WHAT DO THE BUGS SAY? AQUATIC MACROINVERTEBRATE TRENDS IN LONG-TERM GRESHAM MONITORING SITES

JOHNSON CREEK WATERSHED COUNCIL SCIENCE SYMPOSIUM

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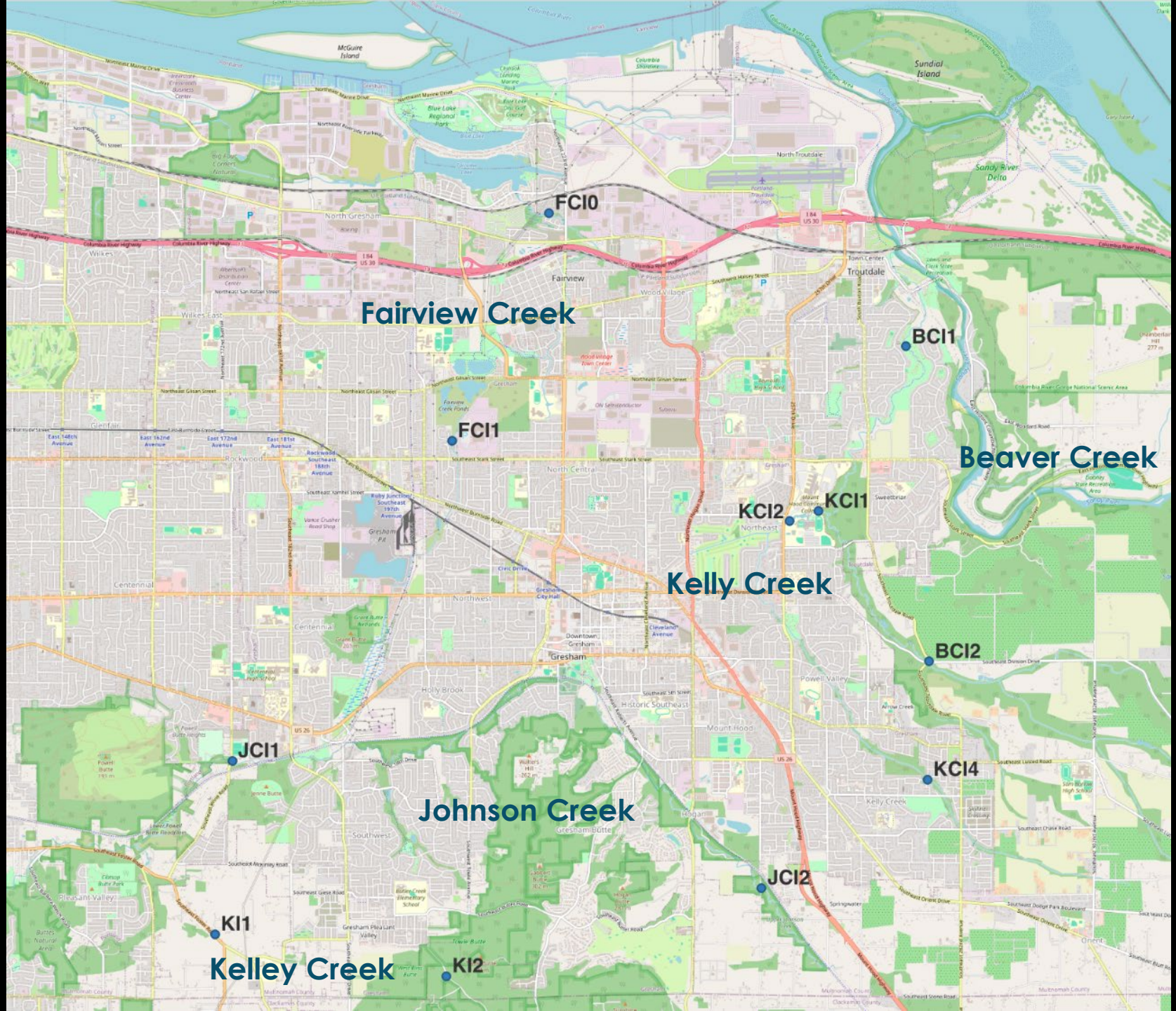
Johnson Creek at Johnson Creek Park; ZSM

Long-term monitoring by City of Gresham & agency partners at 11 sites in regional watersheds

Johnson, Kelley, Beaver, Kelly, and Fairview creek sites sampled 4-17 years


Water strider; ZSM


Western pearlshell; ZSM


FCI0
Fairview Creek
FCI1
BCI1
Beaver Creek
KCI2
KCI1
Kelly Creek
BCI2
JCI1
KCI4
Johnson Creek
JCI2
KI1
Kelley Creek
KI2

Aquatic macroinvertebrate populations change over time:

- restoration
- management
- climate change
- changes in land use
- pollution, sediment, temperature


Rock snails; ZSM

Macroinvertebrate monitoring can reveal stressors and trends

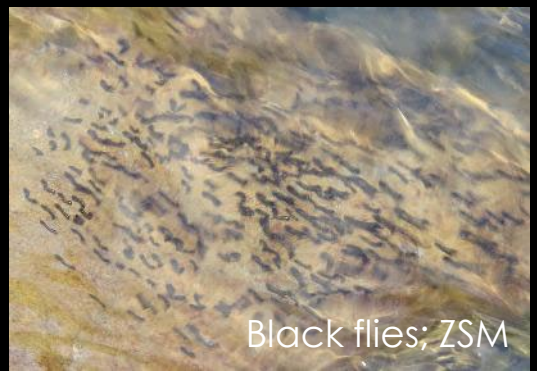
In urban streams where model scores are often low and/or resistant to change…does that mean the community isn't changing?


Dragonfly nymph exuvia; ZSM

CORRELATION ANALYSES

Assessed significant unidirectional trends over time in

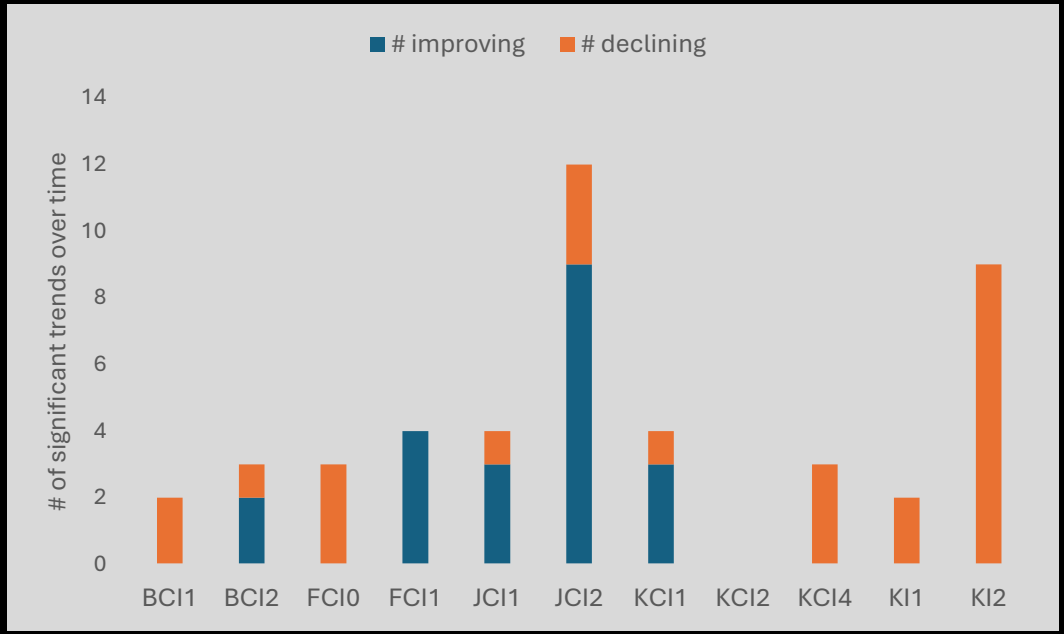
- invertebrate-based index of biotic integrity (I-IBI): 10 metrics (taxonomy, sensitivity/tolerance, community balance)
- macroinvertebrate thermal tolerance index (MTTI): assemblage-level thermal preference
- thermal preferences of individual taxa: cold+cold stenotherm; warm+warm stenotherm


Black flies; ZSM


Predaceous diving beetle; ZSM

LONGTERM SITE TRENDS

- 198 possible correlations (11 sites x 18 metrics)
- 46 significant trends overall (23% of possible)
- 21 trends (46%) suggested improving conditions
- 25 trends (54%) suggested declining conditions



	BCl1	BCl2	FCl0	FCl1	JCl1	JCl2	KCl1	KCl2	KCl4	Kl1	Kl2
	Beaver	Beaver	Fairview	Fairview	Johnson	Johnson	Kelly	Kelly	Kelly	Kelley	Kelley
# total taxa			D		I	I					
# Ephemeroptera taxa											
# Plecoptera taxa		I				I					
# Trichoptera taxa		I	D								D
# sensitive taxa			D	I							D
# sediment-intolerant taxa						I					
Community BI				D		D					
% tolerant organisms				D	D		D				
% sediment-tolerant						D	D				
% dominance of the top taxon				D	D						
M-IBI score						I	I				D
MTTI score		I				I					I
# taxa Warm + Warm Stenotherm	I				I	I	I				I
# taxa Cold + Cold Stenotherm						I			D	D	D
% organisms Warm + Warm Stenotherm	I					I					I
% organisms Cold + Stenotherm Cold						I					
% taxa Warm + Warm Stenotherm									I		I
% taxa Cold + Cold Stenotherm						I			D	D	D

I = increasing

D = decreasing

blue = improving

orange = declining

SUMMARY

Most sites had:

Few to no stonefly, sensitive, or sediment-intolerant taxa

High proportions of tolerant and sediment-tolerant organisms

Low to intermediate IBI scores

Temperature, sediment, disturbance, and/or organic enrichment frequently inferred as stressors


Whirligig beetles; ZSM


Giant stonefly; ZSM

Greatest # of trends suggesting declining conditions were seen in temperature-related metrics

Greatest # of trends suggesting improving conditions were seen in metrics relating to disturbance, sediment, pollution

One metric was not associated with a significant trend at any site: # mayfly taxa


Flatheaded mayfly; A. Carleton


Small minnow mayfly; ZSM

Johnson and Kelley Creek sites had the greatest number of significant unidirectional trends in metrics over time

More trends suggested overall improving habitat conditions in Beaver, Johnson, and Fairview Creek

More trends suggested overall declining habitat conditions in Kelly and Kelley Creek

stream	# sites	# sig. trends	improving	declining
Beaver	2	5	3 (60%)	2 (40%)
Fairview	2	7	4 (57%)	3 (43%)
Johnson	2	16	12 (75%)	4 (25%)
Kelly	3	7	3 (43%)	4 (57%)
Kelley	2	11	0	11 (100%)

No significant difference in mean # of trends at restored vs. unrestored sites

Macroinvertebrate community change occurred at many sites regardless of restoration status →

impacts of climate, land use, and/or management

Stream or watershed-level stressors likely impacting communities more than reach-level


Northern caddisfly; ZSM


Signal crayfish; ZSM

Consistently low or unchanging model scores can obscure changes in community-level taxonomy or ecological traits

Impaired urban streams can undergo habitat changes that significantly impact macroinvertebrate communities

Community changes and potential causes are more apparent with longer-term sampling


Giant stonefly; ZSM


alderfly; ZSM

Questions?

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Blister beetle; ZSM


Humpless casemaker caddisflies; ZSM


Western pondhawk; ZSM


Bee fly; ZSM