

Puget Sound EPA Benthos Grant: Comparison of Sampling Methods and Updated Taxa Attributes

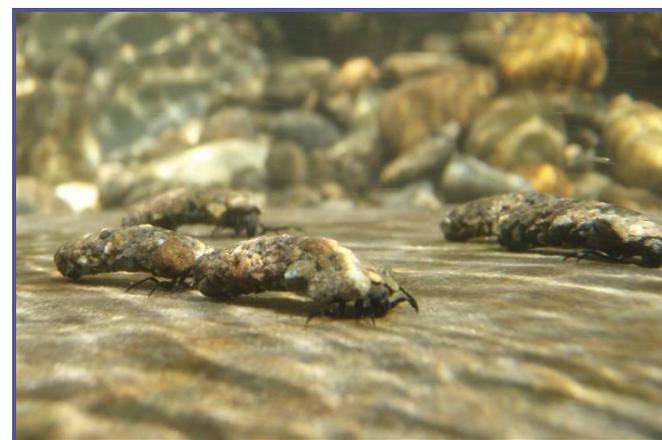
A Project Funded by US EPA Scientific Studies and
Technical Investigation Assistance Program Grant



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Leska Fore, Statistical Design
Karen Adams, WA Department of Ecology
Gretchen Hayslip, EPA Region 10

Overview

- Brief overview of the EPA grant
- Side by side sampling results
- Attribute updates
- Next steps/Timeline



EPA Grant

- EPA Scientific Studies and Technical Investigation Assistance Program
- Support technical studies to guide and evaluate implementation of PSP's Action Agenda
- 2011 to 2013
 - Address monitoring challenges
 - Advance B-IBI tools
 - Partner with others



Regional Benthic Monitoring Issues

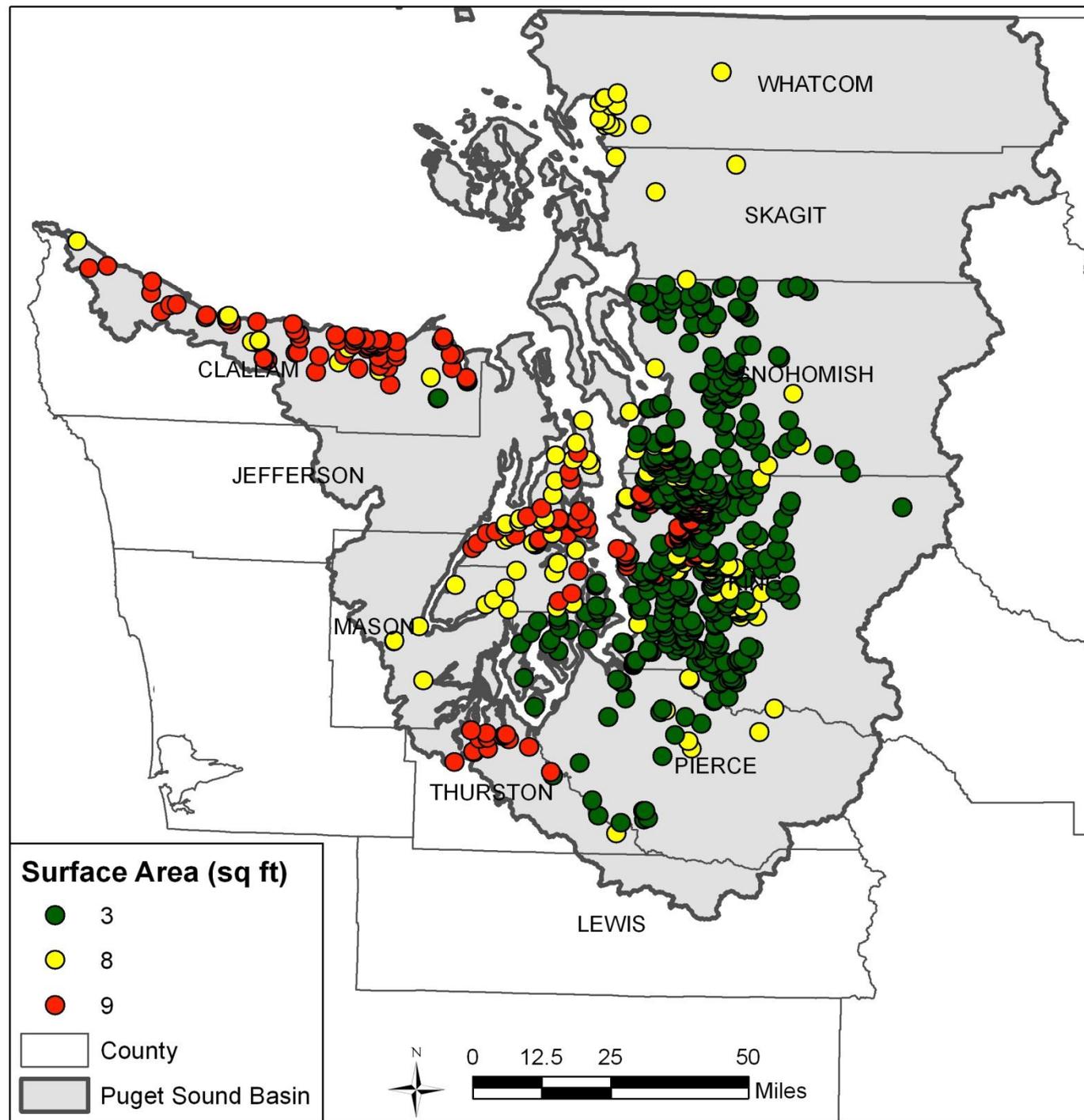
Limitations	Desired Outcomes
Differing collection methods	Standardization
Decentralized data mgmt	Centralized data mgmt
Outdated taxa attributes	Peer-reviewed or Empirically derived attributes
Insufficient sensitivity	Re-calibrated scoring
>20 cities, counties, tribes monitoring independently	Collaboration and communication

Goal: Improved decision making to restore and protect streams

Surface Area

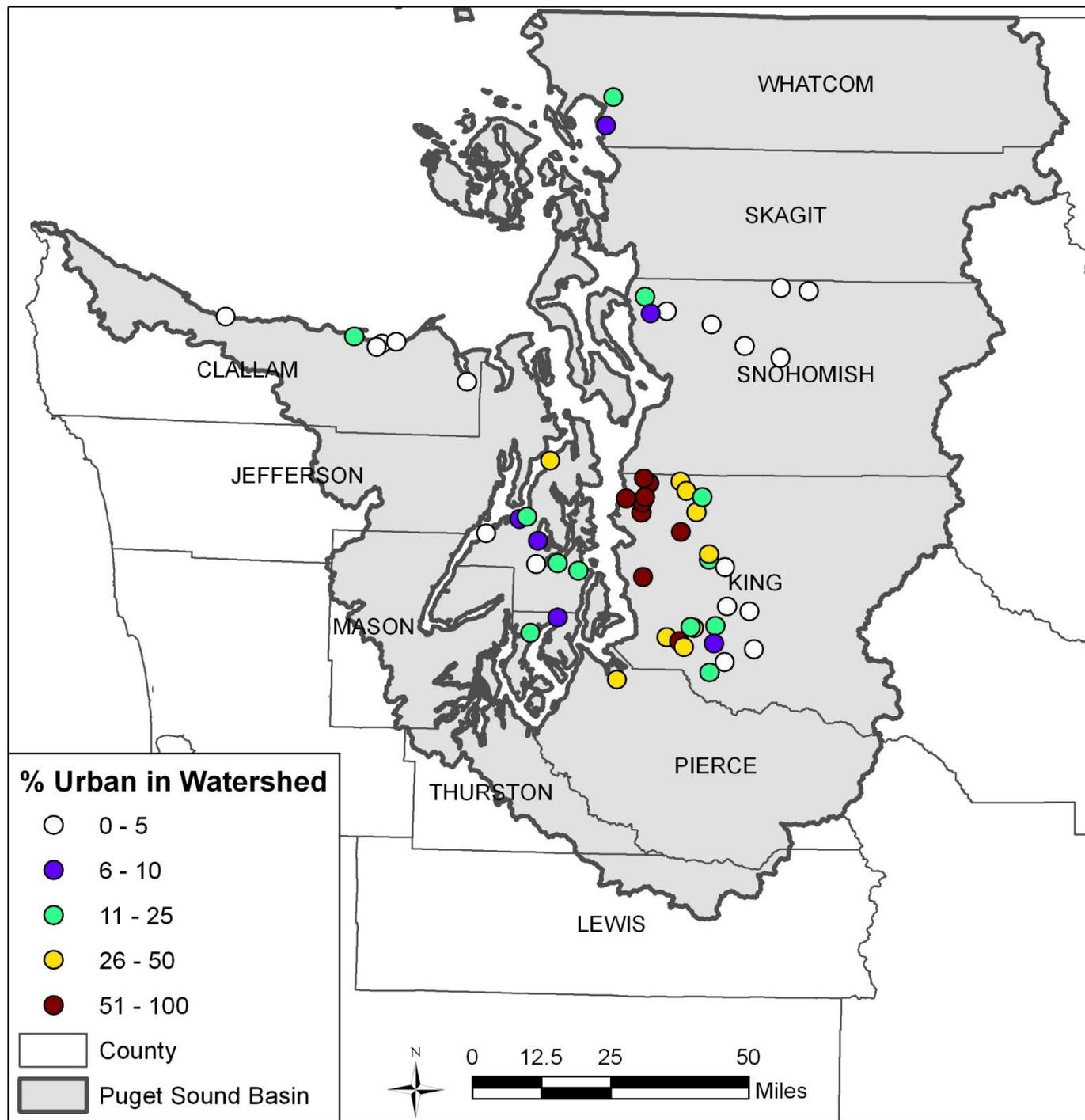


3, 8, and 9
sq ft total
surface area



Sampling Locations

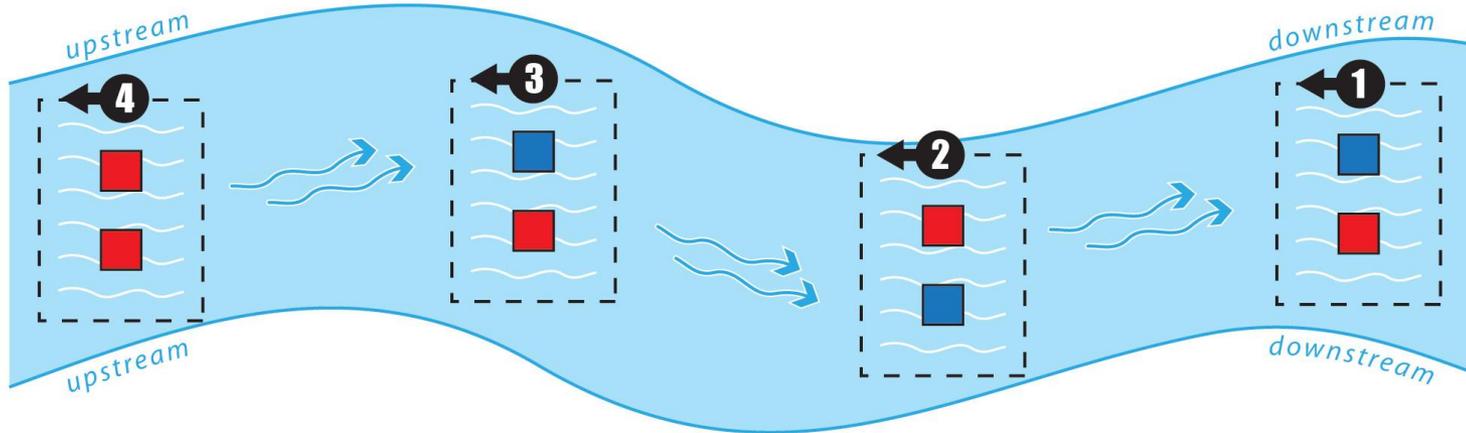
-  55 sites
-  9 partners
-  4-330 m elevation
-  0-93% urban



Sample Collection

STREAM REACH SAMPLE COLLECTION

- Sample each riffle twice, 1 ft² per sample
- Move from downstream to upstream
- 3 ft²: collect one sample from three riffles
- 5 ft²: collect one sample from three riffles and two from a fourth riffle



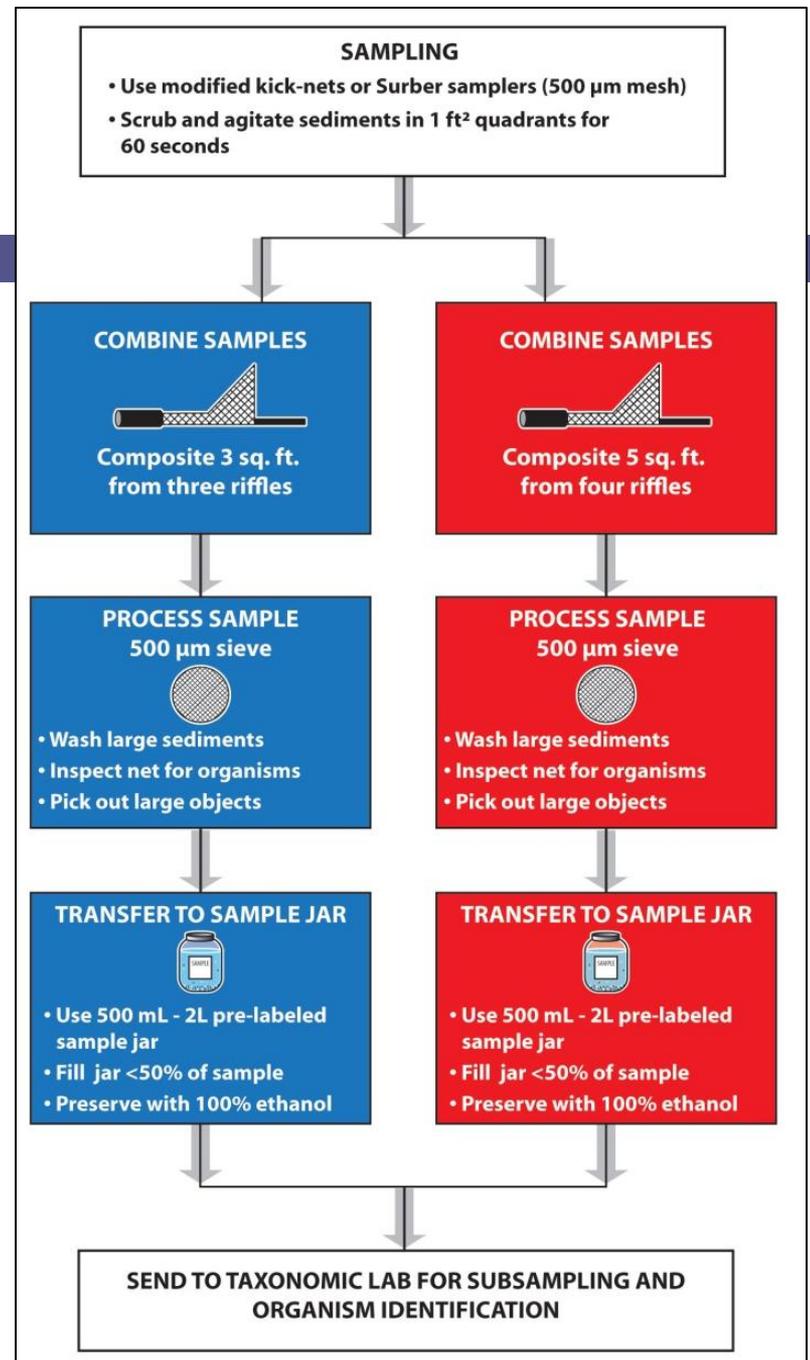
 Sample composited into total 3 ft² area

 Sample composited into total 5 ft² area

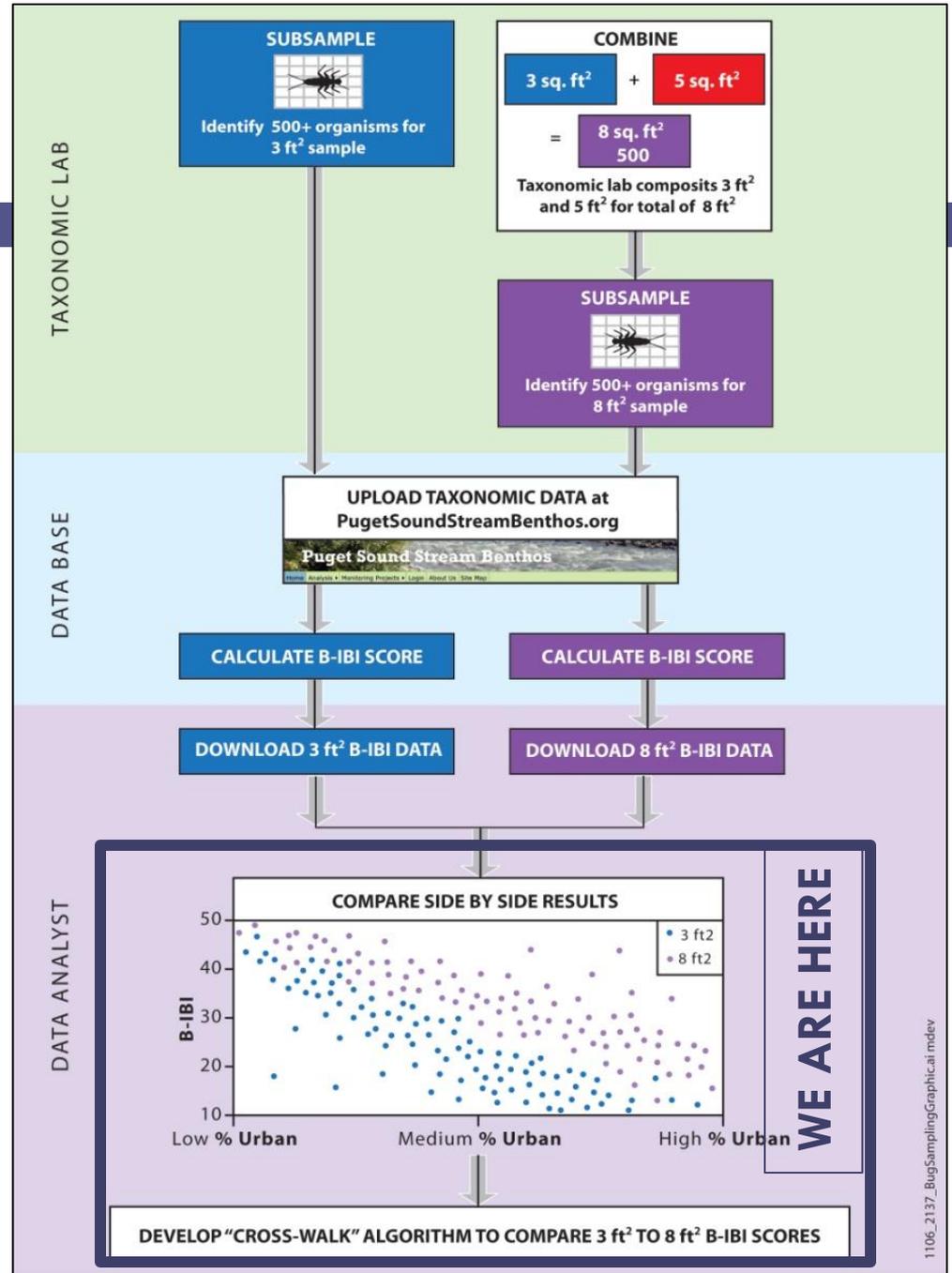
 Fast-moving habitat (riffle)

 Stream flow

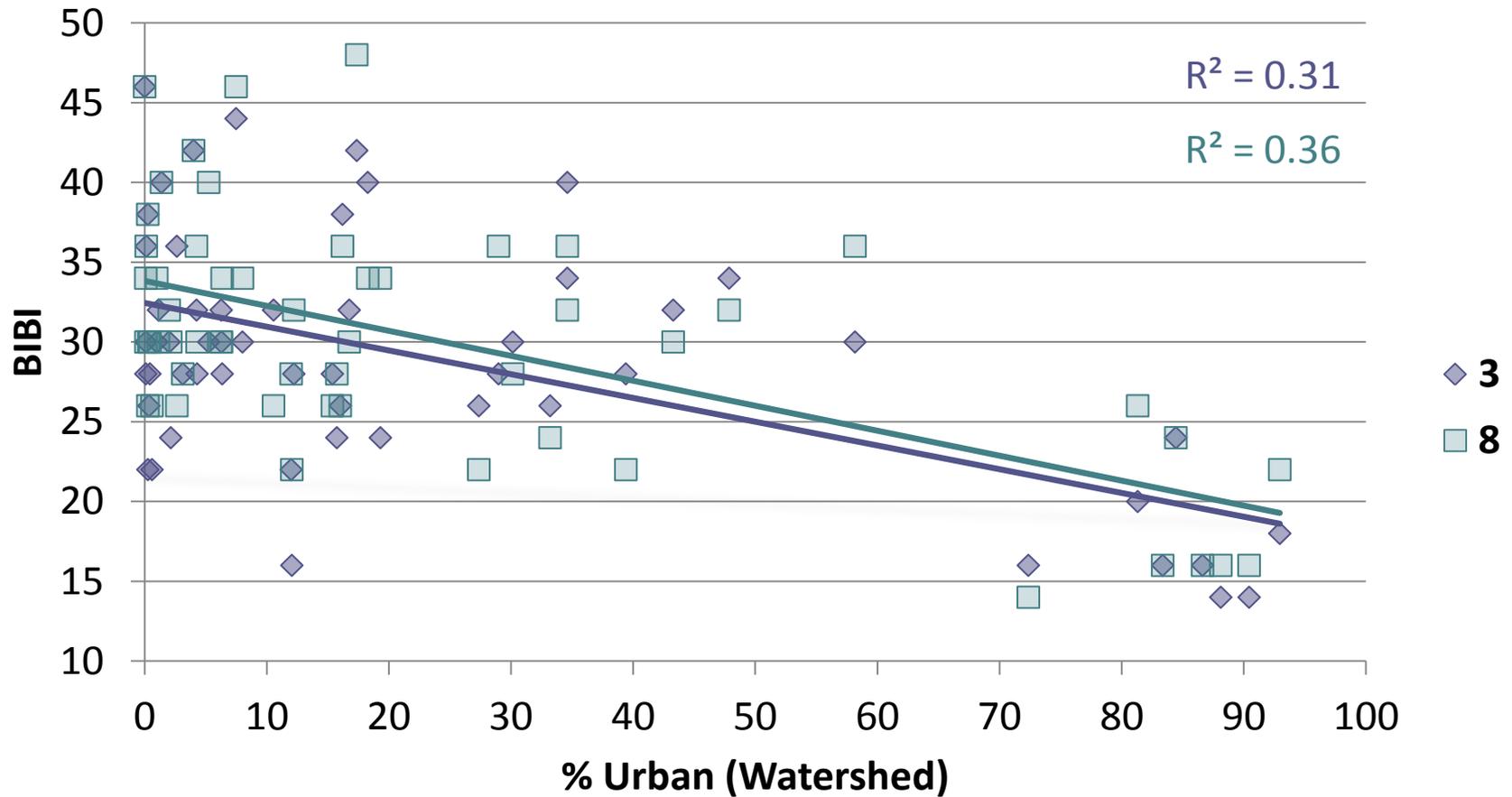
Sample Processing



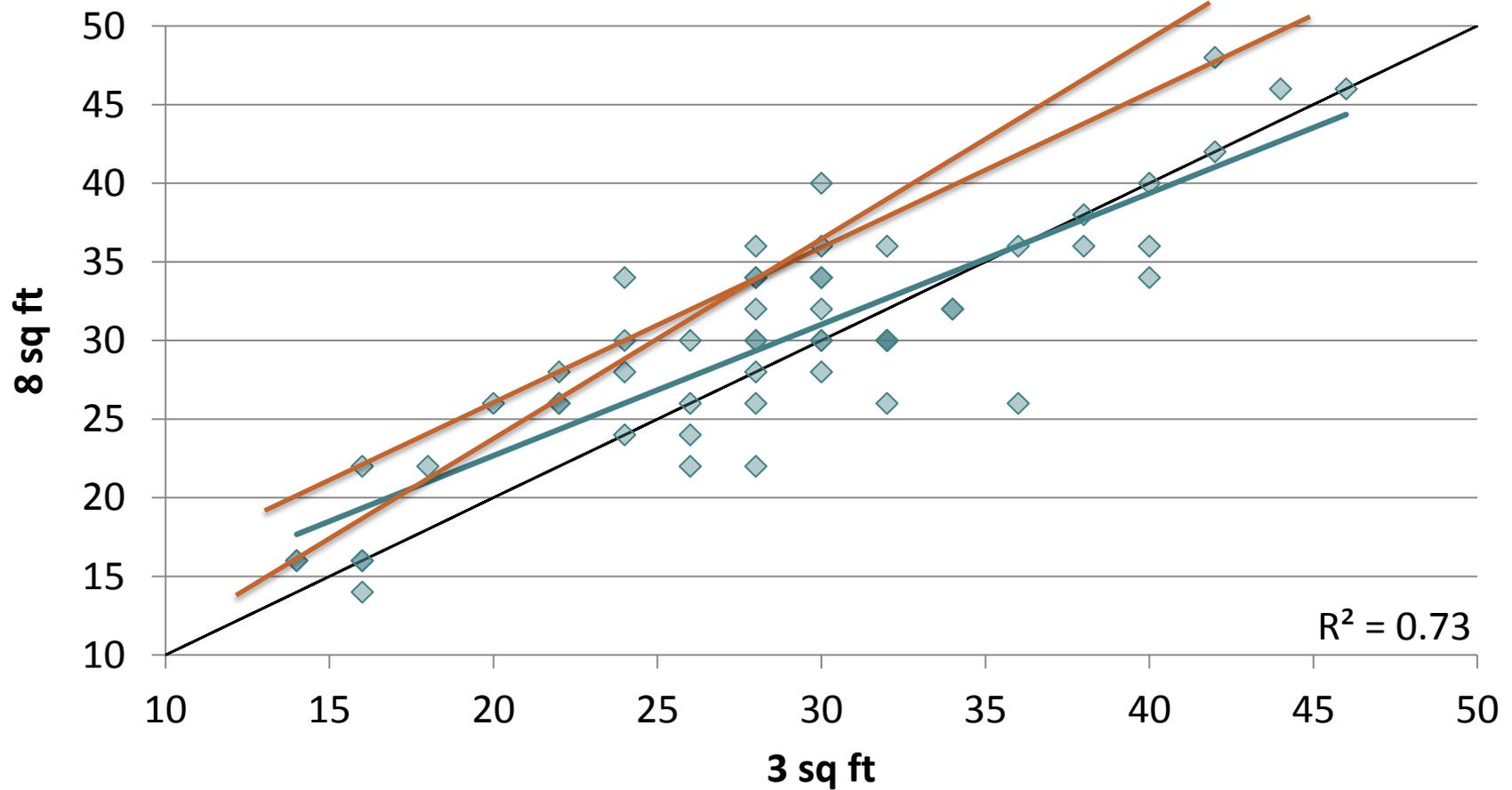
Lab Methods



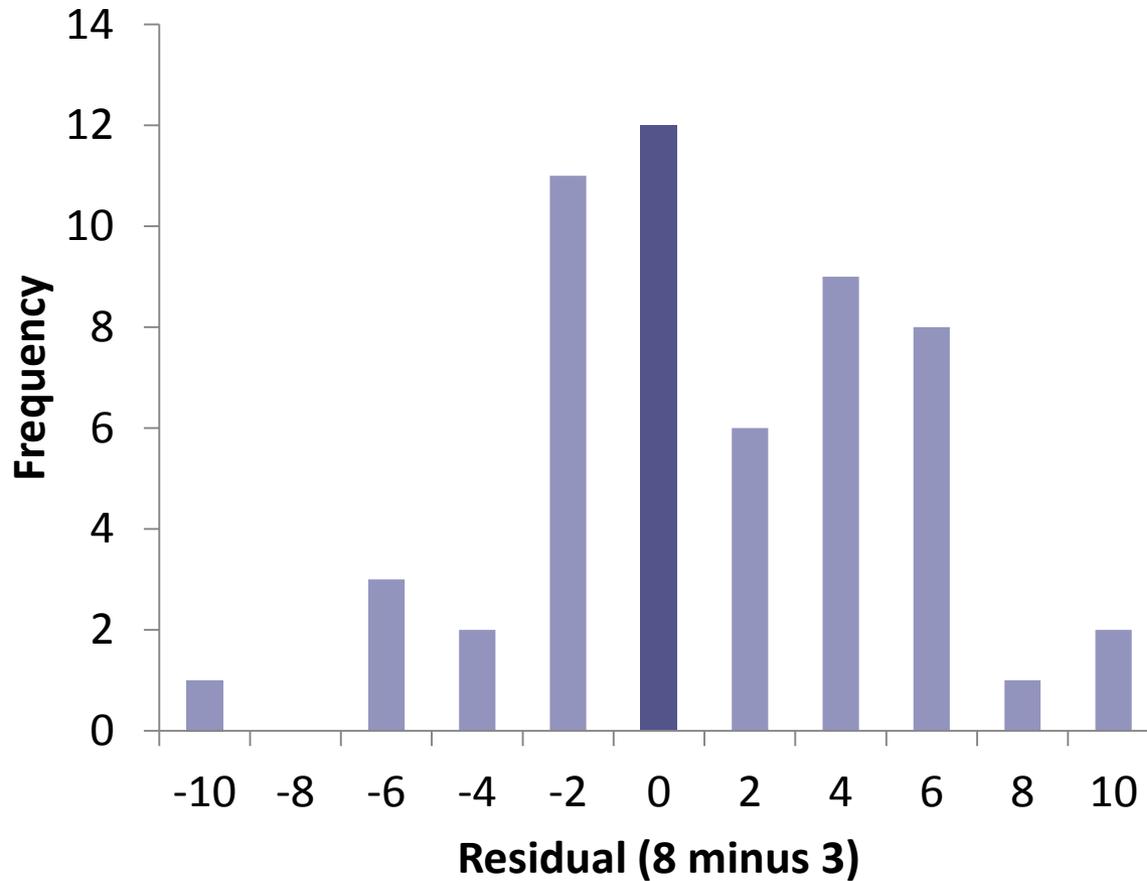
Overall BIBI Score: Landcover



Overall BIBI Score: 3 vs. 8 sq ft



Overall BIBI Score: Residuals



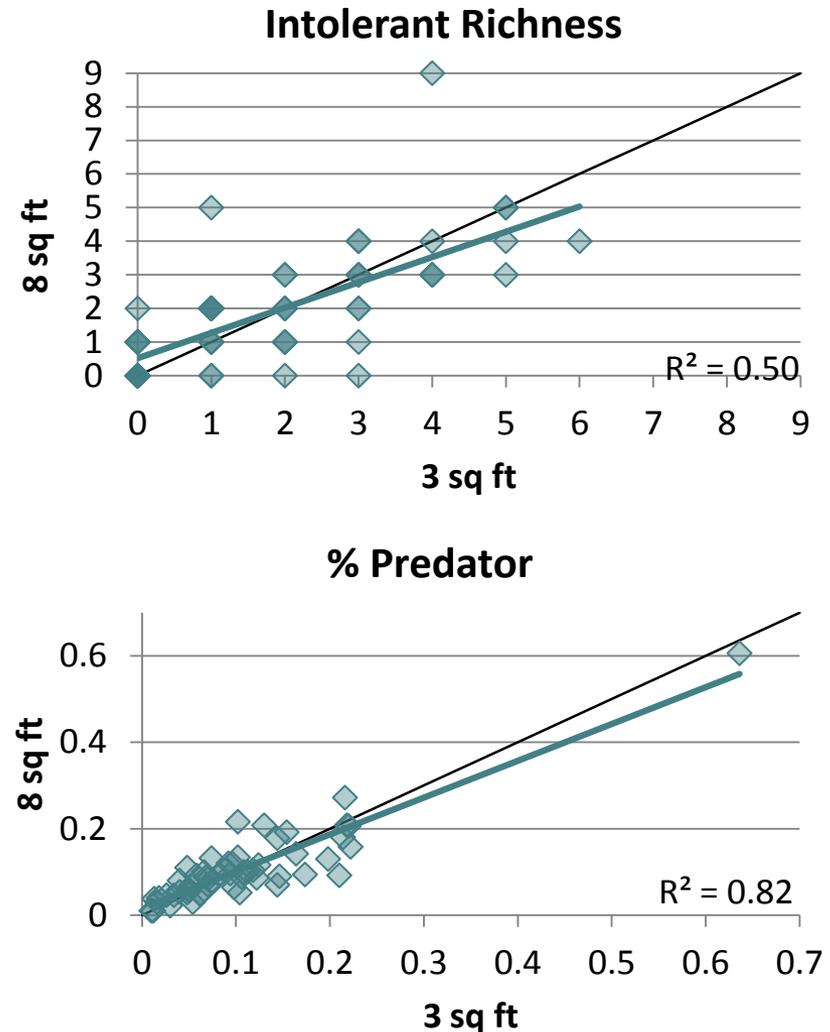
 Mean = 1.2

 $p < 0.05$

 Biologically meaningful?

Individual BIBI Metrics

Metric	R ²	Mean Residual
Total Taxa	0.54	<u>2.33</u>
Mayfly Taxa	0.72	-0.16
Stonefly Taxa	0.66	<u>0.65</u>
Caddisfly Taxa	0.57	0.27
Long-lived Taxa	0.58	0.27
Intolerant Taxa	0.50	<u>0.05</u>
% Tolerant	0.62	-0.01
% Predator	0.82	0.00
Clinger Taxa	0.74	<u>1.13</u>
% Dominance	0.54	0.00



Side by Side Conclusions

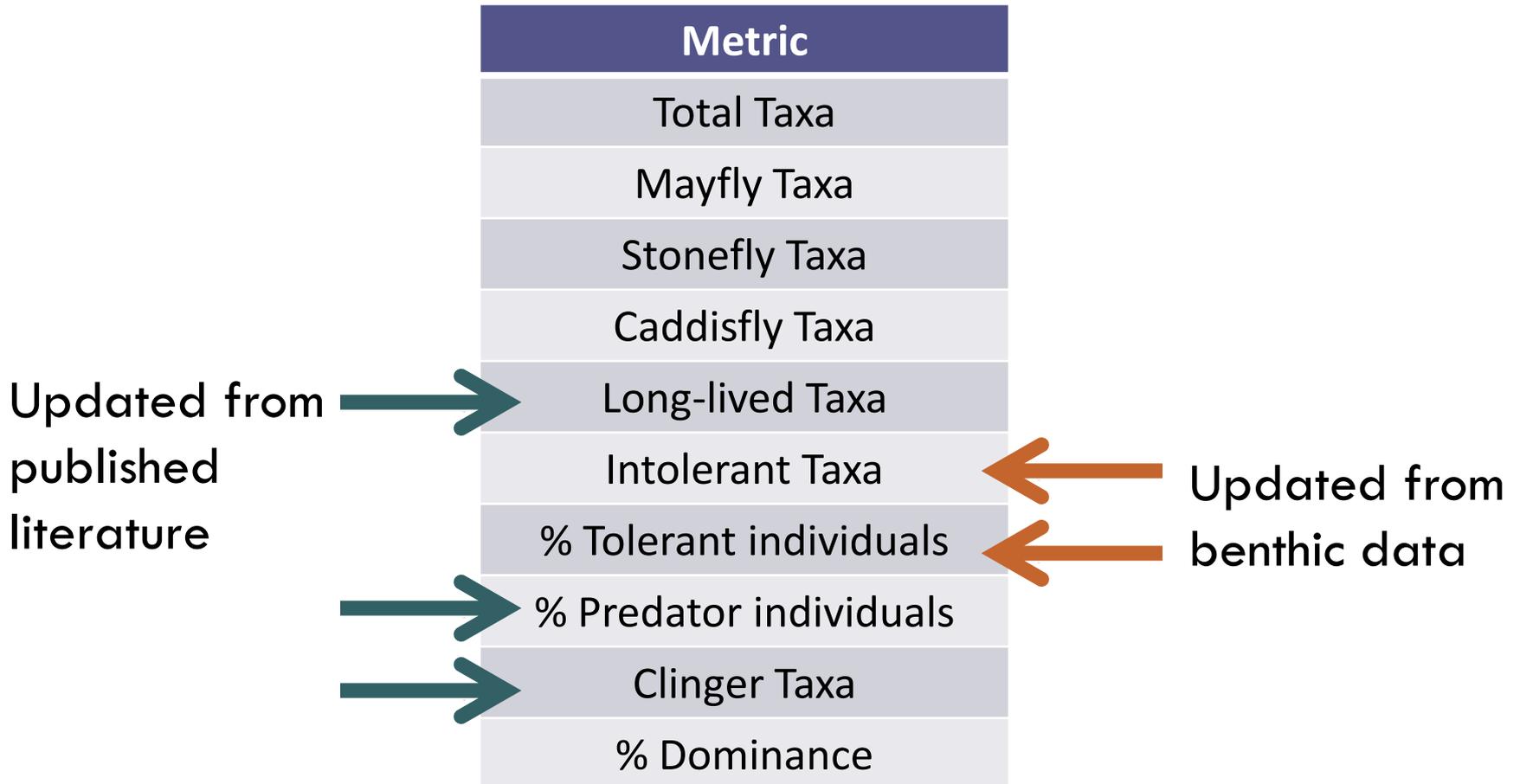
A little more analysis needed, but...

🪳 No additional 2012 sampling

🪳 No “cross-walk” required



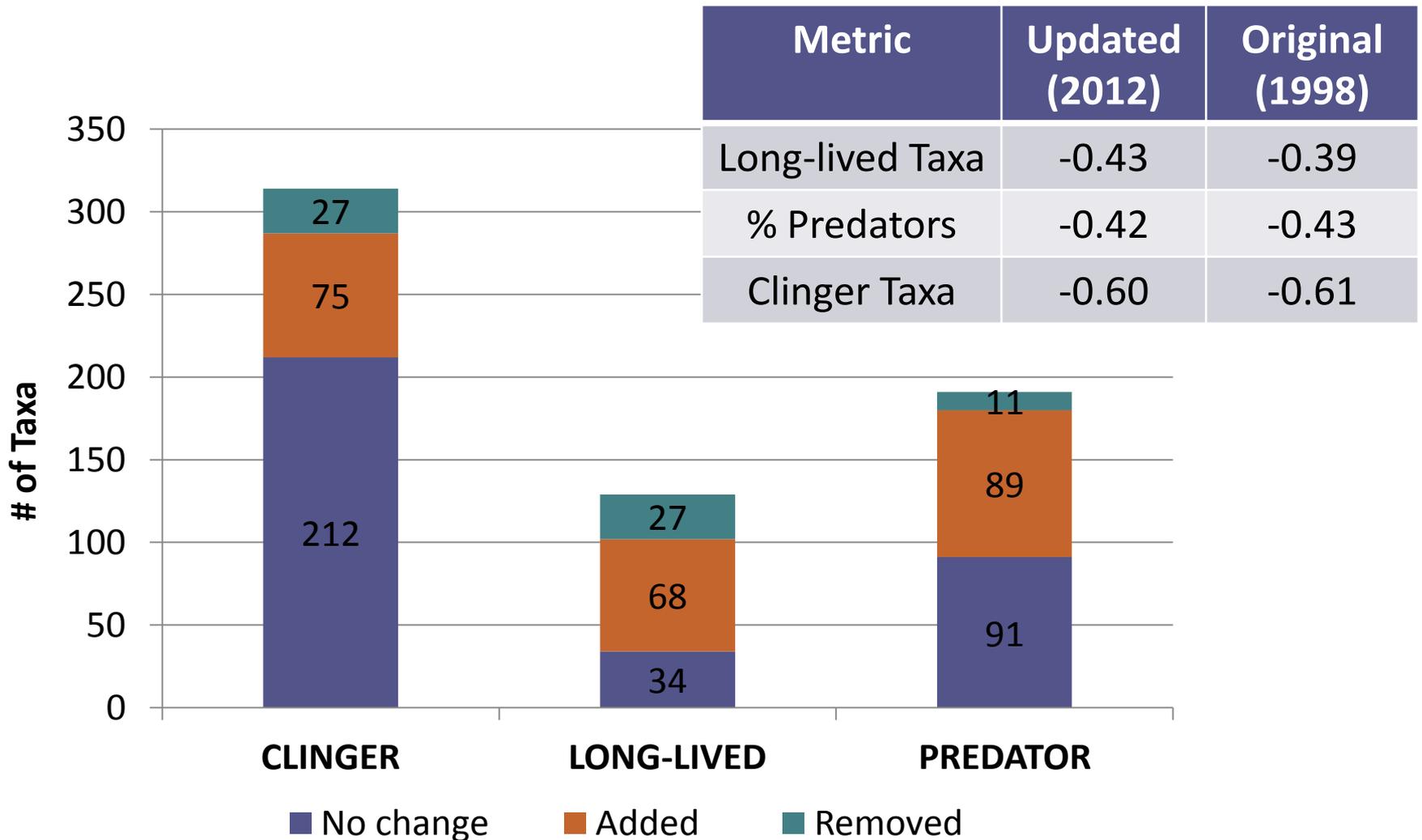
Attribute Updates



Published Literature Updates

Attribute	Taxa Group	Primary resource
Long-lived	stoneflies	Stewart and Stark 2002
	caddisflies	Wiggins 1996
	non-insects	Pennak 1989, Thorp and Covich 2001
	clams	Mackie 2007
	other mollusks	Dillon 2000
	other insect taxa	Hury et al. 2008, Poff et al. 2006
Predator	insects	Merritt et al. 2008
	non-insects	Pennak 1989, Thorp and Covich 2001
Clinger	insects	Merritt et al. 2008
	non-insects	not applicable

Attribute Changes: 1998 vs. 2012



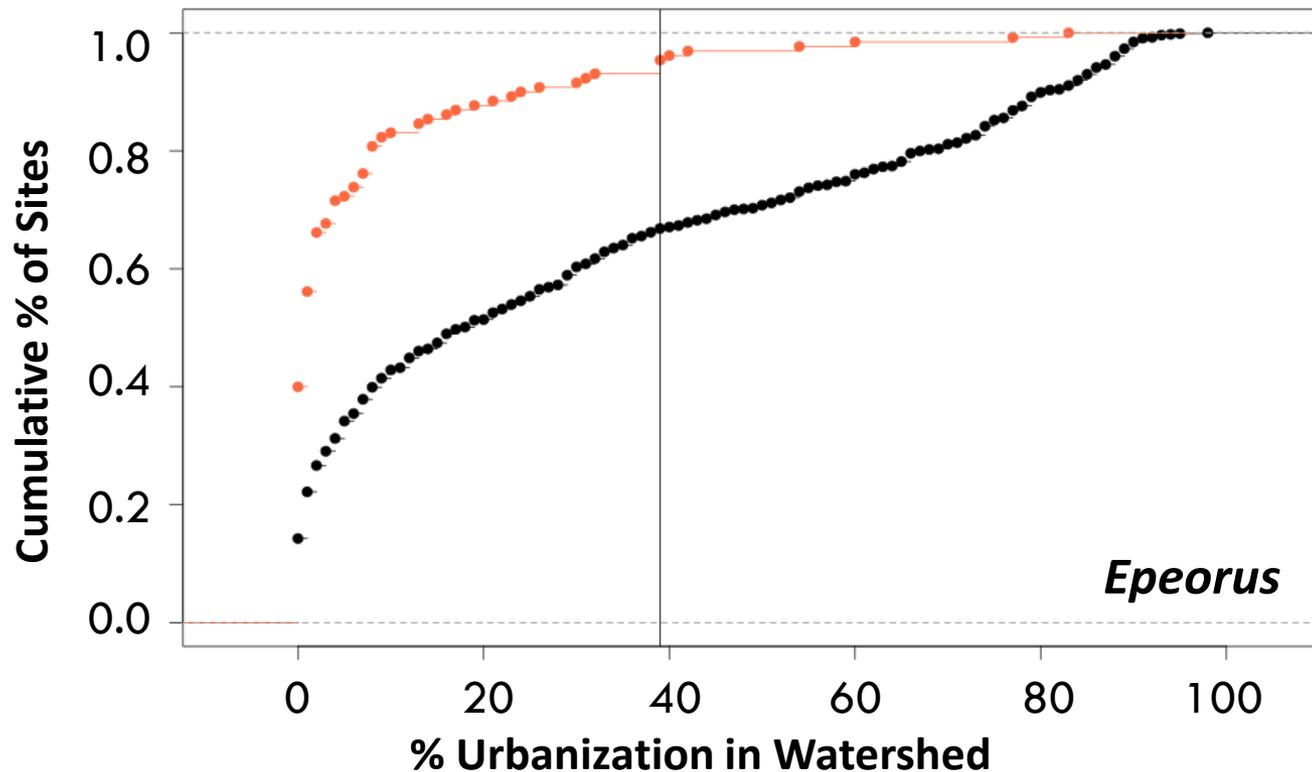
Tolerant & Intolerant Taxa Testing

 N = 784 sites (most recent)

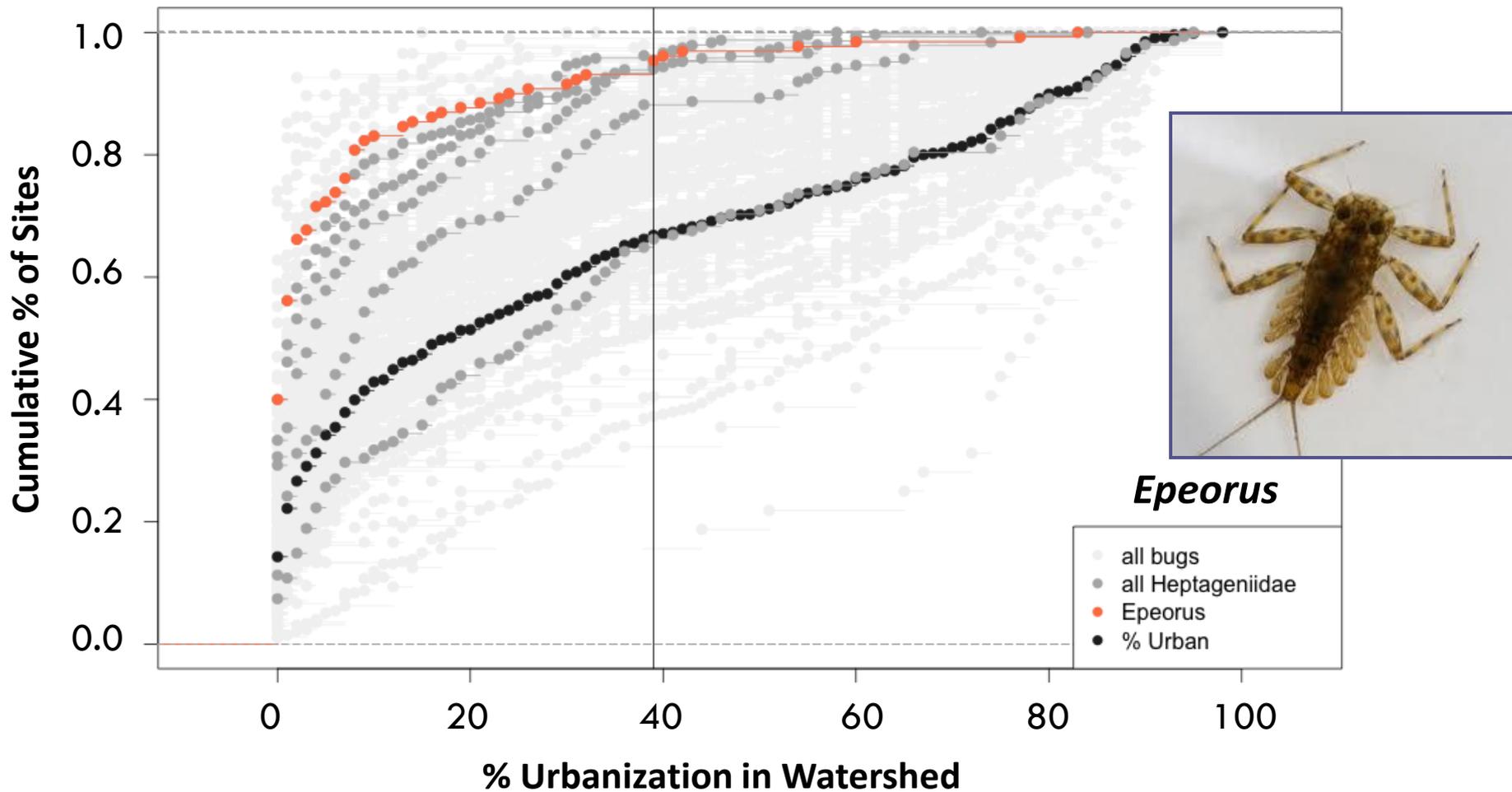
 ≥ 25 occurrences

 Genus level or higher

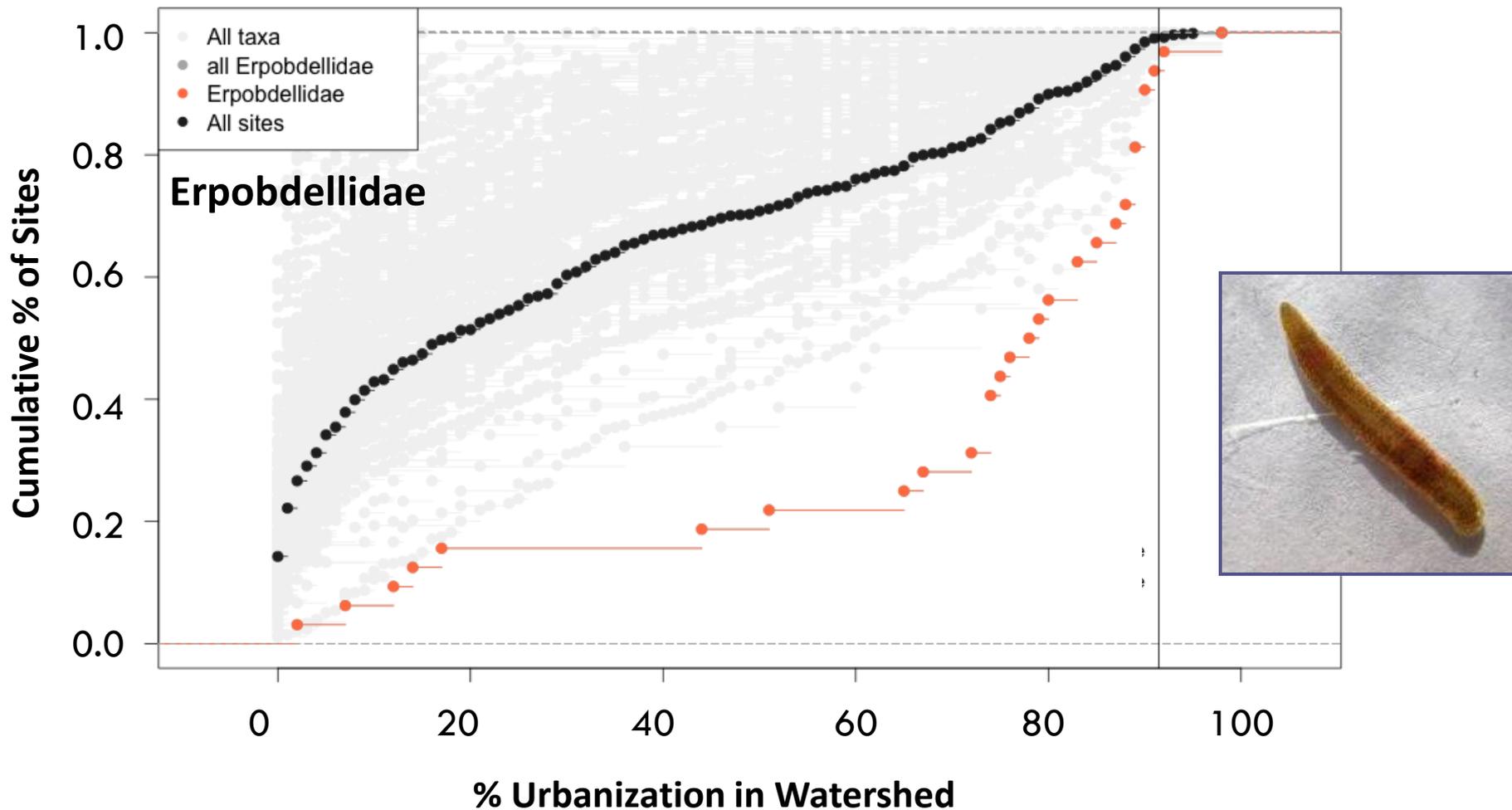
 155 taxa tested



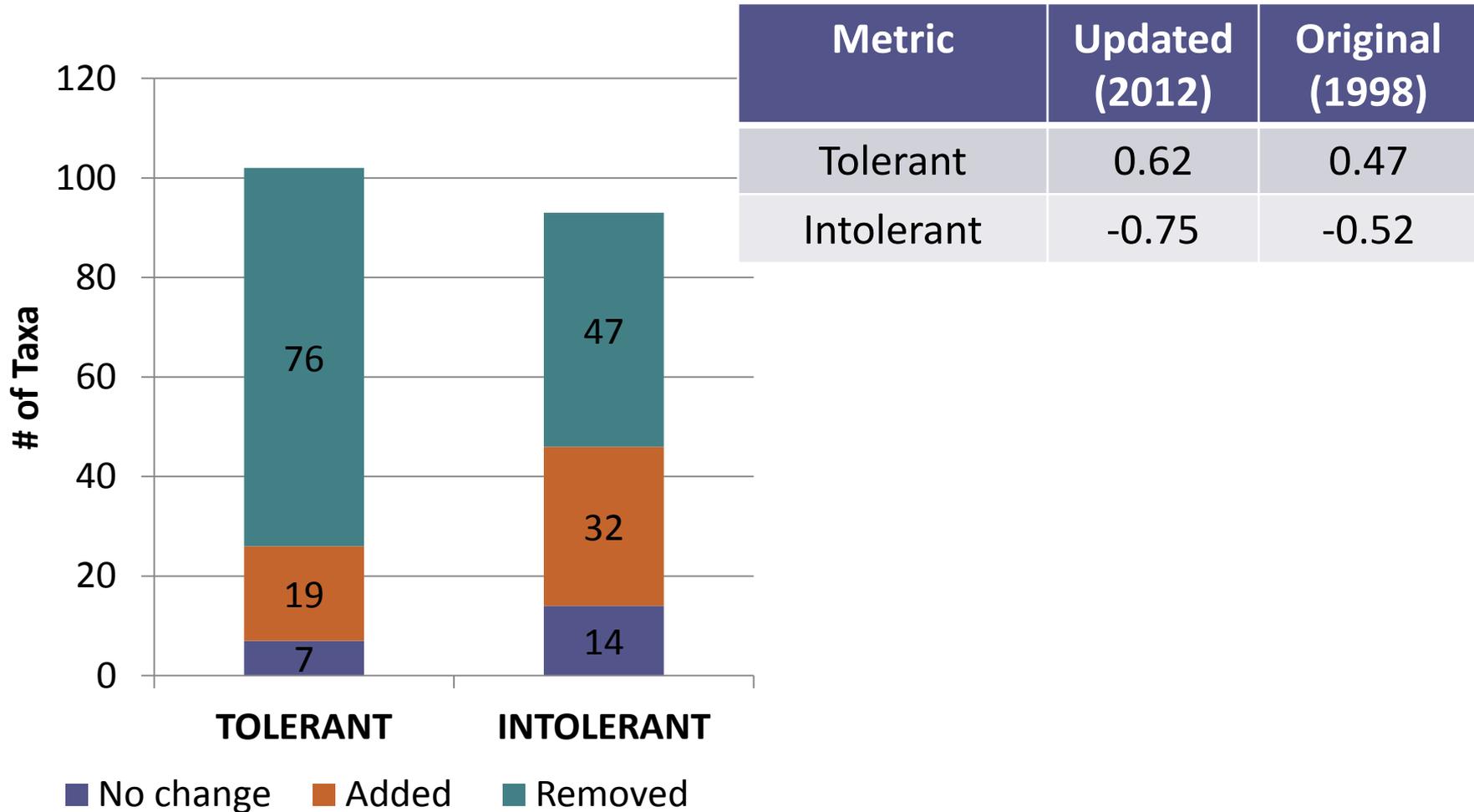
Example of an Intolerant Taxon



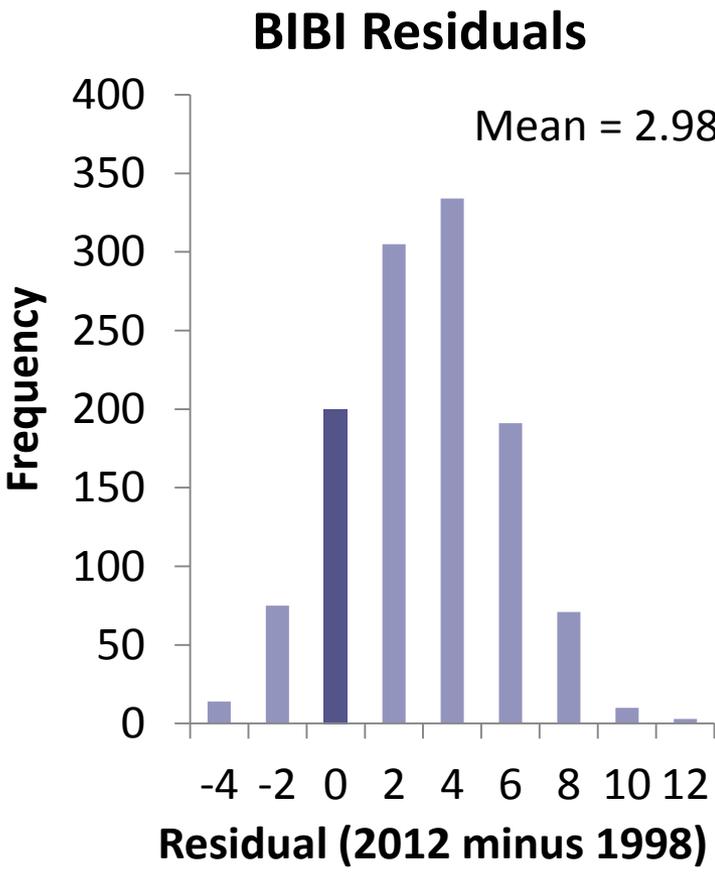
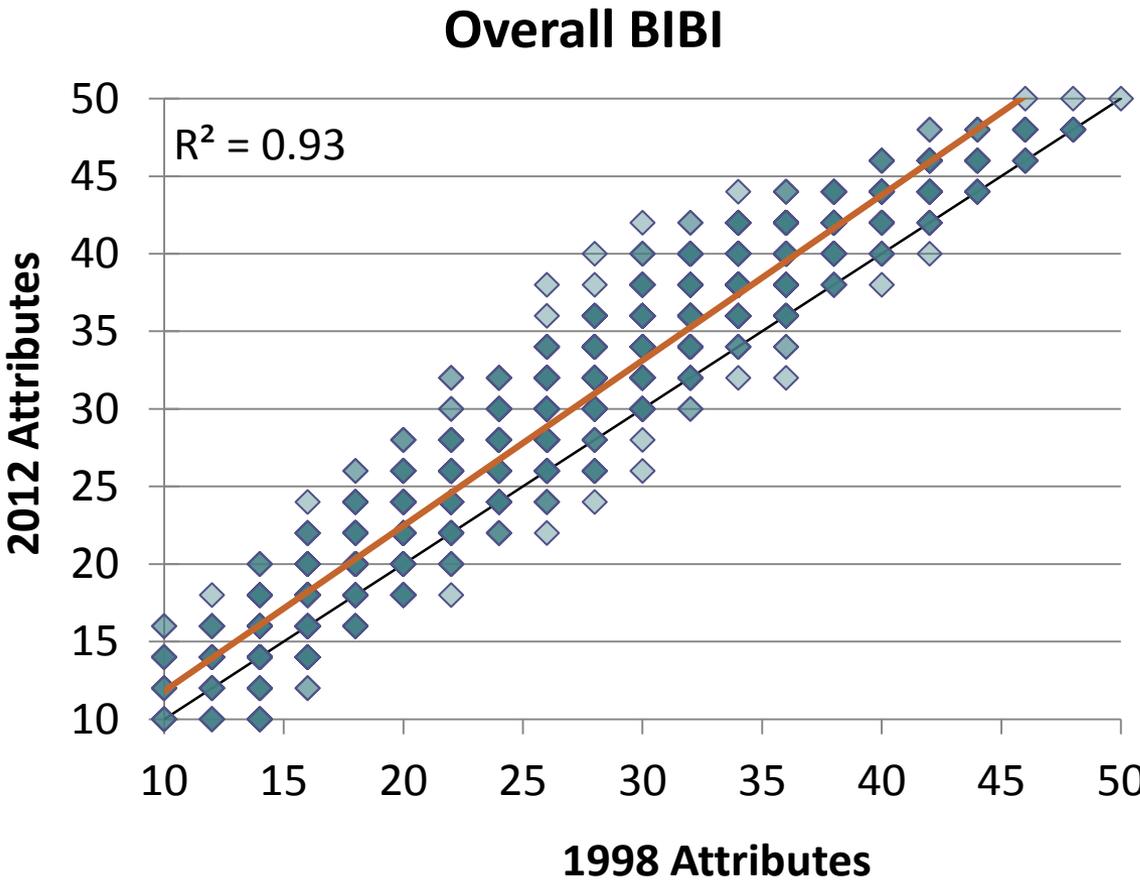
Example of a Tolerant Taxon



Attribute Changes: 1998 vs. 2012



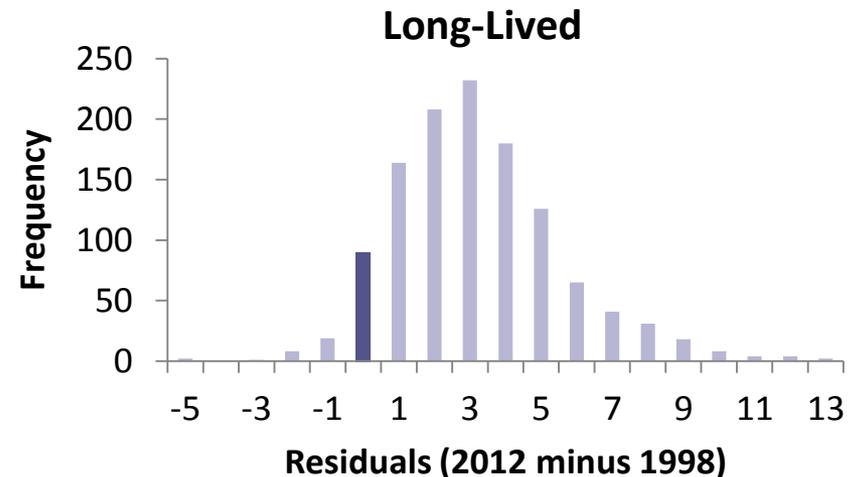
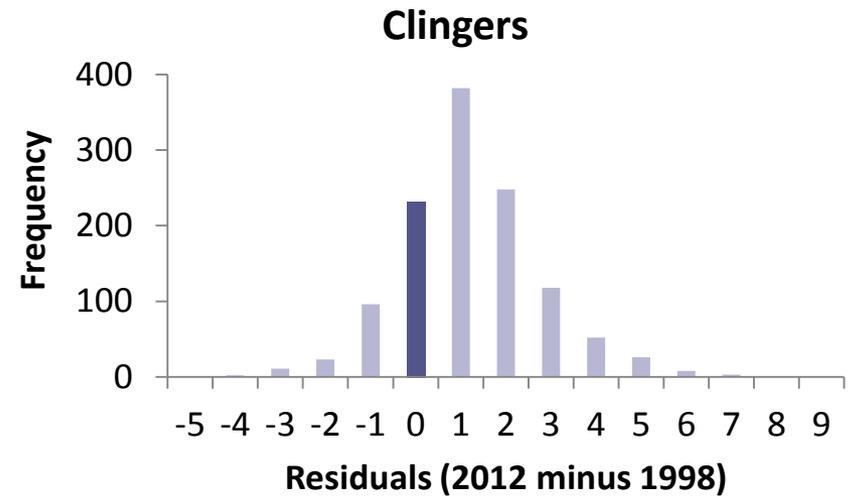
BIBI Scores: Attributes Compared



BIBI Metrics: Influence of Attributes

Metric	R ²	Mean Residual*
Long-lived Taxa	0.41	3.2
Intolerant Taxa	0.49	1.35
Clinger Taxa	0.95	1.21
% Tolerant	0.07	-1.96 %
% Predator	0.96	0.46 %

* All mean residuals are significantly different than 0 ($p < 0.05$)



Taxa Attribute Conclusions

- ✈ No change to structure of B-IBI – all metrics highly correlated with % urbanization
- ✈ Taxa attribute updates may require some recalibration
- ✈ Many rare taxa dropped from tolerant and intolerant lists



Next Steps

- Finalize attributes
- Recalibrate BIBI and adjust scoring
- Reanalyze 3 vs. 8
- Incorporate changes into PSSB
- BCG process/Indicator refinement
- Ongoing collaboration



Acknowledgements

Federal

EPA
NOAA
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State

WA Ecology

County

Clallam
King
Kitsap
Pierce
Snohomish
Thurston

City

Bellevue
Bellingham
Bothell
Everett
Issaquah
Kirkland
Redmond
Seattle
Tukwila

Private

Aquatic Biology Associates
Aquatic Entomology
Rhithron Associates, Inc.

Academic

University of Washington

Non-profit

Pierce Stream Team
Statistical Design
Lake Forest Park Streamkeepers

Tribe

Port Gamble Skallam Tribe
Snoqualmie Nation
Stillaguamish Tribe
Upper Skagit Indian Tribe

The background of the slide is a close-up photograph of several aquatic insects, likely stoneflies, resting on a piece of weathered wood. The insects are dark brown and segmented, with some showing lighter patches. The wood has a distinct grain and is surrounded by a blurred background of similar wooden planks and stones, suggesting a streambed environment.

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