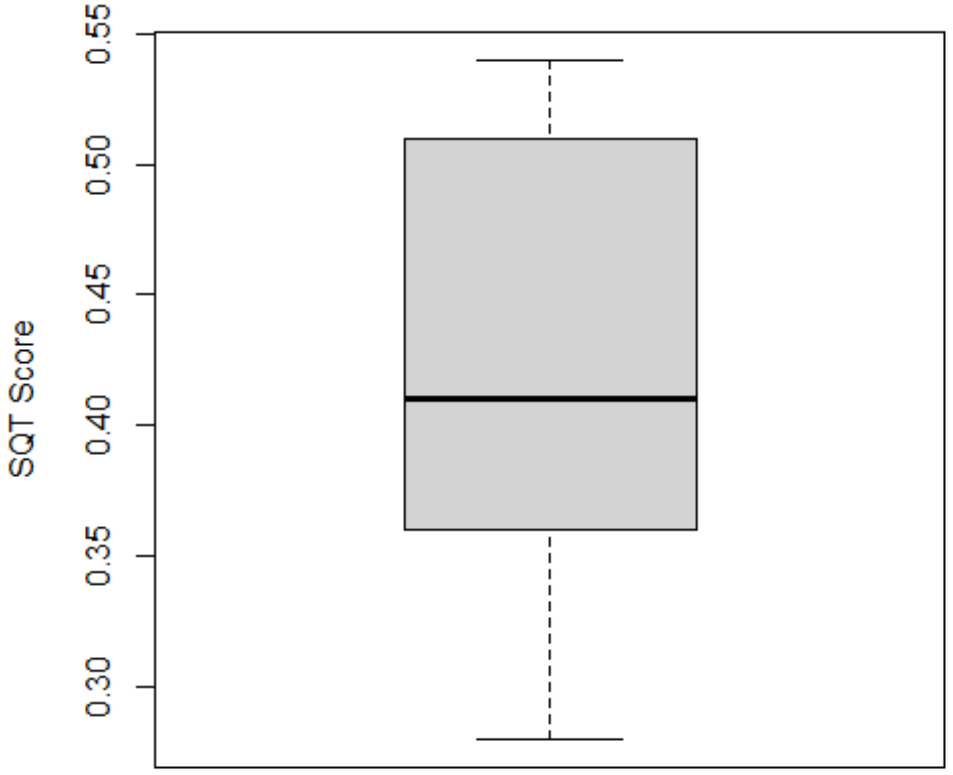
Functional Category	Function Based-Parameters
Hydrology	Catchment Hydrology
	Reach Runoff
Hydraulics	Floodplain Connectivity
Geomorphology	Large Woody Debris
	Lateral Migration
	Riparian Vegetation
	Bed Material Characterization
	Bed Form Diversity
	Plan Form
Physiochemical	Bacteria
	Organic Enrichment
	Nitrogen
	Phosphorous
Biology	Macroinvertebrates
	Fish

Stream Quantification Tool (SQT)

Qualitative Score	Quantitative Score
Not Functioning	0-0.3
Functioning-at-Risk	0.3-0.7
Functioning	0.7-1.0

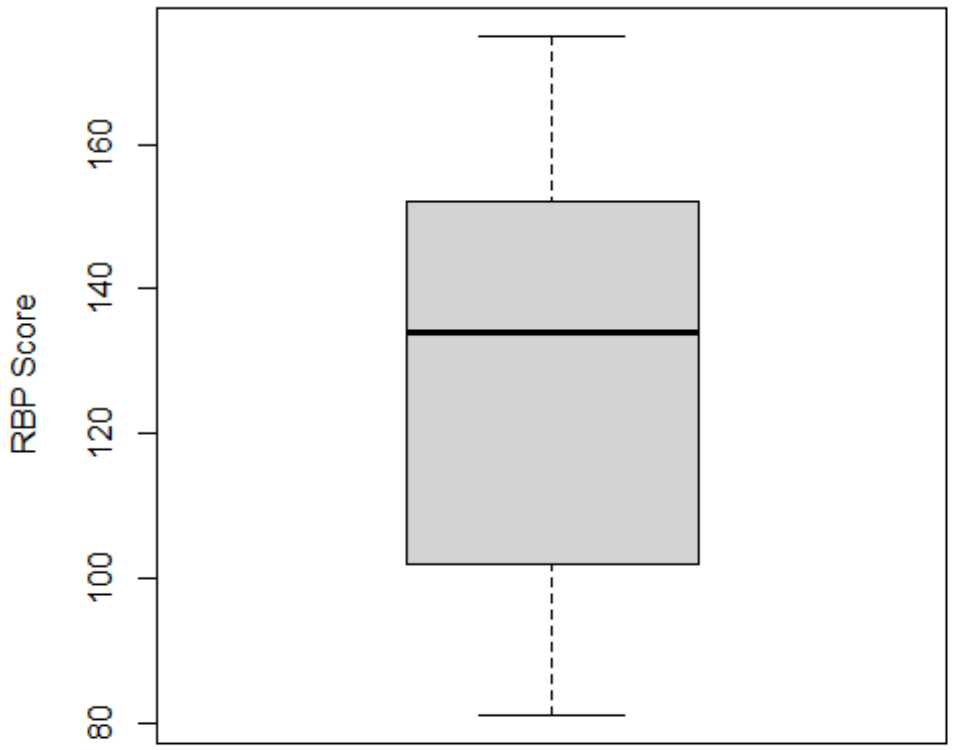
- Mitigation Bank Site in Eastern TN
- RBP and SQT bioassessments
- Mitigation Action type determined through SQT

SQT Score Distribution

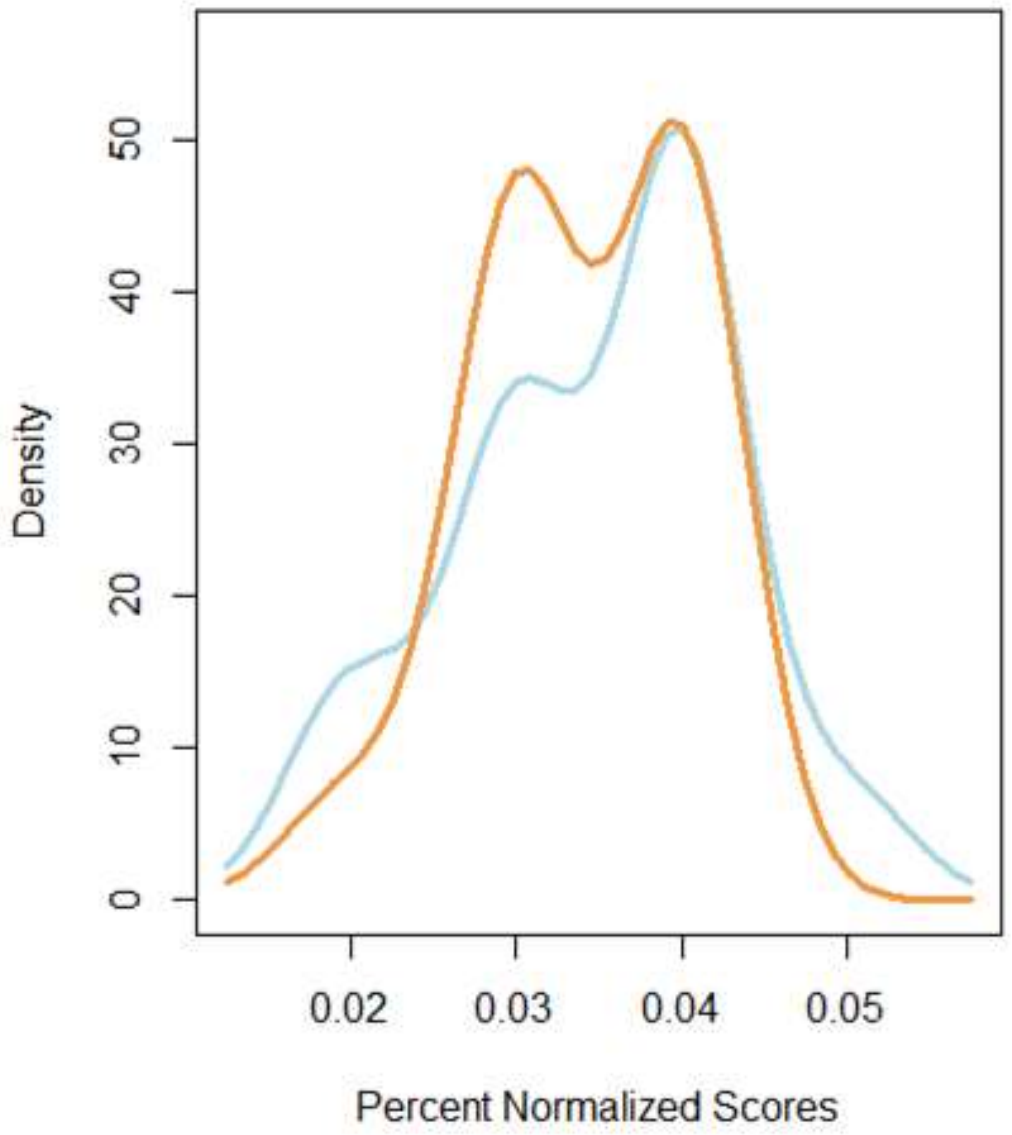


Average	0.42 (Functioning-at-risk)
Range	0.28 – 0.54
Median	0.41

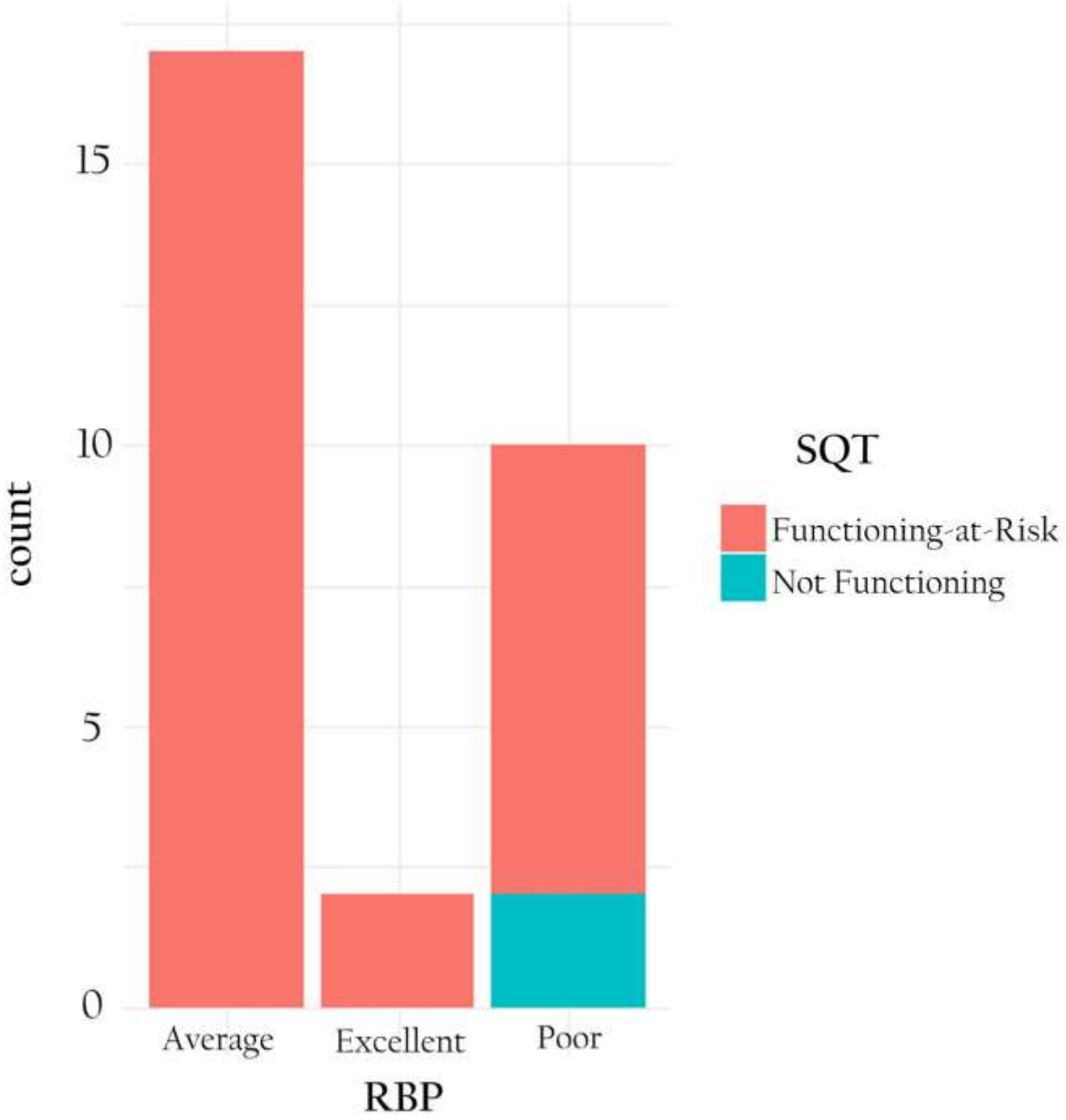
RBP Score Distribution



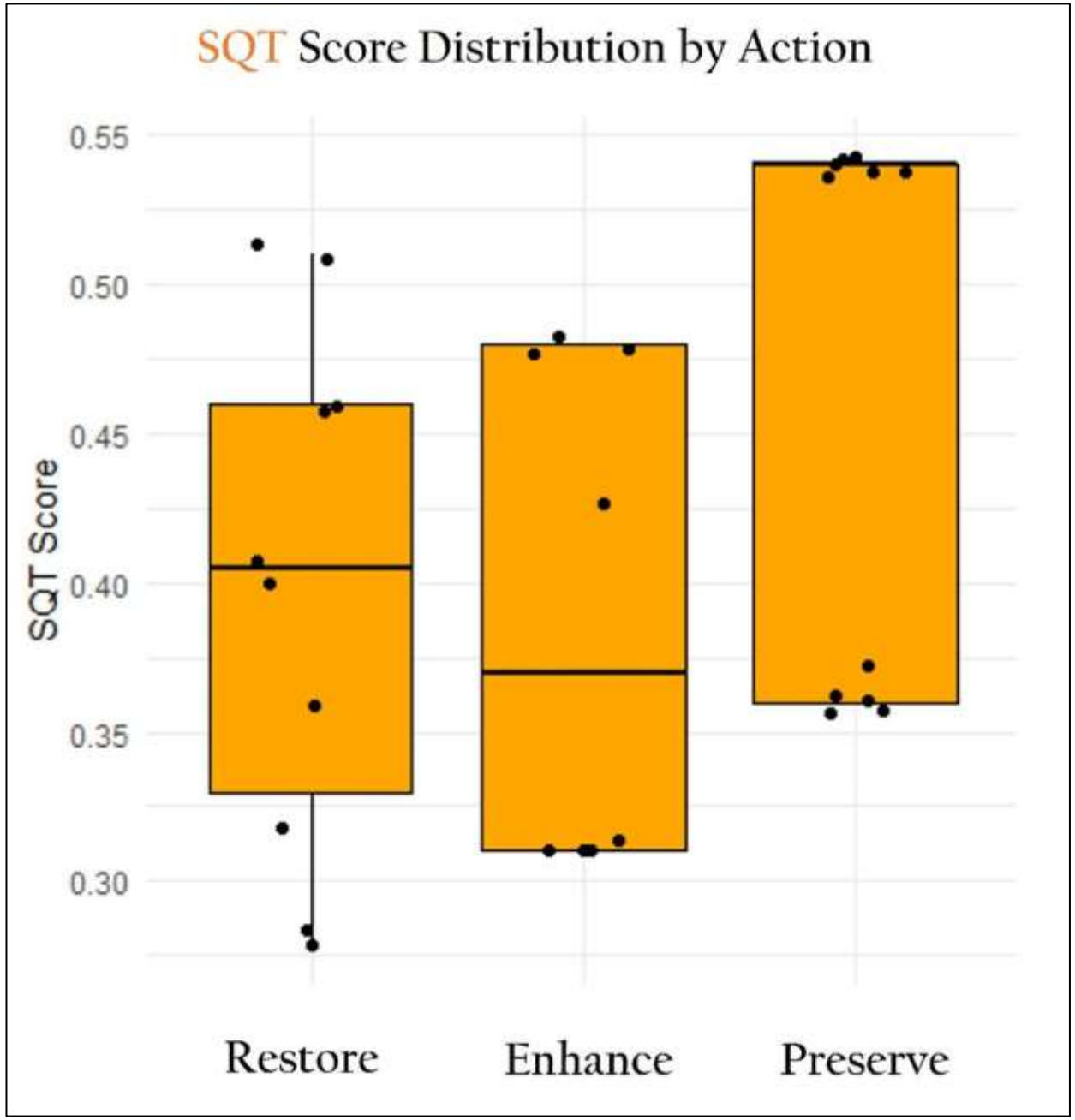
Average	128 (Average)
Range	81 – 175
Median	134

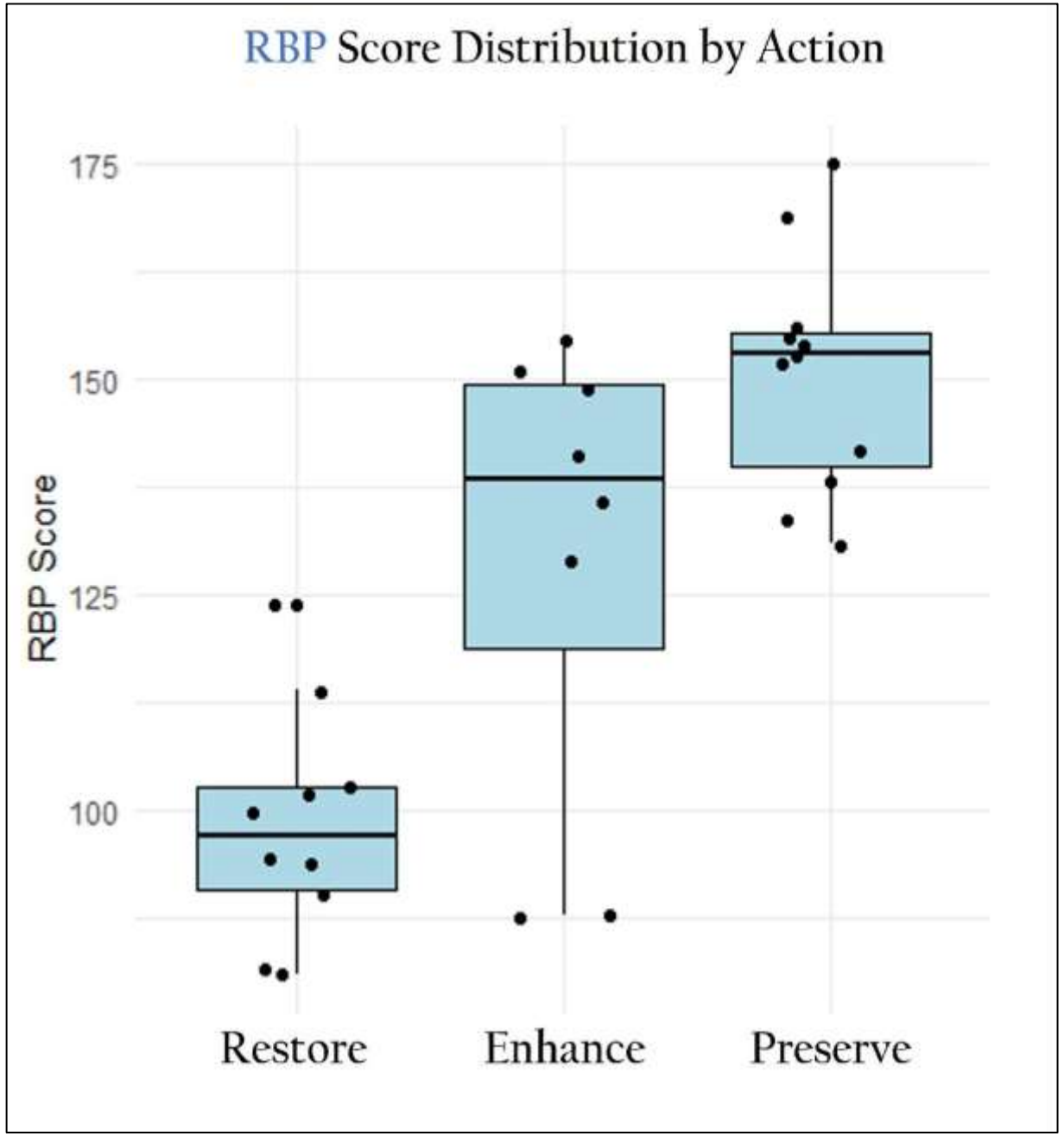


Wilcoxen Rank Sum Test	
W	446.5
P-value	0.6637
The two datasets are NOT different.	



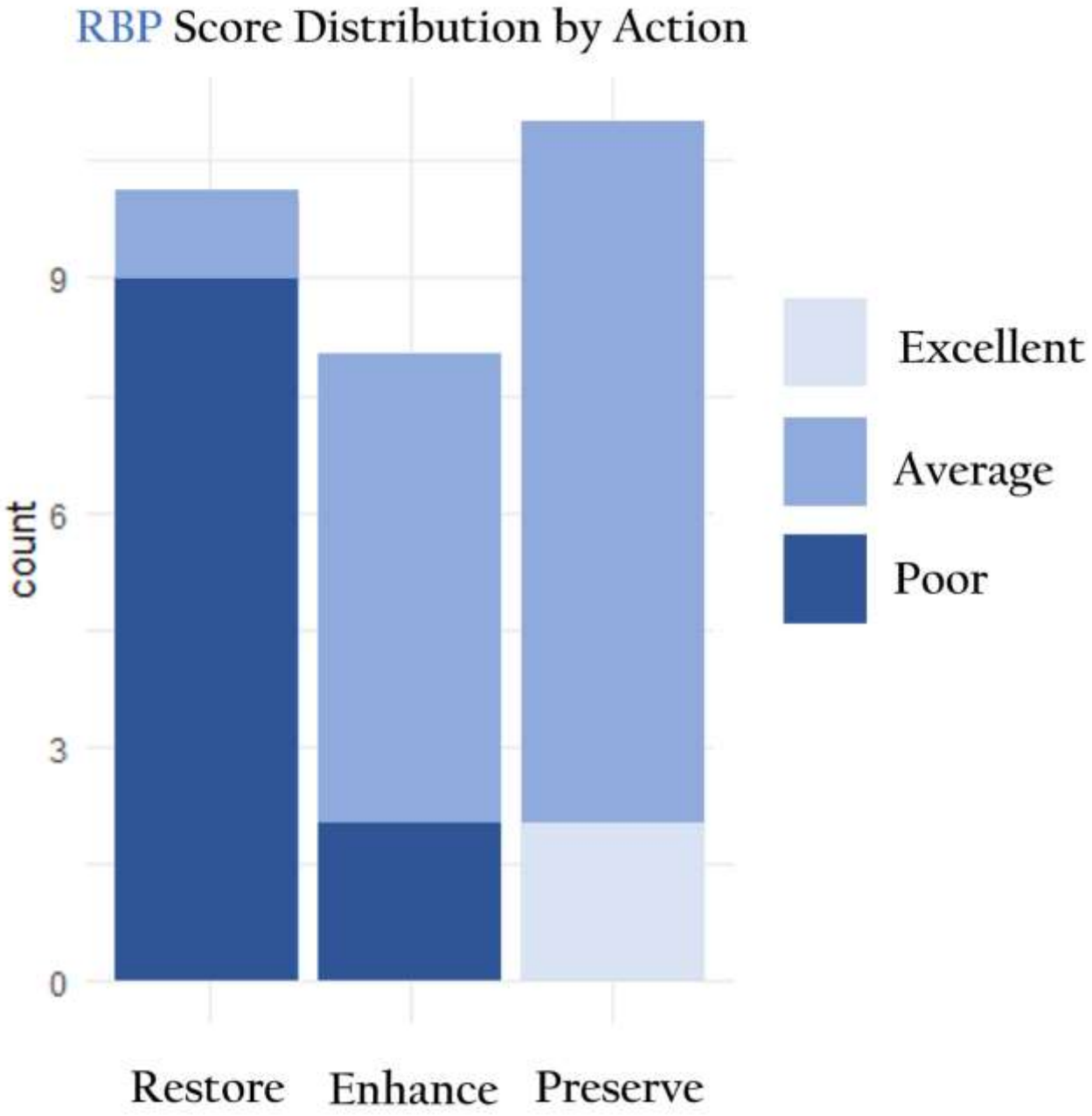
Chi-Squared Test	
X^2	4.08
df	2
P-value	0.1299
The two datasets are NOT different.	


SQT Score Distribution by Action
SQT Score
0.55
0.50
0.45
0.40
0.35
0.30
Restore
Enhance
Preserve


RBP Score Distribution by Action
RBP Score
175
150
125
100
Restore
Enhance
Preserve

Chi-Squared Test	
X^2	4.08
df	2
P-value	0.1299

There is no difference in SQT score and Mitigation Action.



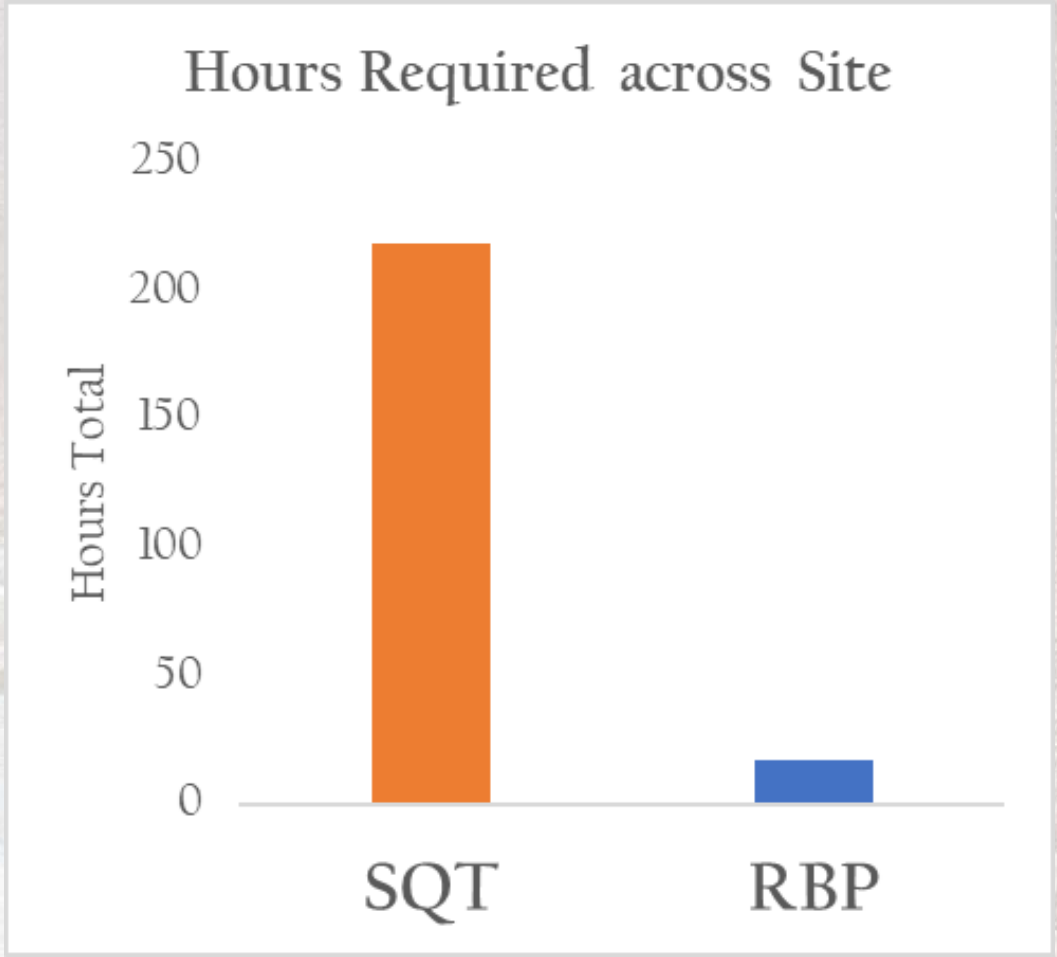
Chi-Squared Test	
X^2	23.31
df	2
P-value	0.00011

There is significant difference between RBP score and Mitigation Action.

Conclusions

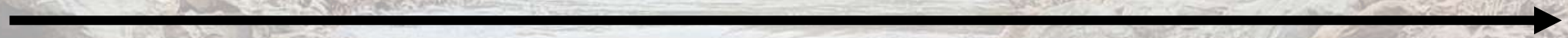
- SQT scores did NOT differ from RBP
- SQT did NOT differ from Mitigation Action
- RBP did differ from Mitigation Action

SQT vs. RBP	
Quantitative Data	SQT > RBP
Time Requirement	SQT > RBP
Training of Field Crews	SQT > RBP



The “HOW” of Stream Assessment:

- Accurately & Efficiently
- Complex Environments



RBP SWAMPIM SWVM HGM SQT

Questions?

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References

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