CLACKAMAS WATER ENVIRONMENT SERVICES

Nov. 8, 2023 | NCWC Interagency Meeting

Geomorphic and Macroinvertebrate Monitoring Kellogg-Mt Scott Creek

Gail Shaloum & Chris Desiderati

Agenda

1 Background and purpose

2 Study area

3 Stream health overview

4 Methods

5 Stream health results

CLACKAMAS WATER ENVIRONMENT SERVICES

BACKGROUND

- Long-term monitoring program to evaluate stream health
- Monitoring sites established throughout WES surface water district
- 19 tributaries of the Clackamas, Tualatin, Willamette rivers
- Macros since 2002—6 times, Geomorph since 2009—4 times

CLACKAMAS WATER ENVIRONMENT SERVICES

PURPOSE

- **Meet DEQ requirements for our Municipal Separate Storm Sewer System Permit (MS4)**

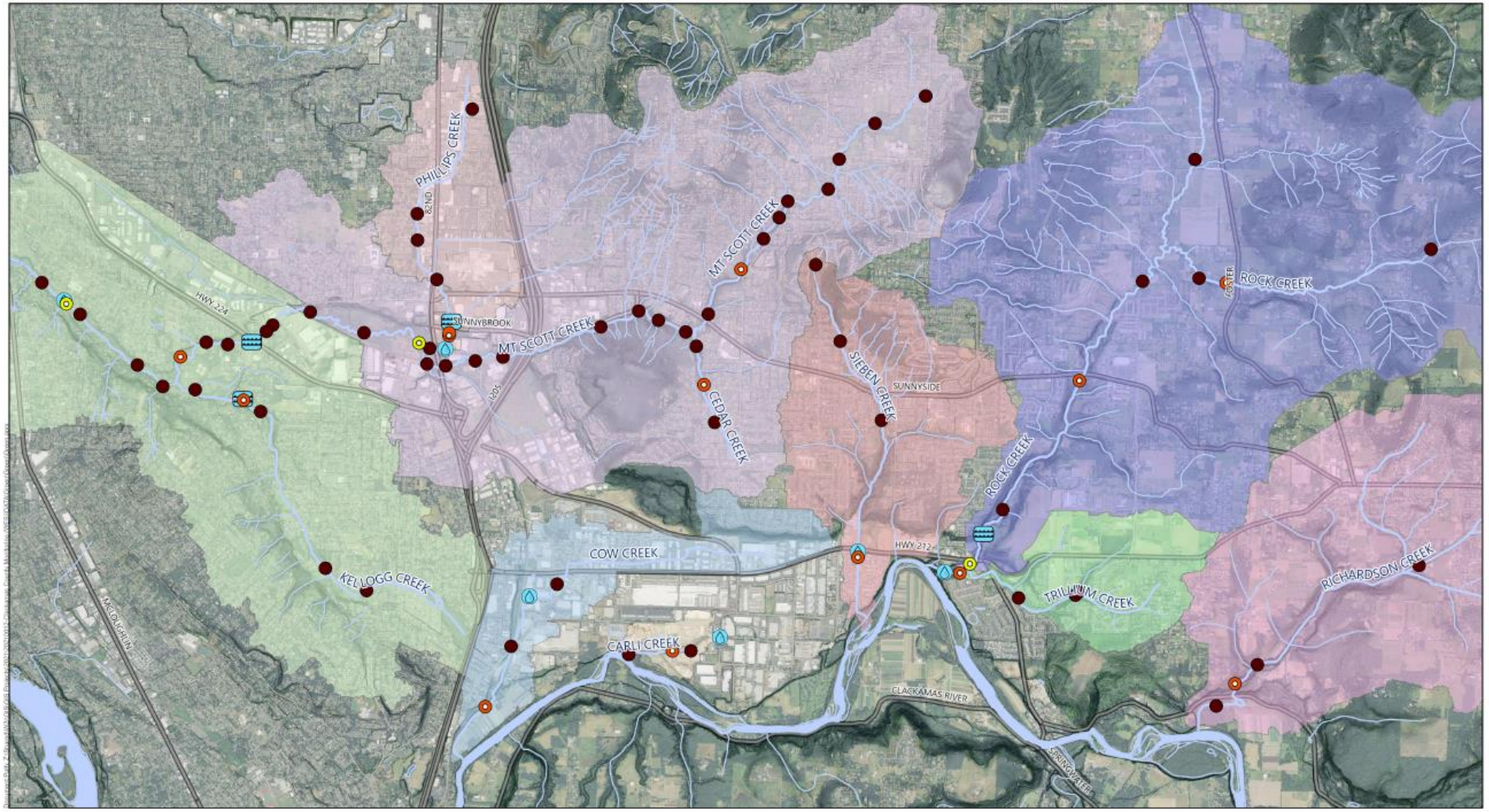
Geomorph: Characterize channel conditions over time throughout the watershed to evaluate effects of hydromodification on stream channels

Macros: Help understand impacts to biological systems

Support efforts to prioritize & improve stream health

STUDY AREA

Monitoring sites-Willamette watershed



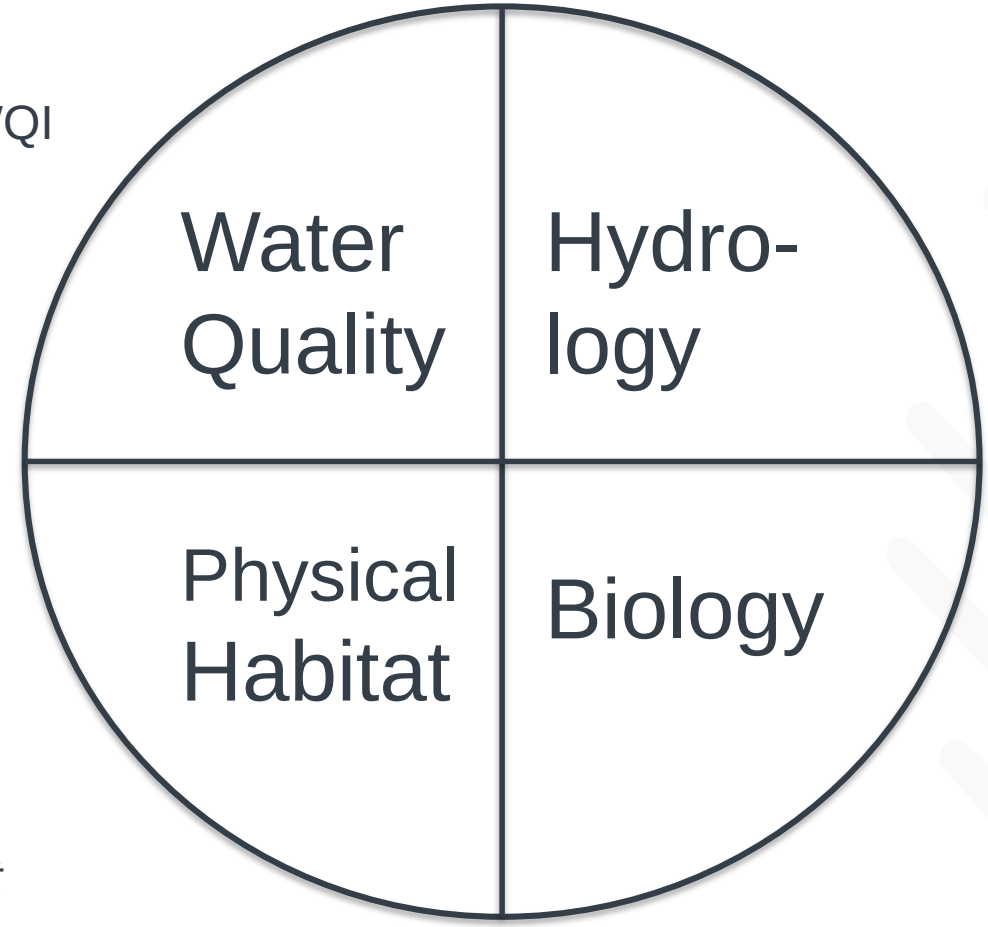
STUDY AREA

Monitoring sites: Kellogg-Mt Scott watershed

Stream	Length, mi	Streamflow	Water quality	Physical habitat	Macro-invertebrates
Cedar	0.9			✓	✓
Kellogg	5.4	✓	✓	✓	✓
Mt Scott	7.0	✓	✓	✓	✓
Phillips	2.2	✓	✓	✓	✓

How we measure stream health

- 5-yr average OWQI
- 10-yr trend
- *WES monitors & calculates*



- % impervious
- Change in % impervious
- *WES measures & calculates*

- Entrenchment
- Complexity
- F.p. connection
- Riparian cover
- *Geomorphologist*

- Predator O/E
- M-IBI
- *Aquatic entomologist*

METHODS: Geomorphology

Level 1: 6 sites

- Detailed status and trends sites
- Detailed cross-sections
- Locations coincide with previous geomorphic monitoring stations

Level 2: 23 sites

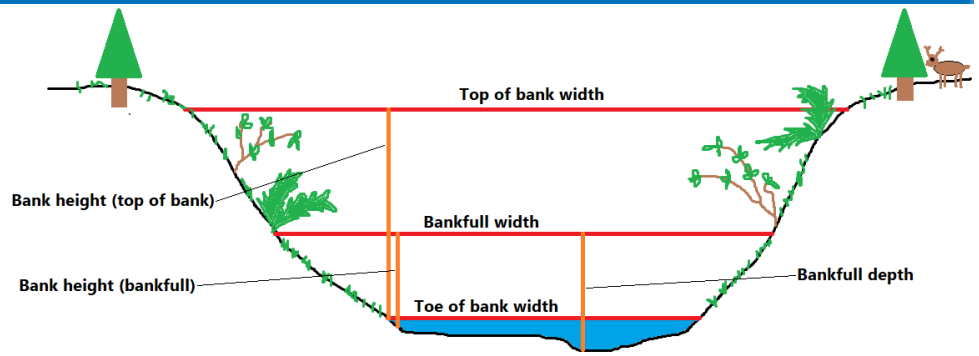
- Moderate-detail level
- Locations coincide with macroinvertebrate monitoring stations

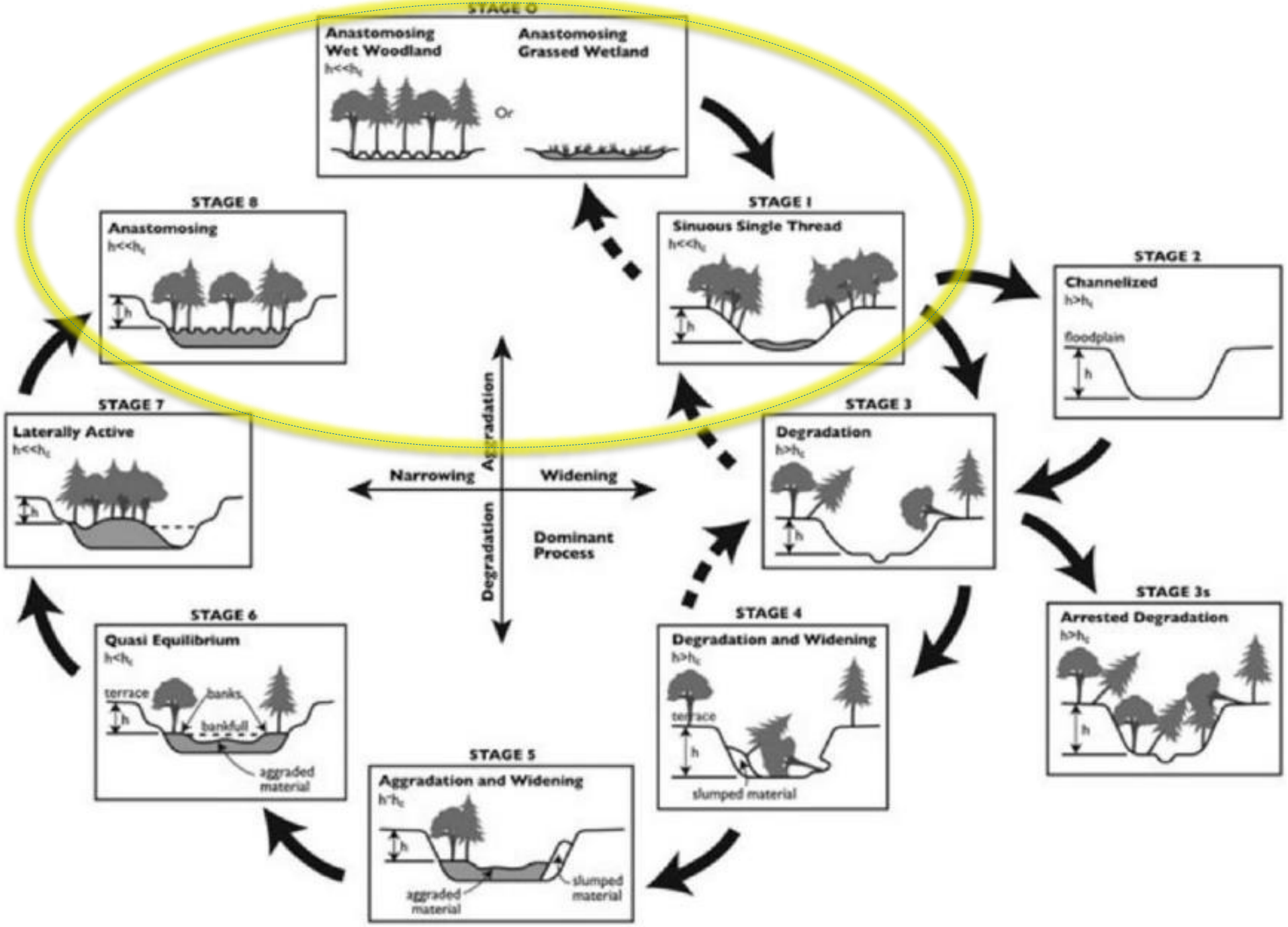
Level 3: approx. 80 sites

- Distributed (rapid) geomorphic characterization
- Gain a broad geographic understanding of stream conditions

Geomorphic measurements & calculations

- Bankfull width, depth, height
- Banktop width, height
- Flow width
- Riffle depth
- Presence of invasives
- Floodplain connectivity
- Vegetation health
- Presence of bedrock
- Channel type
- Bank erosion
- Overhanging bank
- SEM stage
- Drainage area
- Floodplain width
- Confinement ratio
- Riparian cover, change
- Embeddedness
- Bank height ratio
- Fp height, Fp height ratio
- Residual depth
- Bankfull W/D ratio
- Dominant substrate
- Presence of LWD
- Slope
- Impervious area %, change
- Road density
- Road crossings





Stream evolution model (SEM) Cluer and Thorne (2014)

CLACKAMAS WATER ENVIRONMENT SERVICES

Assessment: Geomorphology

- Compile & compare data to previous years for Level 1 sites
- Describe stream condition and trajectories in 4 categories (entrenchment, fp connectivity, complexity, riparian cover)
- Translate condition to numerical score (0-1-2)
- Sum to produce stream scores for:
  - Overall condition (max score 8)
  - Trajectory (max score 6)

Findings Geomorphology

Entrenchment

- Mixed throughout study area
- MSC streams-high incision potential

Stream complexity

- Almost all low to moderate, reaches of Mt Scott & Carli Creeks are high

Floodplain connectivity

- Most low to moderate, none high in MSC watershed

Riparian condition

- Generally low to moderate, partly due to hi invasive cover
- Canopy cover stable to increasing

METHODS: Macroinvertebrates

Macroinvertebrate collection

- Field sampling
- Sample sorting and i.d.
- DEQ protocols for samples collected in riffles only

Assessment: Macroinvertebrates

- Lab i.d. using DEQ Level 3 Protocols
- Multimetric analysis *M-IBI*
- Predictive model analysis *PREDATOR O/E index*
- Both - measure of overall habitat disturbance or impairment

Sampled after "heat dome" that may have affected streamflows & macro communities

Proceed with caution

Findings: Macroinvertebrates

- Even at sites that received lower scores in 2021, overall trends towards increased taxa diversity and/or a more balanced community
- Increases suggest improved conditions, more stable/less impaired communities
- Positive correlation between Multimetric and PREDATOR scores

Findings: M-IBI scores

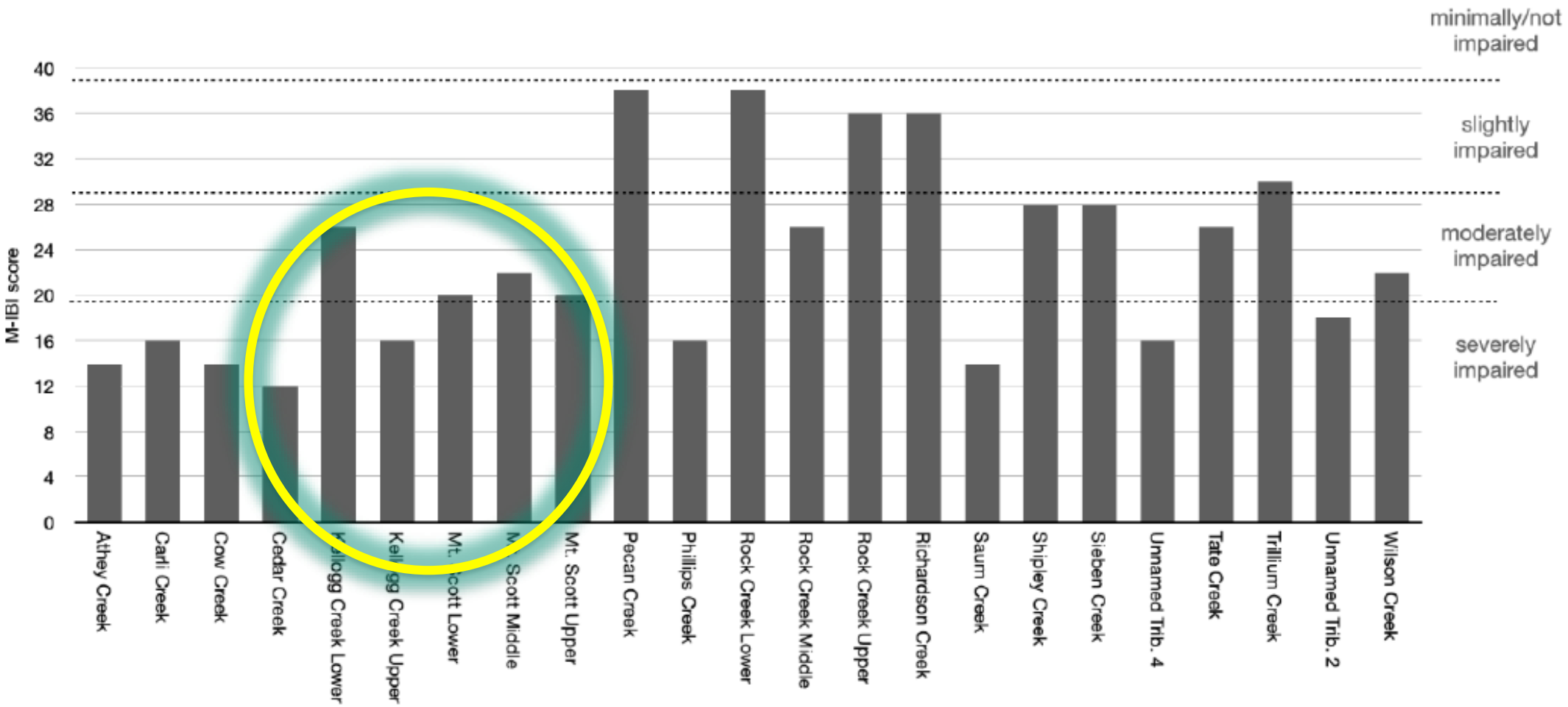


Figure 6: M-IBI model scores among WES macroinvertebrate sampling sites. Dotted lines show cutoff values for site condition assignment.

Findings: Macroinvetebrates

		Trends in metrics			*Trends in model scores*	
Stream	**2021 condition**	**# Total taxa**	**#EPT taxa**	**% top taxon**	**I-IBI**	**O/E**
Cedar^	Severely impaired/ most disturbed	↑	↑	↑	↑	↓
Upper Mt. Scott^	Moderately impaired/ most disturbed	↑	↑	↓	↑	↑
Middle Mt. Scott	Moderately impaired/ most disturbed	↑	↑	↓	↑	↑
Lower Mt. Scott^	Moderately impaired/ most disturbed	↑	↑	↓	↑	↑
Phillips^	Severely impaired/ most disturbed	↑	↑	↑	—	↑
Middle Kellogg^	Severely impaired/ most disturbed	↑	↑	↑	↓	—
Lower Kellogg^	Moderately impaired/ most disturbed	↑	↑	↓	↑	—

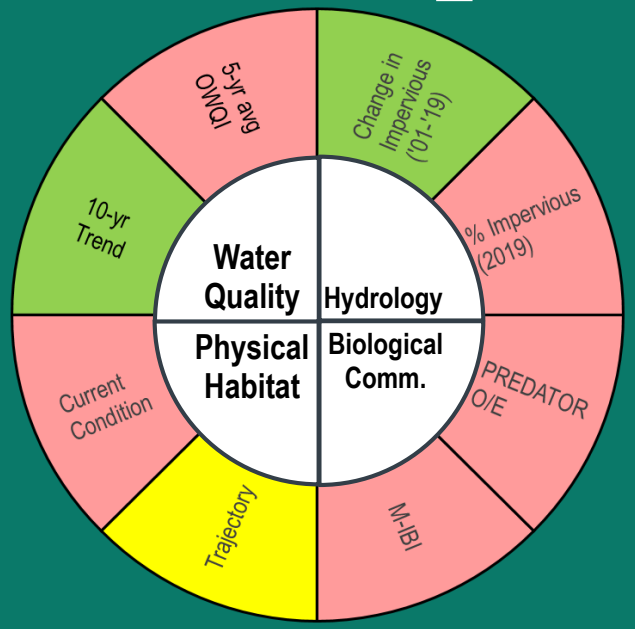
^ Indicates site sampled within seven days of a rain event.

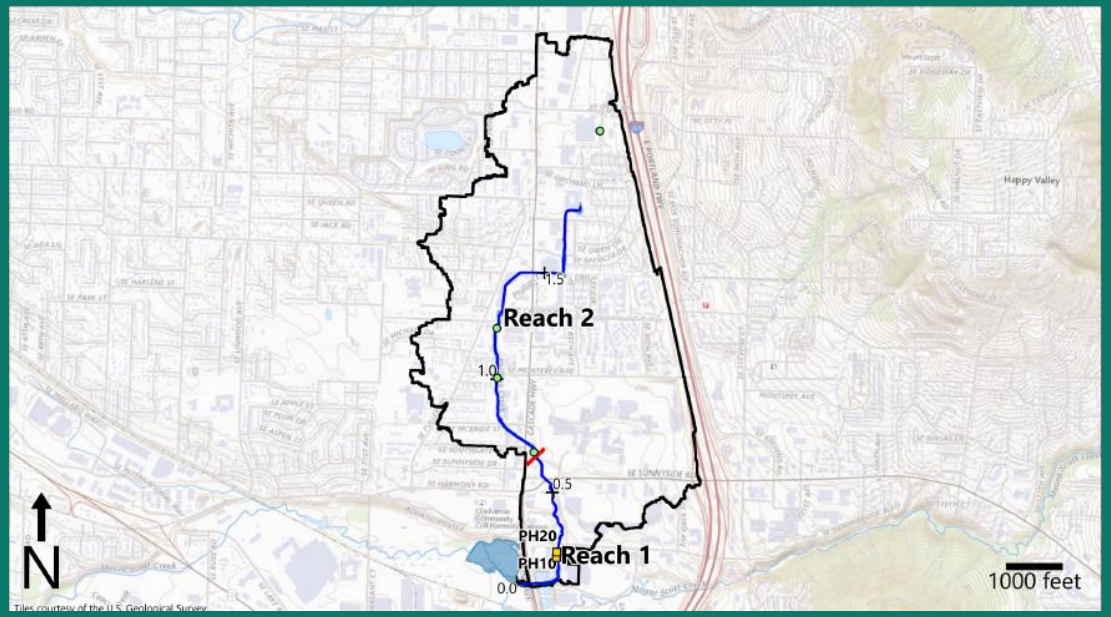
Stream health index ratings

Water Quality		Hydrology		Physical Habitat		Biological Communities	
5-yr avg. OWQI	10-yr trend (2012-2021)	Watershed % Impervious area (2019)	% Change in impervious area (2001-2019)	Current Condition	Trajectory	PREDATOR O/E	M-IBI
Very Poor (10-59)	Significantly Negative	> 67th percentile of sites	> 67th percentile of sites	Likely Impaired	Likely Degrading	Severe/Most	Severe/Most
Poor (60-79)							
Fair (80-84)	Not Significant	>34th and <66th percentile	>34th and <66th percentile	Probably Impaired	Potentially Degrading	Moderate	Moderate
Good (85-100)	Significantly Positive	<33rd percentile of sites	<33rd percentile of sites	Functioning	Likely Improving	Slight/Least	Slight/Least

Results

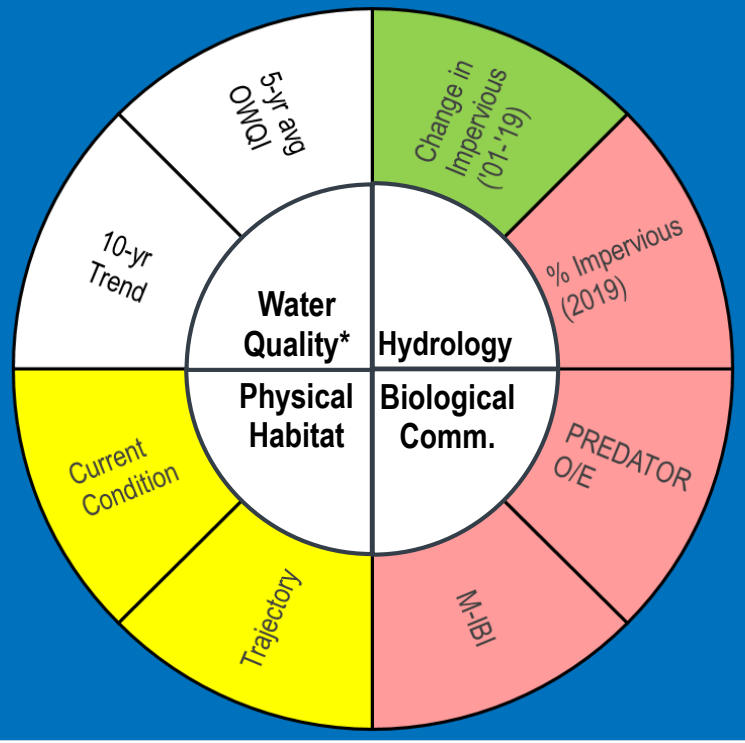
Phillips Creek





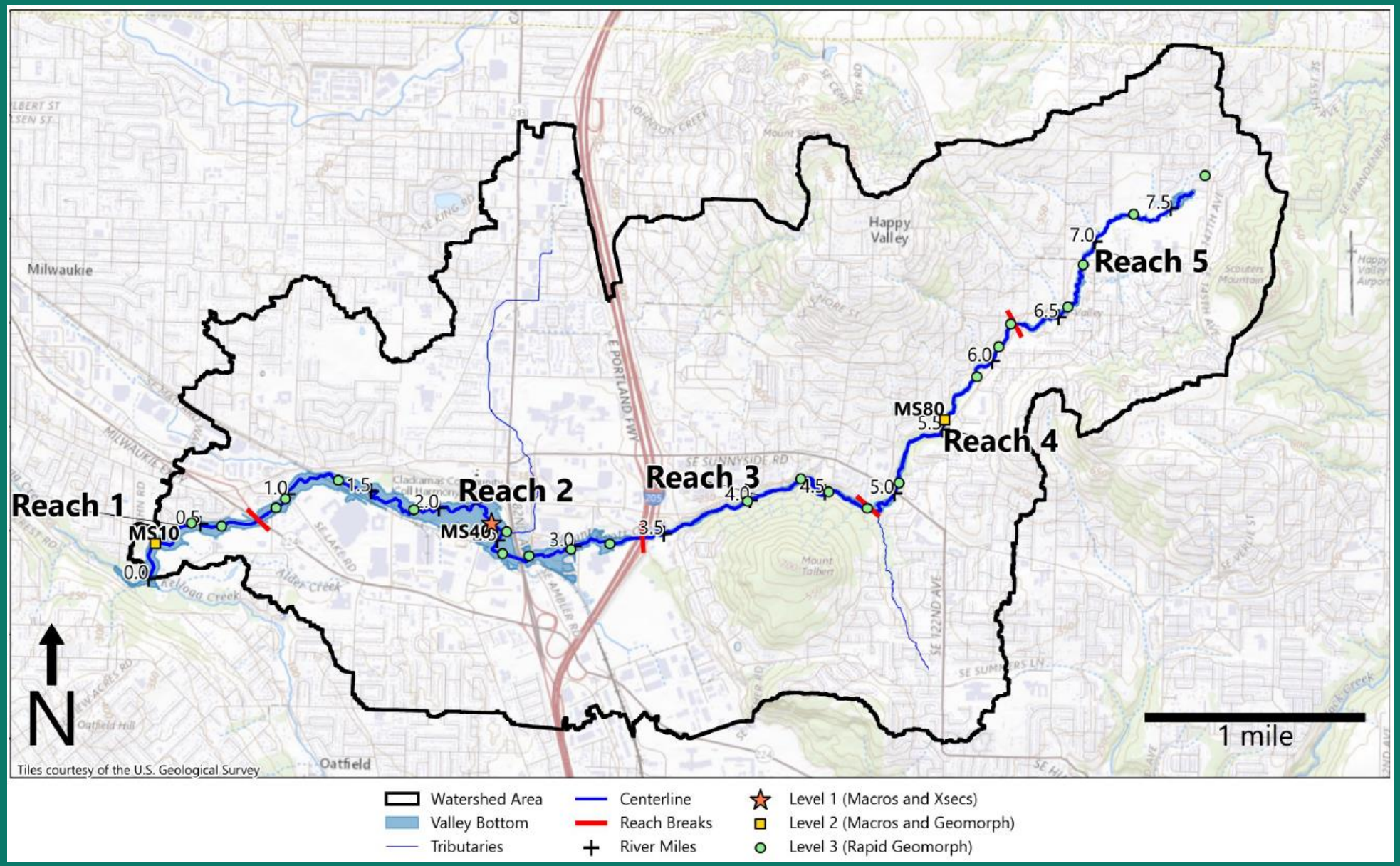
Physical Habitat Scoring									
	Current Condition					Trajectory			
	Entrenchment	Complexity	Floodplain Connectivity	Riparian Condition	Overall Condition	Entrenchment-Incision	Complexity-LWD Recruitment	Riparian Canopy Cover Change ('07-'14)	Overall Trajectory
Stream	Moderate	Moderate	Low	Low	Lkly Imp.	High	Moderate	Increasing	Pot. Degrading
Reach 1	Moderate	Low	Low	Low	Lkly Imp.	High	Moderate	Increasing	Pot. Degrading
Reach 2	High	High	Low	Low	Lkly Imp.	High	Low	Increasing	Lkly Degrading

Cedar Creek

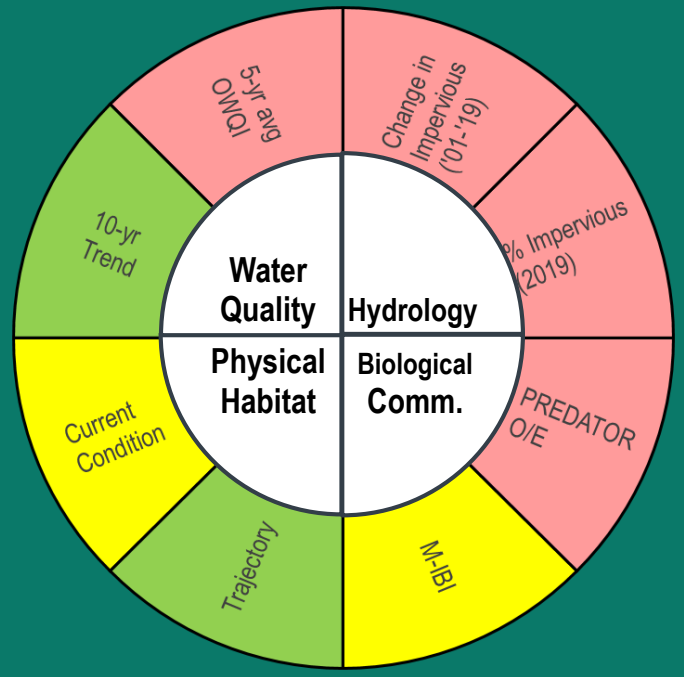


Physical Habitat Scoring									
	Current Condition					Trajectory			
	Entrenchment	Complexity	Floodplain Connectivity	Riparian Condition	Overall Condition	Entrenchment-Incision	Complexity-LWD Recruitment	Riparian Canopy Cover Change ('07-'14)	Overall Trajectory
Stream	Low	Moderate	Moderate	Low	Prob. Imp.	High	Moderate	Increasing	Pot. Degrading
Reach 1	Low	Moderate	Moderate	Low	Prob. Imp.	High	Moderate	Increasing	Pot. Degrading

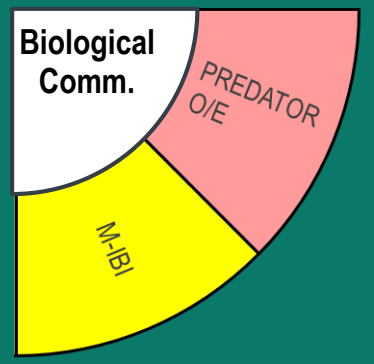
Mt Scott Creek



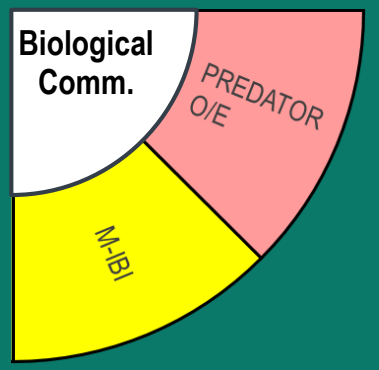
Lower Mt. Scott



Middle Mt. Scott

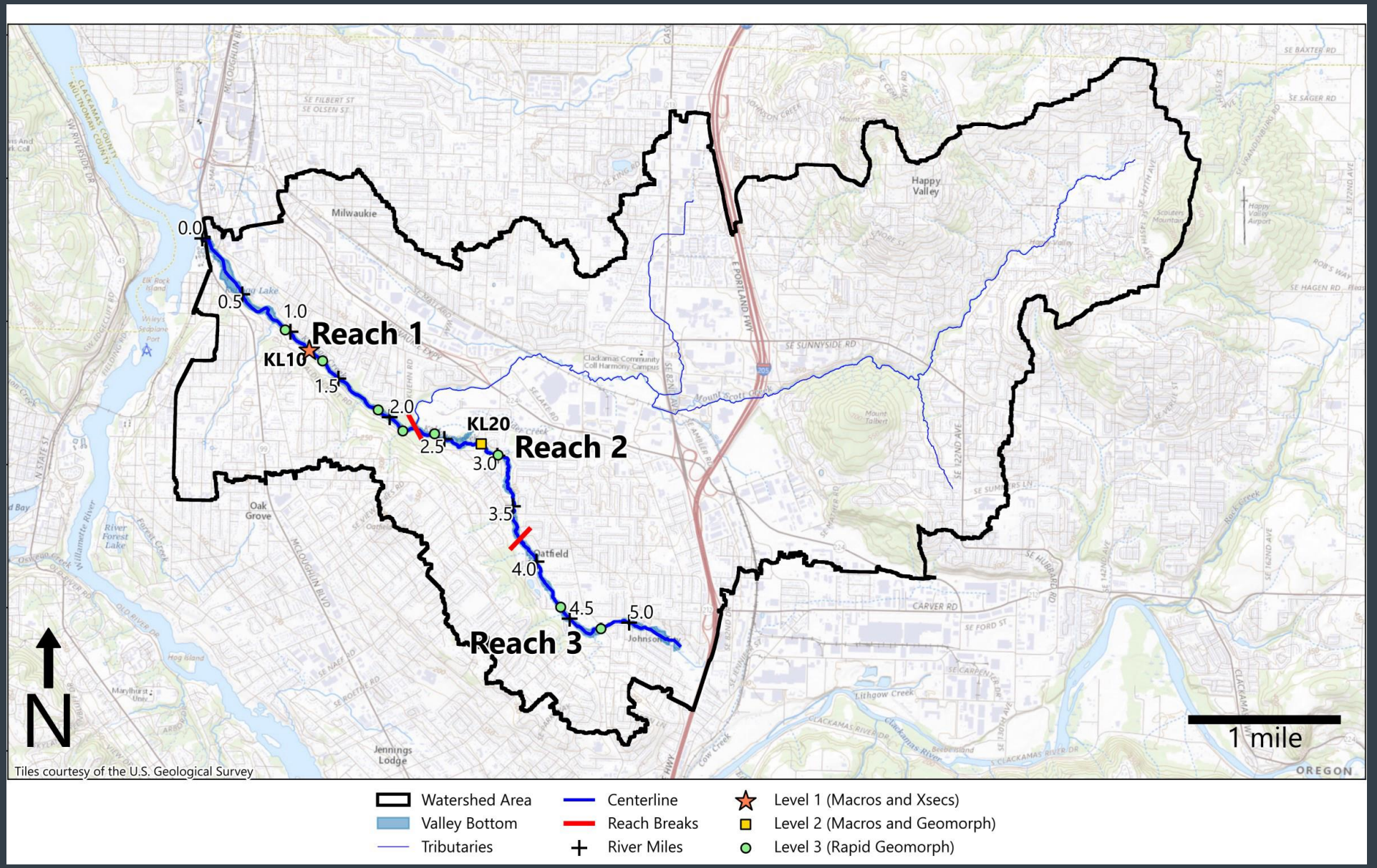


Upper Mt. Scott

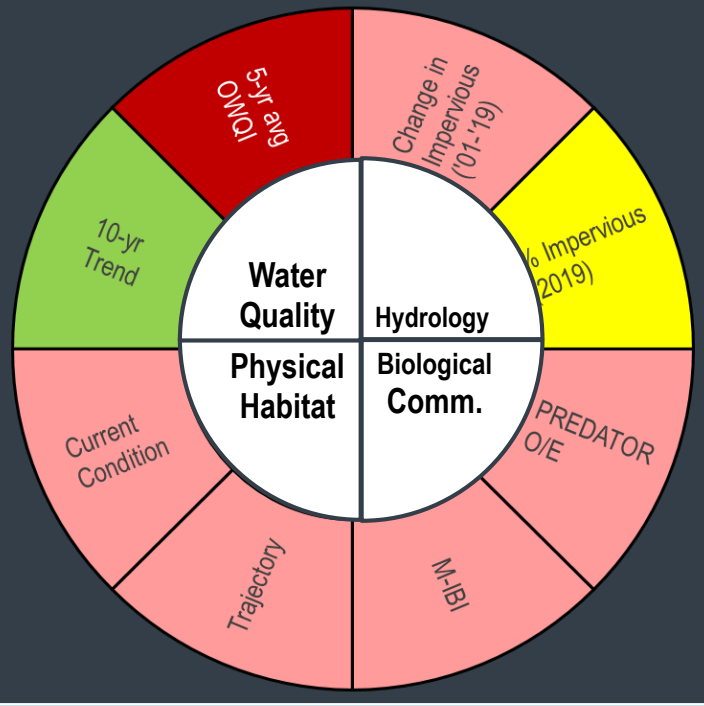


Physical Habitat Scoring									
	Current Condition					Trajectory			
	Entrenchment	Complexity	Floodplain Connectivity	Riparian Condition	Overall Condition	Entrenchment-Incision	Complexity-LWD Recruitment	Riparian Canopy Cover Change ('07-'14)	Overall Trajectory
Stream	Moderate	High	Low	Moderate	Prob Imp.	Low	High	Stable	Lkly Improving
Reach 1	Low	High	Moderate	Moderate	Functioning	High	High	Stable	Pot. Degrading
Reach 2	Moderate	High	Low	Moderate	Prob Imp.	Low	High	Increasing	Lkly Improving
Reach 3	Moderate	Moderate	Low	Moderate	Prob Imp.	High	High	Increasing	Pot. Degrading
Reach 4	Low	Moderate	Low	Moderate	Prob Imp.	High	High	Increasing	Pot. Degrading
Reach 5	Low	Moderate	Low	Moderate	Prob Imp.	High	High	Increasing	Pot. Degrading

Kellogg Creek

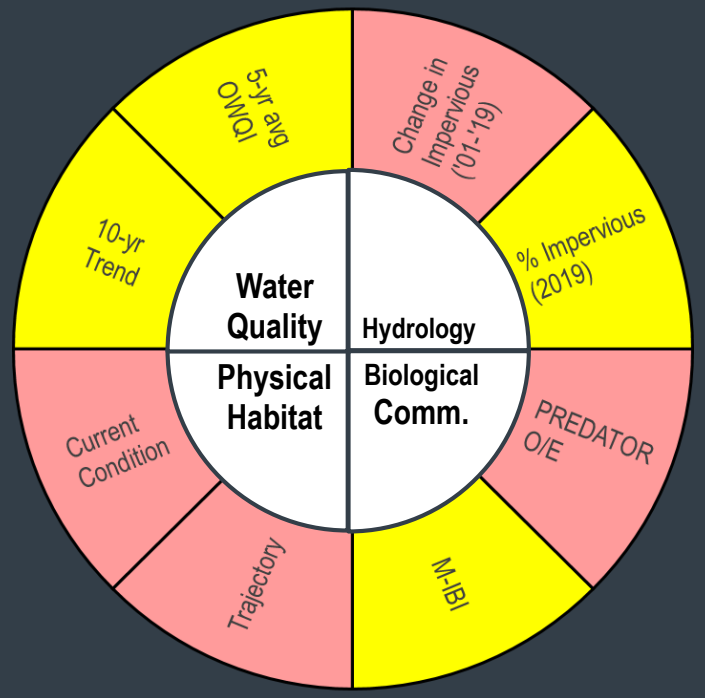


Upper Kellogg



Physical Habitat Scoring									
	Current Condition					Trajectory			
	Entrenchment	Complexity	Floodplain Connectivity	Riparian Condition	Overall Condition	Entrenchment-Incision	Complexity-LWD Recruitment	Riparian Canopy Cover Change ('07-'14)	Overall Trajectory
Stream	High	Low	Low	Low	Lkly Imp.	High	Moderate	Stable	Lkly Degrading
Reach 1	High	Low	Low	Moderate	Prob. Imp.	High	High	Decreasing	Lkly Degrading
Reach 2	High	Low	Low	Moderate	Prob. Imp.	High	High	Stable	Pot. Degrading
Reach 3	Moderate	Low	Low	Low	Lkly Imp.	High	Moderate	Stable	Lkly Degrading

Lower Kellogg



Physical Habitat Scoring									
	Current Condition					Trajectory			
	Entrenchment	Complexity	Floodplain Connectivity	Riparian Condition	Overall Condition	Entrenchment-Incision	Complexity-LWD Recruitment	Riparian Canopy Cover Change ('07-'14)	Overall Trajectory
Stream	High	Low	Low	Low	Lkly Imp.	High	Moderate	Stable	Lkly Degrading
Reach 1	High	Low	Low	Moderate	Prob. Imp.	High	High	Decreasing	Lkly Degrading
Reach 2	High	Low	Low	Moderate	Prob. Imp.	High	High	Stable	Pot. Degrading
Reach 3	Moderate	Low	Low	Low	Lkly Imp.	High	Moderate	Stable	Lkly Degrading

Questions?

Gail Shaloum
Natural Resources Scientist
gshaloum@clackamas.us
(503) 742-4597

Chris Desiderati
Source Control Coordinator
cdesiderati@clackamas.us
(503) 557-2834