Measuring the Health of Puget Sound Streams: B-IBI Recalibration

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

King County

Northwest Biological Assessment Workgroup, Astoria OR Nov 6, 2013

Overview

- Background
- Puget Lowland B-IBI Recalibration
  - Taxa Attribute Update
  - Rescore B-IBI from 10-50 to 0-100
- Next Steps



EPA Grant

- EPA Scientific Studies and Technical Investigation Assistance Program
- 2011 to 2014
  - Address monitoring challenges
  - Advance B-IBI tools
  - Partner with others




Regional Benthic Monitoring Issues

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Outdated taxa attributes	Peer-reviewed or Empirically derived attributes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

Goal: Improved decision making to restore and protect streams

Strengthen Sensitivity of Taxa Attributes

Puget Lowland B-IBI Metrics
Total Taxa
Mayfly Taxa
Stonefly Taxa
Caddisfly Taxa
Long-lived Taxa
Intolerant Taxa
% Tolerant individuals
% Predator individuals
Clinger Taxa
% Dominance

Update Using Peer-Reviewed Literature

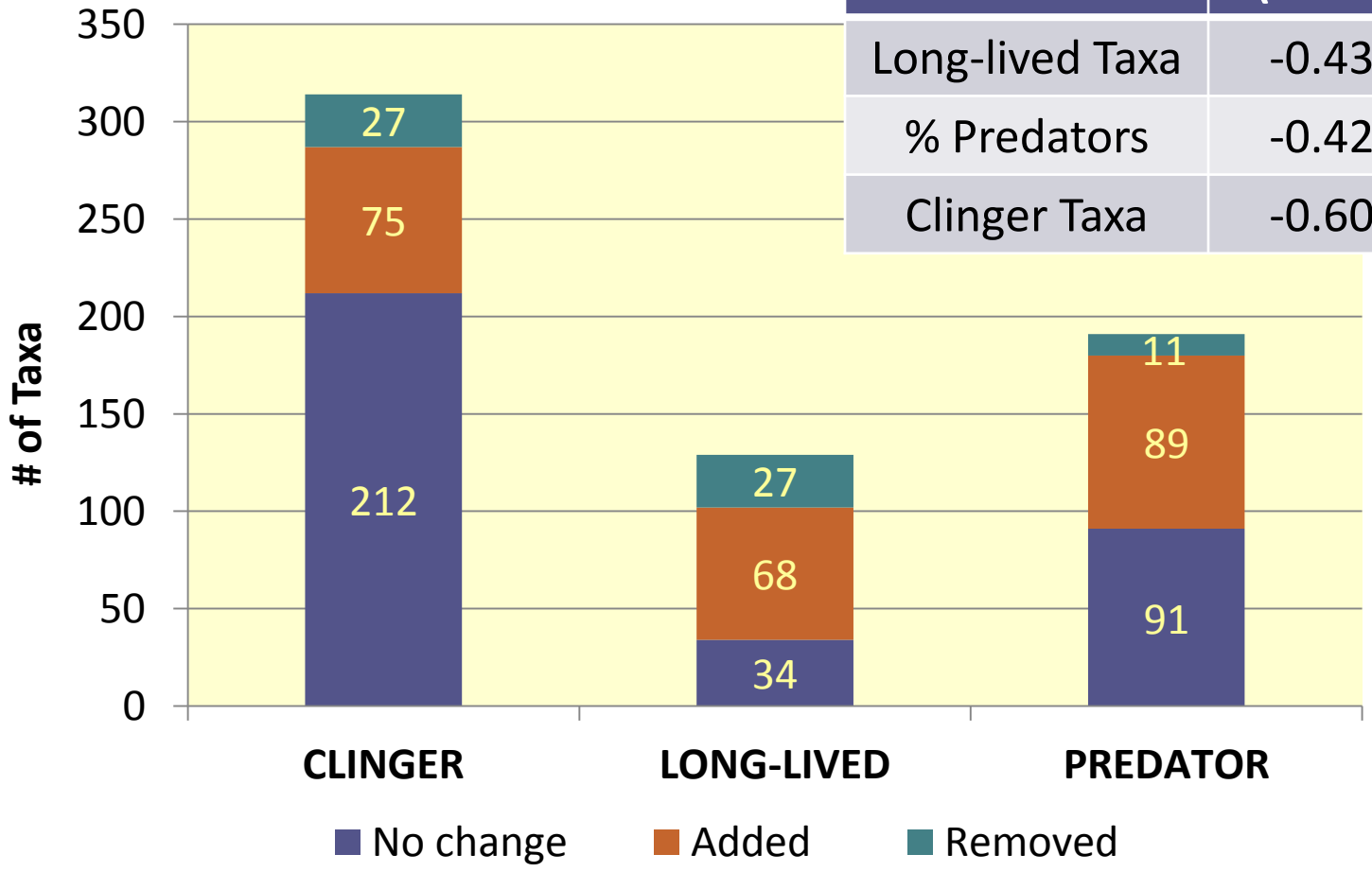
Update with Existing Data

Published Literature Updates

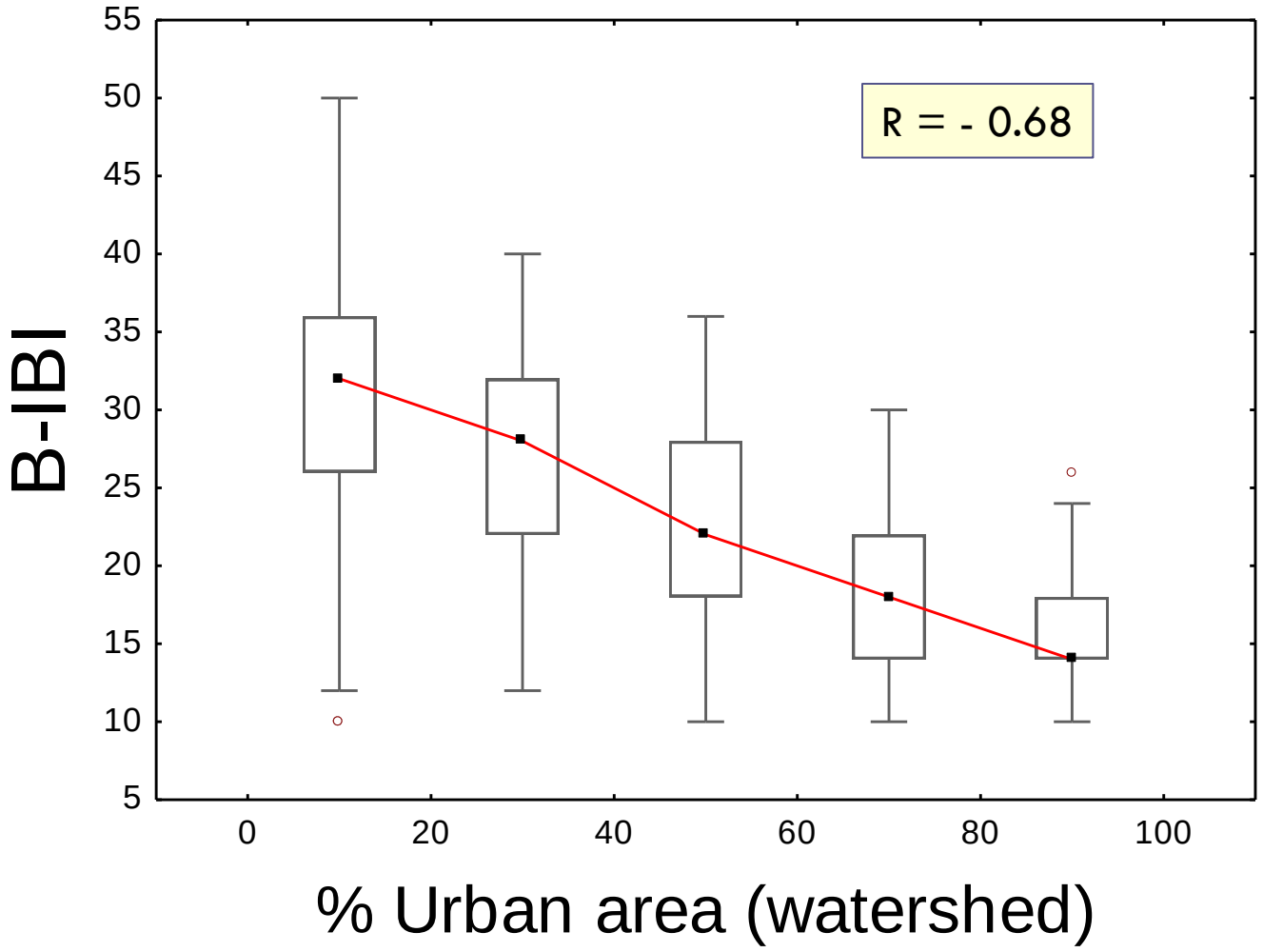
Attribute	Taxa Group	Primary Resources
Long-lived	stoneflies	Stewart and Stark 2002
	caddisflies	Wiggins 1996
	non-insects	Pennak 1989, Thorp and Covich 2001
	clams	Mackie 2007
	other mollusks	Dillon 2000
	other insect taxa	Huryn et al. 2008, Poff et al. 2006
Predator	insects	Merritt et al. 2008
	non-insects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

Attribute Changes: 1998 vs. 2012

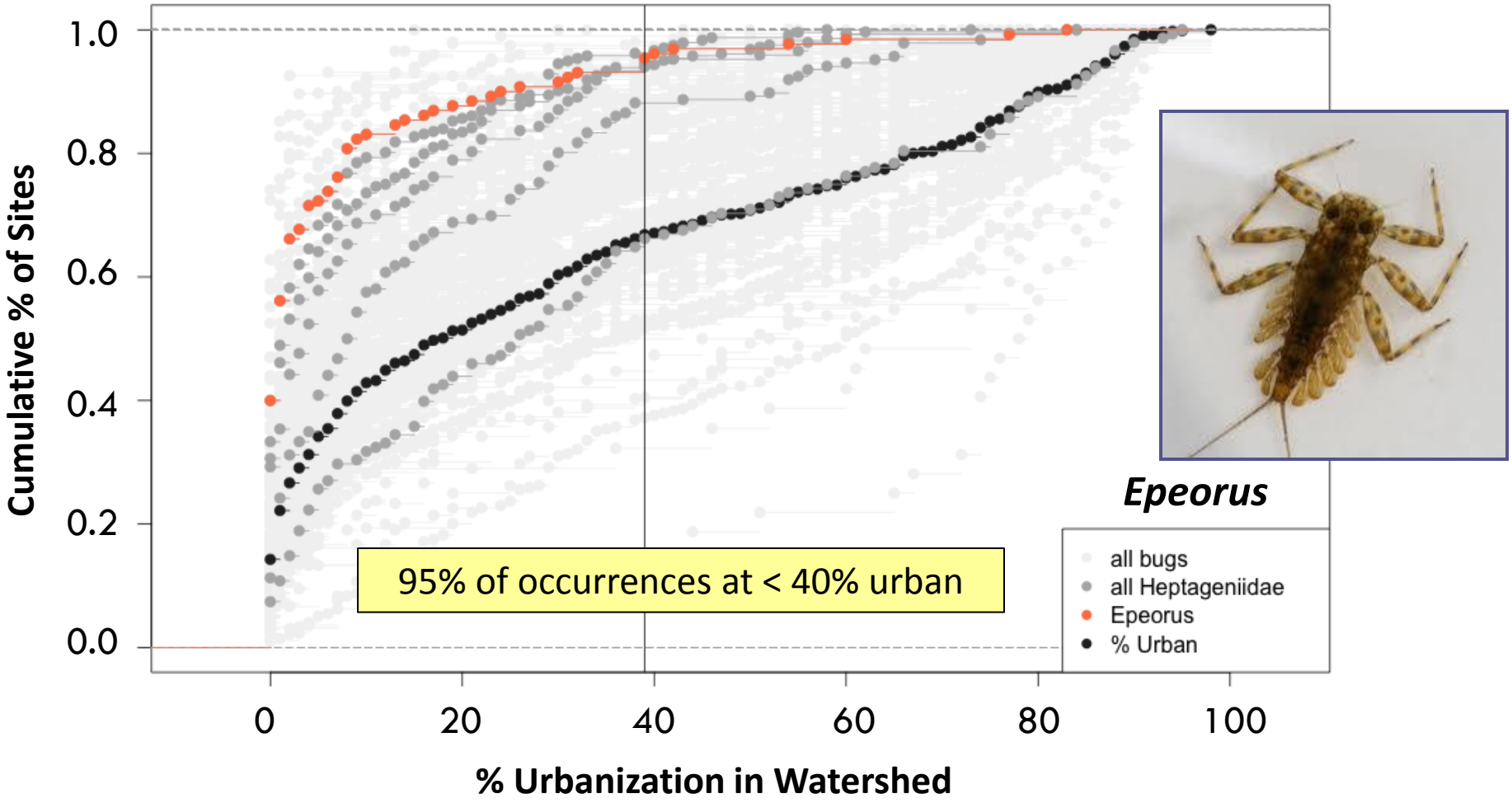
Metric	Updated (2012)	Original (1998)
Long-lived Taxa	-0.43	-0.39
% Predators	-0.42	-0.43
Clinger Taxa	-0.60	-0.61



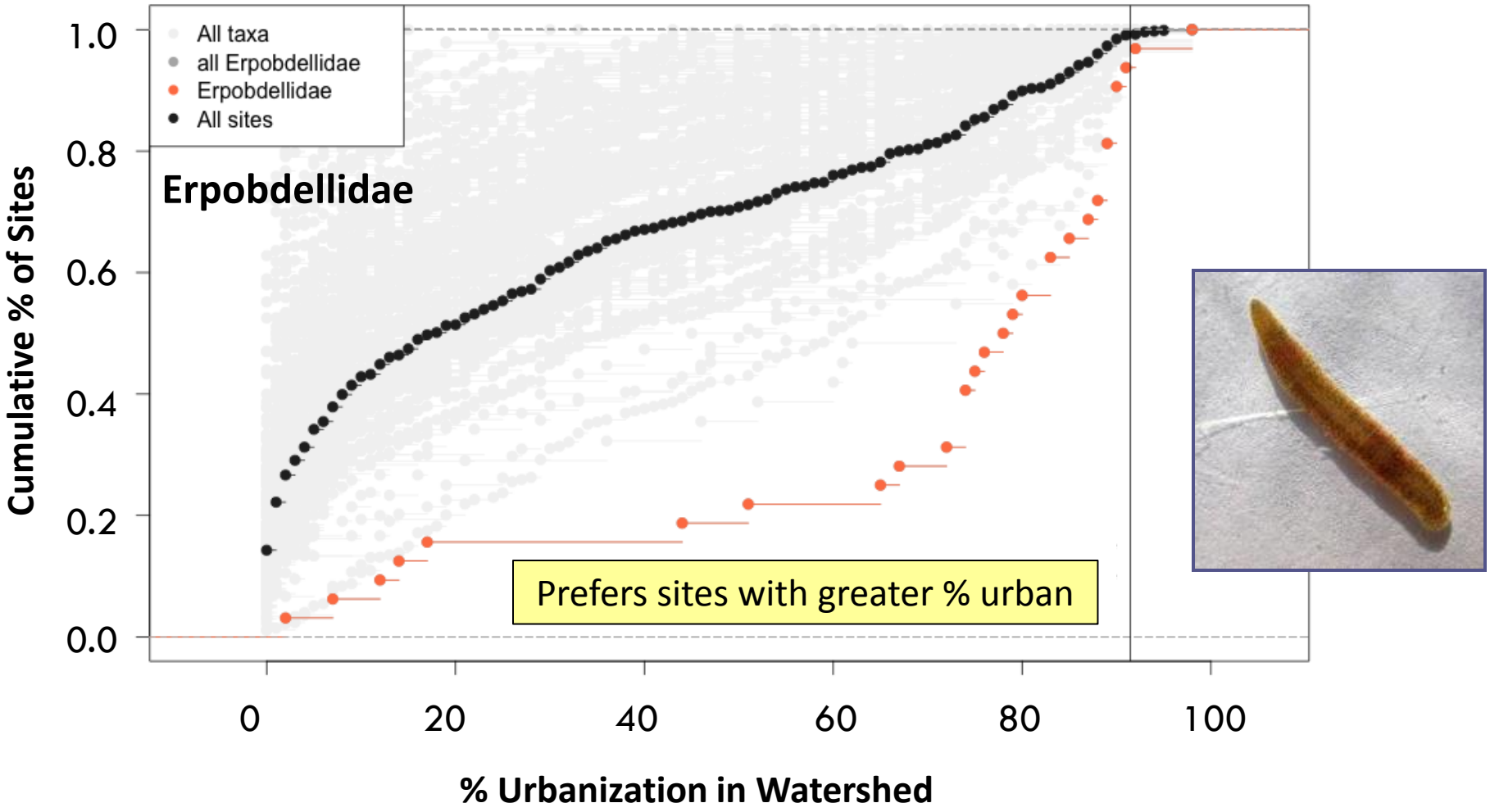
Strengthen Sensitivity of Tolerant/Intolerant Attributes



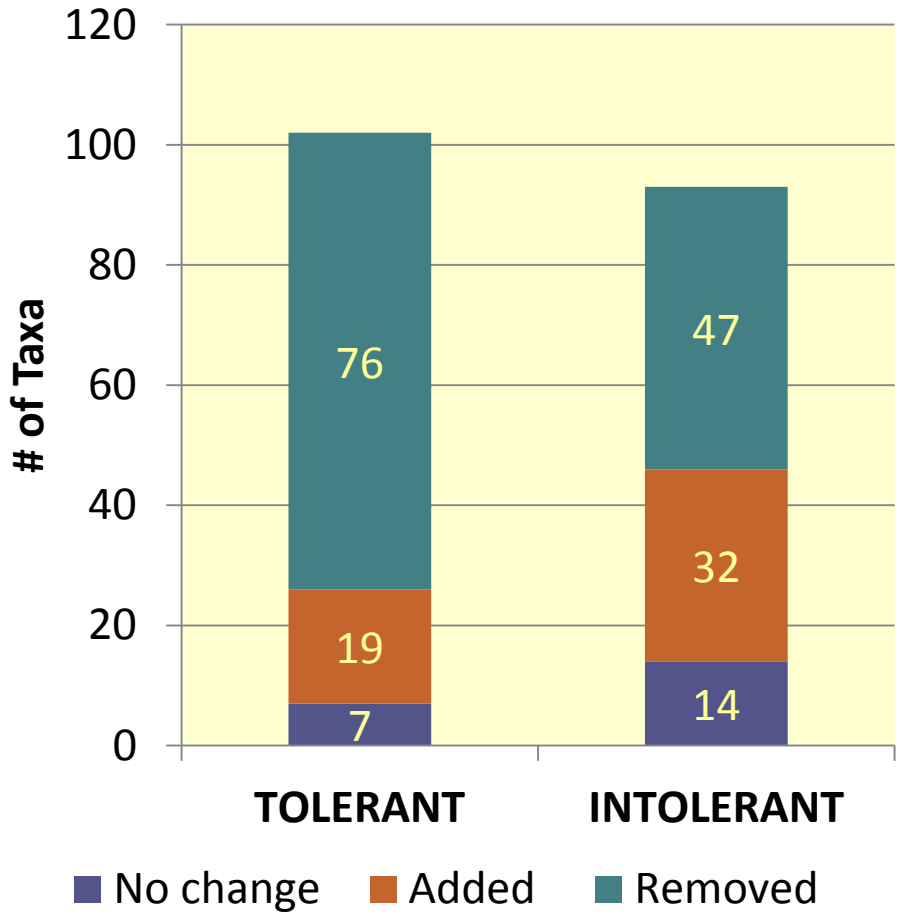
Example of an Intolerant Taxon



Example of a Tolerant Taxon

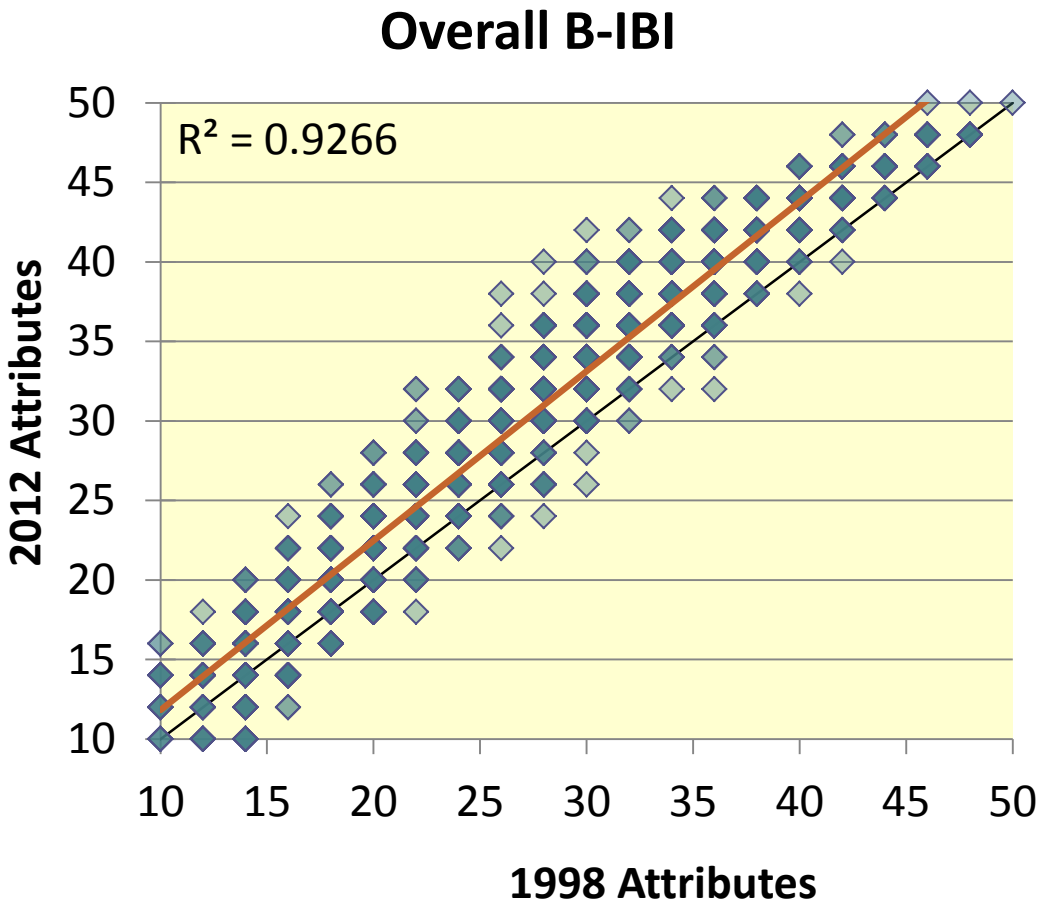


Attribute Changes: 1998 vs. 2012



Metric	Updated (2012)	Original (1998)
Tolerant	0.62	0.47
Intolerant	-0.75	-0.52

B-IBI Scores: Attributes Compared



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%
Overall B-IBI	0.93	2.98

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

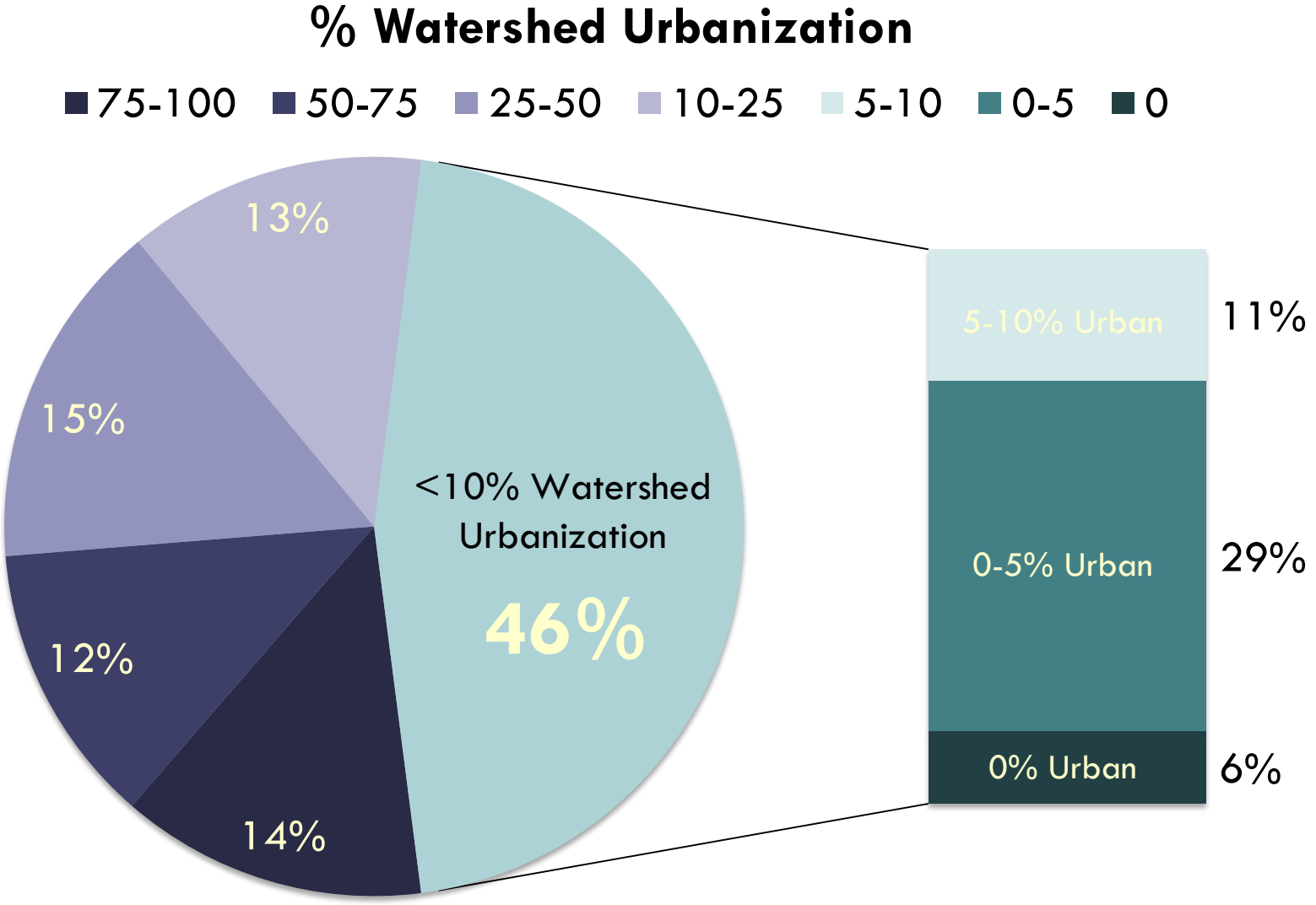
Taxa Attribute Conclusions

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

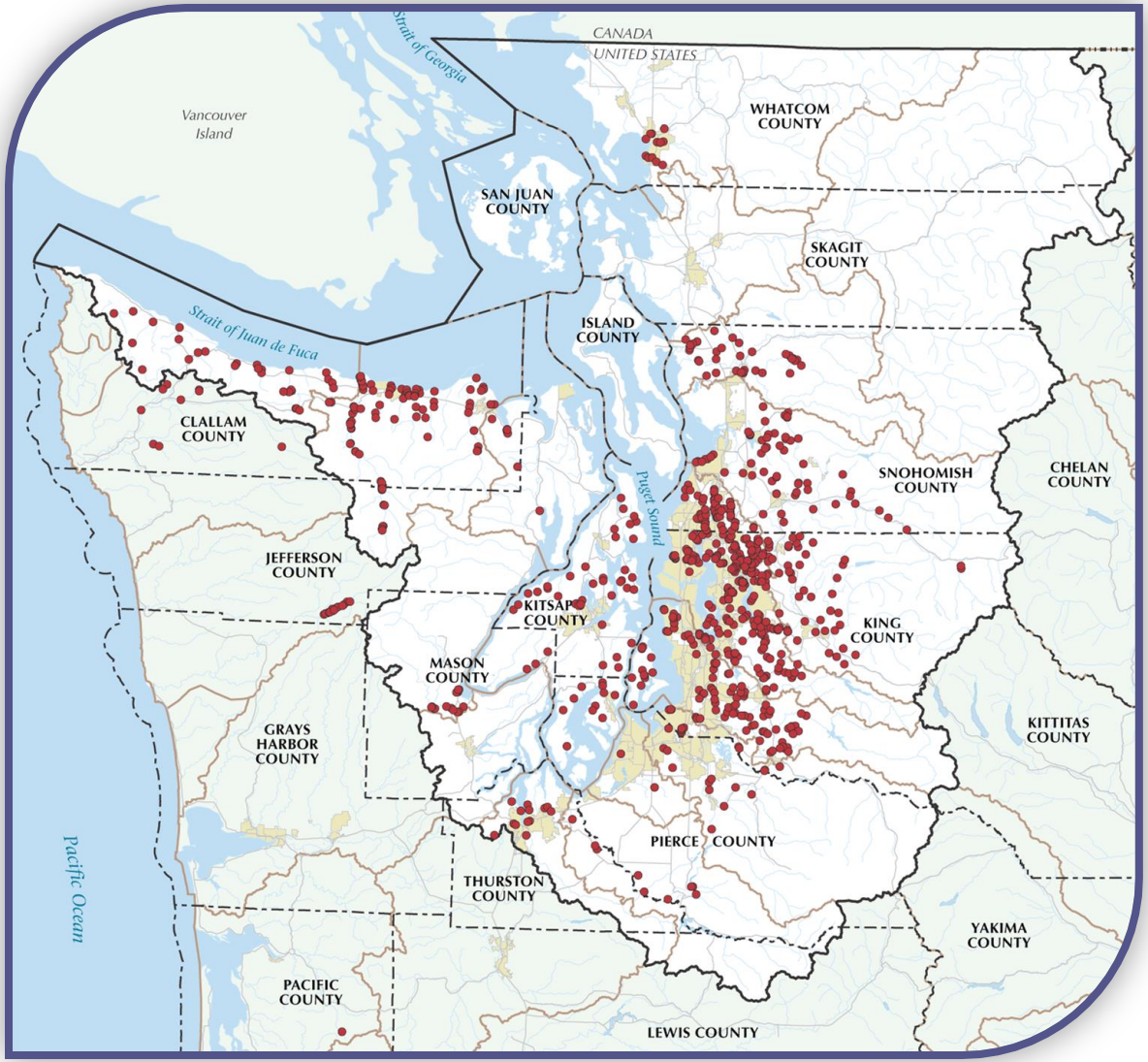
B-IBI Recalibration

- Incorporate new attributes
- Utilize existing data: 856 sites
- New scoring scheme

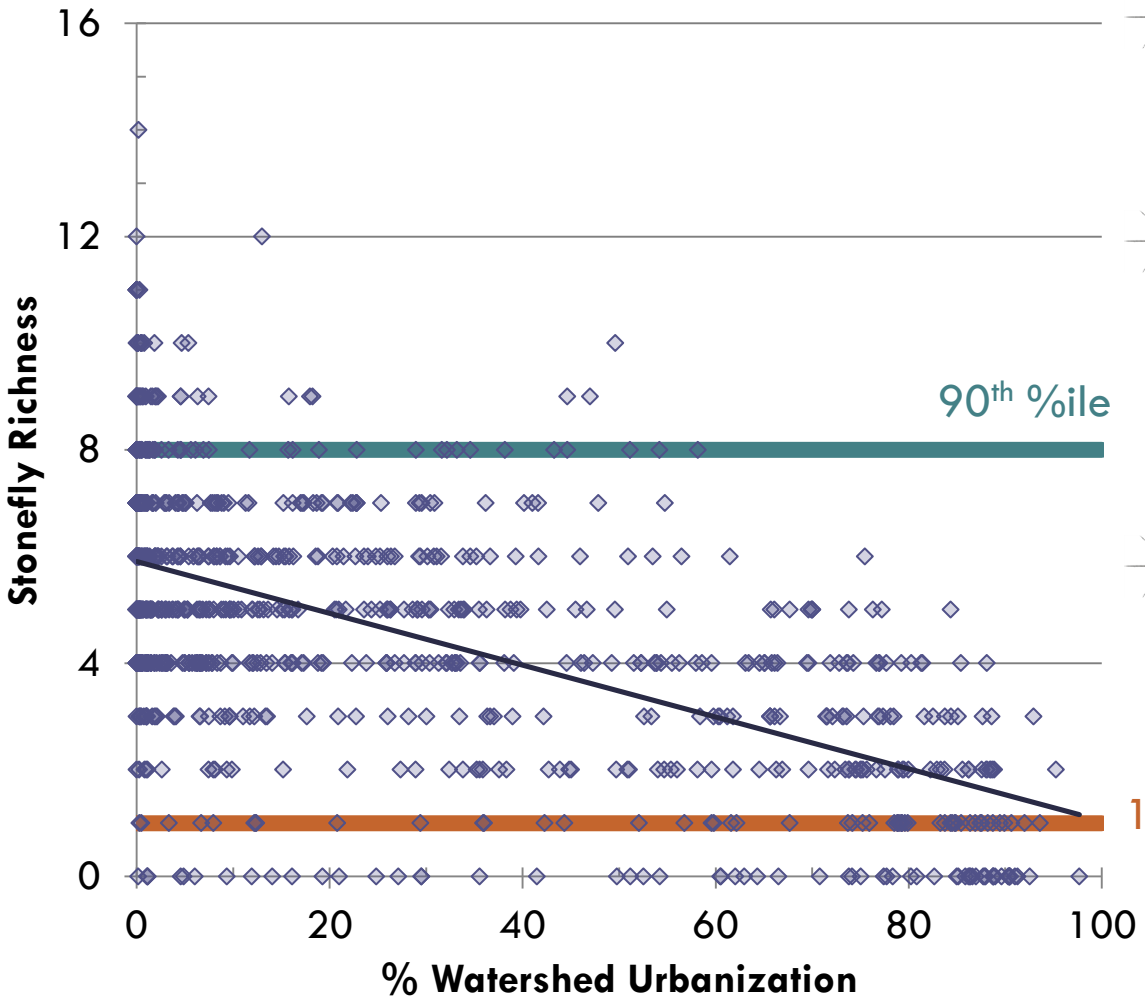
Landcover: Watershed Urbanization



Puget Sound Stream Monitoring



B-IBI Recalibration: Scoring



- Metrics well behaved
- Percentiles set upper & lower bounds
- Continuous scoring

B-IBI Recalibration: Scoring

$$= \frac{10 * (\text{Observed Value} - 10^{th}\ \%ile)}{(90th\ \%ile - 10th\ \%ile)}$$

- Metrics that *decrease* with disturbance
  - Values < 10th %ile score 0
  - Values > 90th %ile score 10

B-IBI Recalibration: Scoring

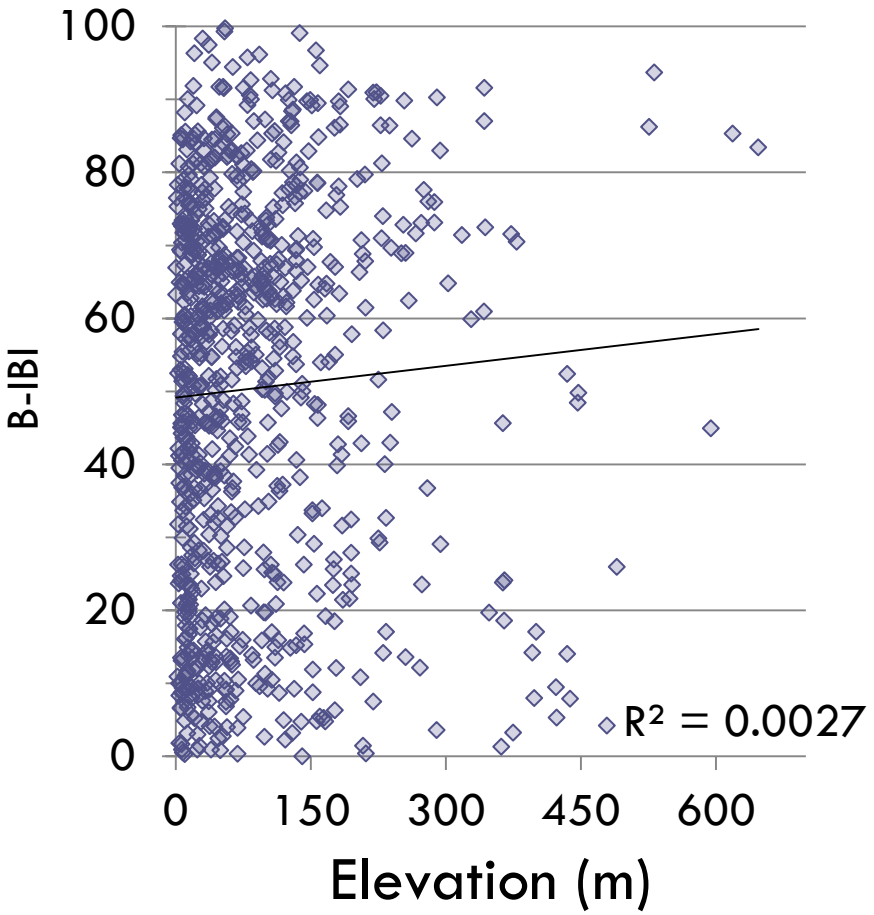
$$= 10 - \left[\frac{10 * (\text{Observed Value} - 10^{th}\ \%ile)}{(90th\ \%ile - 10th\ \%ile)} \right]$$

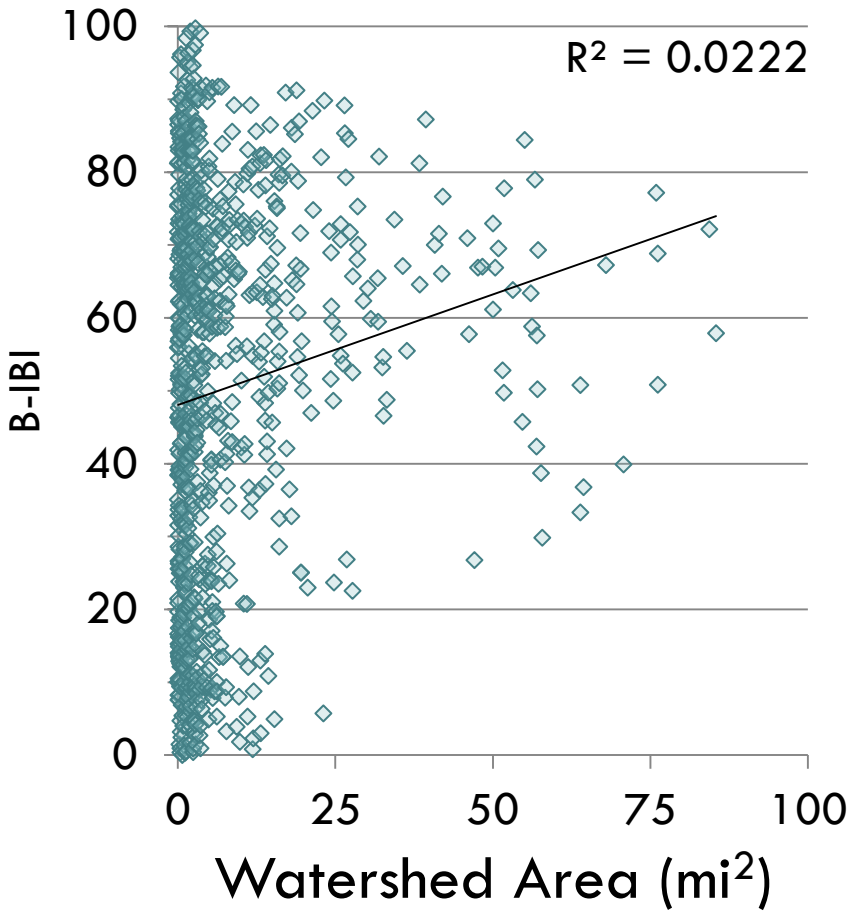
- Metrics that ~~*decrease*~~ *increase* with disturbance
  - Values < 10th %ile score ~~0~~ 10
  - Values > 90th %ile score ~~10~~ 0

B-IBI Recalibration: Testing

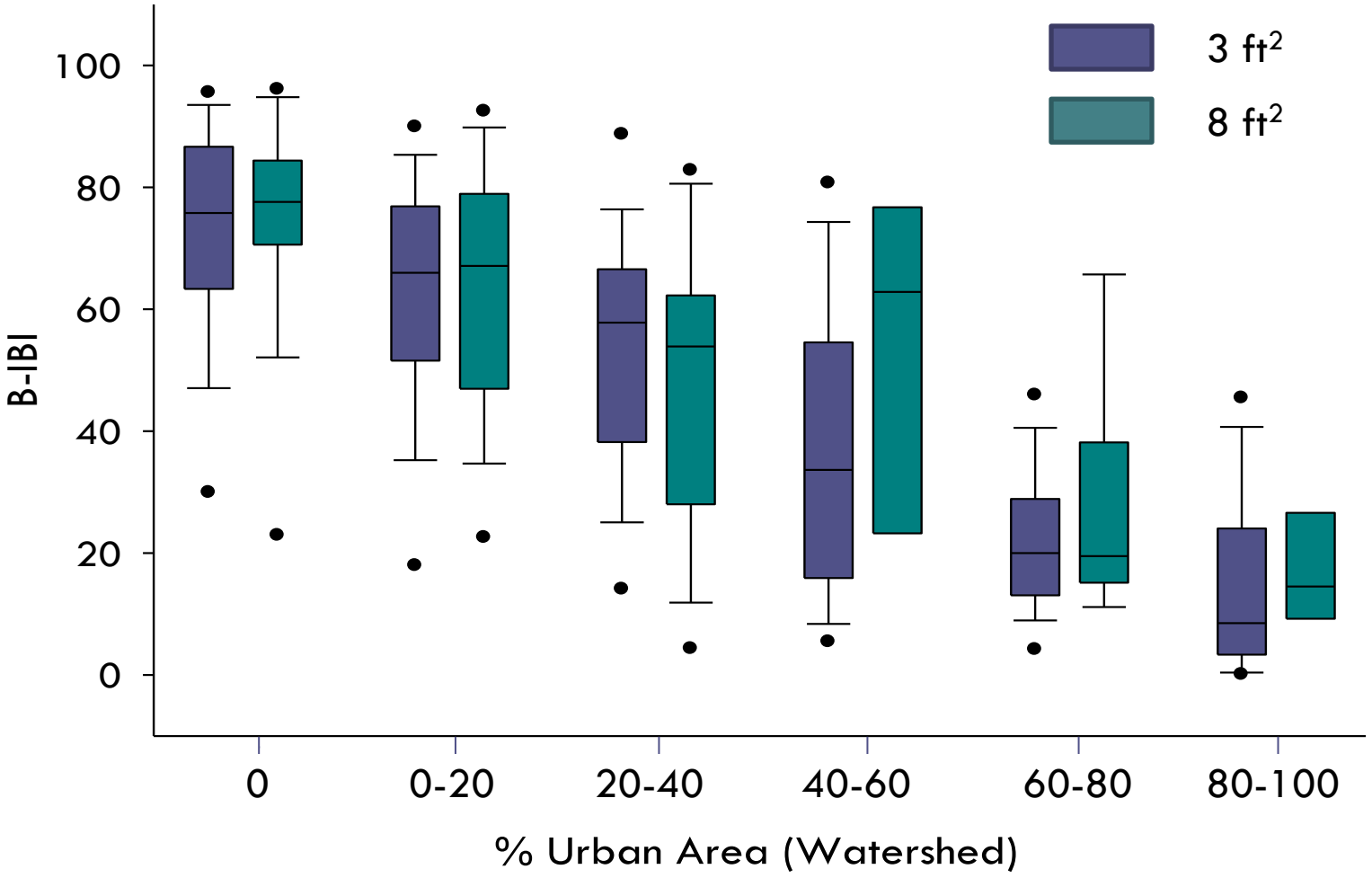
- Natural Features
  - Elevation
  - Watershed Area
- Surface Area Collected
- Taxonomic Effort

Natural Features





Collection Area

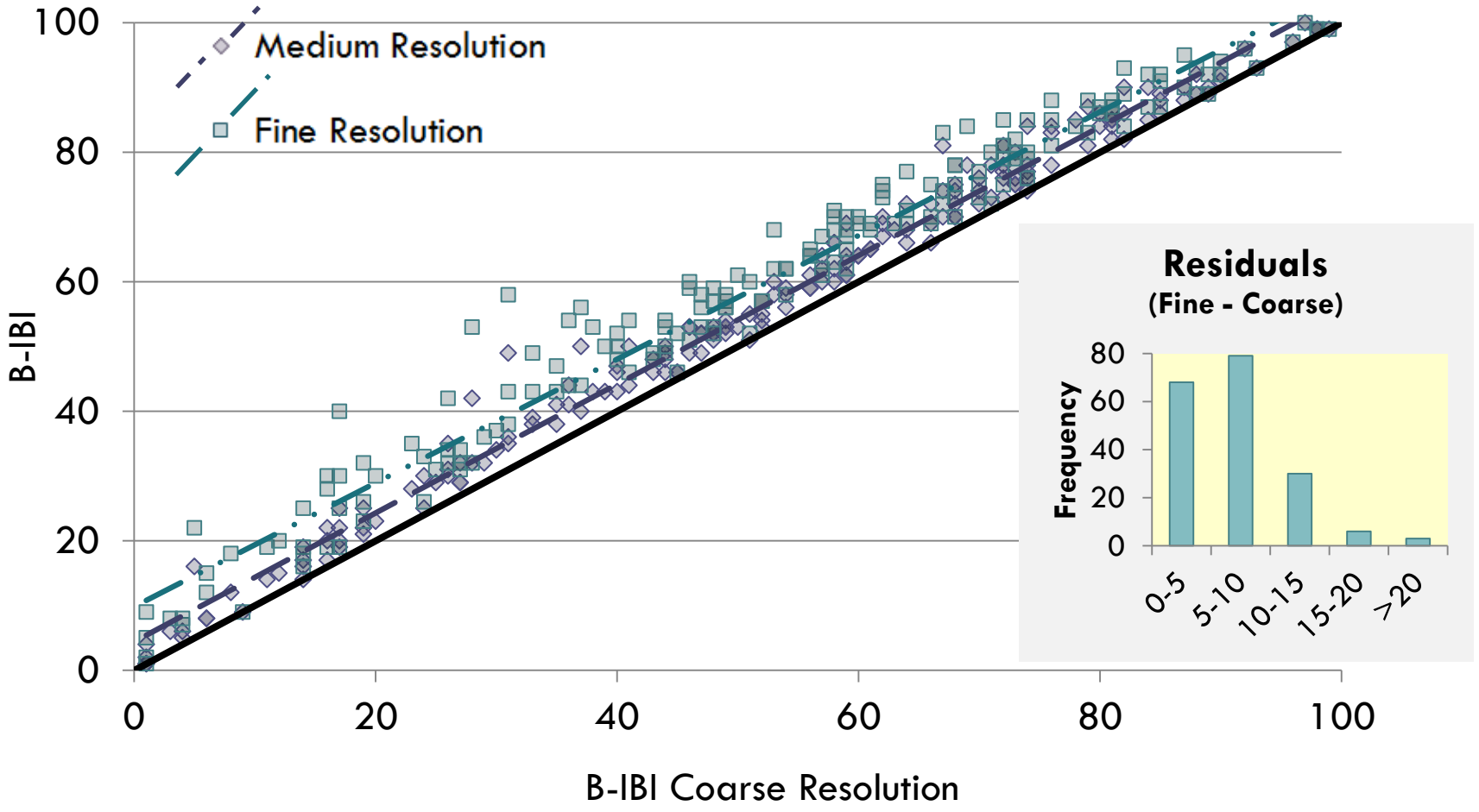


Taxa Effort: 3 Levels of Resolution

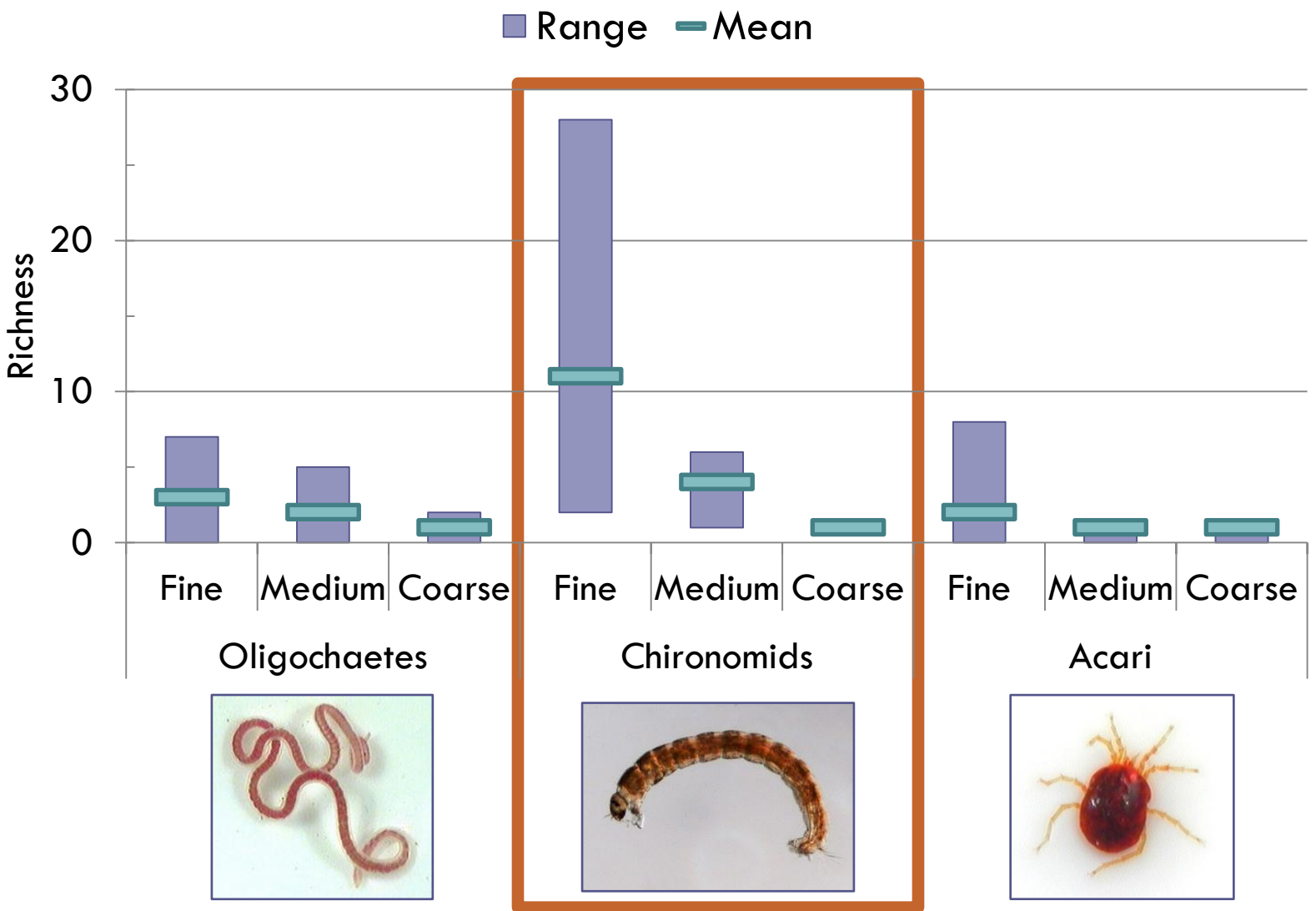
Taxa	Fine	Medium	Coarse
Oligochaetes	Subfamily/Genus	Family	Subclass
Acari	Genus	Subclass	Subclass
Gastropods	Genus	Genus	Family
Dytiscids	Genus	Genus (adults) Family (larvae)	Family
Simulids	Genus	Genus (larvae) Family (pupae)	Family
Chironomids	Genus/Sp/Sp grp	Subfamily/tribe	Family
Trichoptera (Pupae only)	Genus/Sp/Sp grp	Family	Order

Other groups = Lowest practical level (Genus/sp)

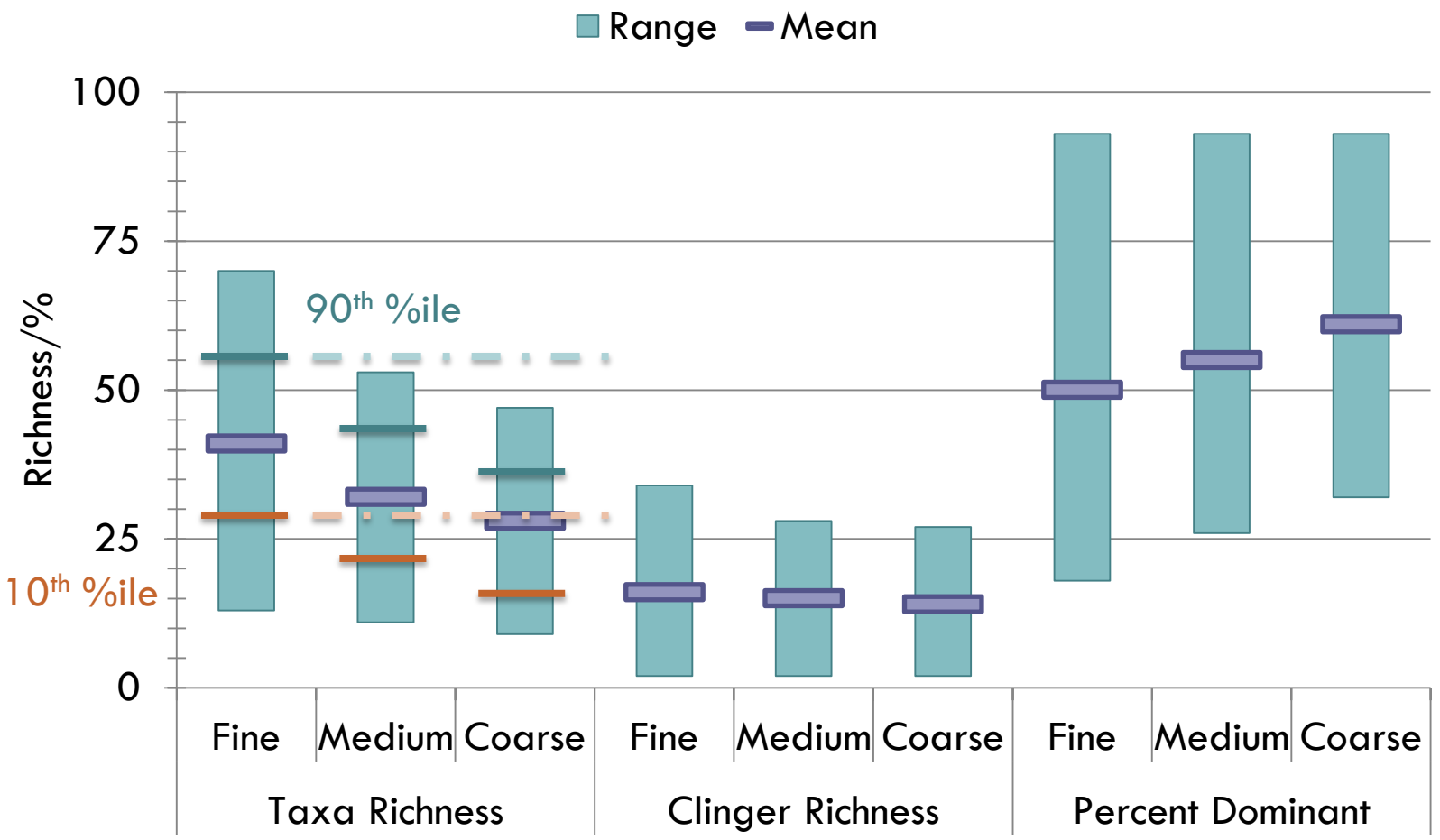
B-IBI: No Taxa Adjustments



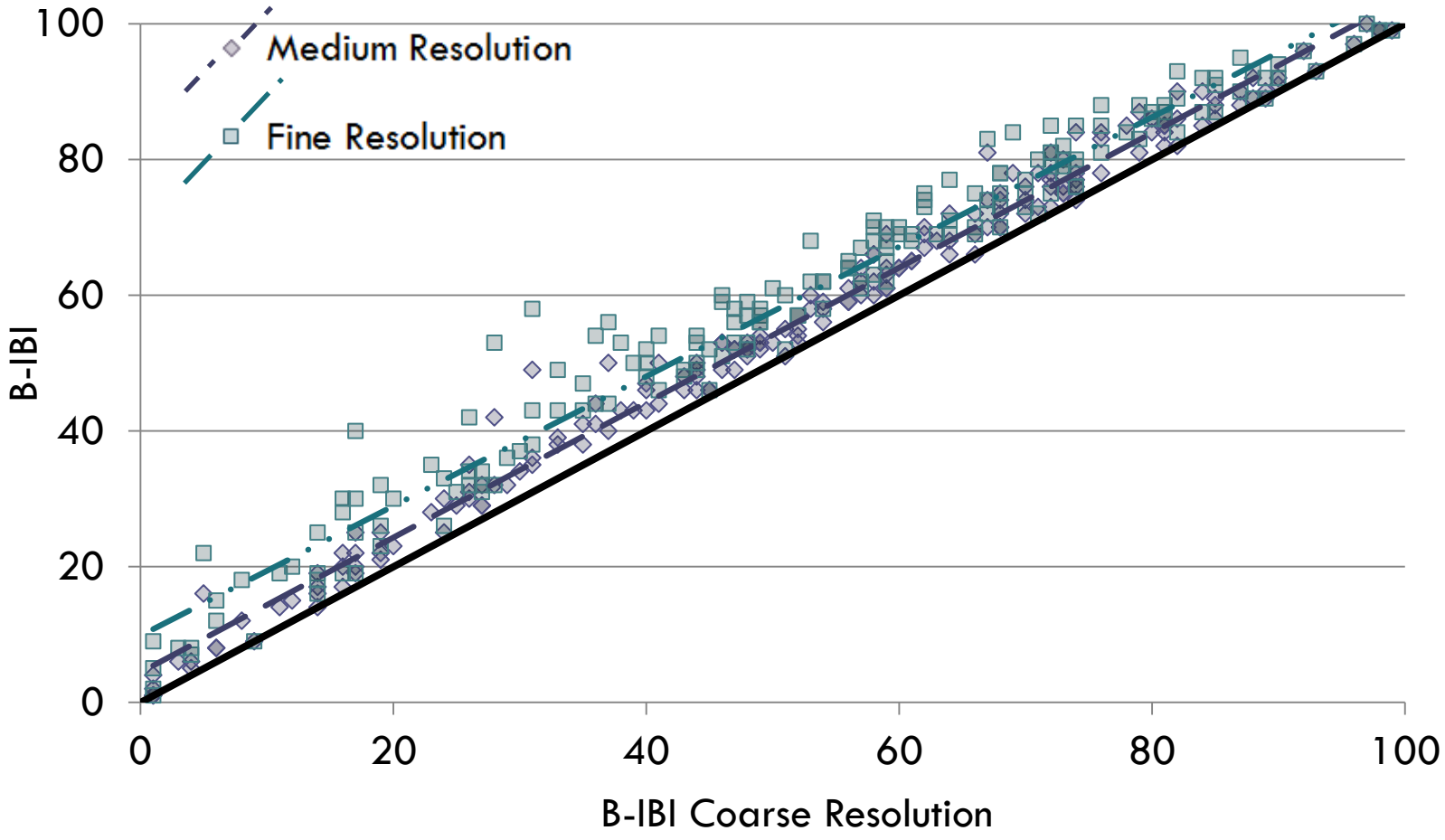
Taxa Effort: Chironomids Matter



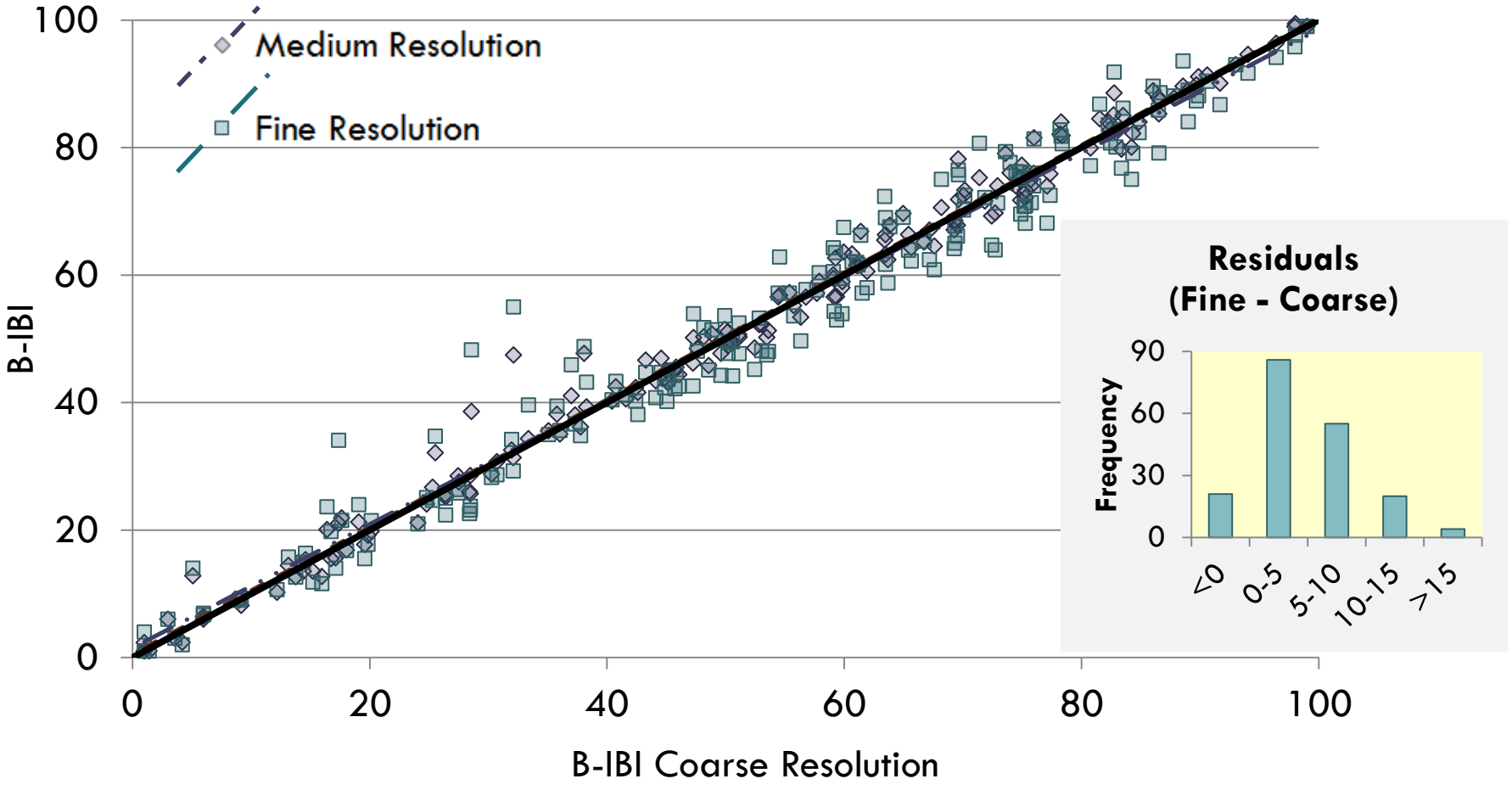
Taxa Effort: 3 Metrics Influenced



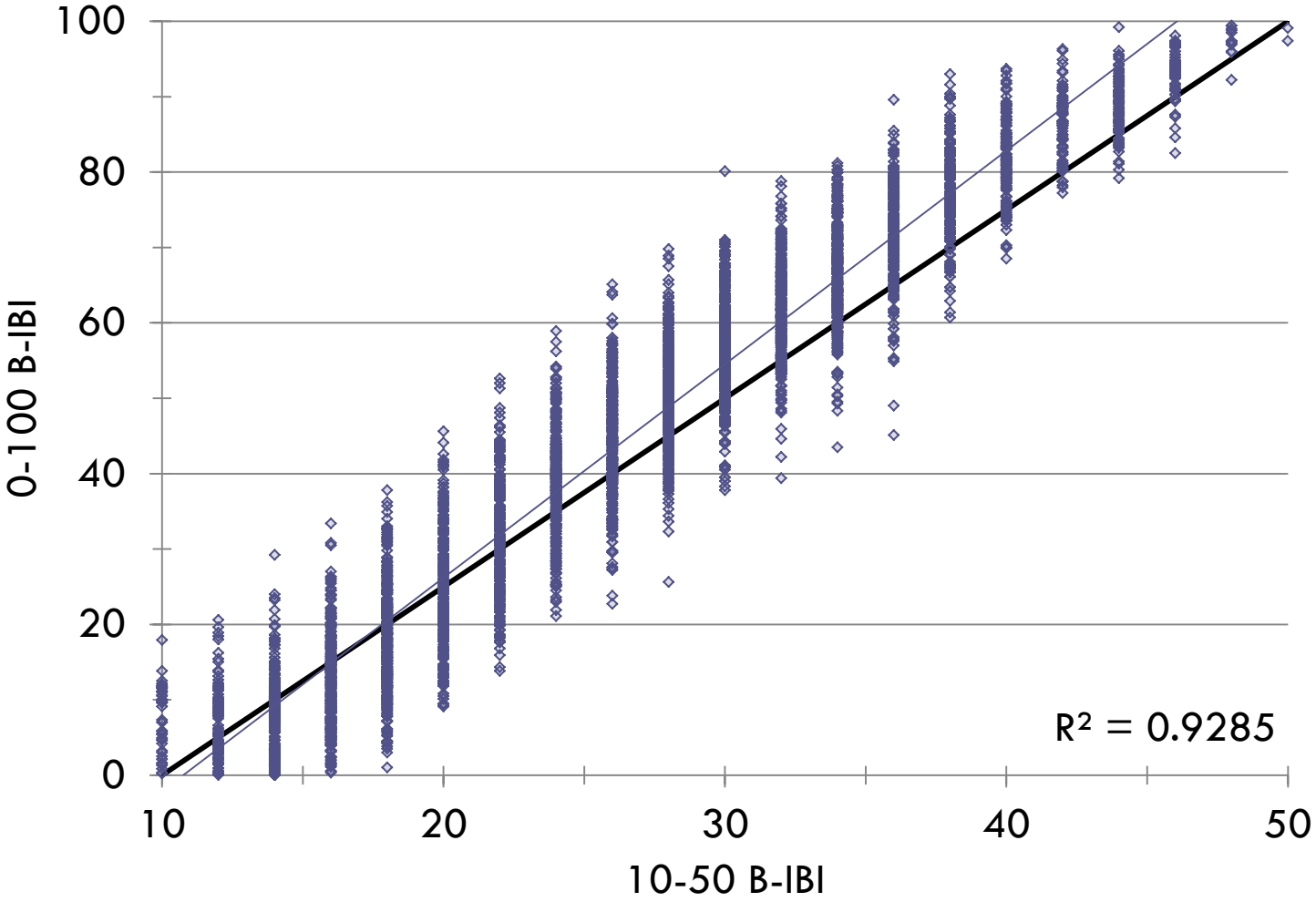
B-IBI: No Taxa Adjustments



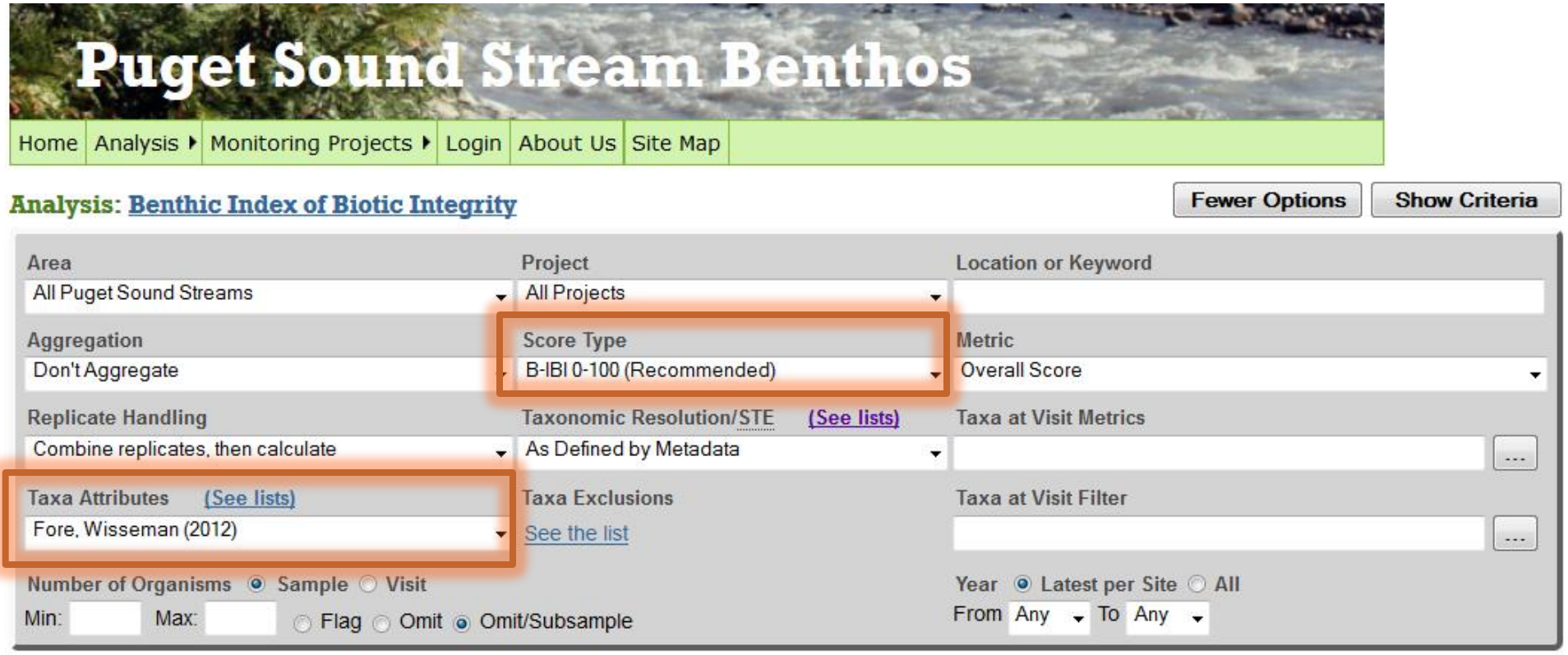
B-IBI: Adjusted for Taxa Effort



B-IBI Recalibration: Comparison



B-IBI Recalibration: Now Available!



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B-IBI Recalibration: Next Steps

- Assess variability
- Compare 10-50 and 0-100 B-IBI
- Determine categories (e.g., good, poor, etc.)

Acknowledgements

- Karen Adams - WA Dept of Ecology (Lower Columbia Fish Recovery Board)
- Gretchen Hayslip - US EPA Region 10
- Peter Leinenbach - US EPA Region 10
- Elene Dorfmeier - King County
- Wease Bollman - Rhithron Associates, Inc
- Sean Sullivan - Rhithron Associates, Inc

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All Grant Materials Can be Found at:
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