

#### PLA Project Team Updates

#### **Team Structure**



Bo Li, PhD, PE

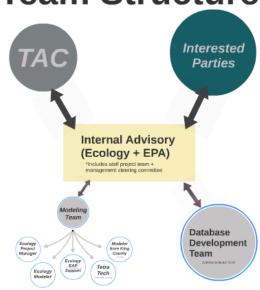
Environmental Engineer Department of Ecology NWRO Water Quality Program

#### **Project Timeline**

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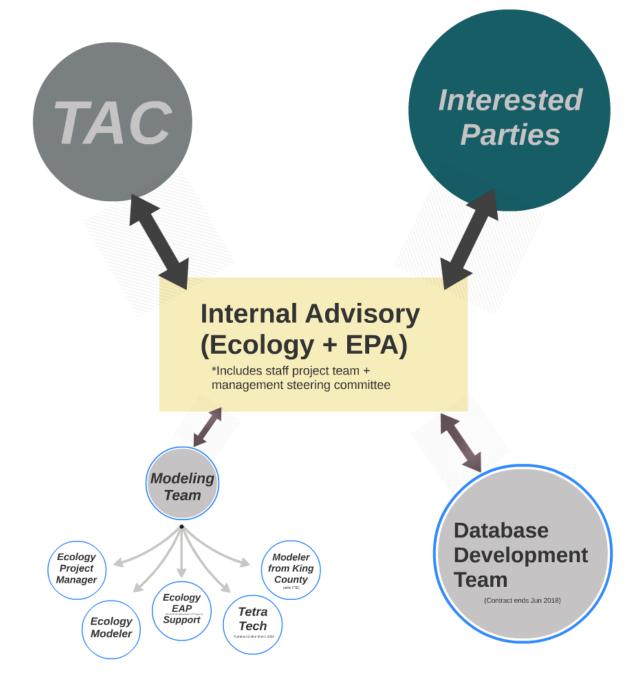
#### Bo Li, PhD, PE

Environmental Engineer
Department of Ecology
NWRO Water Quality Program

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Technical Approach	Modeling CAPP	1987 Fydrodynamics	_		CAPP Update	LISPE Tool c		Becausing Water	Model	Feed Web Model	I valuete Mana)	ement Scenario
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# **Team Structure**





Ecology Project Manager

**Ecology Modeler** 

Ecology
EAP
(Environmental Assessment Program)
Support

Modeler from King County

(40% FTE)

Tetra Tech

\*Contract Ended March 2018

# Tetra Tech

\*Contract Ended March 2018

# Modeler from King County

(40% FTE)

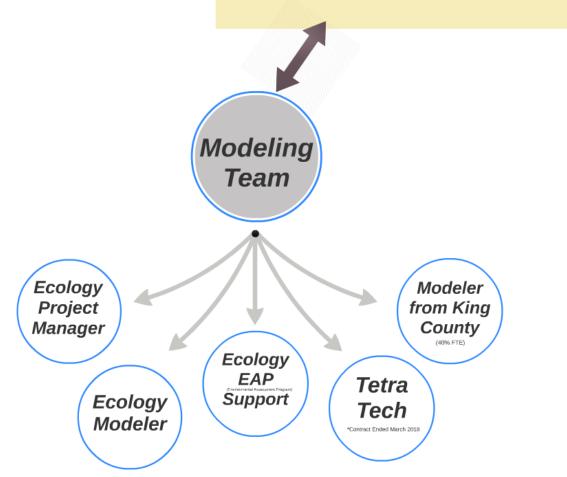
# Modeling Team

# Database Development Team

(Contract ends Jun 2018)

## Internal Advisory (Ecology + EPA)

\*Includes staff project team + management steering committee



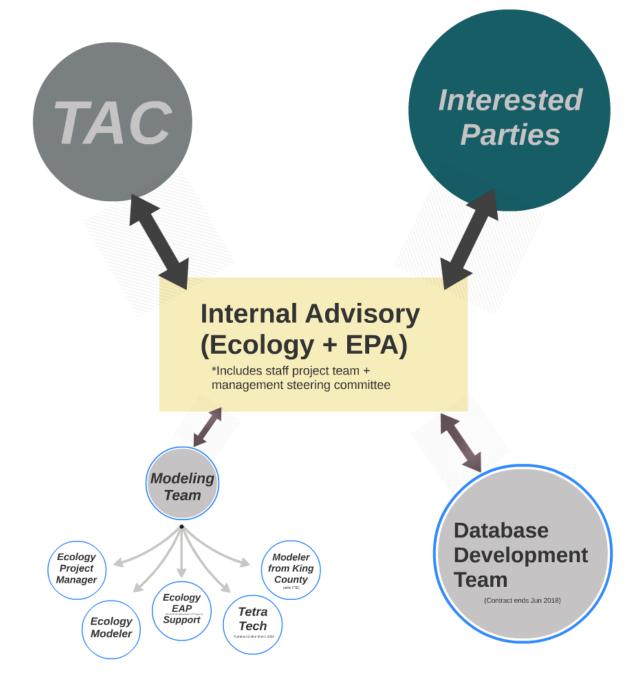
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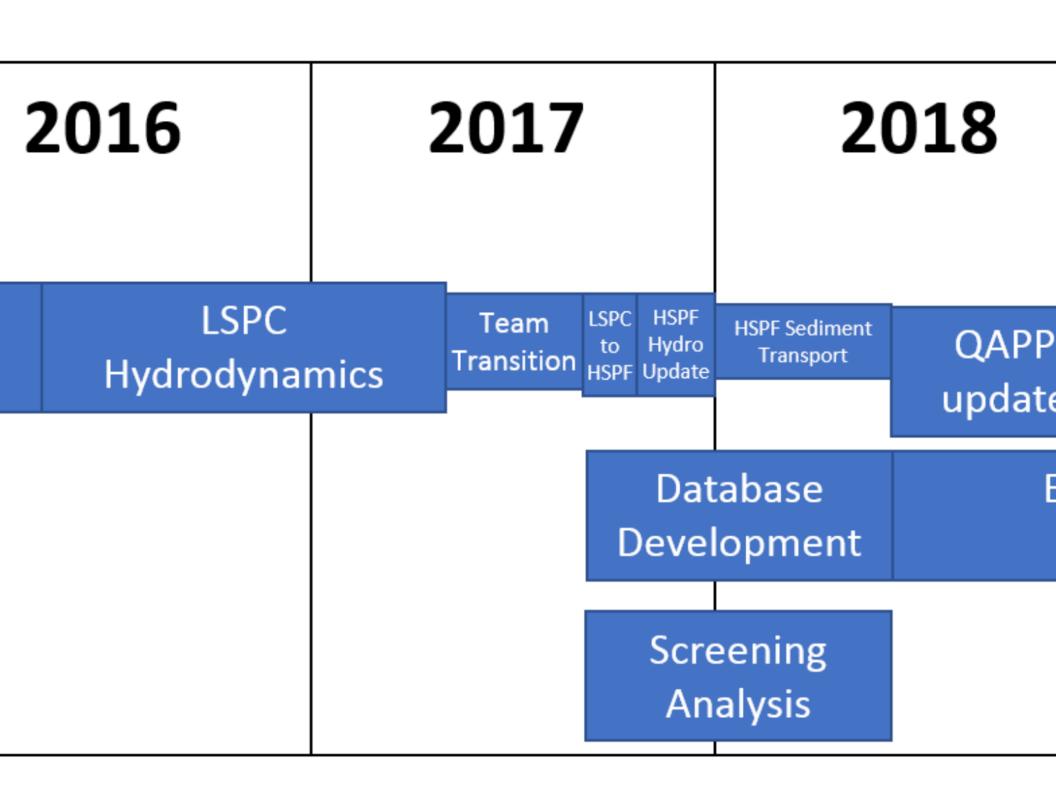
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# **Project Timeline**

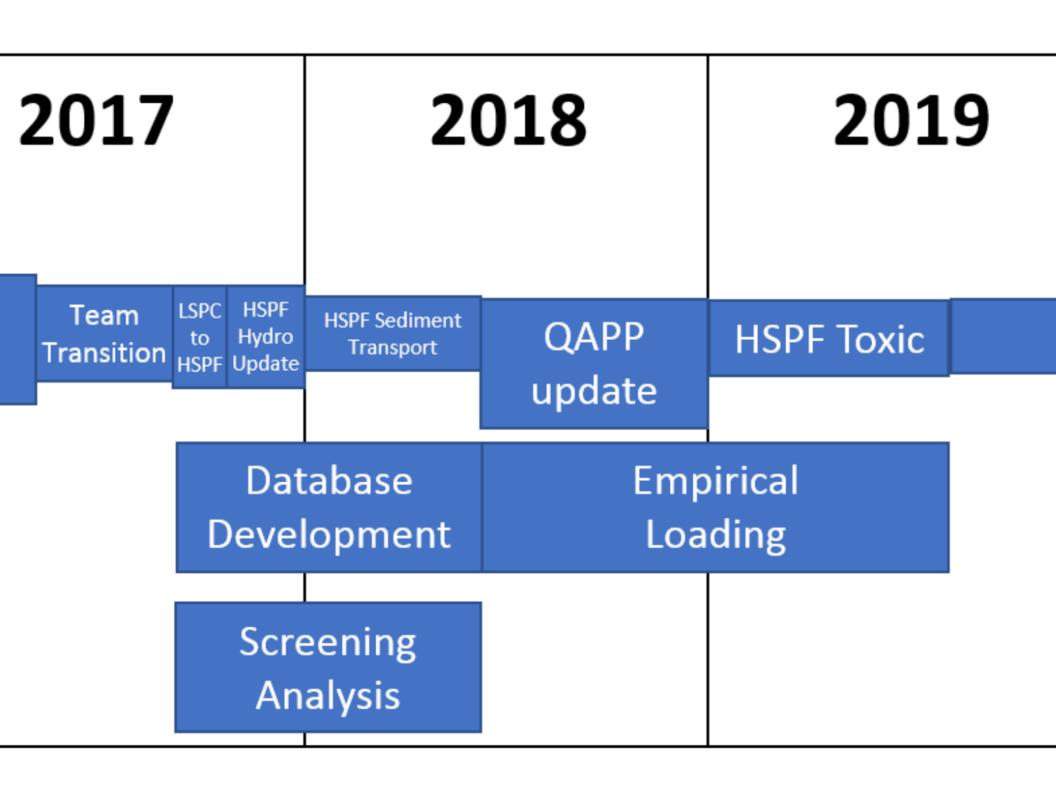
2015		2016	2017	2018	2019	2020	2021	2022	2023	2024
Technical Approach	Modelir QAPP		Team LSPC HSPF to Typide HSPF Update	HSPF Sediment Transport QAPP update	HSPF Toxic	Receiving Water	r Model	Food Web Model	Evaluate Manag	gement Scenario
				tabase Em	pirical ading					
				eening alysis						



HSPF Hydro Update

HSPF Sediment Transport

QA



2019	2020	2021
oxic	Receiving Water	Model

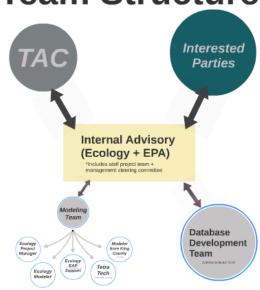
2022	2023	2024
Food Web Model	Evaluate Manag	ement Scenaric

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Approach	QAPP	Hydrodynai	Da'	update tabase Emi lopment Loa	pirical ading					
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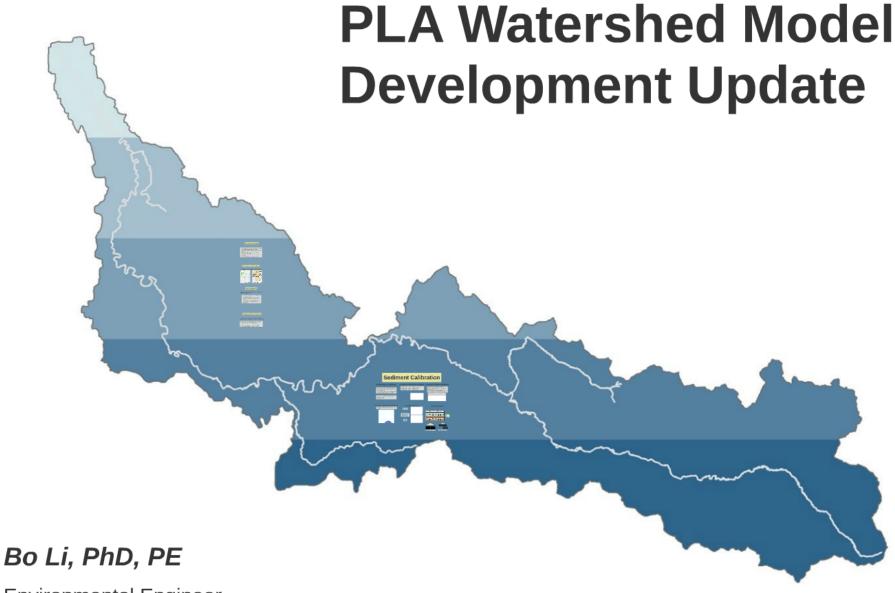


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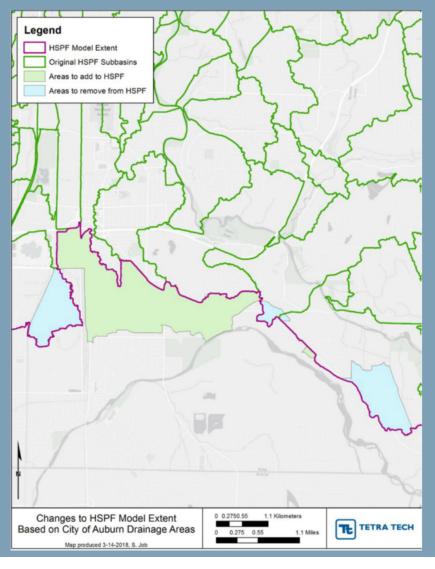
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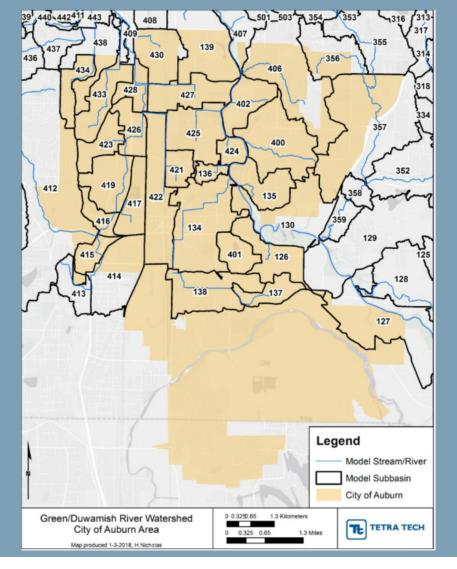
#### **Conversion to HSPF**

- Renumbered delineated catchments and reaches from six digit codes to three digit codes.
- Renumbered upland Hydrologic Response Units (HRUs).
- Implemented hydrology parameters from the calibrated LSPC models.
- Transferred key components of the hydrology simulation.
- Extended HSPF through Water Year 2016.

## **Hydrology Model Updates**

#### Subbasin and reach refinements





## **Reach Hydraulics**

Generated new Functional Tables using a variety of quantitative approaches:

- Extracting information from calibrated HEC-RAS and SWMM models
- Representing large infiltration basins explicitly
- Using USGS and King County Gage rating tables
- Implementing the standard BASINS approach paired with regional hydraulic geometry relationships

## **Changes to Flow Calibration**

#### In general, the changes are small. (Table 2-1)

Changes caused by switching from LSPC to HSPF.

Larges changes for Green River near Auburn

Changes caused by model revisions for Auburn.

Most notable changes at Mill Creek stations

# **Sediment Calibration**

#### 1. Boundary conditions

Upstream boundary: Howard Hanson Dam.

- Tacoma Public Utilities withdrawals data
- USGS Gage data
- derived from a regression to estimate TSS concentration from observed daily flow

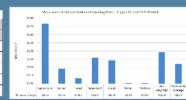
Outflow from Lake Youngs enters upper Little Soos Creek

-TSS = 1 mg/L

#### 2. Upland Sediment Loading 3. Reach Sediment Balance

Updated upland sediment simulation so that sediment yields for each land use match expectations to local and regional data.

Table 3-1. Reference Upland Sediment Loading Rates						
Land Use	Loading Rates (tons/ac/yr)					
Land Use	Minimum	Mean	Maximum			
Agriculture	0.02	0.07	0.15			
Commercial and industrial	0.36	0.38	0.38			
I creed	0.00	0.00	0.15			
High Donnity Residential	0.03	0.13	0.19			
Low Donsity Residential	0.00	0.08	0.17			

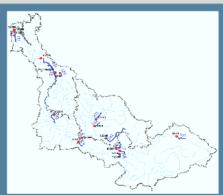


- Set initial shear stress scour and deposition thresholds based on an analysis of tau distributions individually for each reach.
- Examine long term simulation of deposition and scour in each reach and tune until the behavior matches physically realistic expectation. (bed depth)

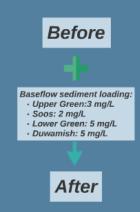
Model	Change in Reach Bed Depth (ft)				
Model	Minimum	Mean	Maximum		
Upper Green	-0.10	-0.01	0.02		
Soos	-0.40	-0.03	0.05		
Lower Green	-0.47	-0.03	0.19		
Duwamish	-0.34	-0.02	0.00		

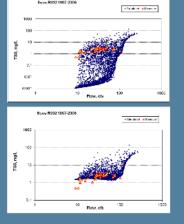
#### 4. Instream Sediment Calibration

Compare instream simulated and observed sediment concentrations and loads and refine sediment parameters as needed to achieve an acceptable fit



#### Low Flow Calibration





#### **Calibration Updates**

Model Component	Very Good	Good	Fair	Poor
Suspended Sediment	≤ 20%	20 - 30%	30 - 45%	> 45%

Model Reach	HSPF Model	Monitoring Site ID(s)	TSS Sample Count	Start Date	End Date	Calibration Perfomance
106	Upper Green	9871	245	1/20/1997	9/11/2017	Very Good
118	Upper Green	12307	130	1/14/2004	12/9/2015	Good
129	Upper Green	3196	73	1/14/2004	12/9/2015	Good
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344	500s	12308	93	1/14/2004	12/9/2015	Poor
358	Soos	12306	128	1/14/2004	11/12/2015	Very Good
153	Lower Green	12301, 9865, 12297	374	1/12/1997	9/11/2017	Fair
409	Lower Green	12304	97	1/14/2004	12/9/2015	Good
550	Duwamish	12298	130	1/14/2004	12/9/2015	Very Good
604	Duwamish	12296	58	1/14/2004	12/3/2008	Good
710	Duwamish	12309, 12556	251	1/15/2004	12/9/2015	Poor
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Very Good: 5 Good: 6 Fair: 2 Poor:2

	Morare	Velidorium 1997-3886	Calibration 2007-30-0
	Greet	34	59
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	COYOFE IS NO FINESS BYY.	08129	-1.19%
	Look Nation Con-	606 A 265 -1 2775	396.69%
Owner 2.5		100	
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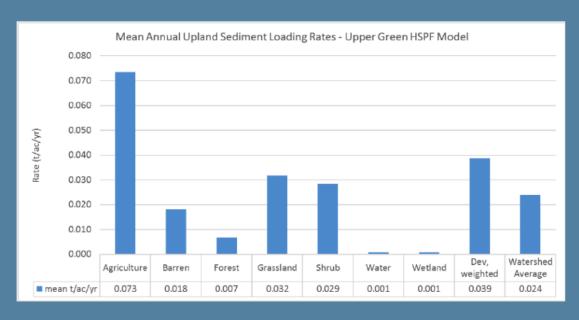
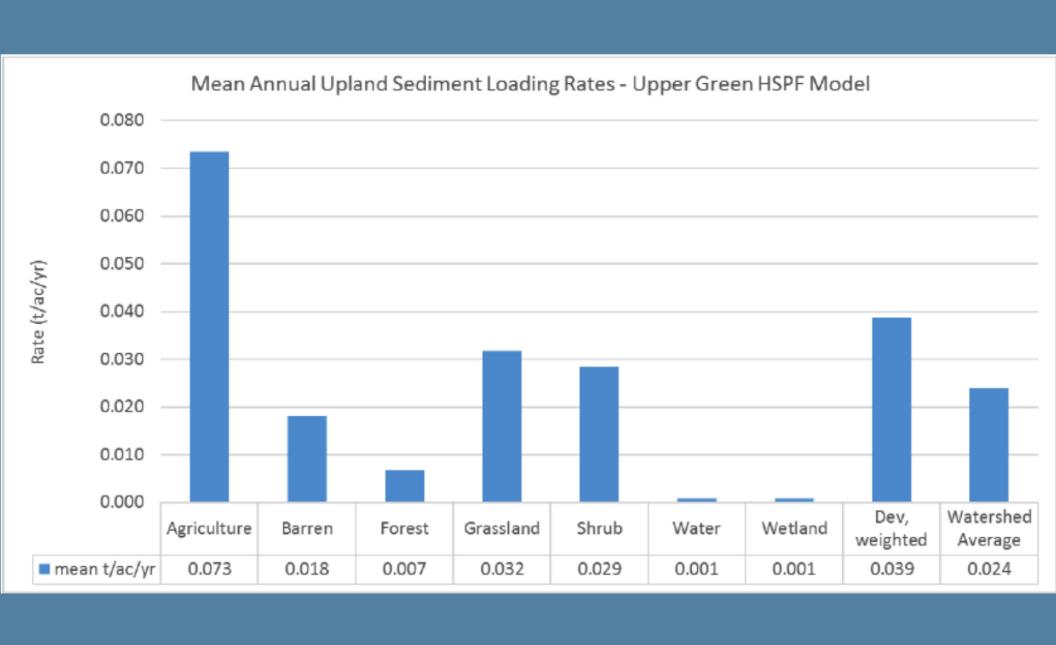


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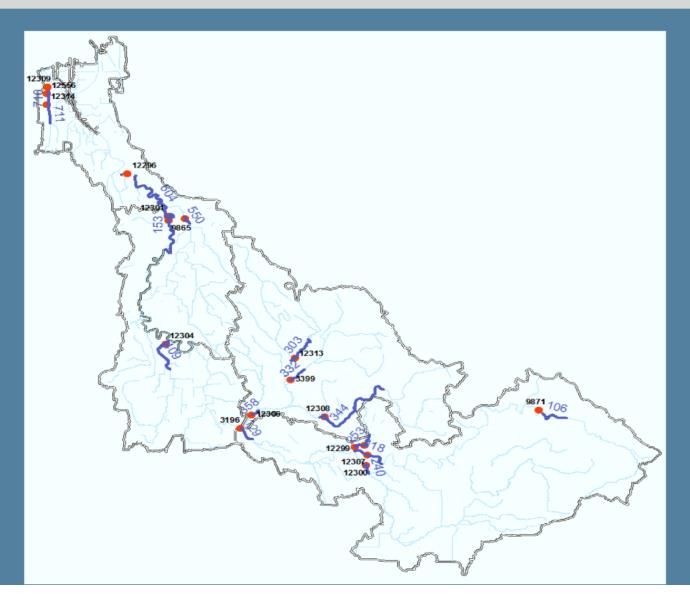
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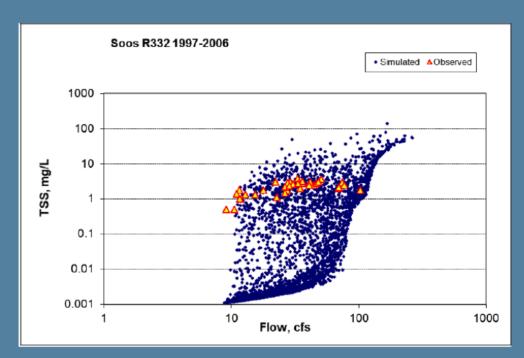
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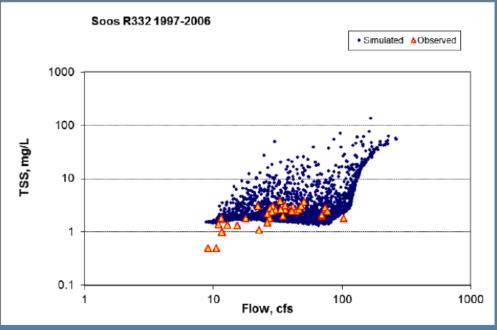


#### Baseflow sediment loading:

- · Upper Green:3 mg/L
- · Soos: 2 mg/L
- · Lower Green: 5 mg/L
- · Duwamish: 5 mg/L







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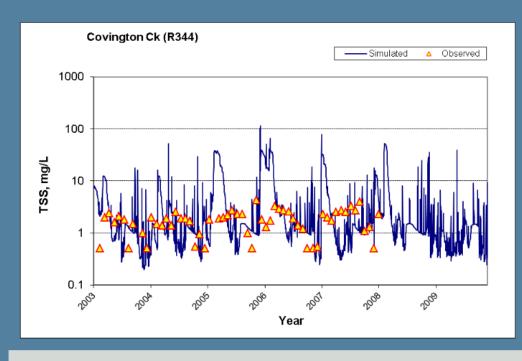
Very Good: 5

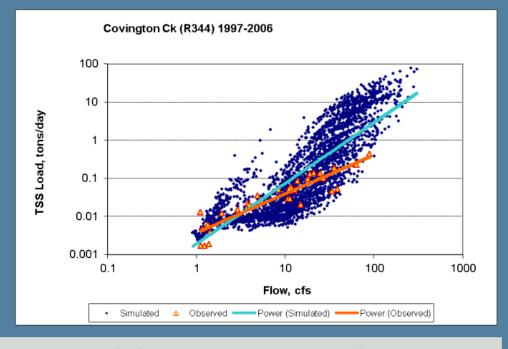
Good: 6

Fair: 2 Poor:2

### Reach 344

Measure	Validation 1997-2006	Calibration 2007-2017
Count	34	59
Concentration Average Error	162.07%	77.97%
Concentration Median Error	-28.52%	-1.18%
Load Average Error	690.48%	301.19%
Load Median Error	-4.25%	-0.13%

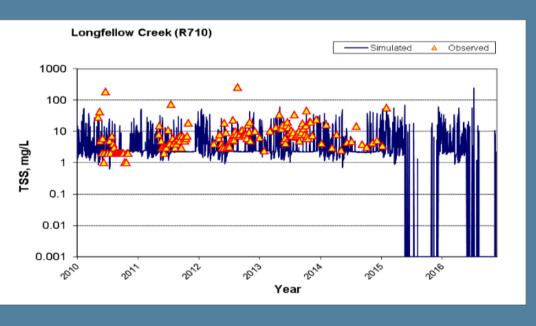


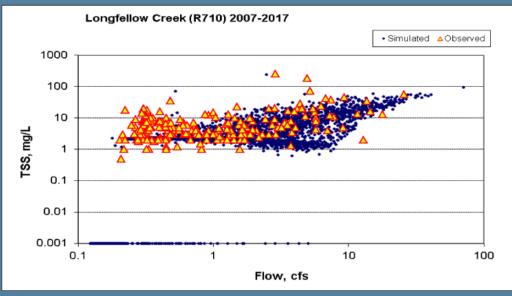


- Minimized the KSAND and M for the R344 and the upstream reach.
- Will try reducing the sediment supply from both sediment bed and upland.
- TAUCD and TAUCS could be adjusted

### Reach 710

Measure	Validation 1997-2006	Calibration 2007-2017
Count	34	217
Concentration Average Error	-3.81%	-59.35%
Concentration Median Error	10.84%	-18.40%
Load Average Error	-28.16%	-46.43%
Load Median Error	0.45%	-3.18%





- Maximized the KSAND, EXPSND and M to increase the TSS.
- Will try increasing the sediment supply from upland.
- Also need to increase the sediment supply from impervious land.