# Watershed Health Monitoring

A briefing for the WFPA 6/17/2021

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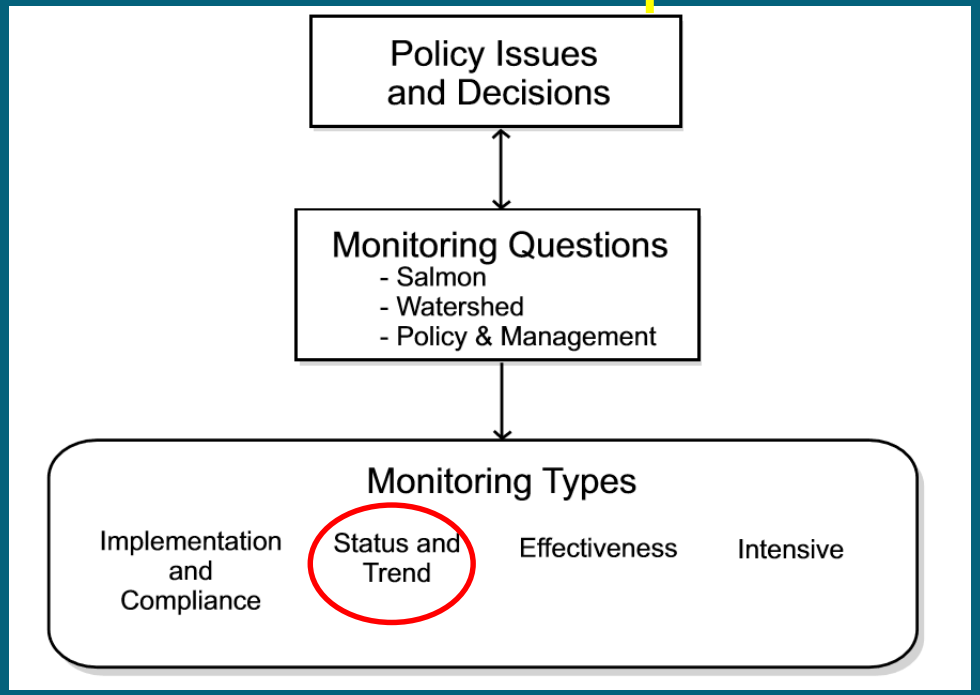
# Outline

- Origins of WHM – the methods backbone
- Goal/objectives
- Products

# Watershed Health Monitoring Origins

| Mandates | State Strategy | Guidance | Monitoring Plan | Long-term monitoring |
|---|---|---|---|---|
| ESA<br>CWA 305(b) | Comprehensive Monitoring Strategy | Governor's Monitoring Forum + Stakeholder Workshops | Pub#<br>06-03-203 | Methods<br>Public Db<br>Reporting |
| 1970s | 2002 | 2004-2005 | 2006 | 2007-present<br>Sampling since 2009 |



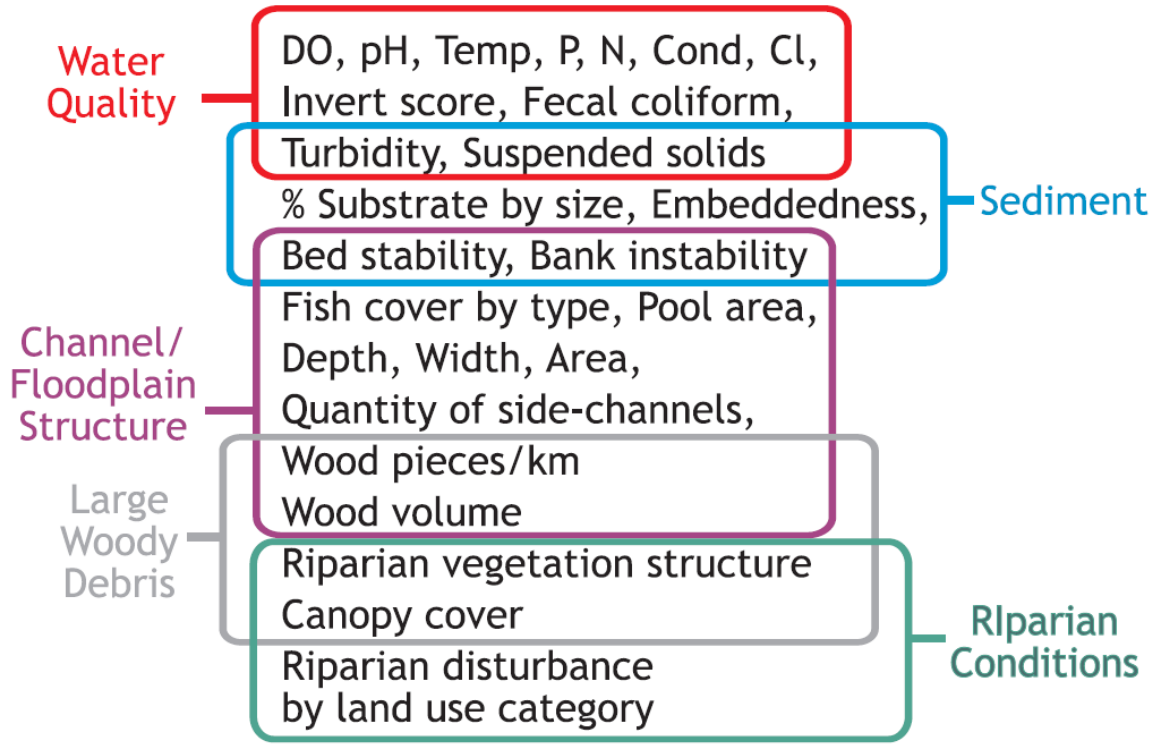

S&T (extensive) design
- not cause-effect
- means of assessing condition

Major themes of CMS
- Need for habitat data
- Standard methods
- Data sharing

# WHM Objectives

Goal: Estimate habitat status & trends, including salmonid limiting factors

**Figure 3:** The relationship of field-sampled metrics to limiting factors.

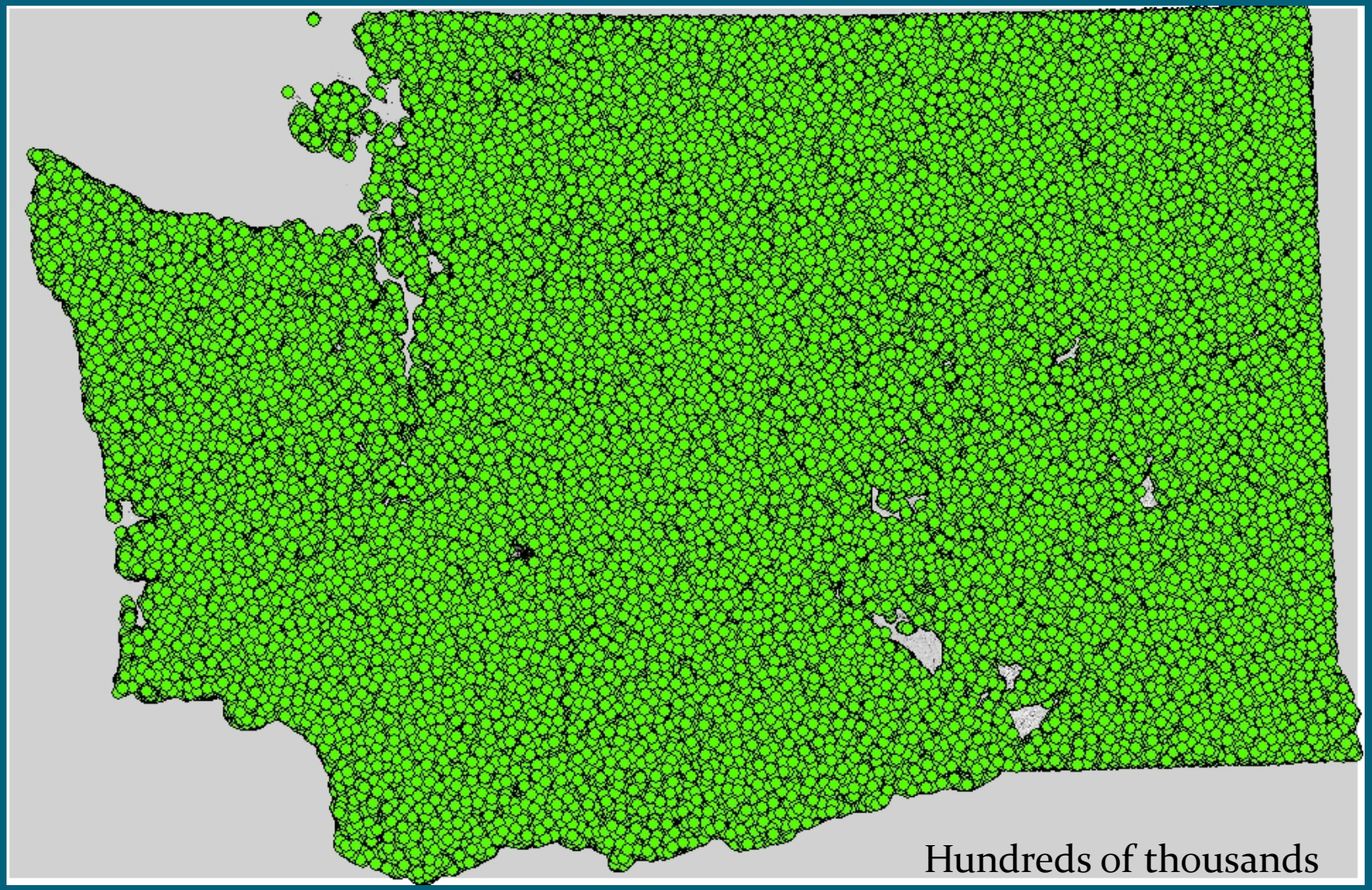



Objectives

- Standard Methods
- Known Confidence
- Multi-scale
- Existing information
- Partnerships

# RANDOM DESIGN

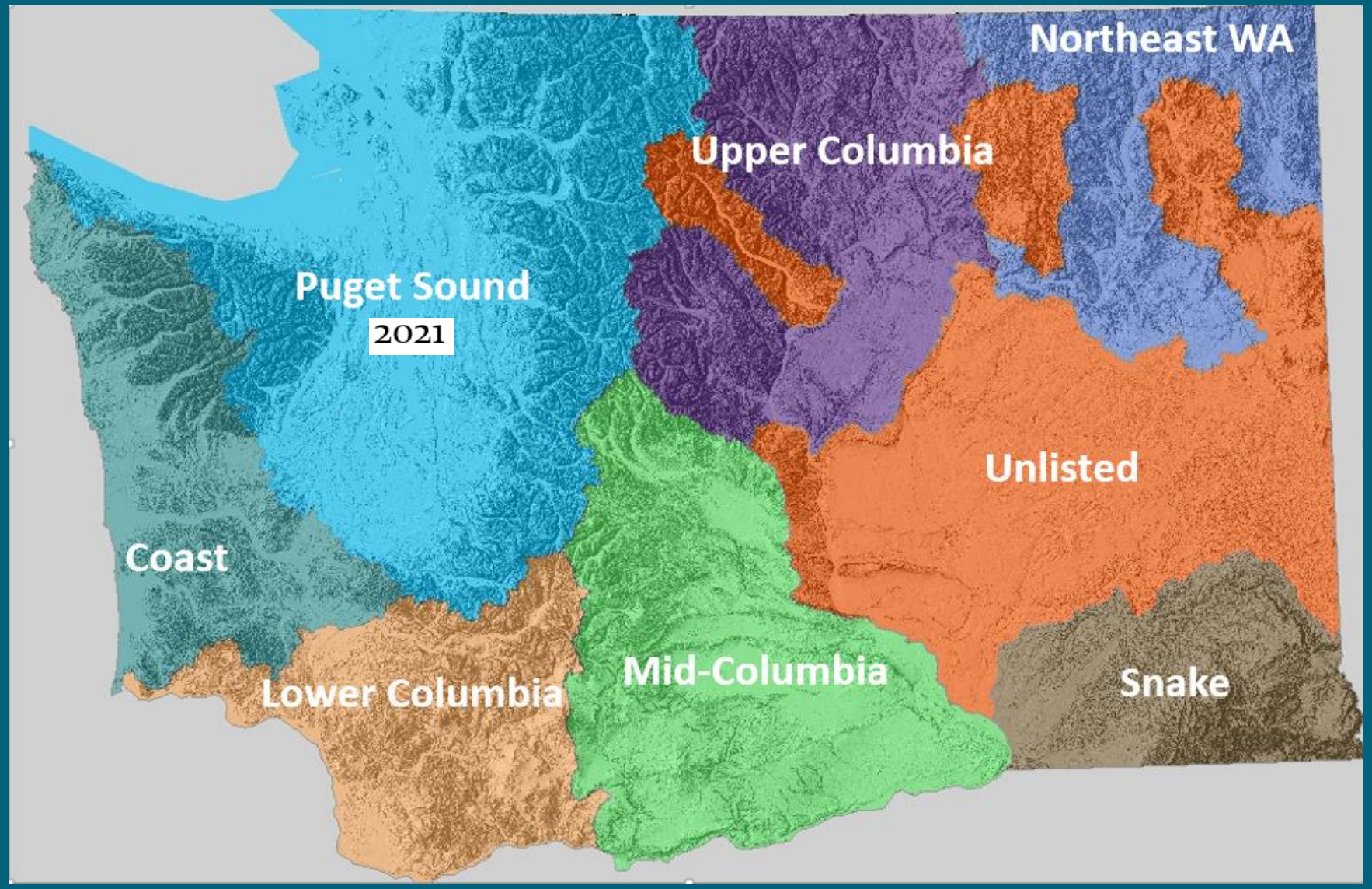
# Master Sample – via GRTS




Latest frame

- NHD 1:24k
- HUC Based – crosses borders
- 1/km – for multi-scale use

# Eight survey regions – now at 1/year



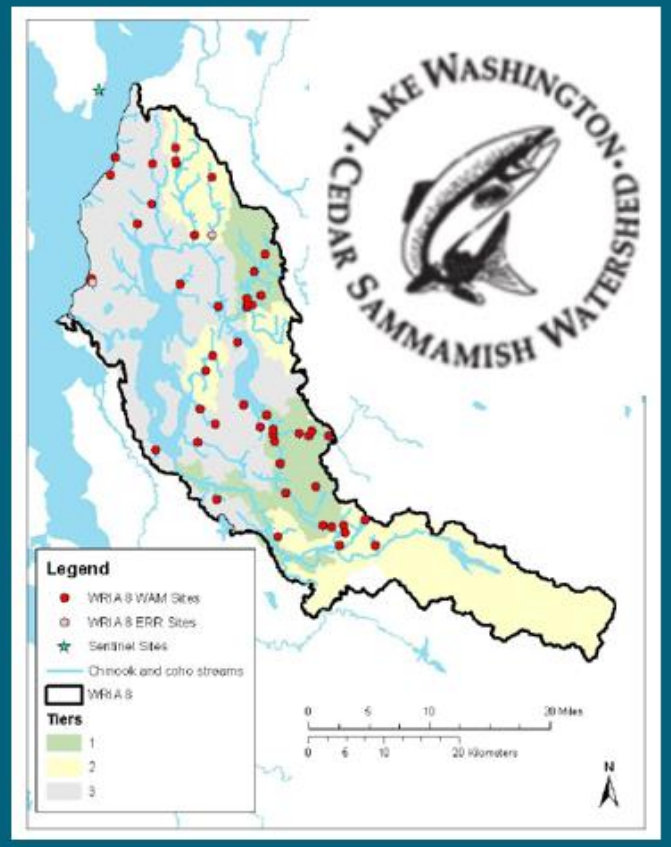

Based on guidance

- Forum
- Workshops

| Status and Trends Monitoring Regions | Round 1 | Round 2 | Round 3 |
|---|---|---|---|
| Puget Sound | 2009 | 2013 | 2021 |
| Coastal | 2010 | 2014 | 2022 |
| Lower Columbia River | 2010 | 2014 | 2023 |
| Mid Columbia | 2011 | 2015 | 2024 |
| Snake River | 2011 | 2016 | 2025 |
| Upper Columbia | 2012 | 2017 | 2026 |
| Northeast Washington | 2012 | 2018 | 2027 |
| Unlisted Washington | 2010 | 2019 | 2028 |

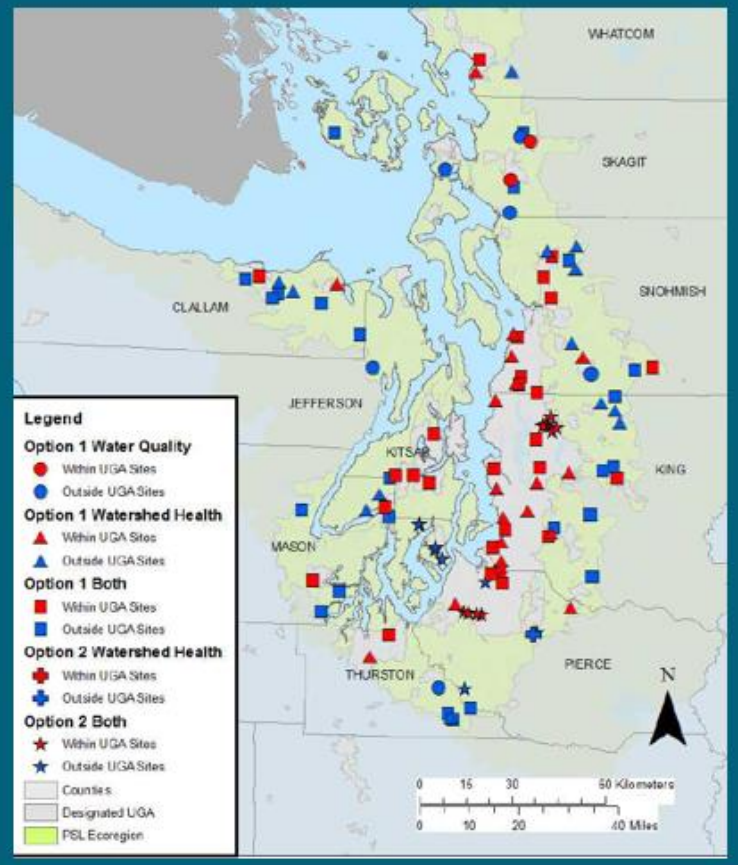
# External entities can use at finer scale

WRIA 8 Salmon Recovery Council




https://your.kingcounty.gov/dnrp/library/2015/kcr2671.pdf

Stormwater Action Monitoring



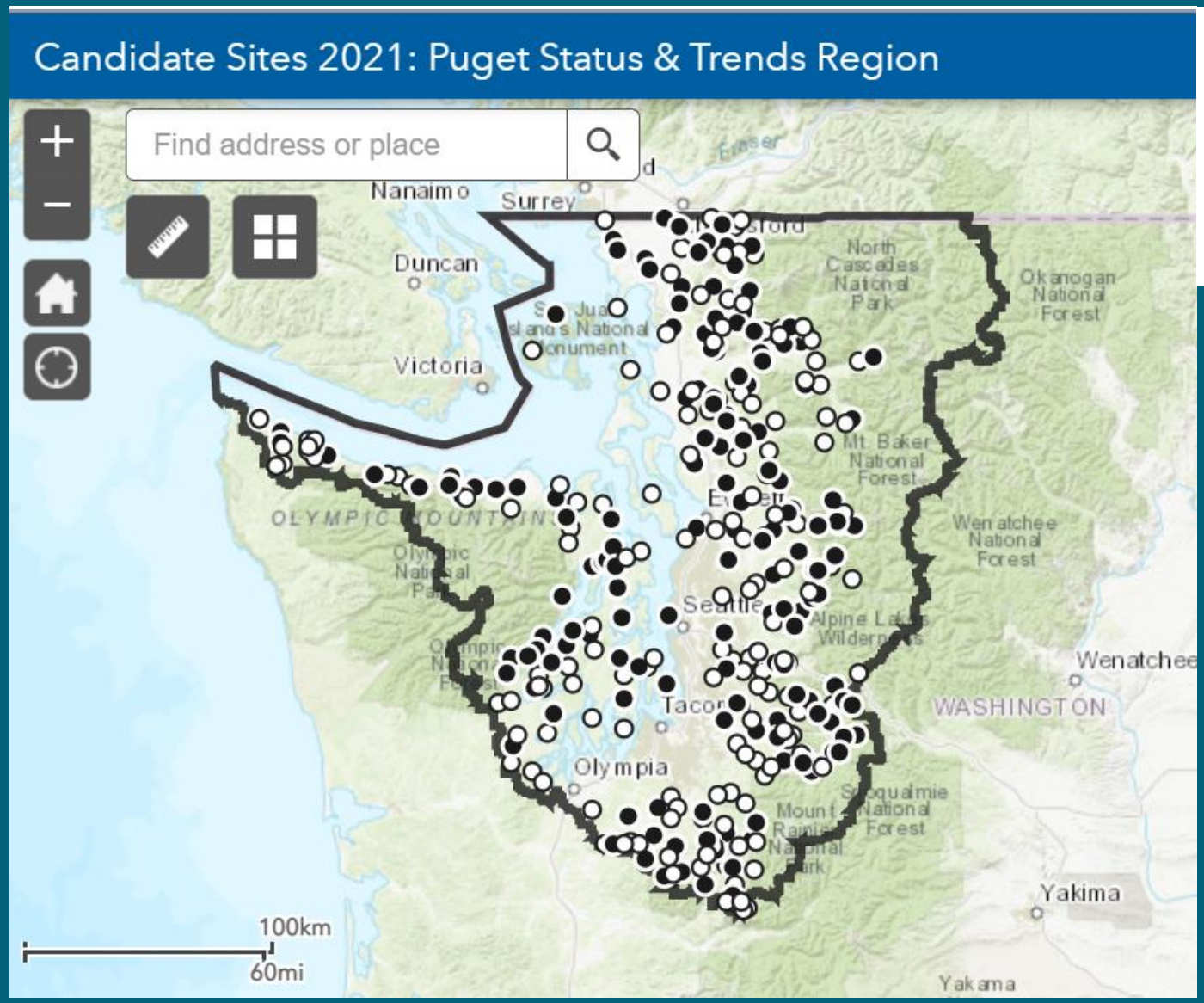

https://your.kingcounty.gov/dnrp/library/2018/kcr2968/kcr2968.pdf

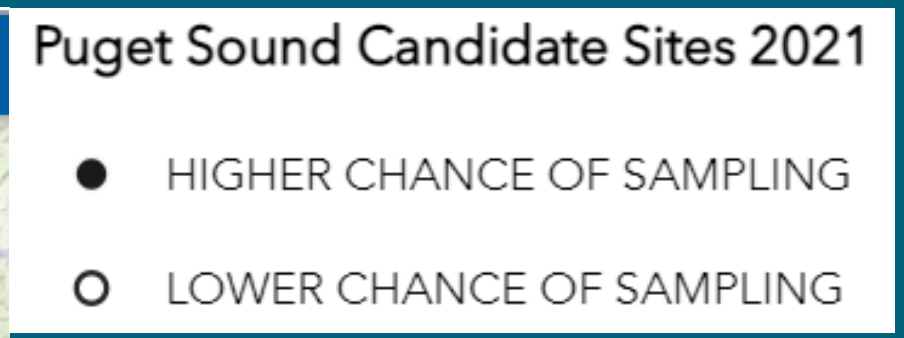
# Iterative filtering to *exclude* points on…

- Federal, reservation lands, other states, Canada
- Marine, brackish, tidal waters
- Lentic waters*
- Channels with temporary or mostly subsurface flow*
- Constructed channels
- Points of each size class after 10 successfully sampled each*
- Property without granted permission.

* Requires within season evaluations.
Flow status is especially hard to pre-determine for small streams

# So far, we've filtered to hundreds. Next to 50



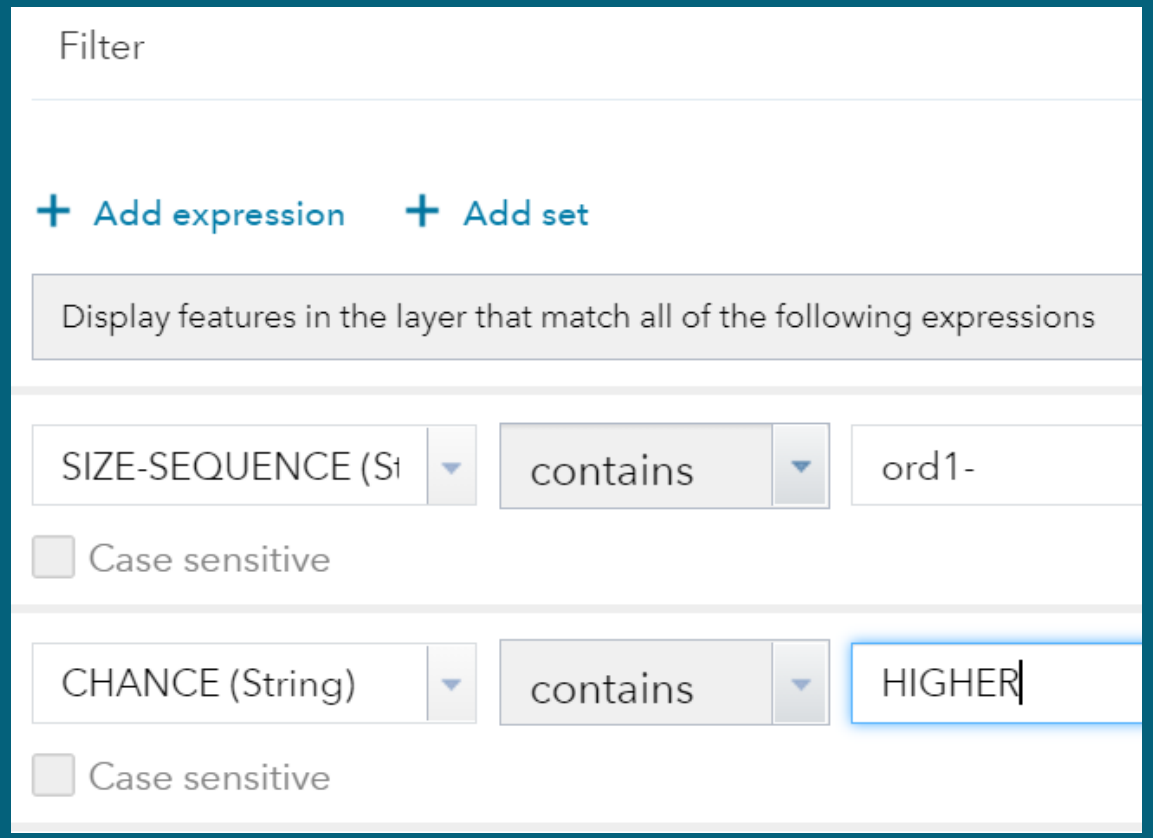

## Equal across sizes

- 10 1st order
- 10 2nd order
- 10 3rd order
- 10 4th order
- 10 5th order/larger

Ensures that headwaters don't dominate sampling

Sample results are NOT part of impairment lists.

# Candidate sites 2021




- Size 1 (138 -> 68 high chance)*
- Size 2 (89 -> 43)
- Size 3 (43 -> 23)
- Size 4 (42 -> 21)
- Size 5 (23 -> 12)

* Smallest streams are most likely to be dry, impermanent, inaccessible.

# Question for landowners:

Would limiting our requests to the “high chance” dark points help?

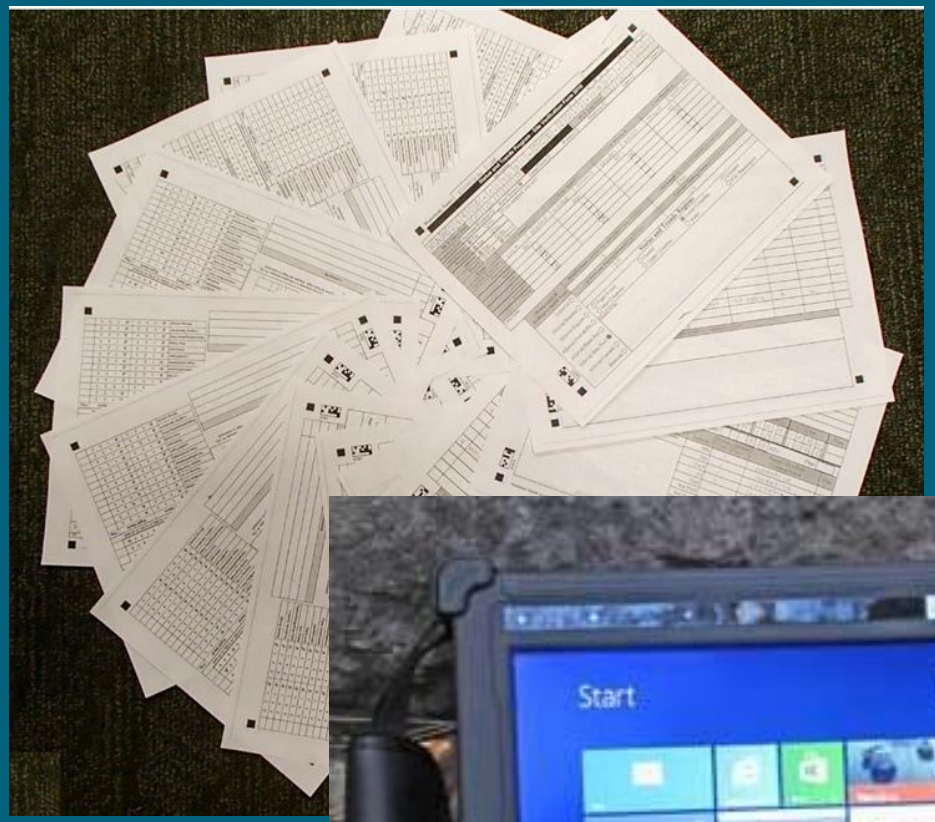
# STANDARDIZED METHODS

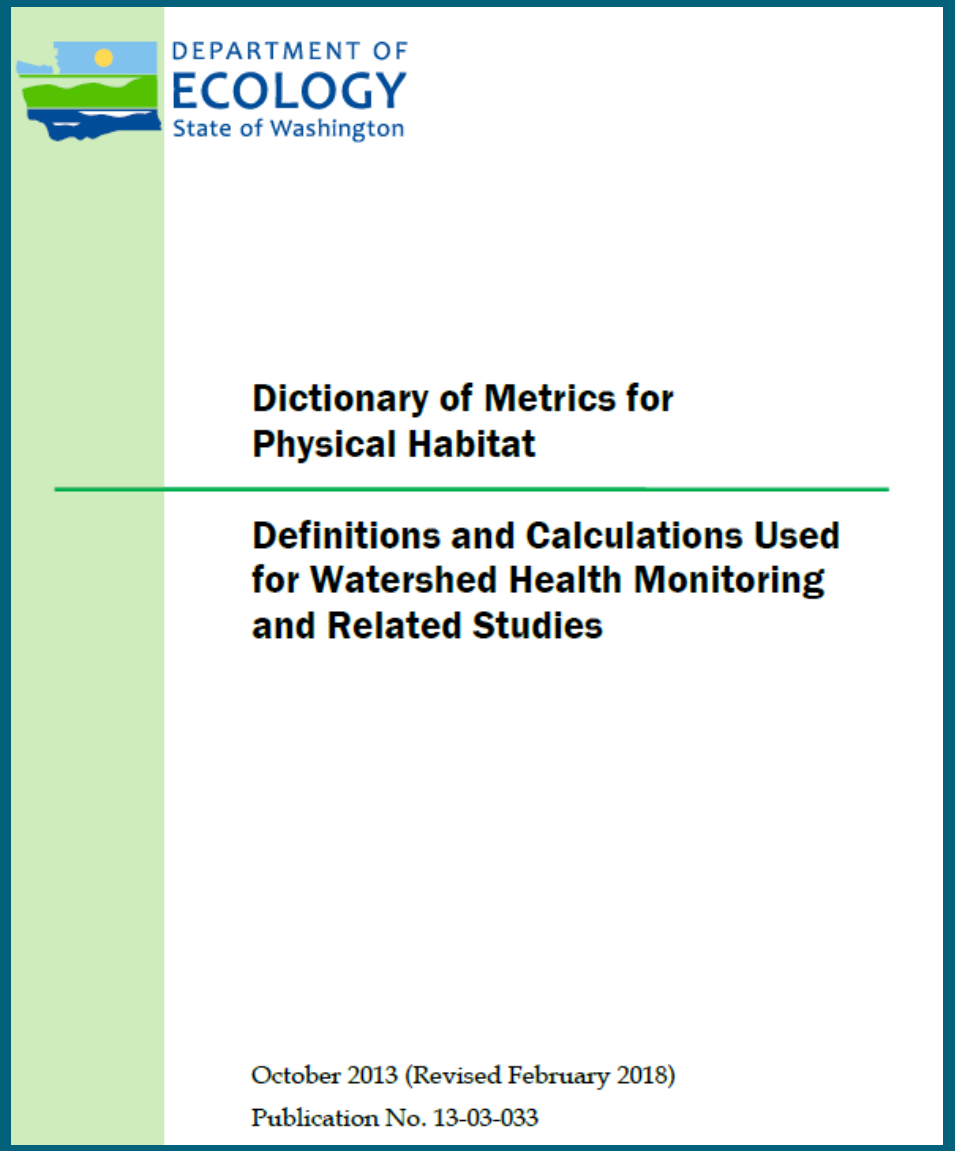
# SOPs for waded streams

| Procedure | Publication | Procedure | Publication |
|---|---|---|---|
| Discharge (EAP109) | 19-03-226 | Vertebrate assemblage (EAP124) | 18-03-228 |
| Slope (EAP122) | 19-03-218 | Sediment chemistry (EAP110) | 18-03-227 |
| Compass bearings (EAP123) | 19-03-217 | Site verification & layout (EAP106) | 18-03-226 |
| Water sampling (EAP095) | 19-03-216 | Habitat units (EAP120) | 18-03-225 |
| Bank conditions (EAP112) | 19-03-215 | Riparian disturbance (EAP118) | 18-03-224 |
| LWD count (EAP 121) | 19-03-214 | Thalweg profile (EAP119) | 18-03-223 |
| Invertebrate sampling (EAP073) | 19-03-211 | Riparian vegetation (EAP117) | 18-03-222 |
| Periphyton sampling (EAP111) | 19-03-207 | Fish cover (EAP116) | 18-03-221 |
| In situ measures (EAP108) | 19-03-206 | Densiometer (EAP115) | 18-03-220 |
| GPS coordinates (EAP107) | 18-03-230 | Channel dimensions (EAP113) | 18-03-219 |
| Substrate & Embeddedness (EAP114) | 18-03-229 | | |

https://ecology.wa.gov/Research-Data/Monitoring-assessment/River-stream-monitoring/Habitat-monitoring/Habitat-monitoring-methods (scroll to bottom)

# The database and QA





DEPARTMENT OF
ECOLOGY
State of Washington

**Dictionary of Metrics for Physical Habitat**

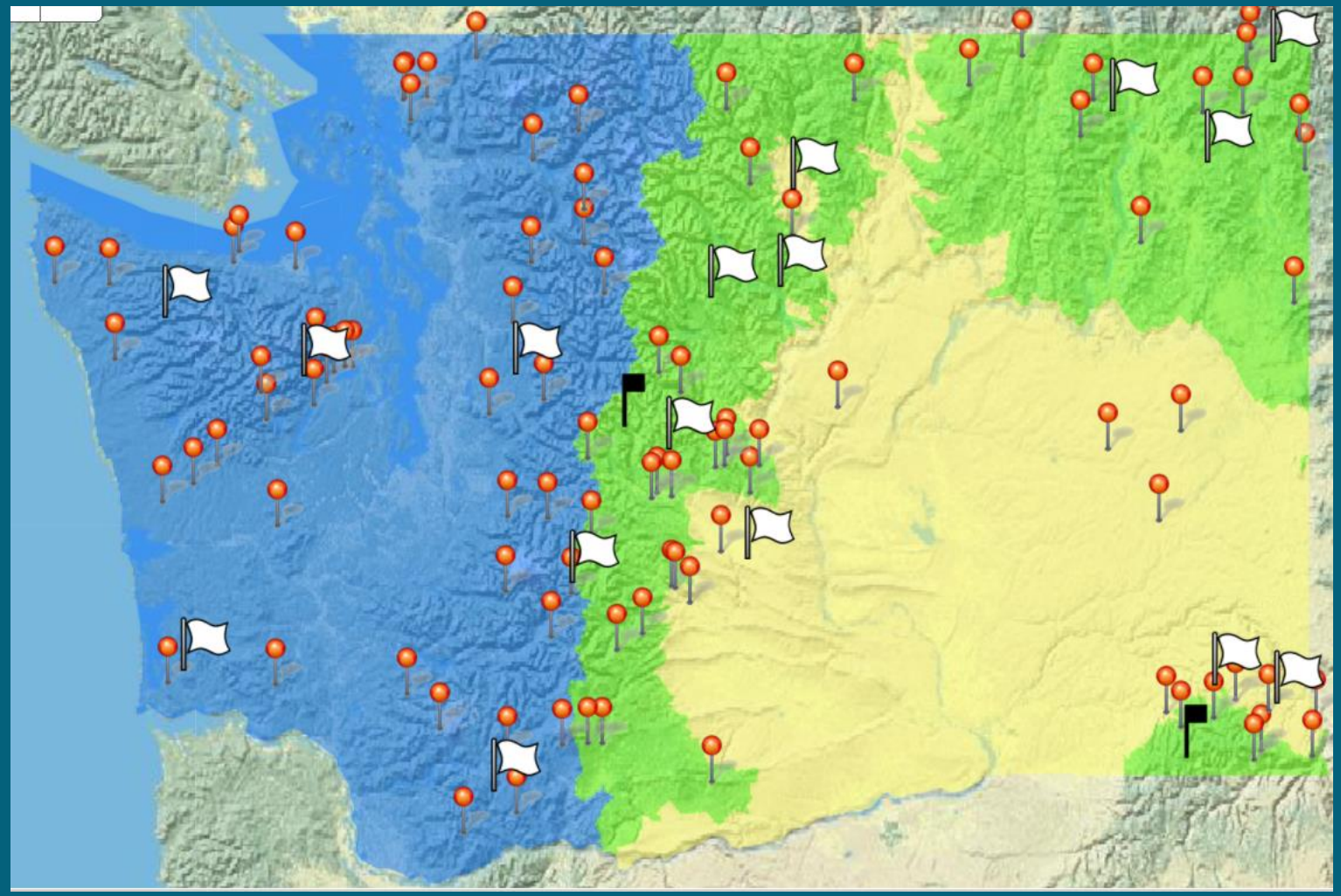
**Definitions and Calculations Used for Watershed Health Monitoring and Related Studies**

October 2013 (Revised February 2018)

Publication No. 13-03-033

# Reference condition monitoring

## The Stream Biological Monitoring Program



- 3 Ecoregions (Wilmoth et al)
- About 40+ sites/year – with some new
- WHM SOPs

# On-site effort

Table 2. Idealized daily work flow.

| ACTIVITY | PERSONS | Time Since Arrival On-site (Hrs) 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Verification& Layout | AB | ■ | | | | | |
| Water/In Situ | CD | ■ | | | | | ■ |
| Benthos/Sediment | AB | | ■ | | | | |
| Habitat | CD | | ■ | ■ | ■ | ■ | |
| Vertebrates | AB+ | | | ■ | ■ | ■ | ■ |

# RESULTS

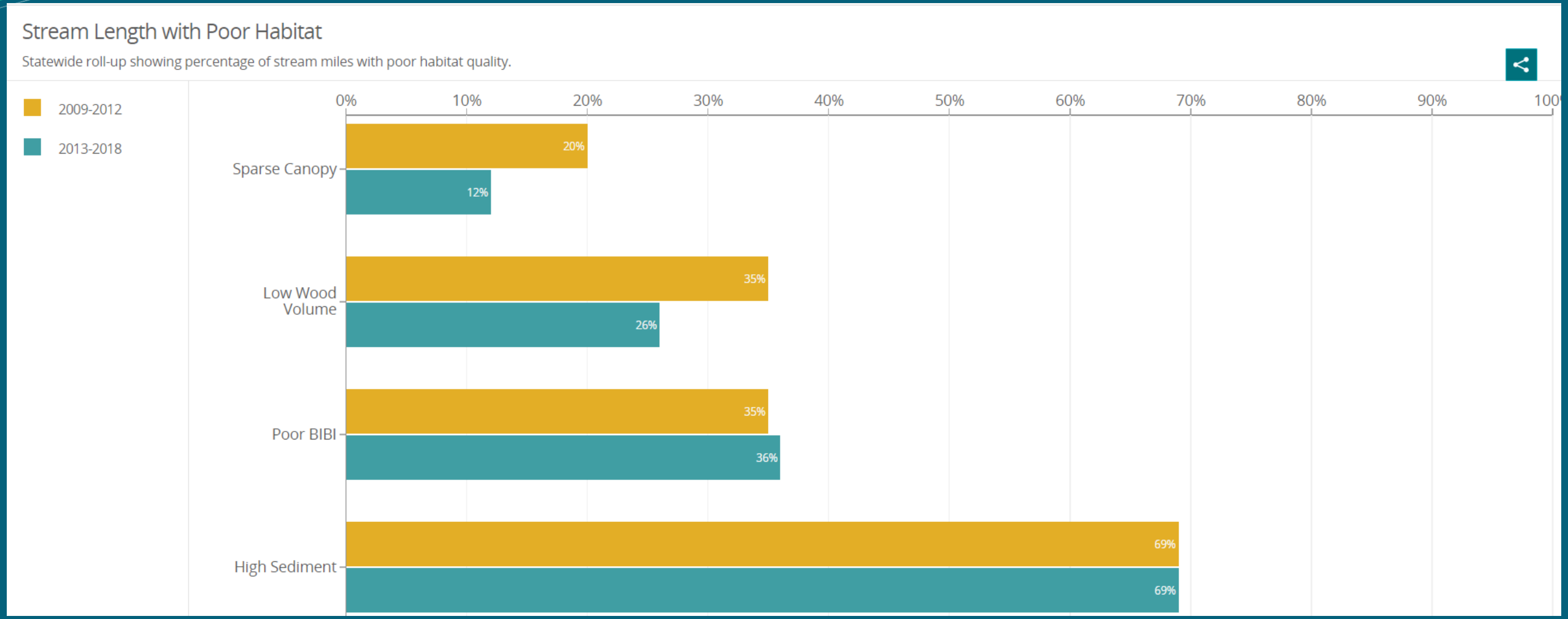
Completed…

1) Puget Sound tributaries: Pub # 12-03-029
2) Least-impacted conditions: Pub # 15-03-011
3) Risk analysis: *Ecological Indicators*, July 2019, 175-185
4) State of the Salmon (2016, 2018, 2020,…): Statewide Habitat Quality
5) Certification of WHM data through 2019
   https://tinyurl.com/WatershedHealthData

Coming…

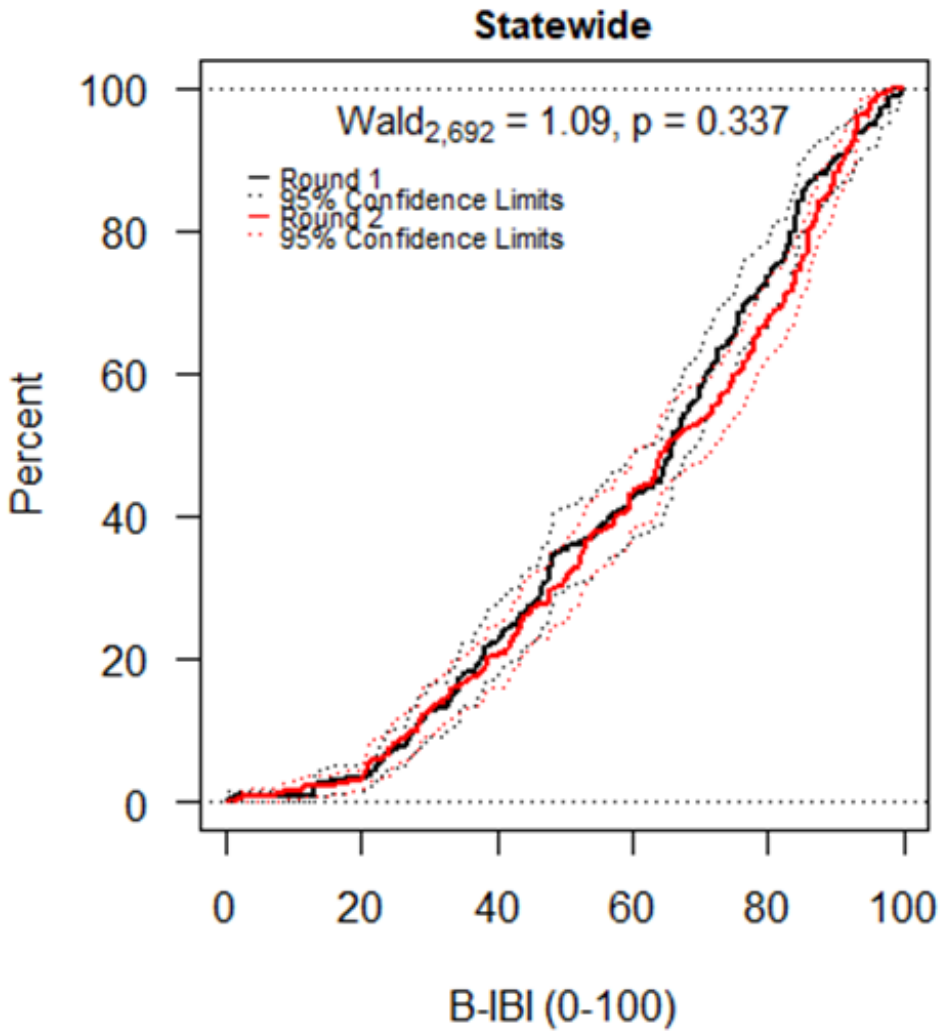
1) Regional Focus Sheets
2) Short report on metric precision
3) 305(b) report will use #3 above to compare survey rounds.
4) Sentinel sites results

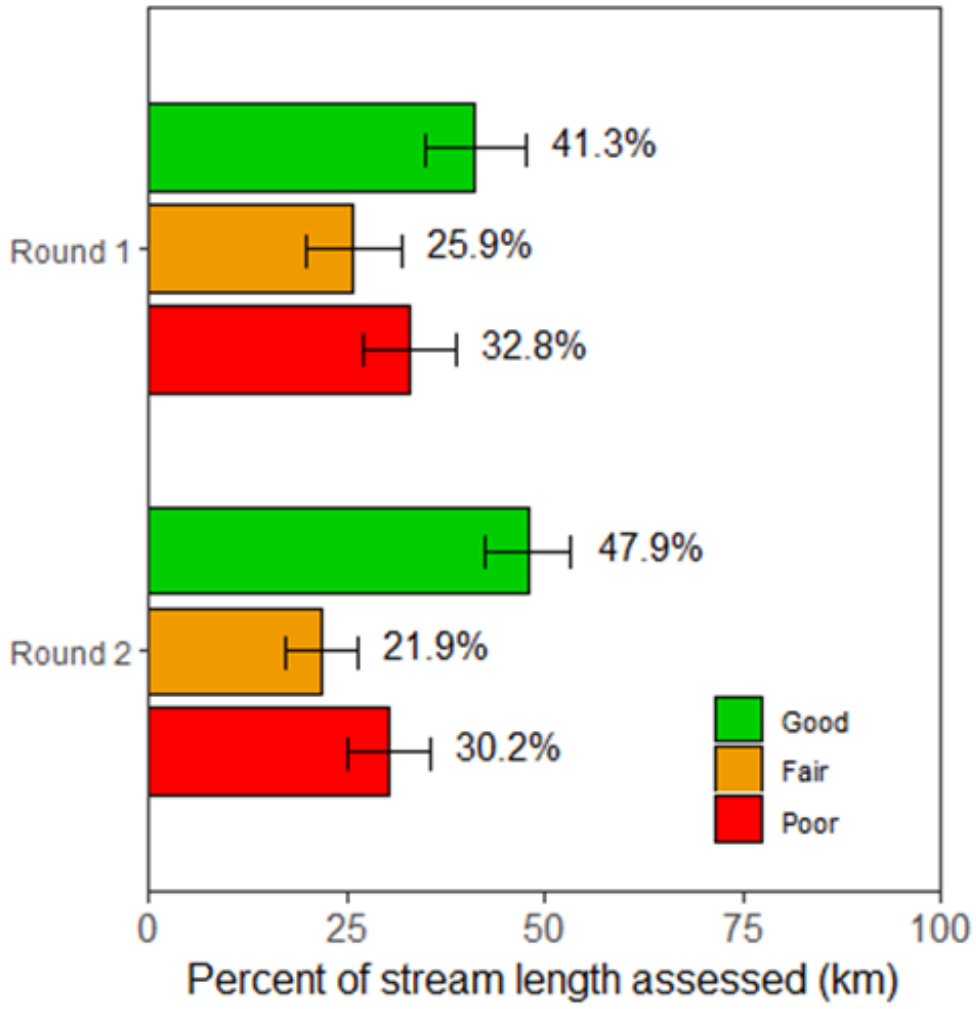
# 2020 SOS Report: Statewide Habitat*




* Graph is limited to regions with ESA listings

# Statewide example (with 95% confidence)

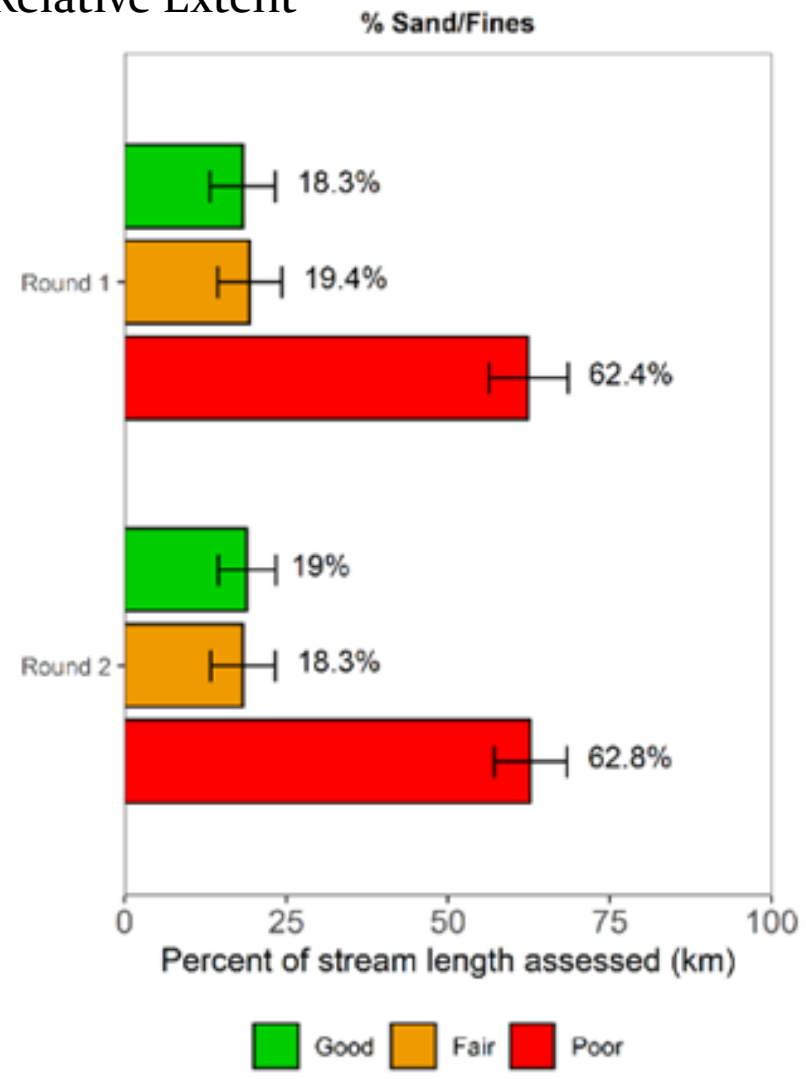


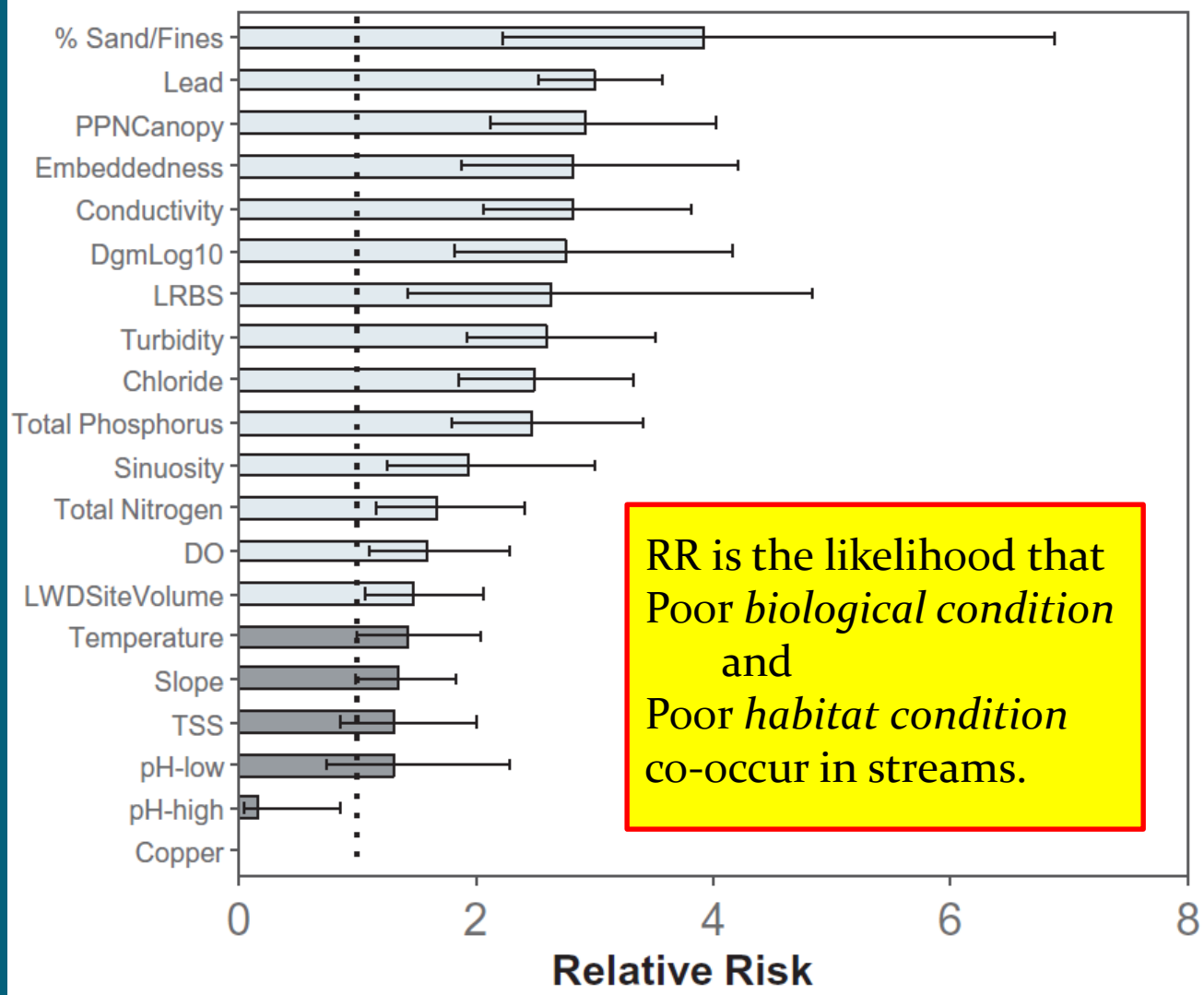



# Habitat Metrics & Relative Risk

Statewide – Round 1

Relative Extent




RR is the likelihood that Poor *biological condition* and Poor *habitat condition* co-occur in streams.

Ecological Indicators 102 (2019) 175–185

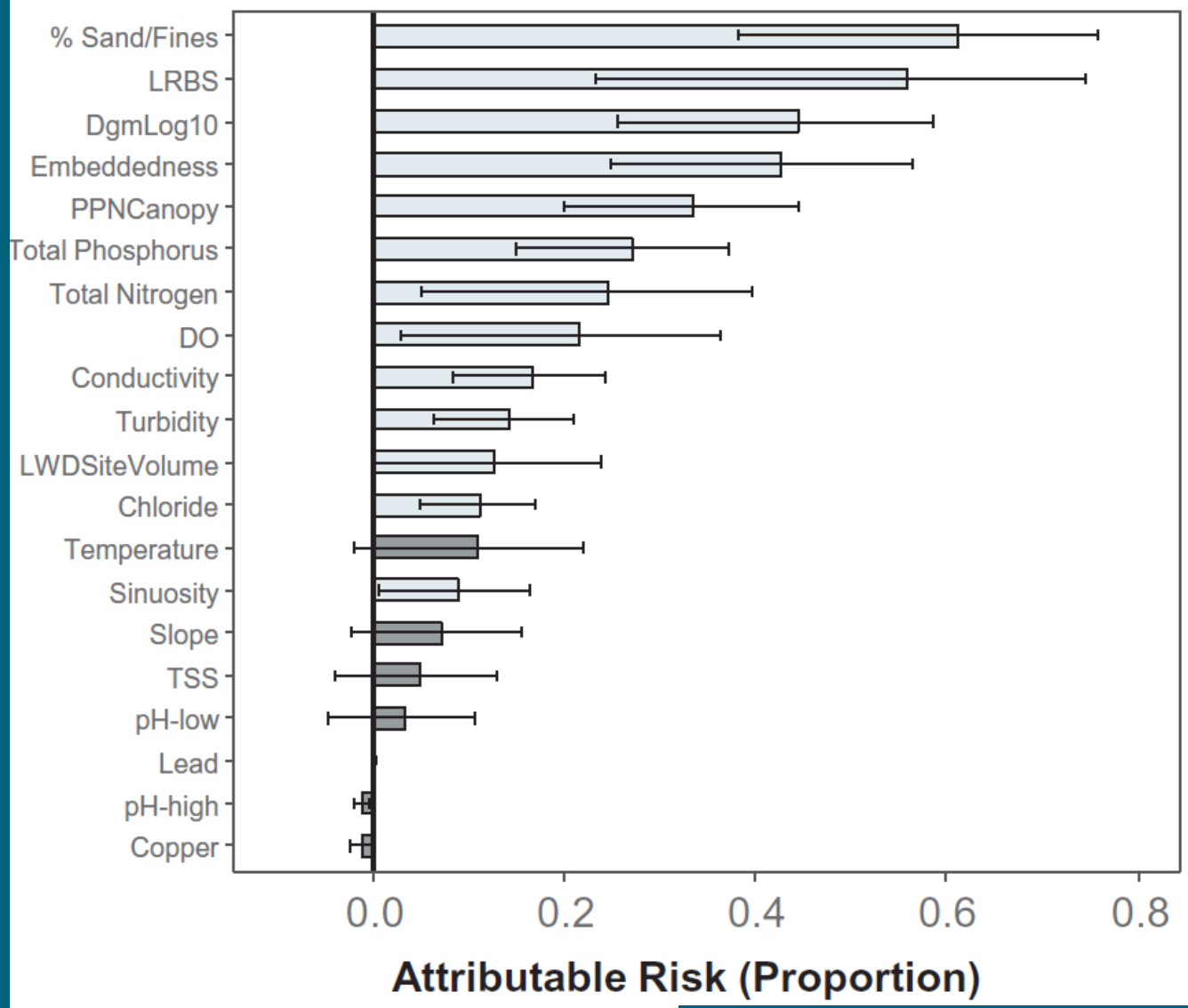
# Attributable Risk

Statewide – Round 1

Factors

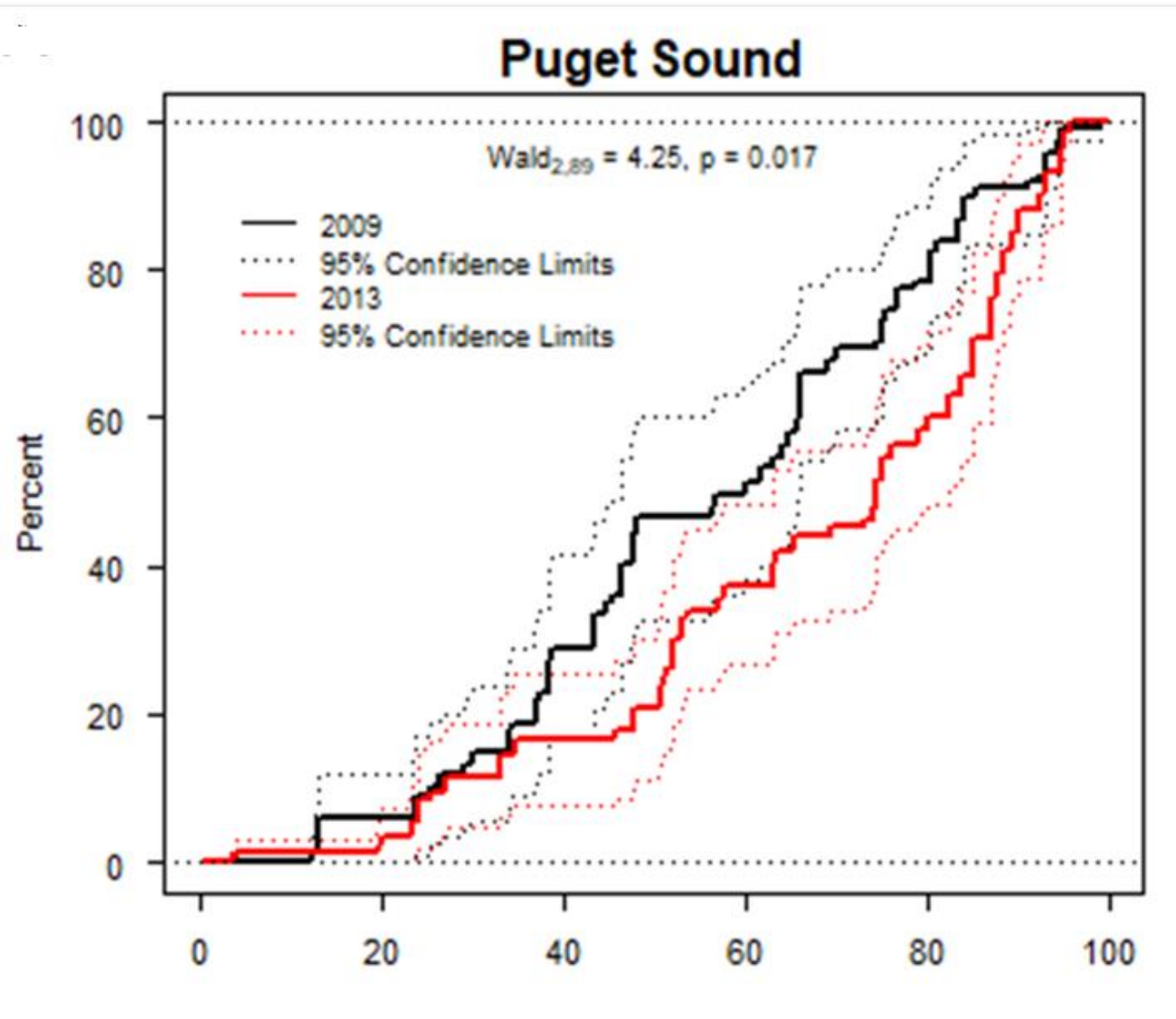
- Relative Risk
- Extent

Habitat metrics with high relative risk but low extent don't rank high: see Lead



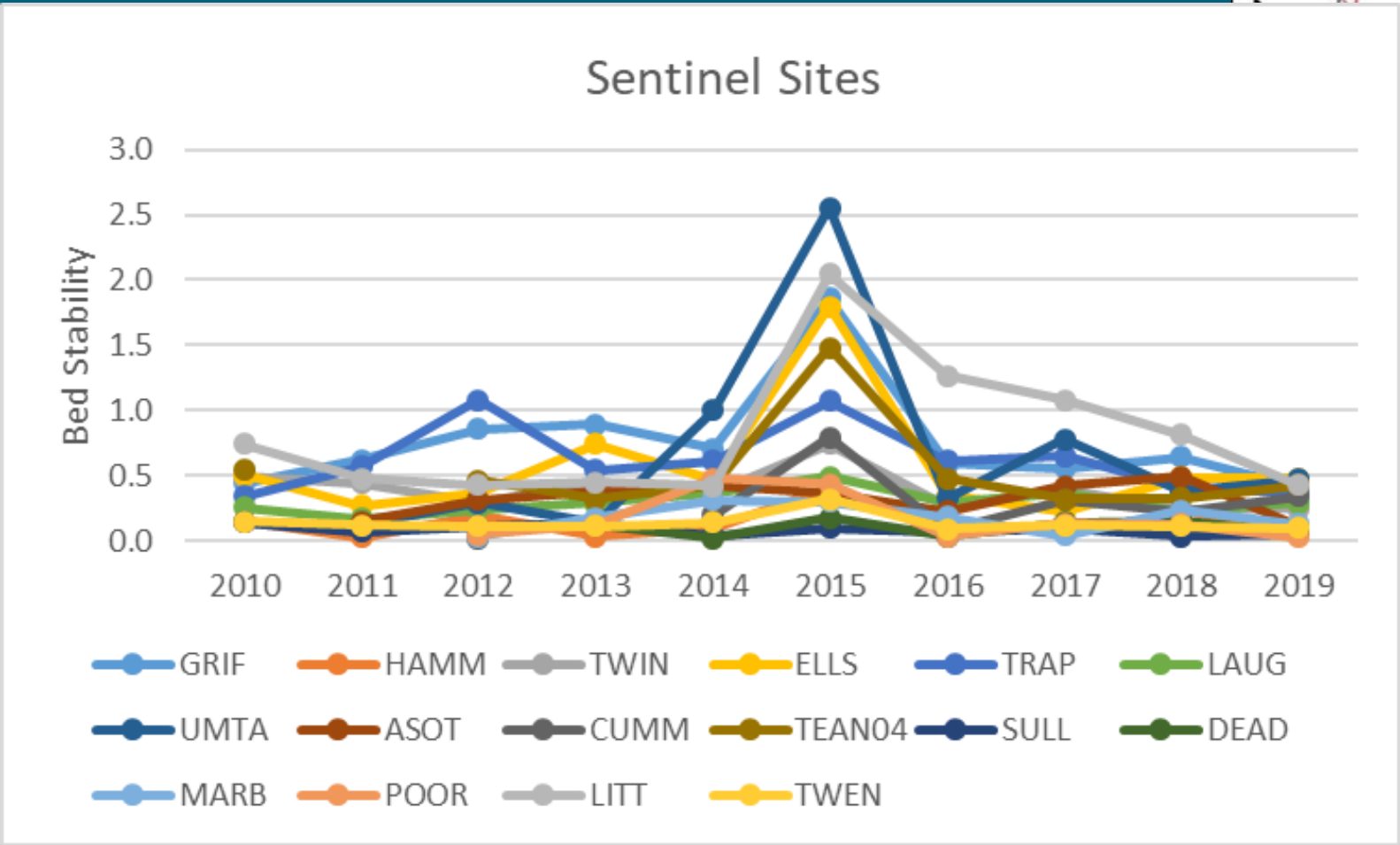

Ecological Indicators 102 (2019) 175–185

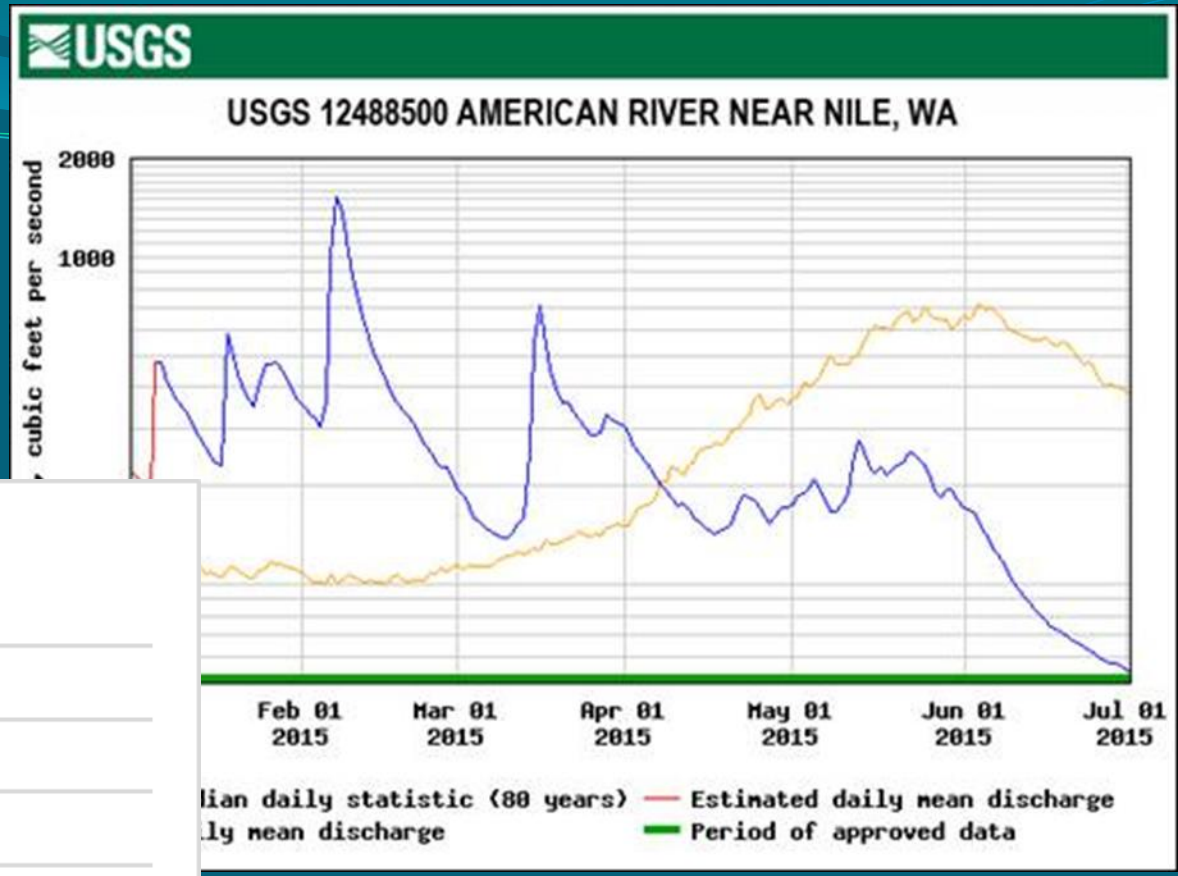
# Similar analyses per Status & Trends Region



# Sentinel sites

The white flags on reference sites map




Climate-induced sediment movement?

# Questions?

glenn.merritt@ecy.wa.gov
https://ecology.wa.gov/WatershedHealthMonitoring