

# 2017 Spokane Dissolved Oxygen TMDL Annual Meeting







Jan. 4, 1913 - W.W.P.-294



# Biennial Report Review



**It is 2010 - 7 years ago...**

**EPA approved the TMDL.**

**Stringent wasteload allocations are  
assigned to WA dischargers.**

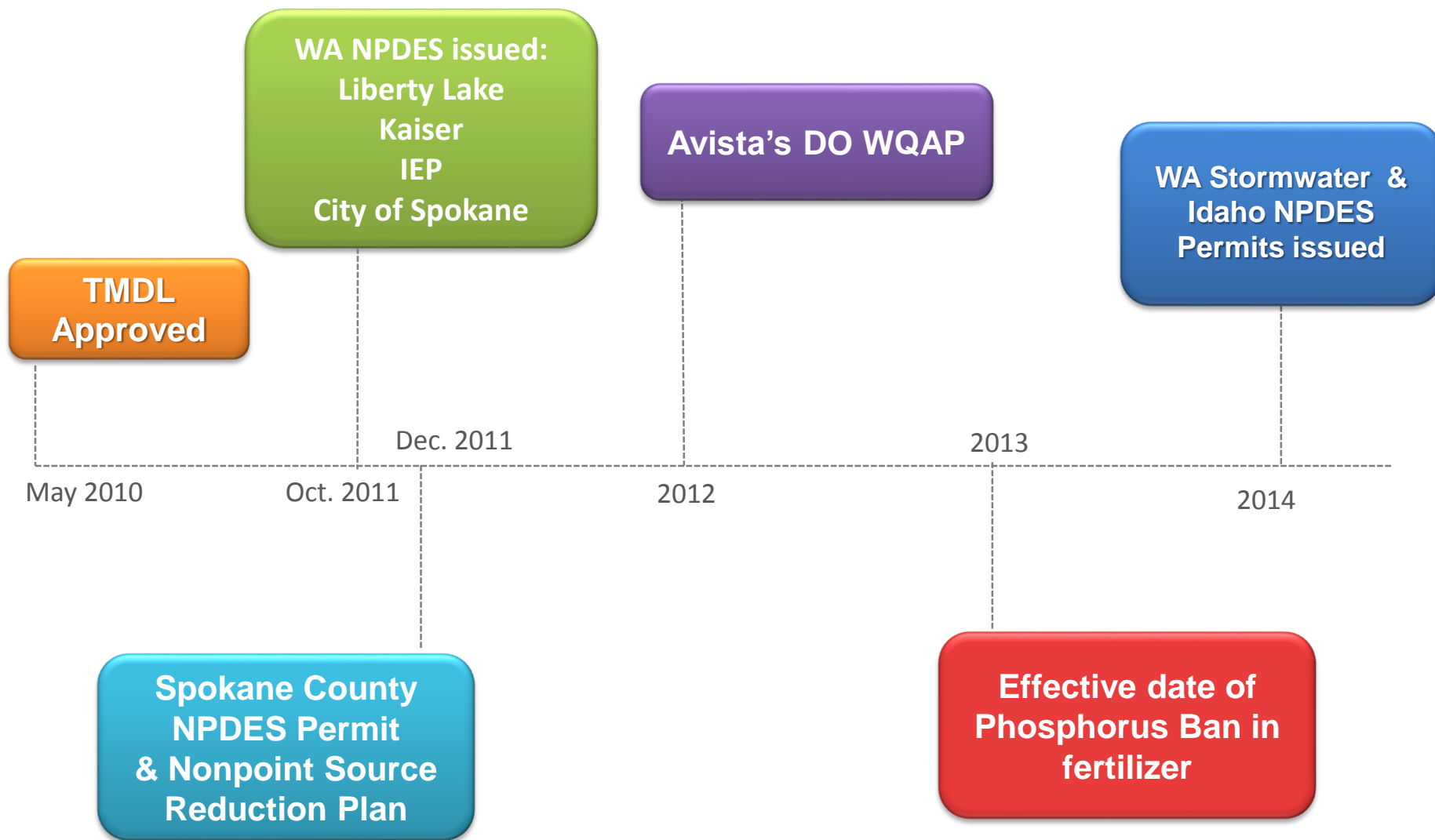
**Avista is assigned a Responsibility.**

**Assumptions for nutrient reductions  
from Idaho dischargers are made.**

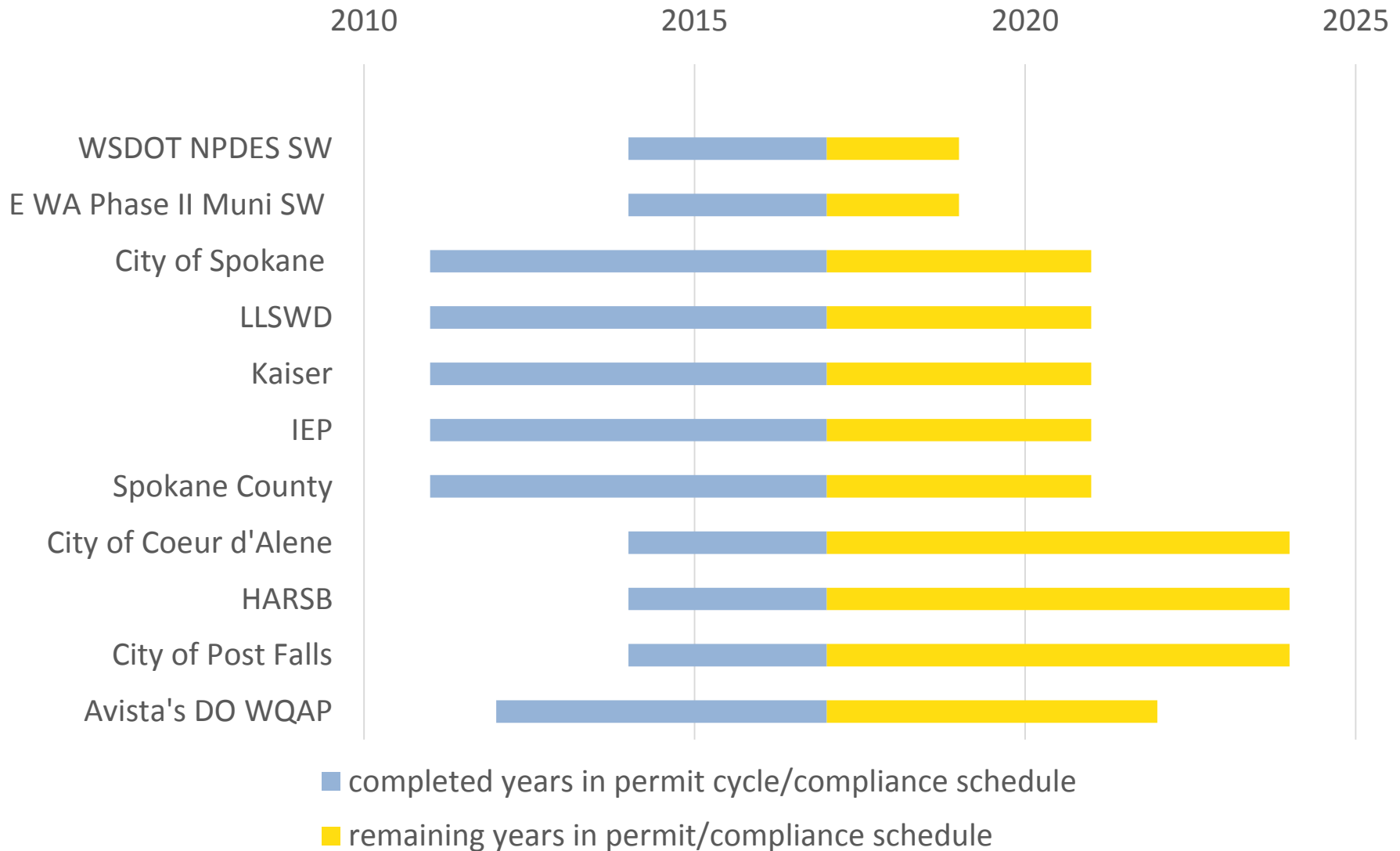
**Implementation begins...**



# The First Four Years



# Permit/Compliance Schedules



# Nonpoint Reductions

Nearly 300 projects completed since 2000

- > 50% in Hangman Creek watershed
- ~ 30% in the Little Spokane River watershed
- 13% in the Spokane River & Lake Spokane watersheds.



# Stormwater



- City of Spokane Valley removed their outfall to the river beneath the Sullivan Bridge
- Spokane County road improvement projects (Country Homes, Hawthorne)
- 8 CSO storage facilities built by the City of Spokane
- Tests on pervious pavement, biochar, and mushrooms







# Riparian Buffer

- Over 20 miles of stream banks planted
- 7000 Willow whips planted along Hangman Creek in 2015 & 2016
- Over 11 projects to stabilize the shoreline
- 1 project to re-meander a stream
- 1 beaver dam analog



# Livestock BMPs



> 30 projects installed fencing to keep livestock away from over 2 miles of surface water.

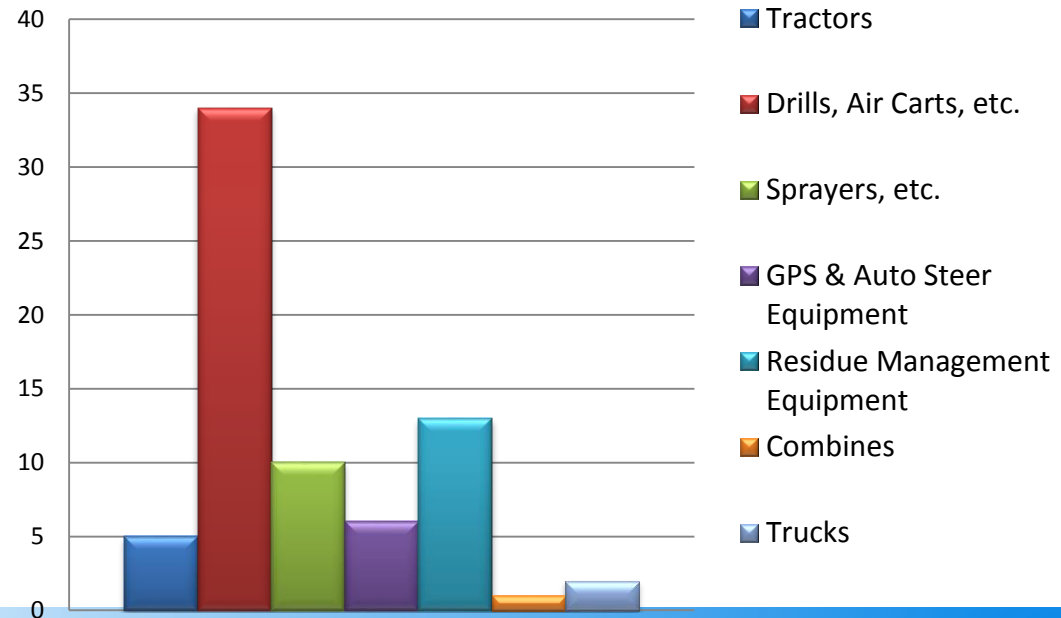


# Agricultural BMPs



- 60 projects applied BMPs to agricultural land.

Direct Seed Equipment Purchased with Loans

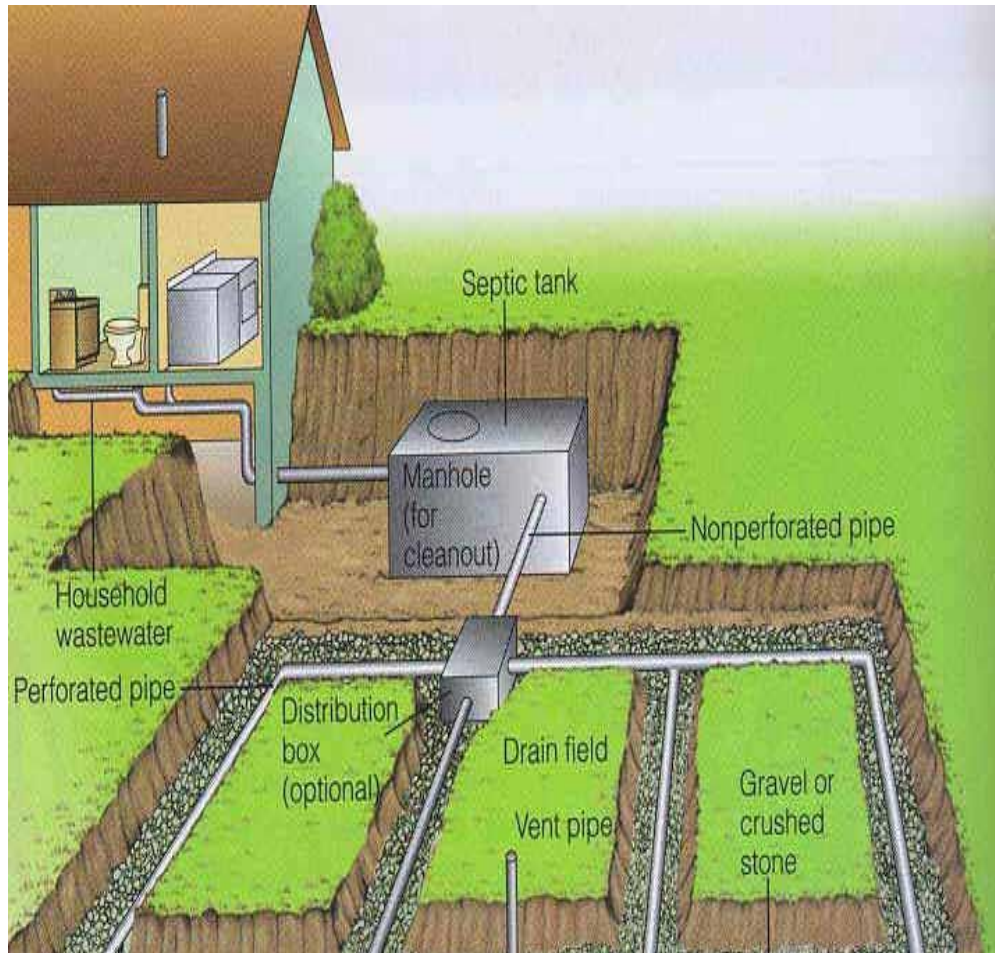


- ~ 13.6 square miles direct seeded as of 2014, saving an estimated 52,000 tons of soil.





# On-Site Septic Systems



Spokane County & City of Spokane:

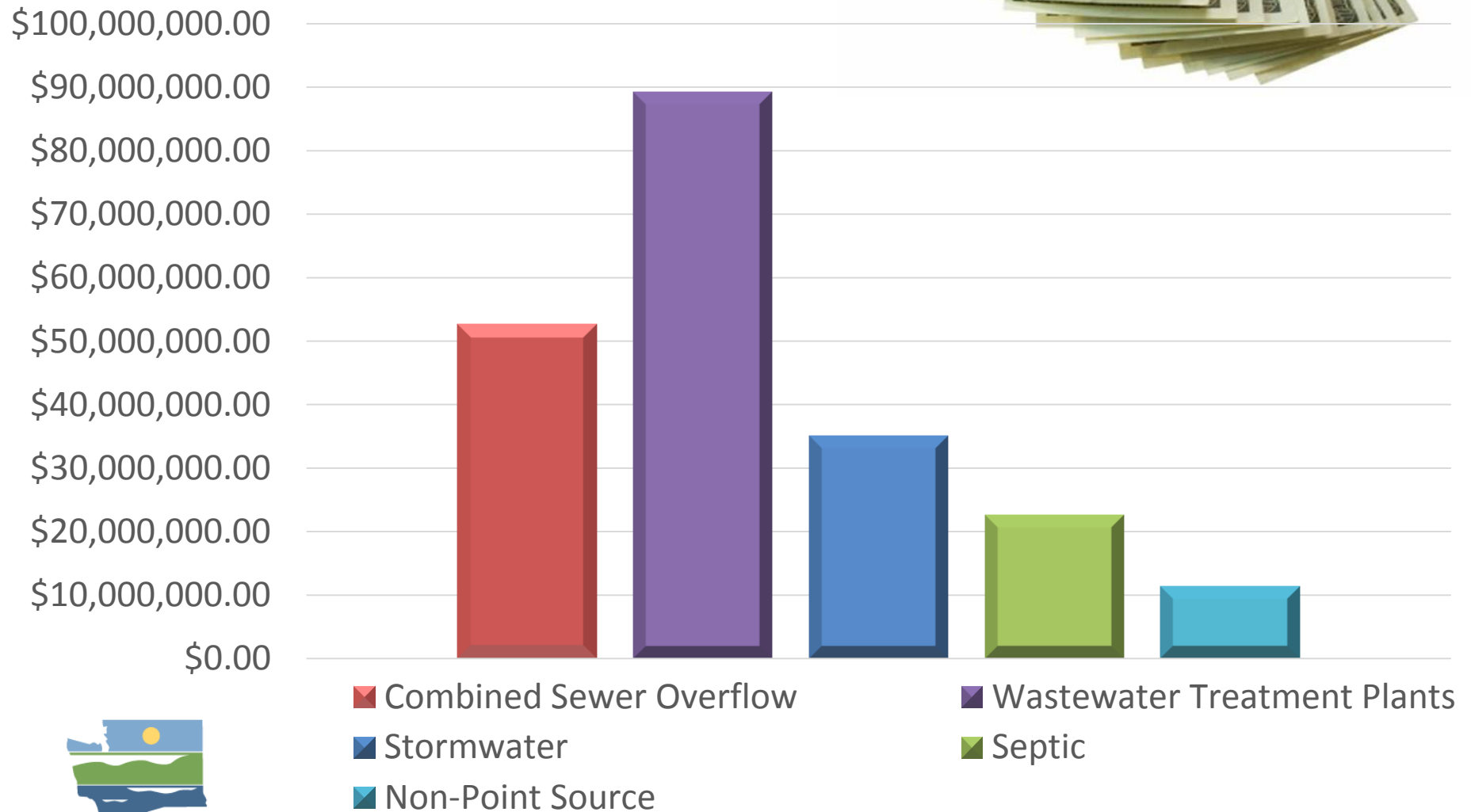
- new sanitary sewer connections increased to ~ 42,000 since 1984

Spokane Conservation District in 2015-2016:

- Made 66 connections
- Repaired or replaced 14 systems

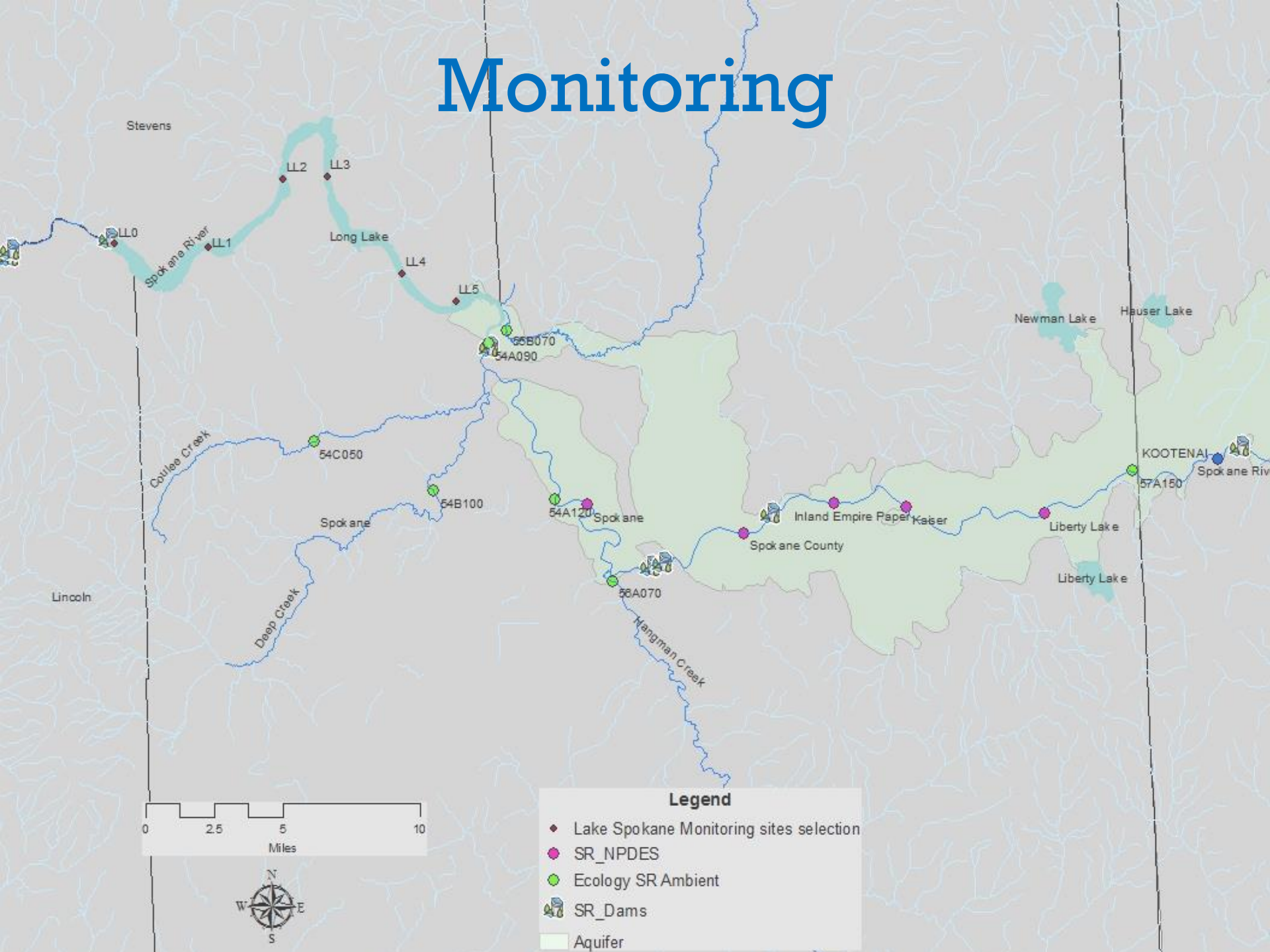


# \$211 million awarded between 2010-2016

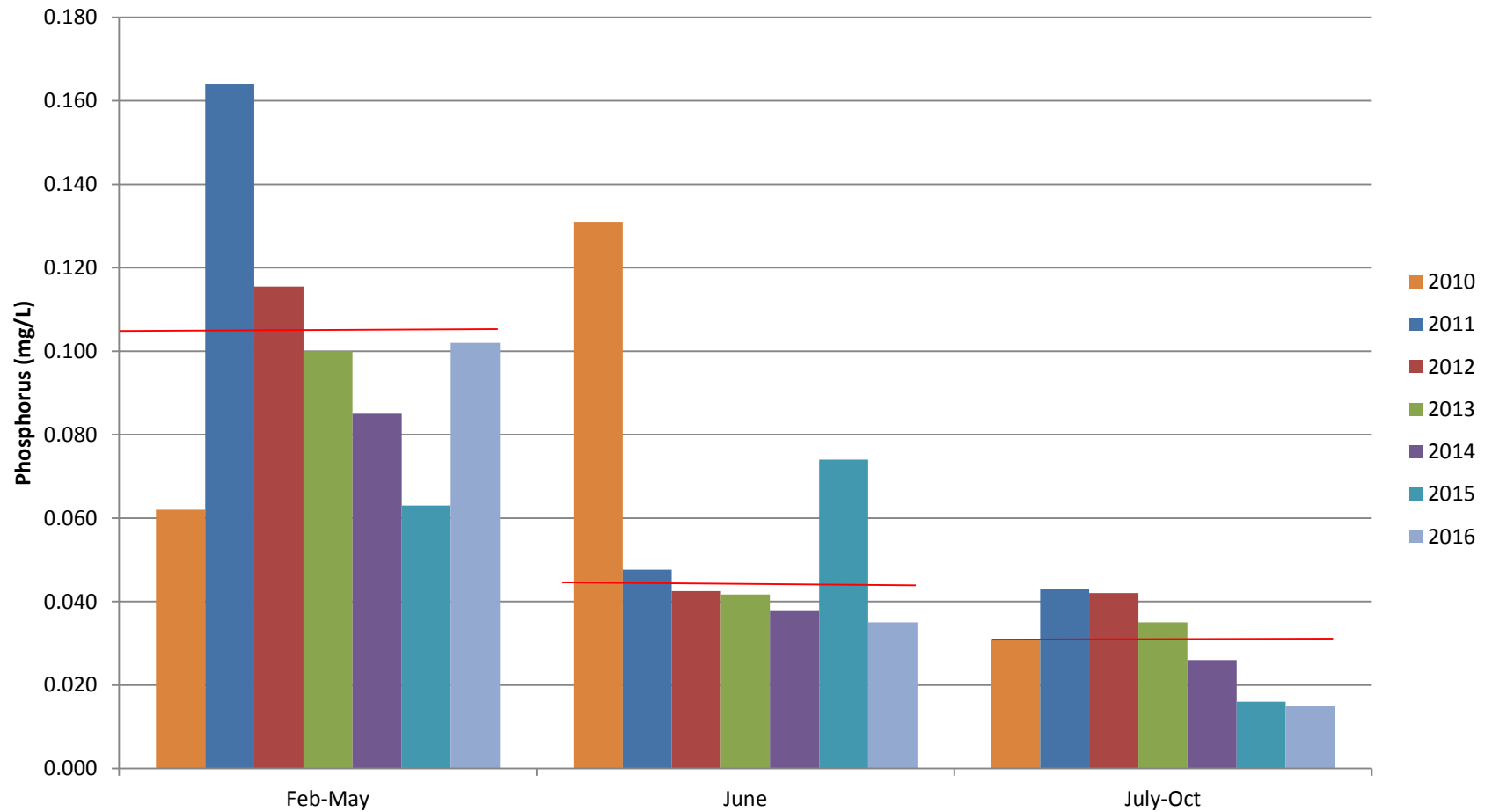


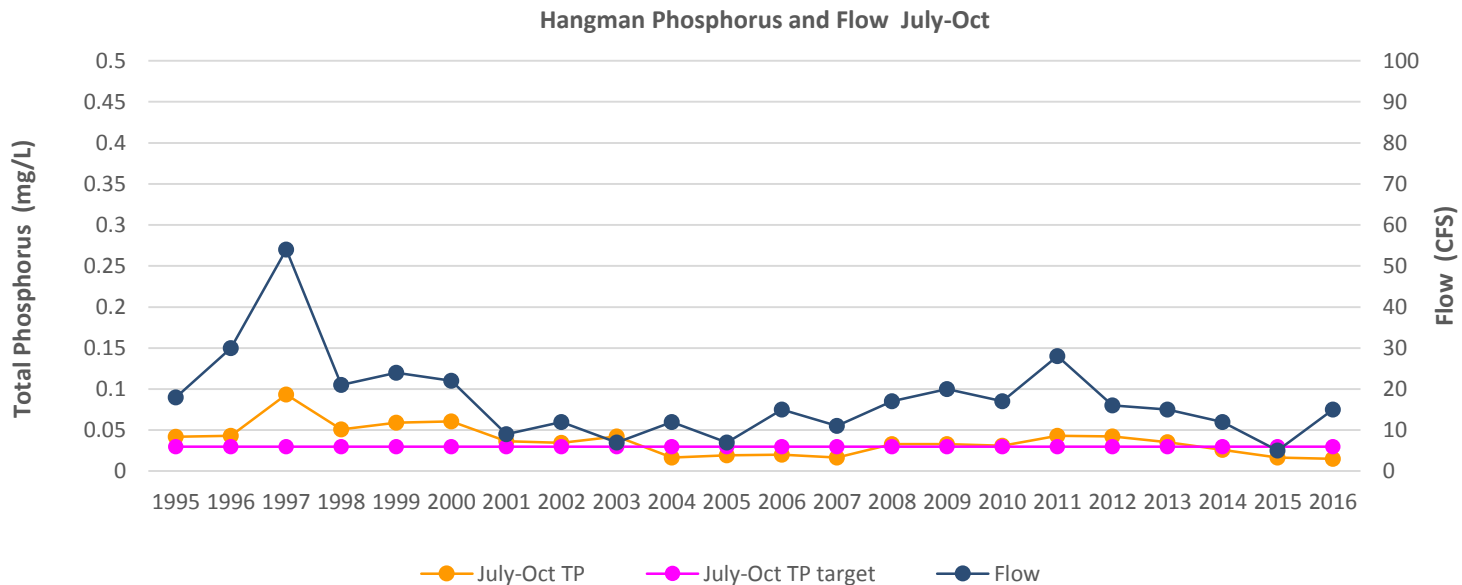
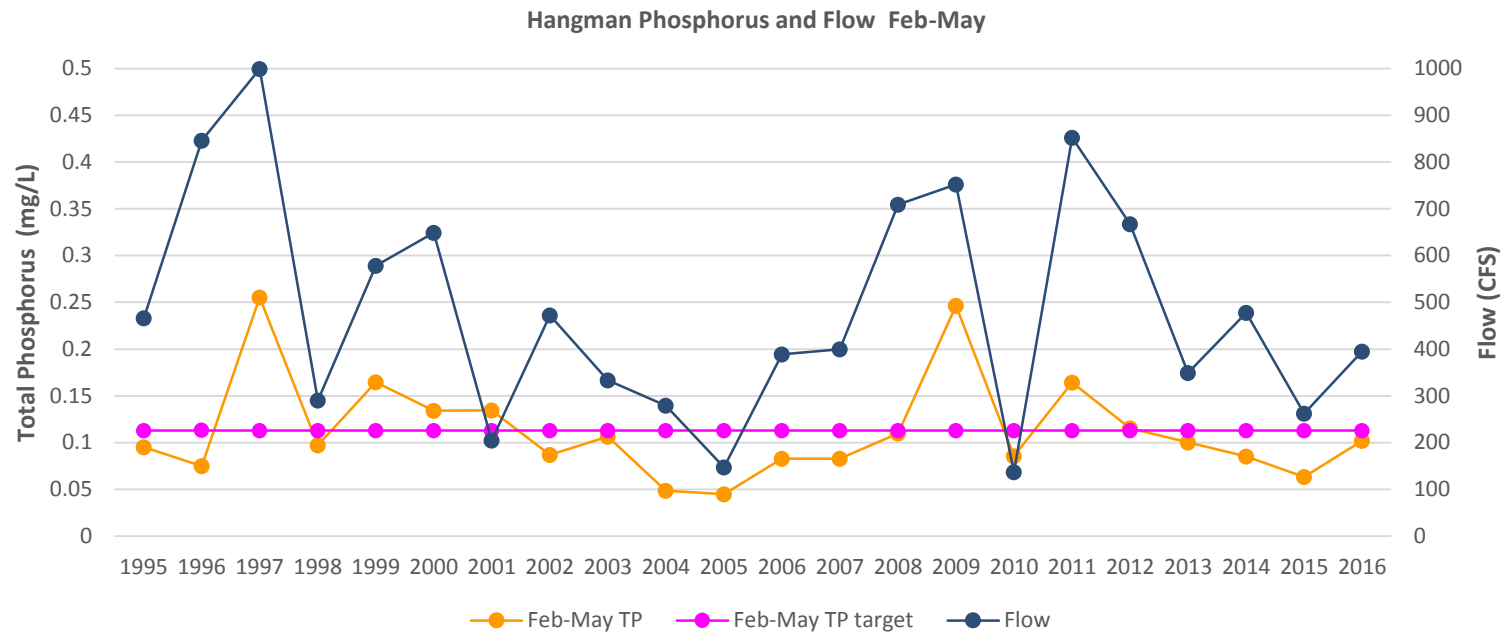


# Monitoring



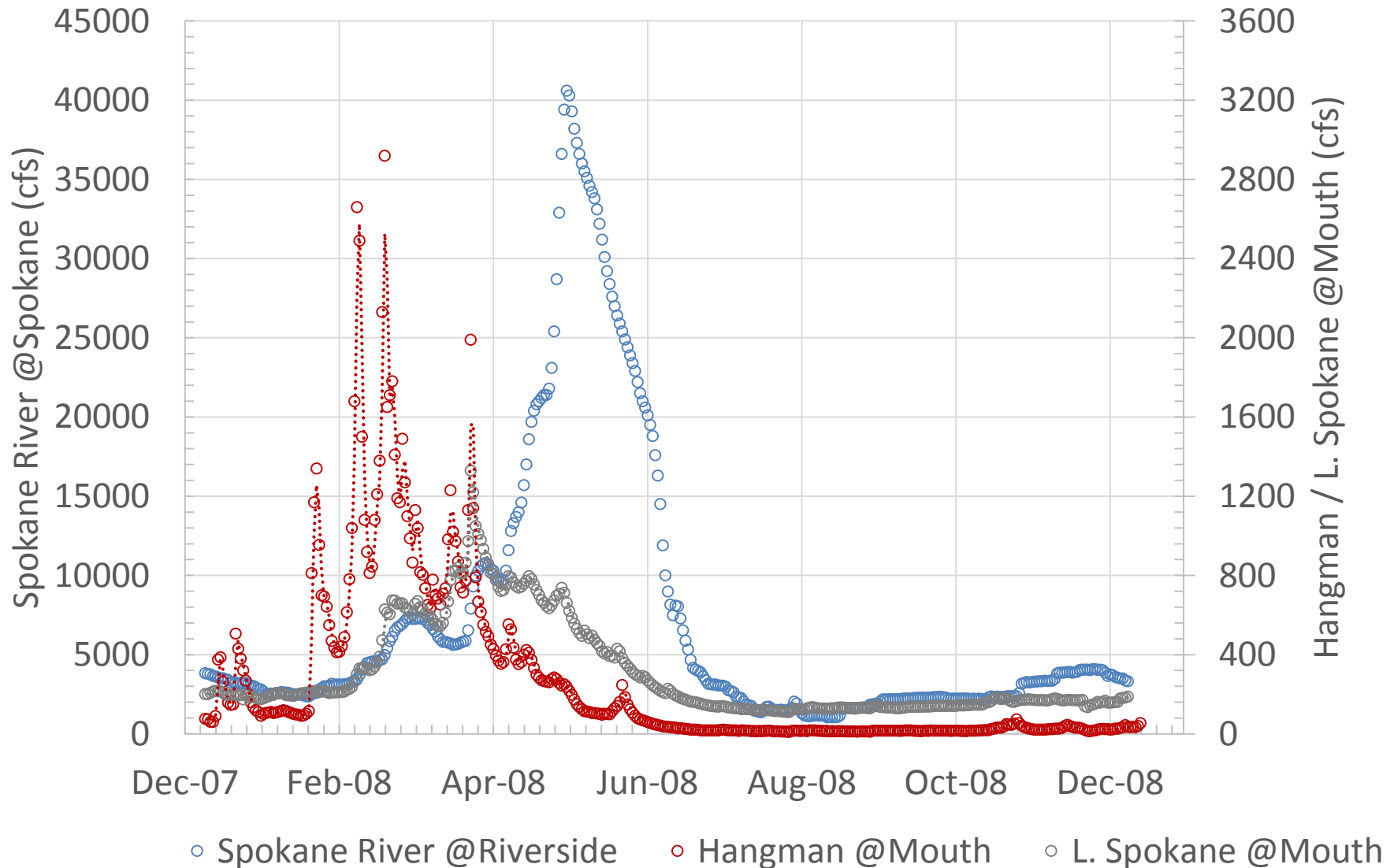
# Hangman Creek Phosphorus 2010-2016





# Hangman Phosphorus & Flow

# Hangman, LSR & Spokane flows



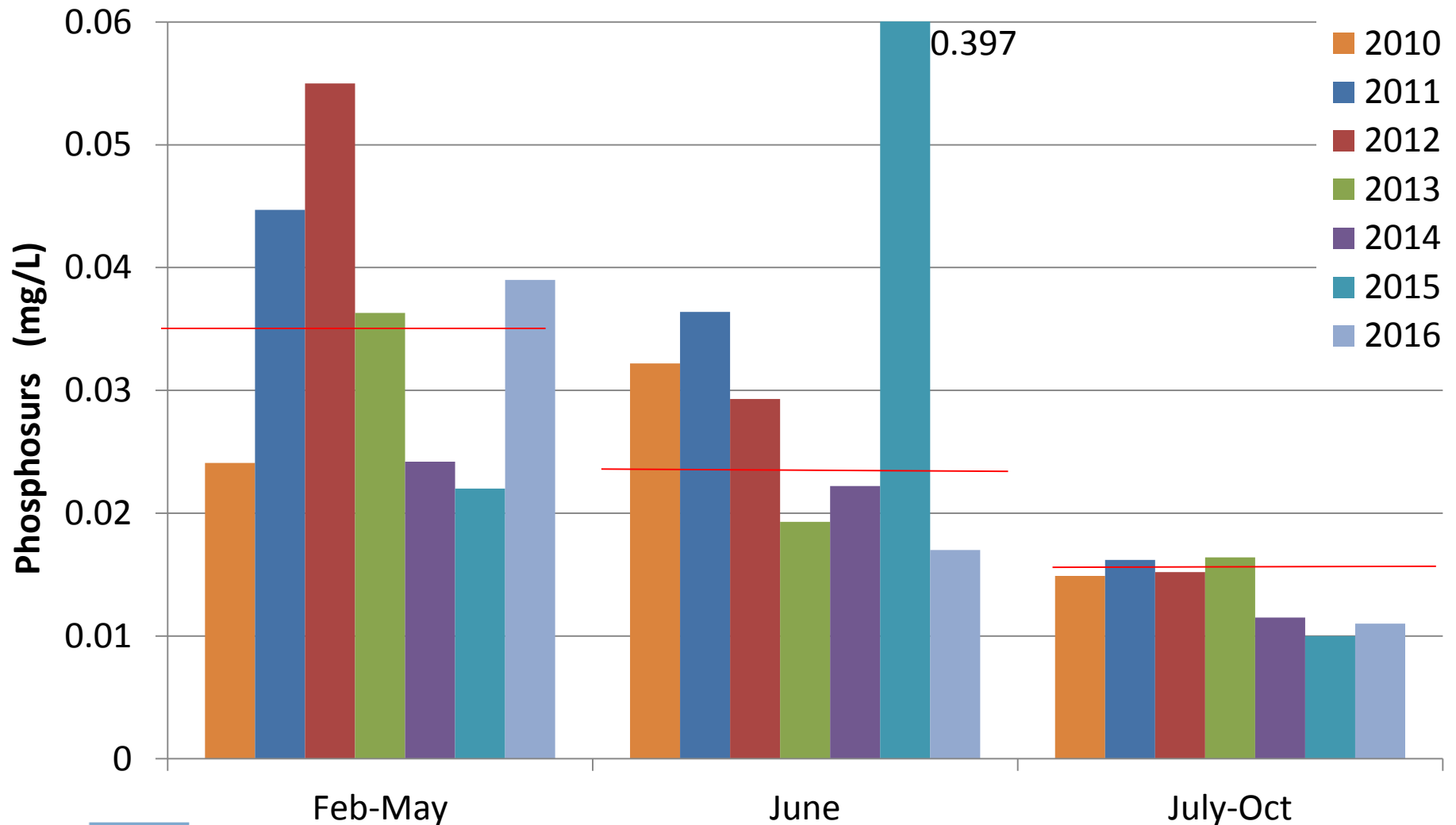
# 2012-2016 Hangman Creek Total Phosphorus Loading

Season	Allocation lbs/d	2012 lbs/d	2013 lb/d	2014 lbs/d	2015 lbs/d	2016 lbs/d
March – May average	140.2	147.8	116.0	123.0	44.6	199.7
June	7.5	<b>16.9</b>	10.1	7.4	12.7	<b>5.0</b>
July – October average	1.4	<b>5.2</b>	3.2	1.6	0.4	<b>0.7</b>

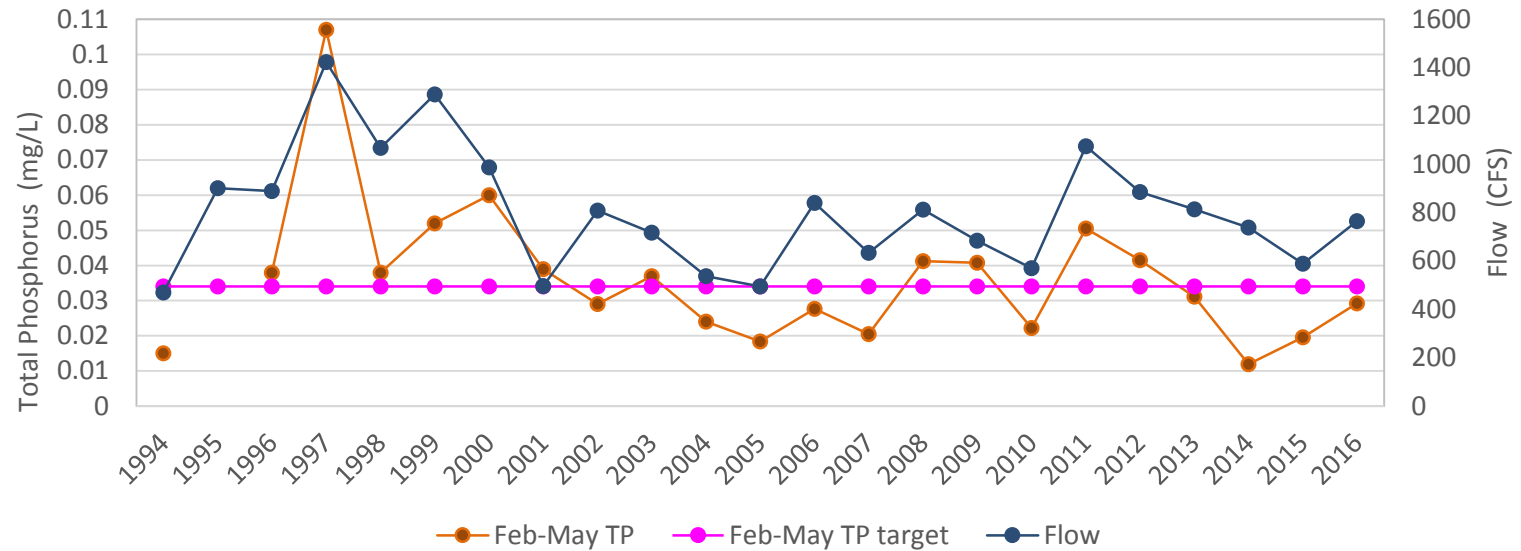




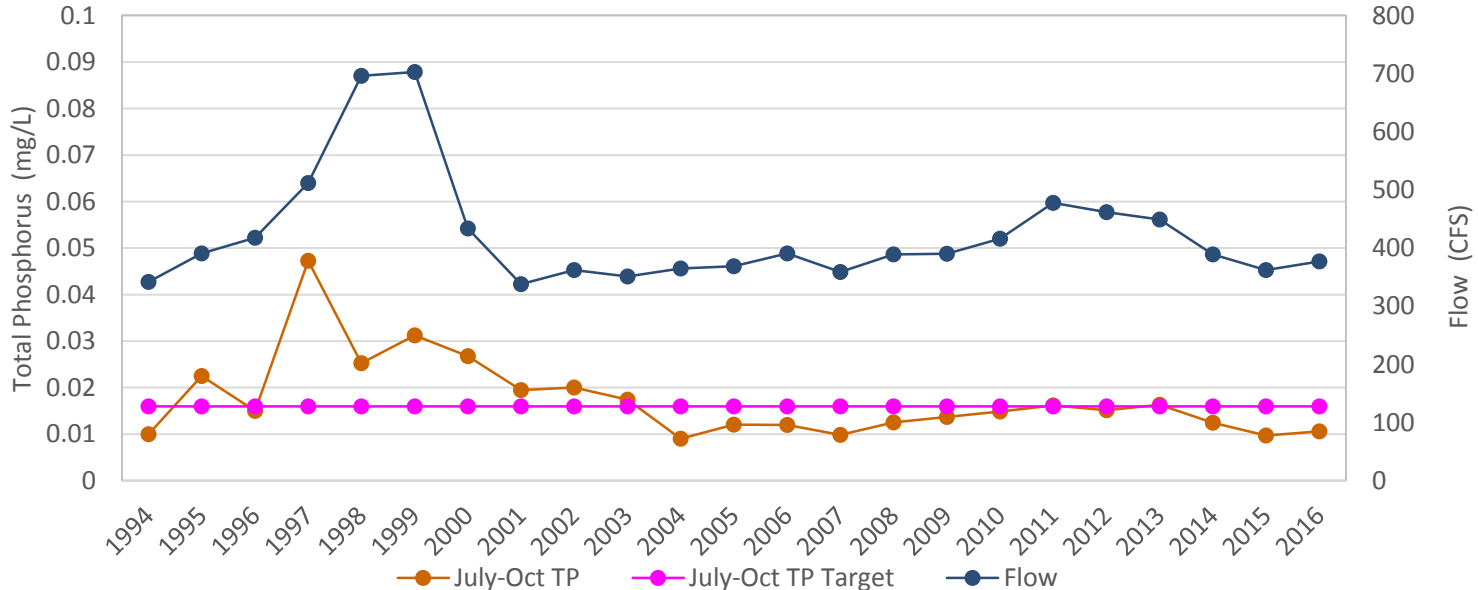
# Little Spokane River Phosphorus 2010-2016



Little Spokane River Phosphorus and Flow Feb-May



Little Spokane River Phosphorus and Flow July-Oct

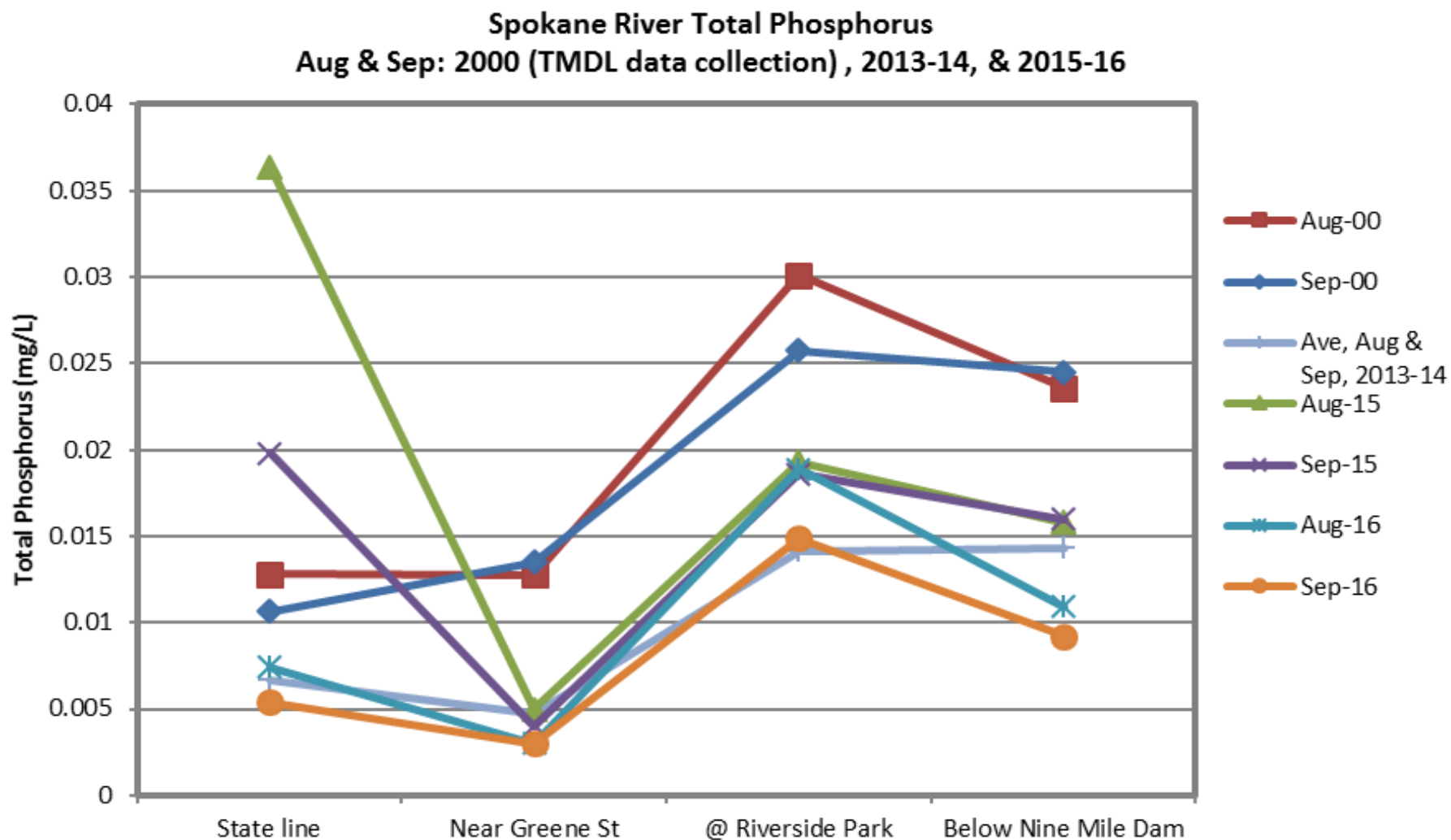


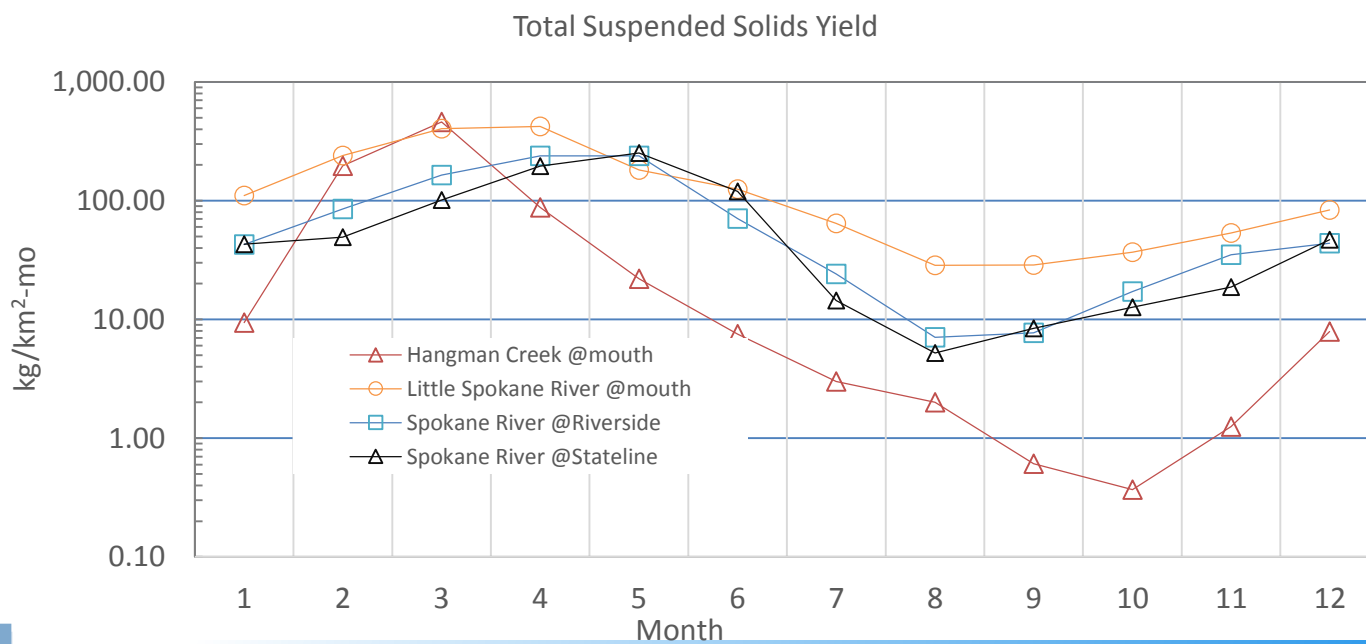
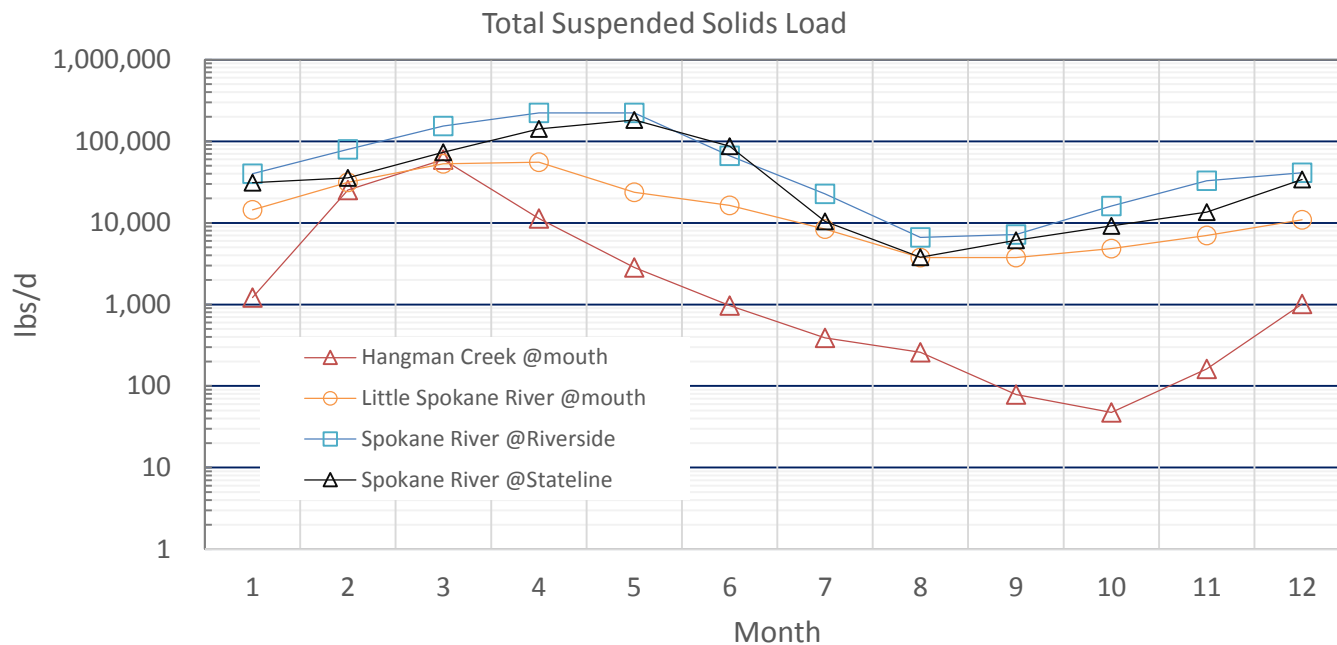
# Little Spokane Phosphorus & Flow

# 2012-2016 Little Spokane River Total Phosphorus Loading

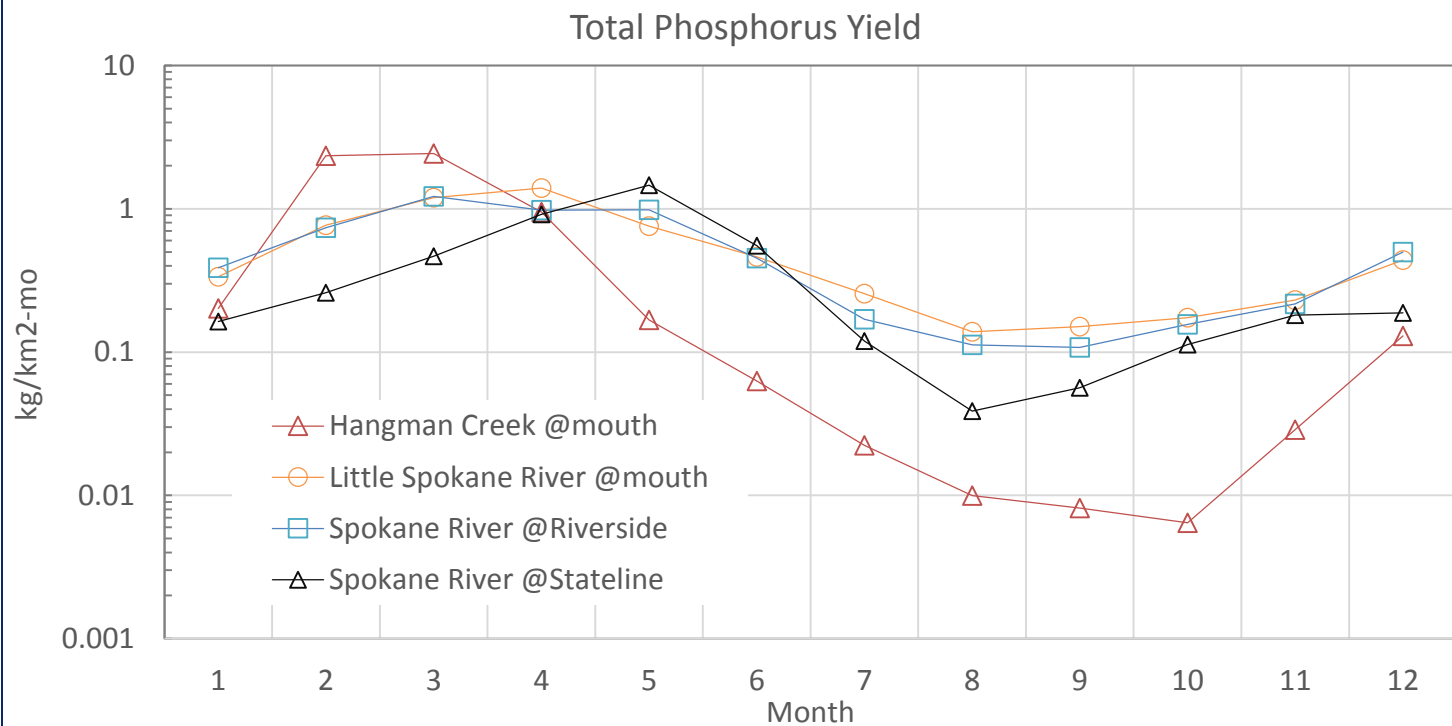
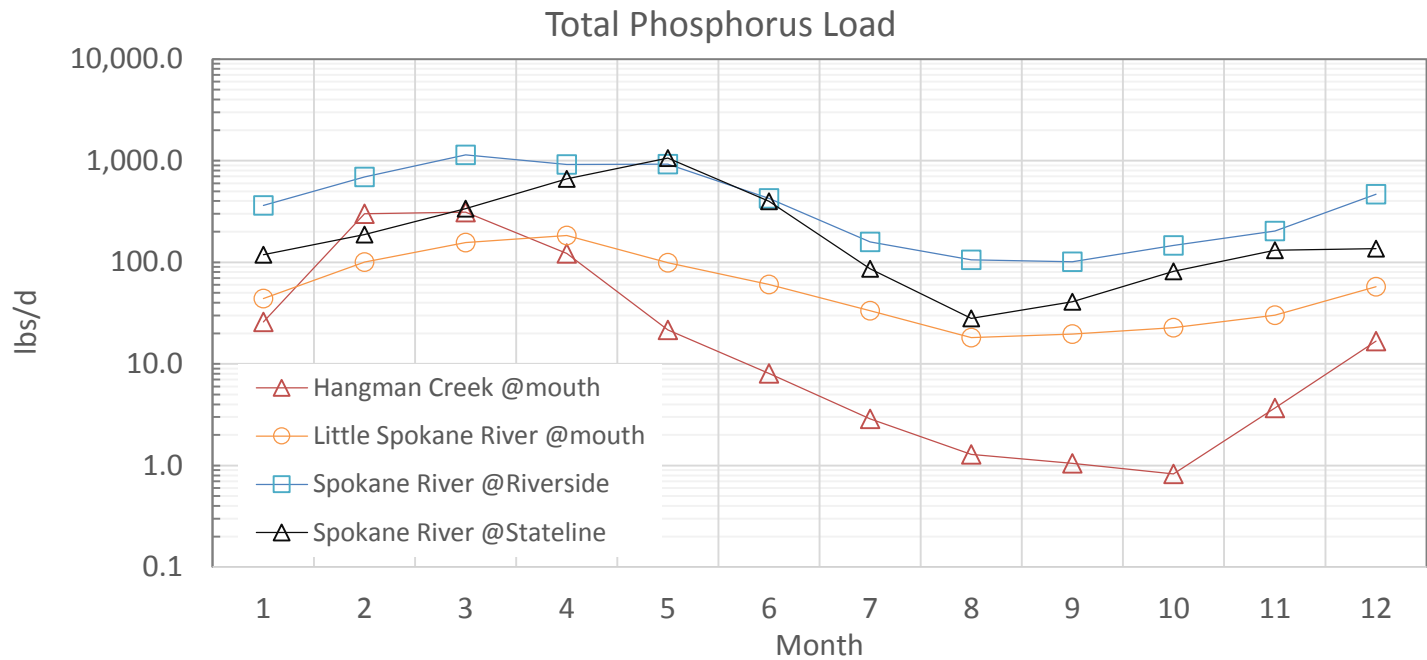
Season	Allocation lbs/d	2012 lbs/d	2013 lbs/d	2014 lbs/d	2015 lbs/d	2016 lbs/d
March – May average	102.5	188.0	109.4	56.0	35.5	119.8
June	53.9	73.9	28.4	27.9	<b>643.9</b>	15.3
July – October average	32.2	<b>15.2</b>	14.9	8.6	4.7	<b>6.1</b>

# Spokane River Total Phosphorus

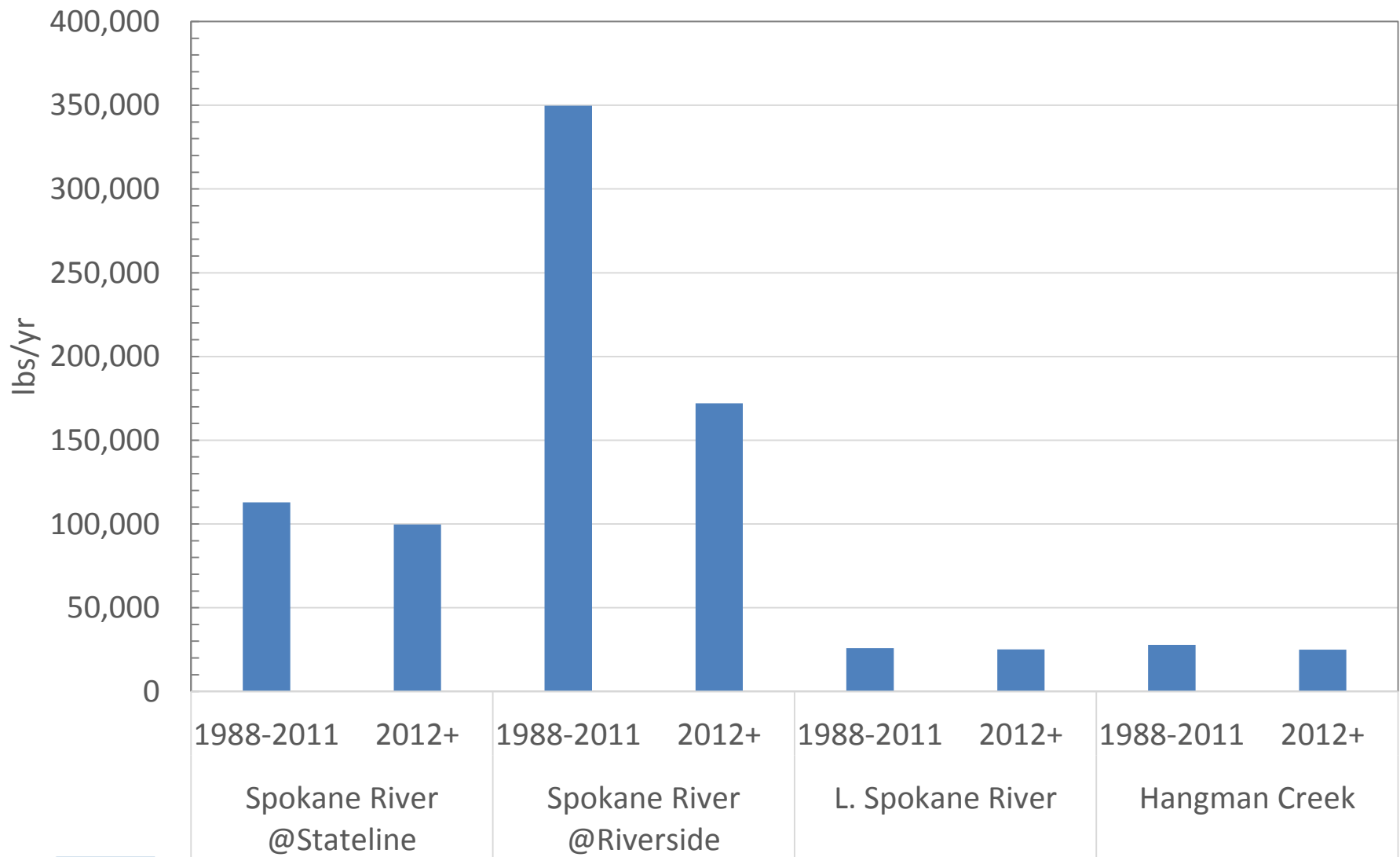




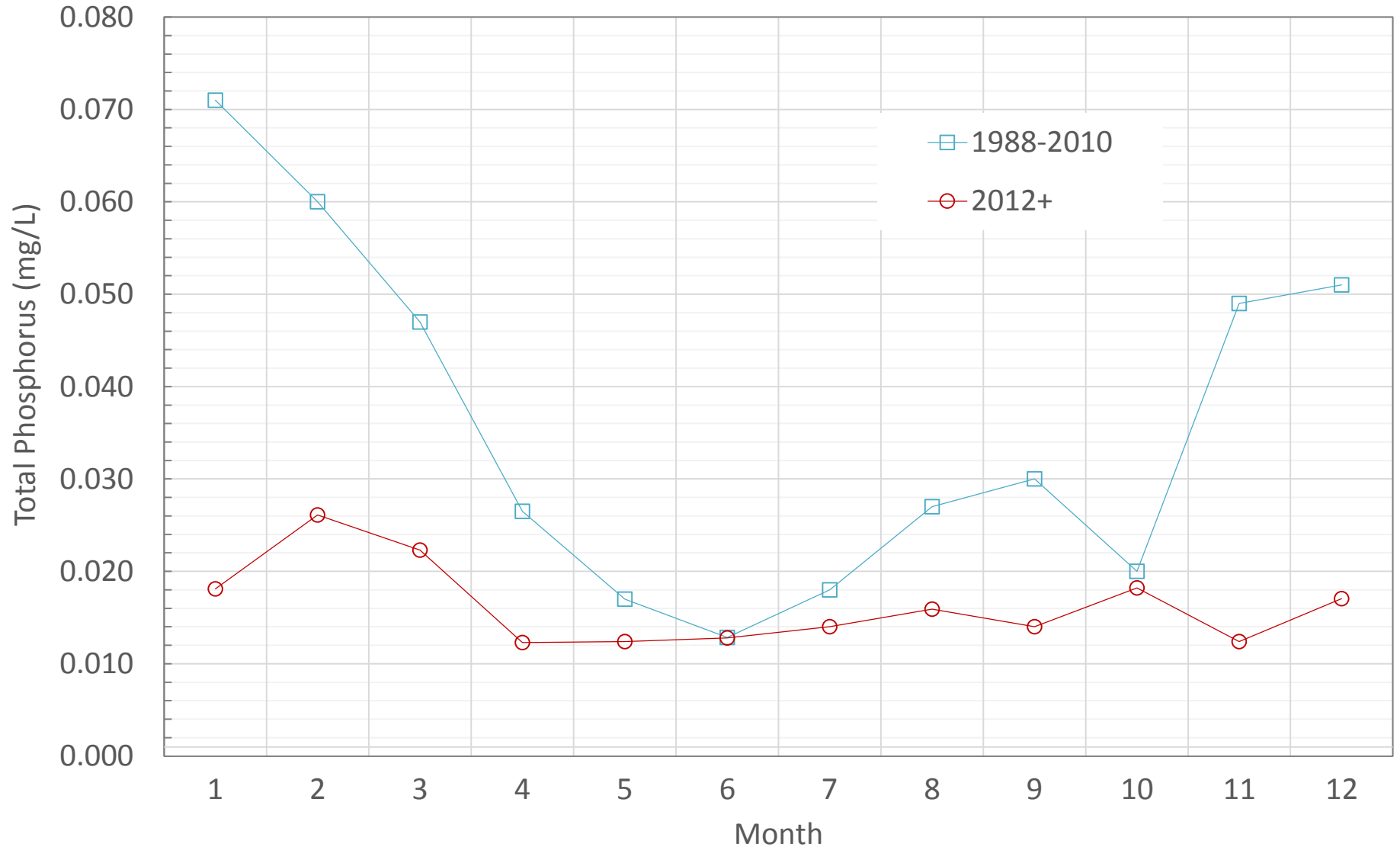




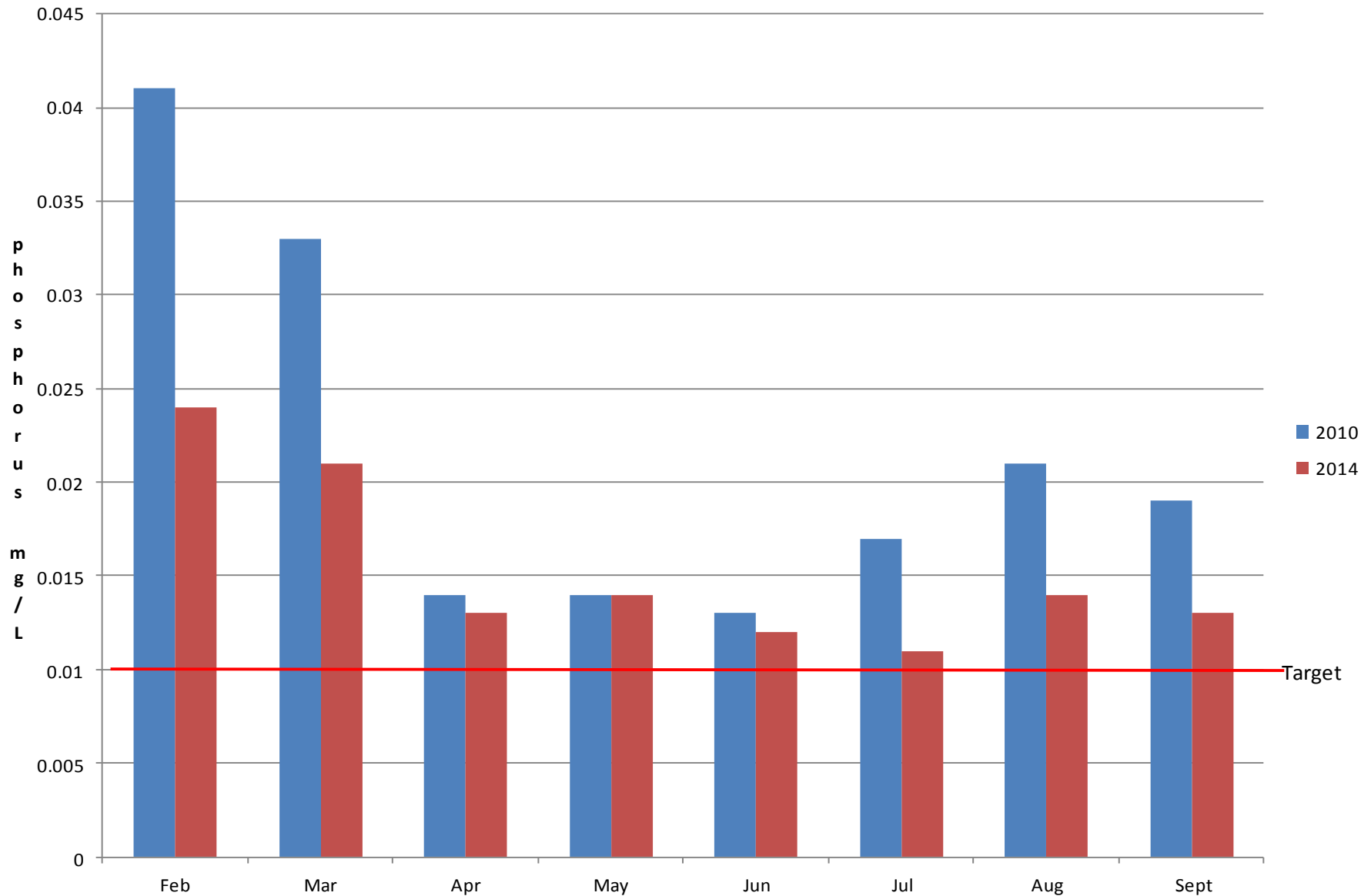
# Annual Total Phosphorus Load



# Total Phosphorus at Riverside State Park

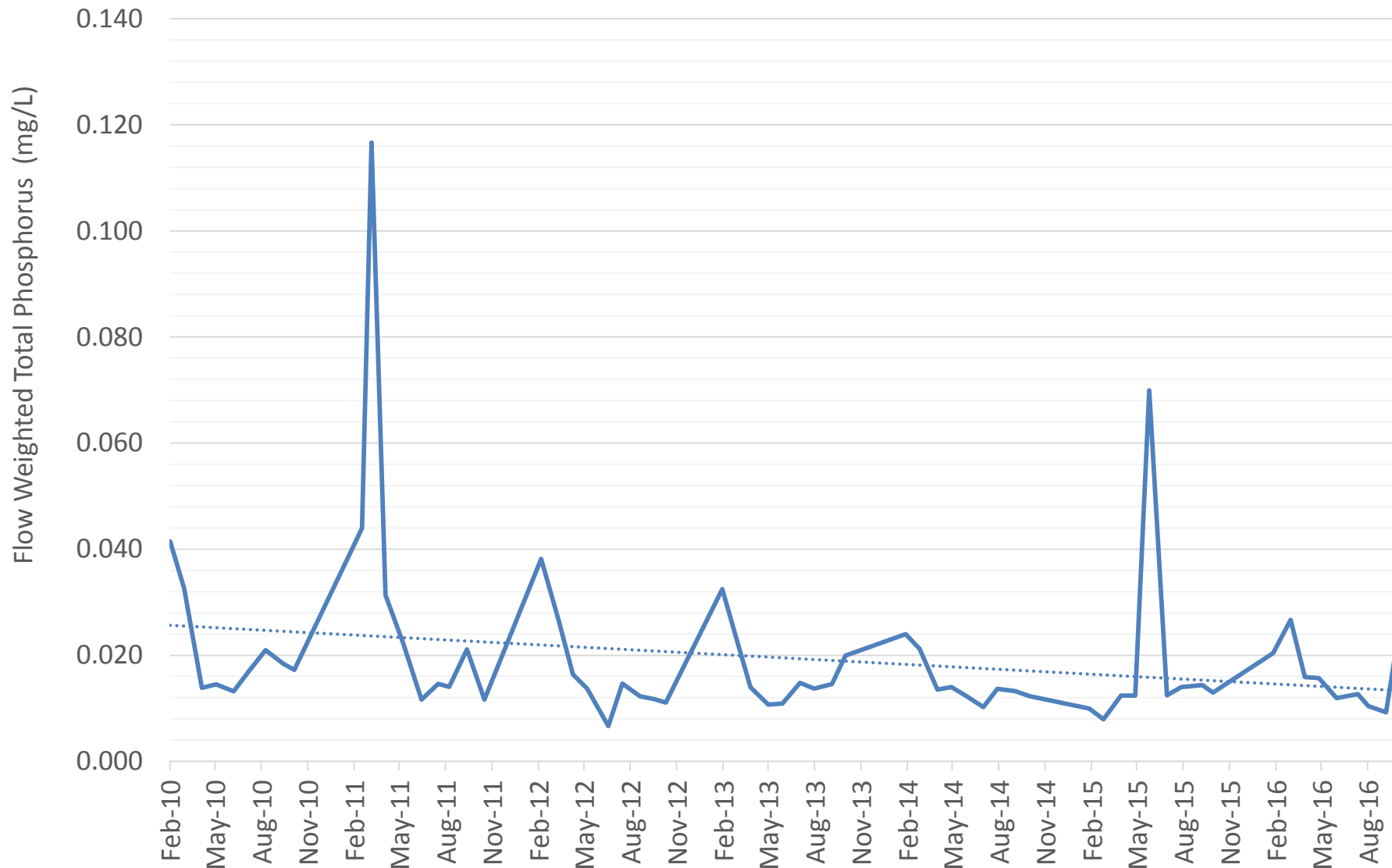


## Phosphorus at Riverine Assessment Point



# Riverine Assessment Point

# Riverine Assessment Point Total Phosphorus Feb-Oct 2016



# Groundwater Total Phosphorus

Year	2010	2011	2012	2013	2014	2015	2016
Range of highest Total Phosphorus concentrations (mg/L)	0.101- <b>0.352</b>	0.101 - 0.282	0.101 – 0.150	0.035 – 0.076	0.035 – 0.068	0.035 – 0.052	0.035 – <b>0.062</b>
# of sampling sites above 0.010 mg/L	12	19	15	15	14	15	20

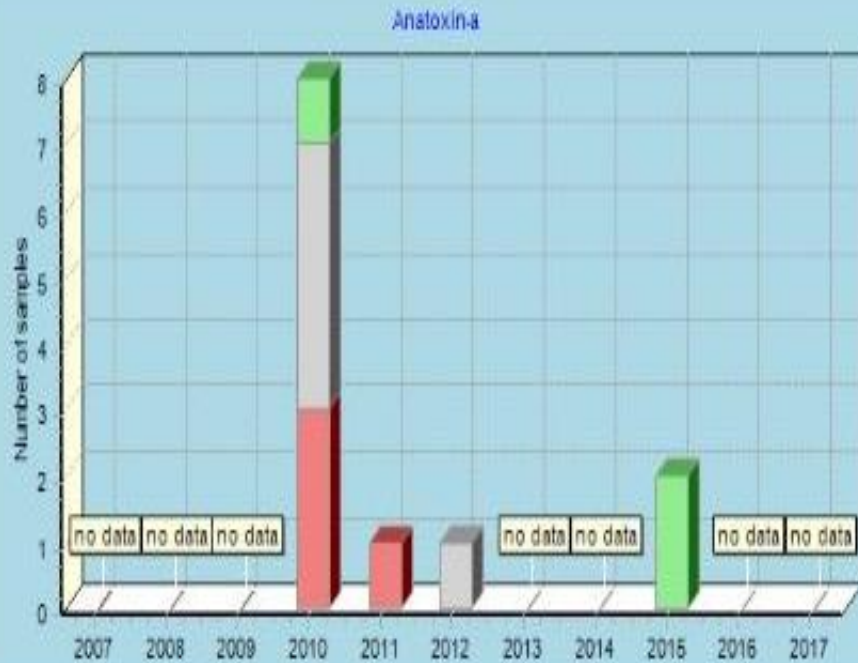
# We're Getting Close to the Goal!

- Point sources are close to targets
- Hangman Creek loads & concentrations are decreasing during June and July-October seasons
- Little Spokane River July-Oct season concentration allocation met every year since 2011
- Nearly 49% reduction @ Riverside State Park
- Downward trend @ Riverine Assessment point with majority of the concentrations below 0.02 mg/L.



# Algae Samples

Since 2012  
Fewer  
samples  
have been  
submitted to  
the lab





~~IM~~POSSIBLE



City of Spokane

# 2017 EARTH DAY TREE PLANTING

# ECOLOGY UPDATES



# NPDES Permits

Pat Hallinan  
Water Quality Program

# Background

- Ecology issued 1<sup>st</sup> Round NPDES Permits in **2011** (5 year permit term)
  - Contained 10 year compliance schedule to meet DO TMDL requirements
- Ecology began the reissuance process in **2016**.



# Background

- Also in **2016**, Ecology completed a four year process to revise WQ Standards
  - Incorporated human health criteria
  - Included new ‘tools’ for complying with criteria





# Background

- EPA partially approved our rule on November 15, 2016 (disapproved a number of human health criteria values)
- EPA adopted revised toxic criteria for Washington
  - Lower values (170 vs 7 pg/L for PCBs)
  - Rule effective December 28, 2016



# Currently

- Ecology plans to engage stakeholders for best path forward for permitting Spokane River Discharges
  - Using new criteria values
  - Considering the new ‘tools’ for compliance



# Currently

- By rule, permits have been administratively extended. This means:
  - Conditions remain in effect
  - Compliance schedules still active



# Path Forward

- Stakeholder meetings beginning in June
- Best path forward for permitting
  - Using new criteria values
  - Considering the new ‘tools’ for compliance
  - Collaborative process
- Finalize plan by early **2018**





# Little Spokane TMDL & Hangman Creek

Elaine Snouwdaert  
Water Quality Program

# Updates on Little Spokane River and Hangman Creek studies

Elaine Snouwaert

Washington Department of Ecology

June 8, 2017

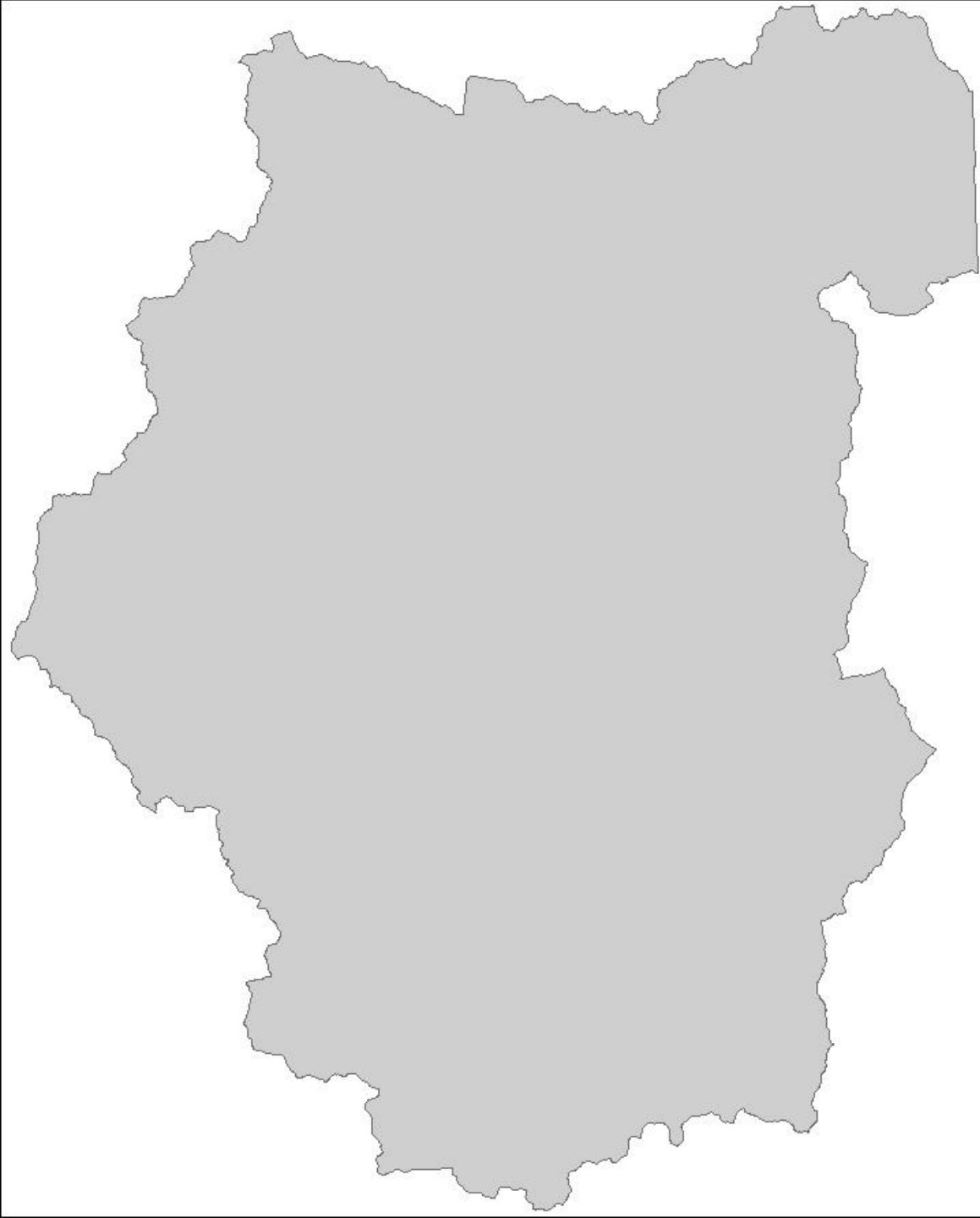
Spokane River DO Annual Meeting

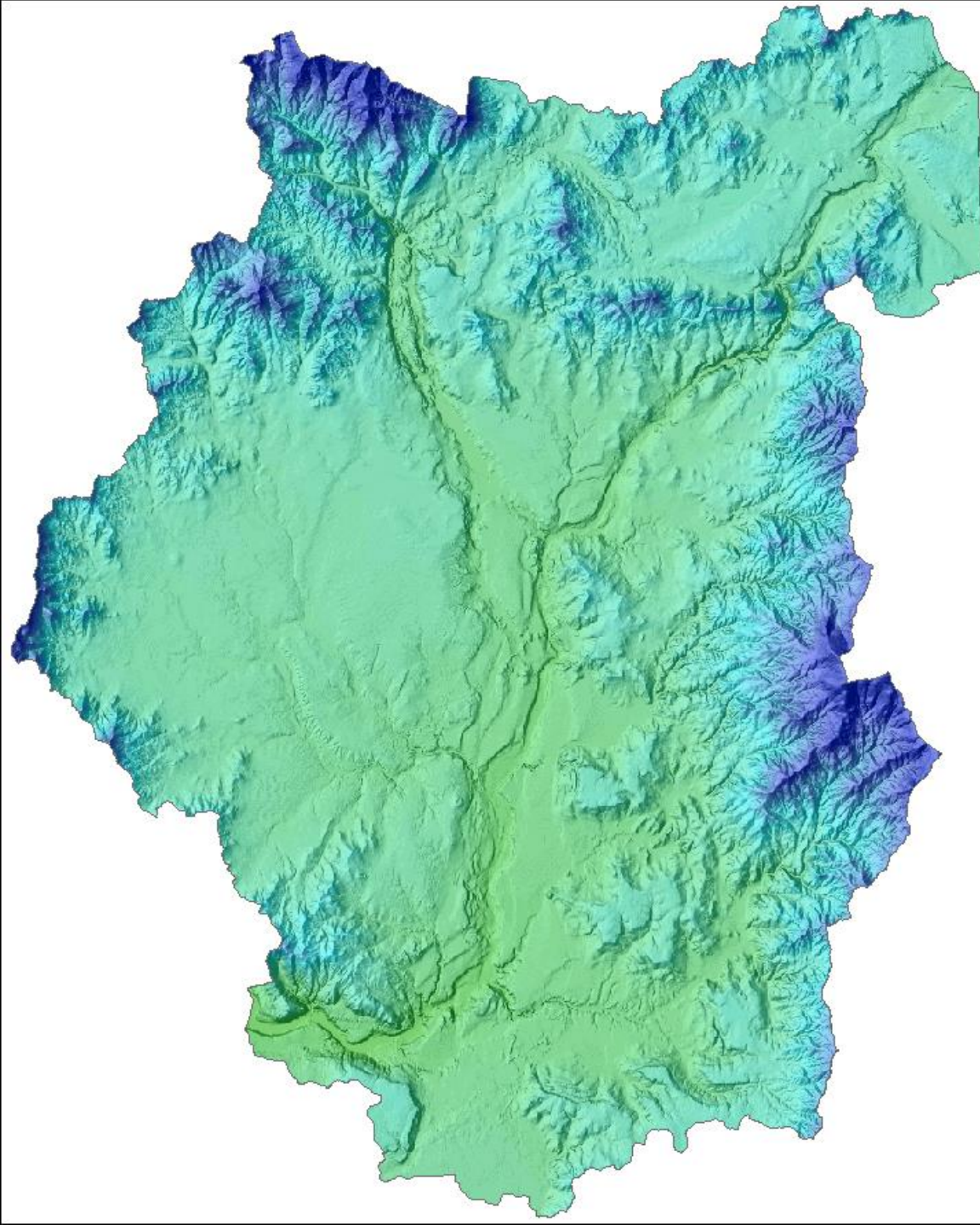


# Little Spokane River Dissolved Oxygen and pH TMDL

- Collected field data in 2010, 2013, and 2015-2016
- Currently analyzing data and drafting technical report
- Aiming for a draft around the turn of the year (winter 2017-18)
- Implementation portion will be a “strategy” with full Implementation Plan developed after EPA Approval
- Implementation Plan will also address bacteria, temperature, and turbidity from 2012 TMDL

## Little Spokane Watershed

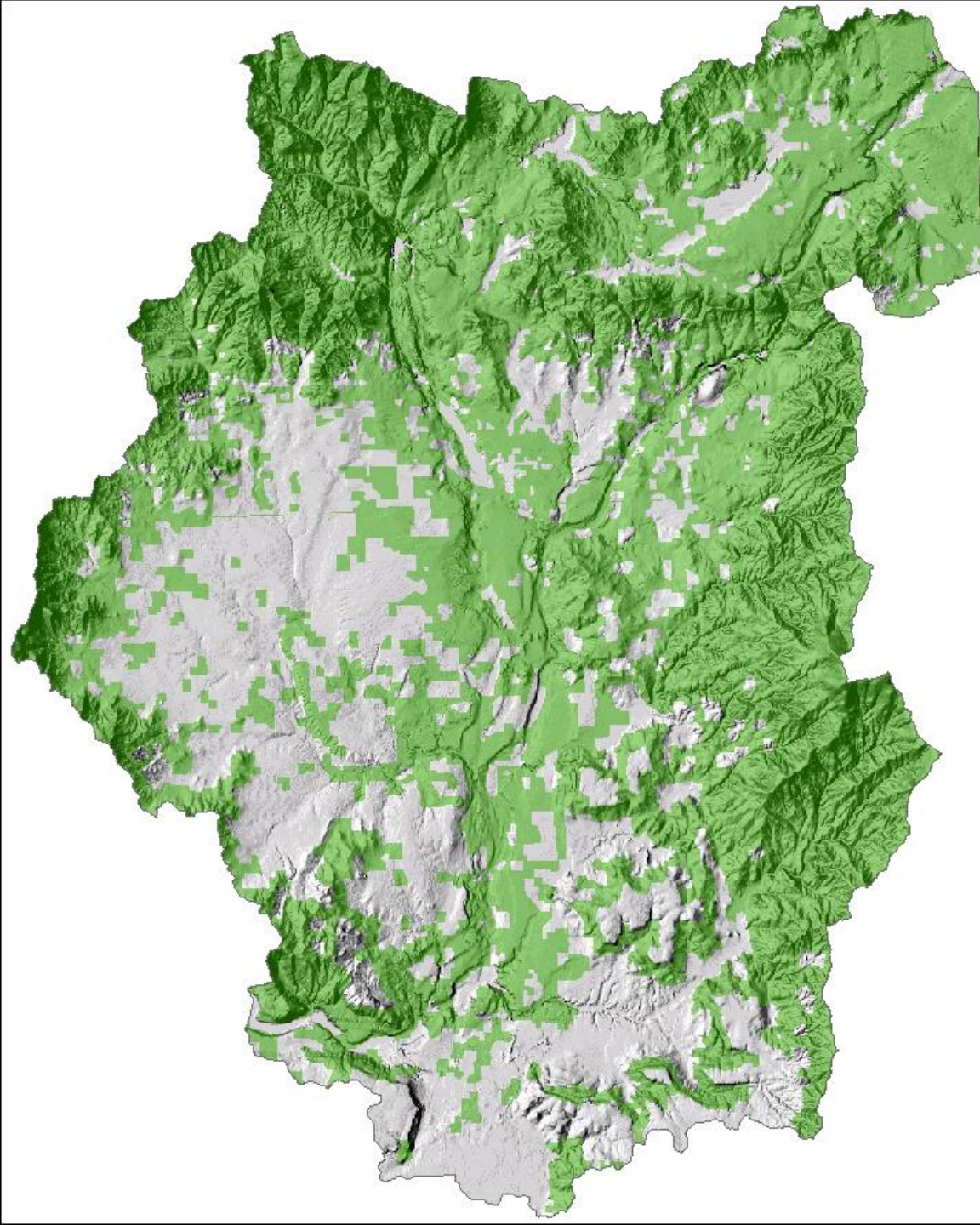




## Little Spokane Watershed

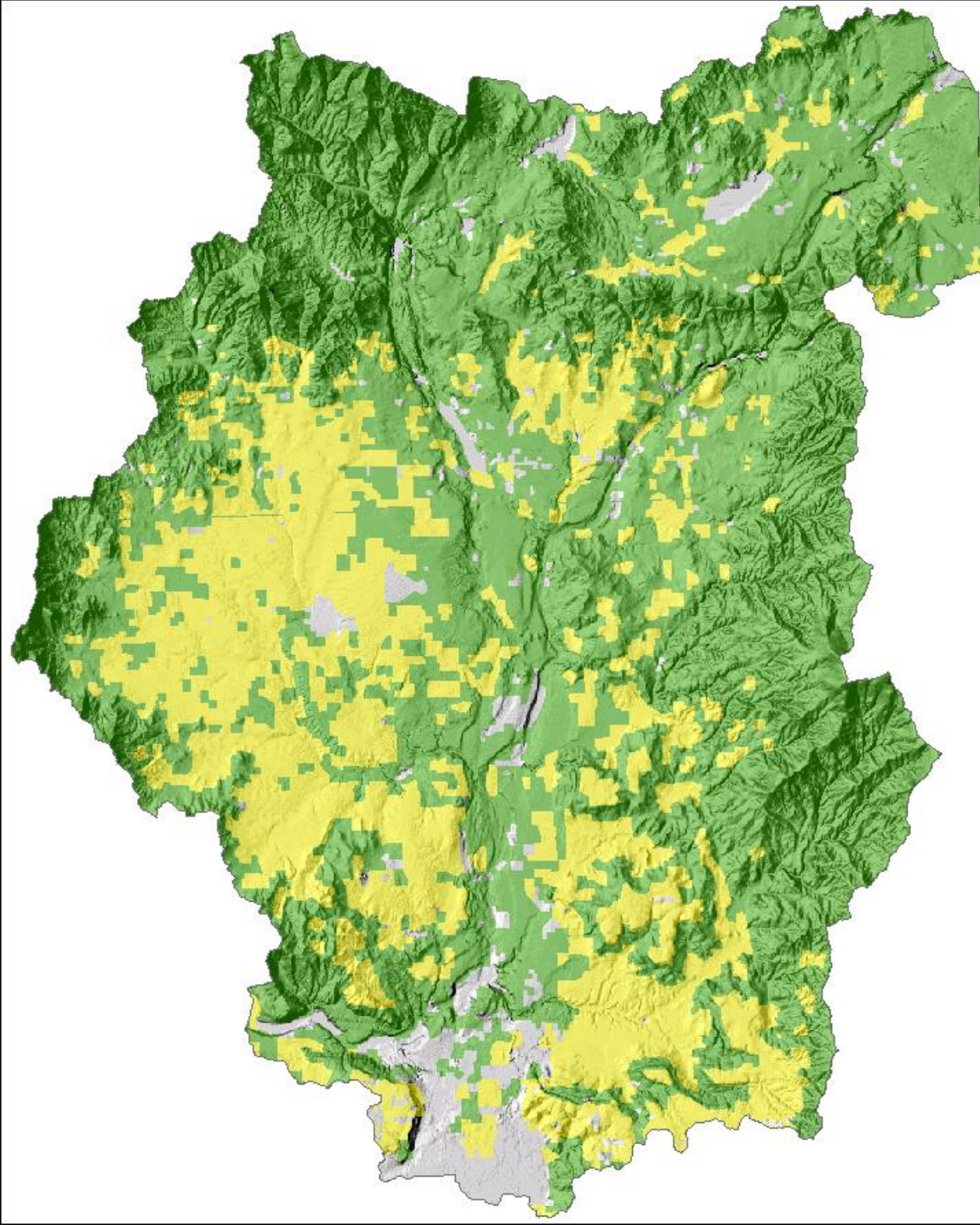
- Landforms (Elev 1537 – 5883 ft)





## Little Spokane Watershed

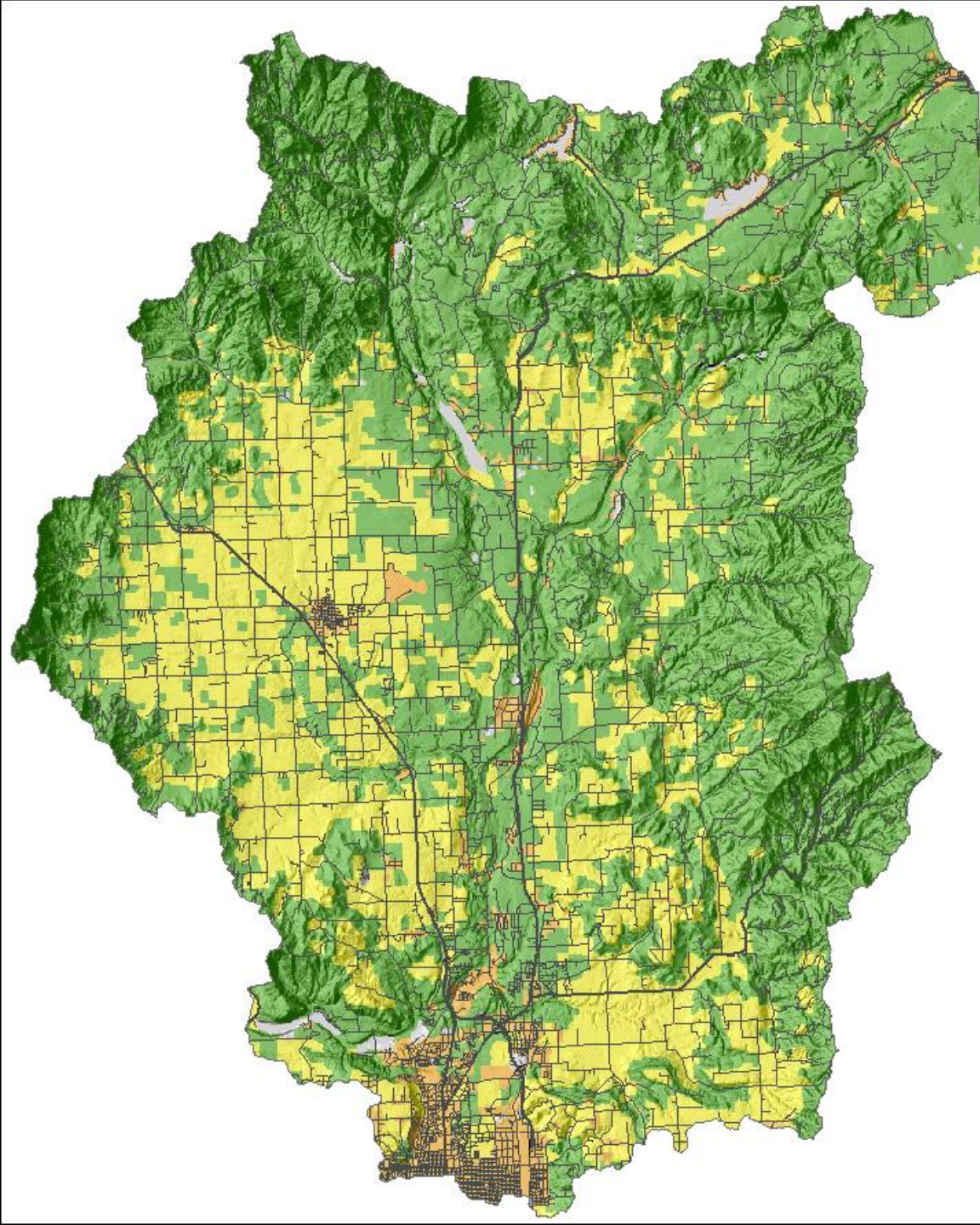
- Landforms (Elev 1537 – 5883 ft)
- Land uses/land cover
  - Forest



## Little Spokane Watershed

- Landforms (Elev 1537 – 5883 ft)
- Land uses/land cover
  - Forest
  - Agriculture (crop + pasture)

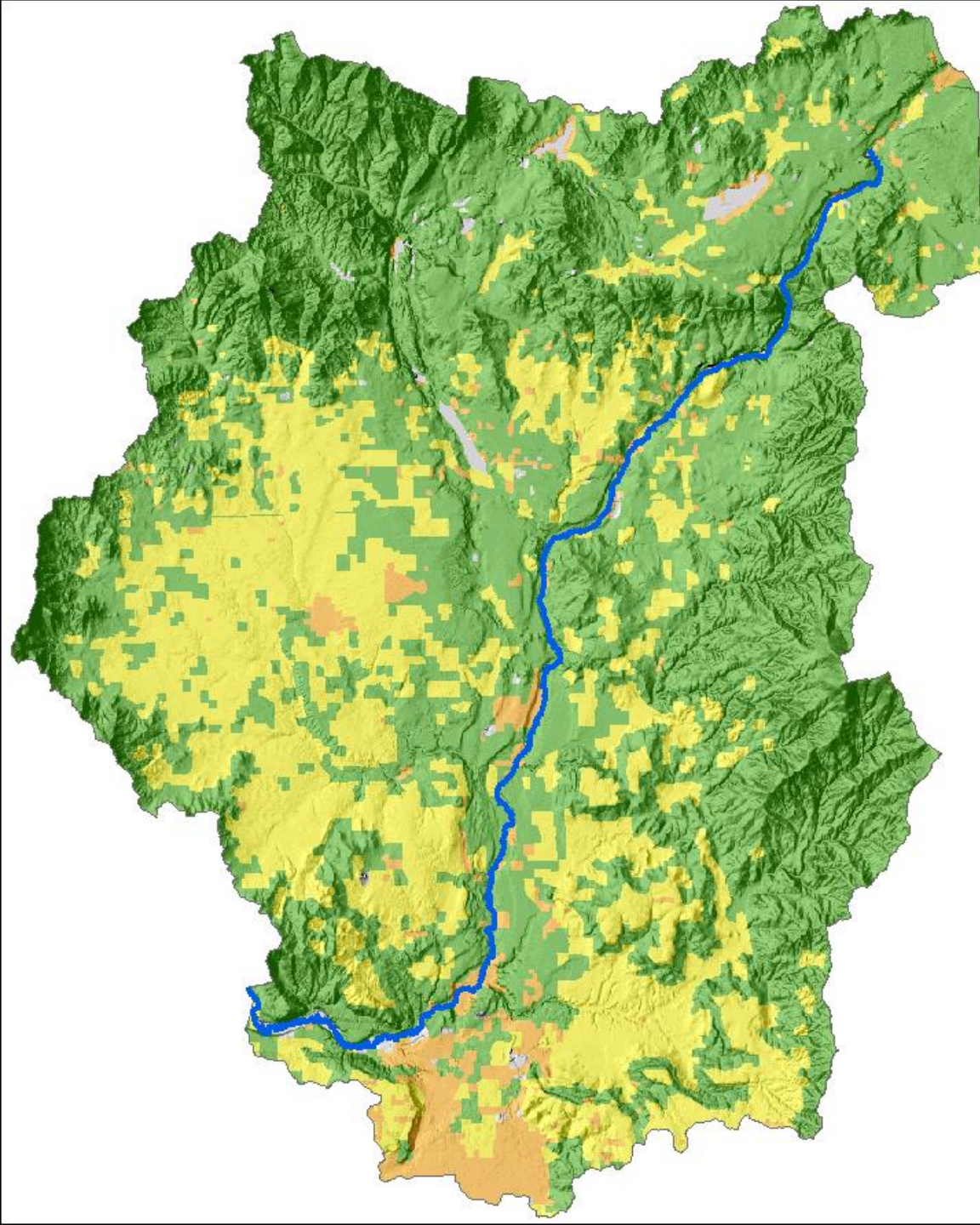




## Little Spokane Watershed

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  - Agriculture (crop + pasture)
  - Urban/Residential

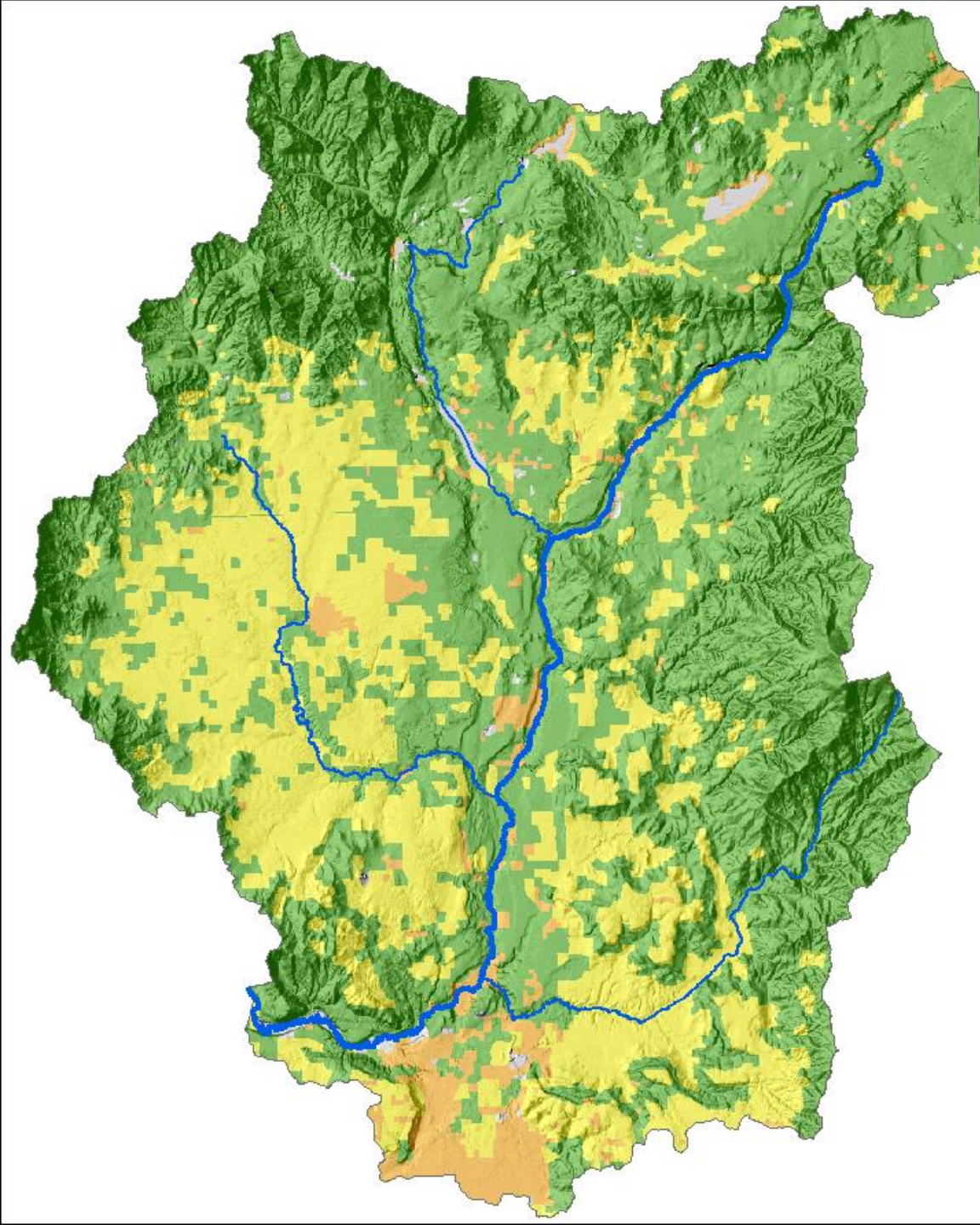




## Little Spokane Watershed

- Landforms (Elev 1537 – 5883 ft)
- Land uses/land cover
  - Forest
  - Agriculture (crop + pasture)
  - Urban/Residential
- Water bodies
  - LSR mainstem (55 mi)

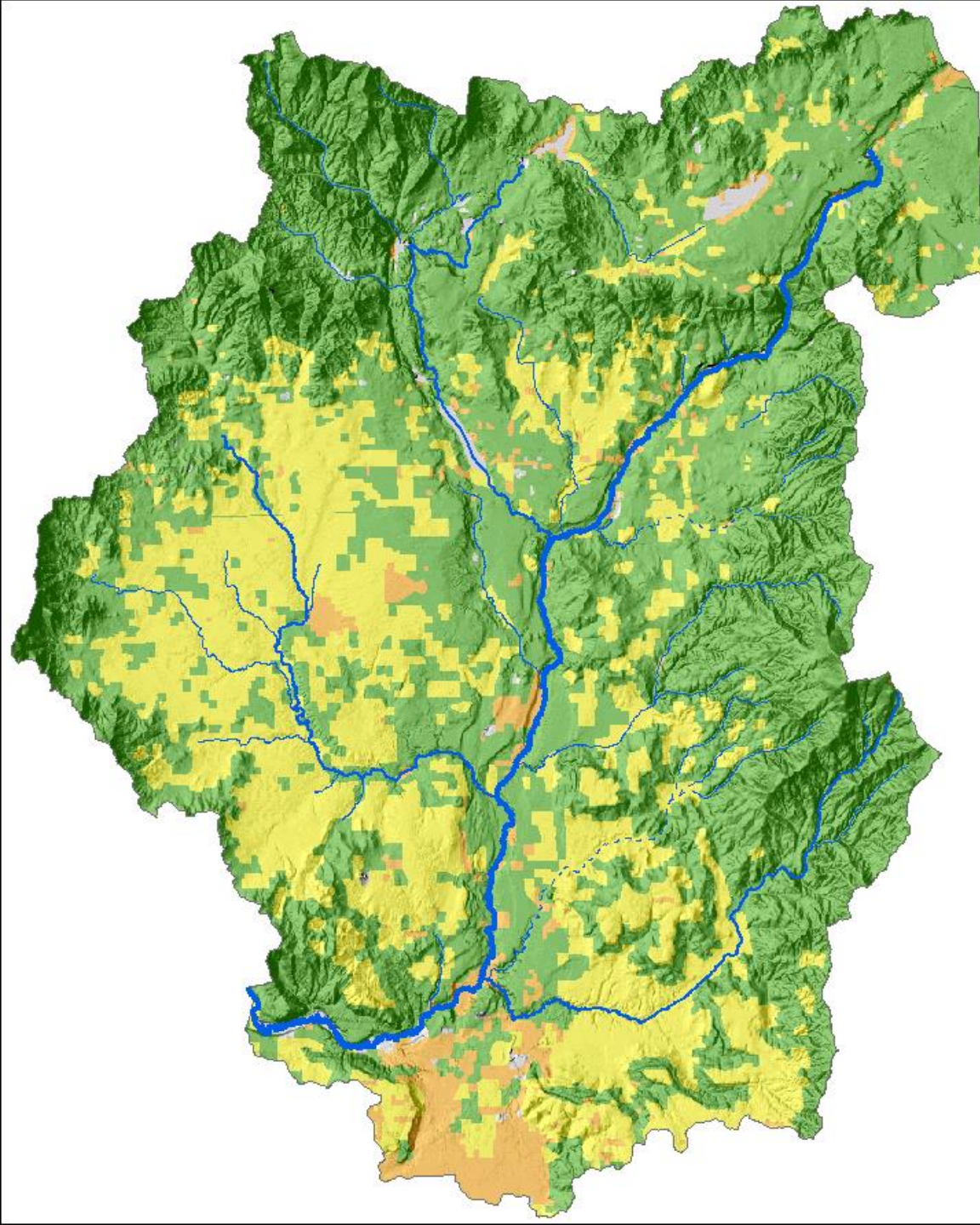




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- Landforms (Elev 1537 – 5883 ft)
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  - Agriculture (crop + pasture)
  - Urban/Residential
- Water bodies
  - LSR mainstem (55 mi)
  - Major tribs (71 mi)

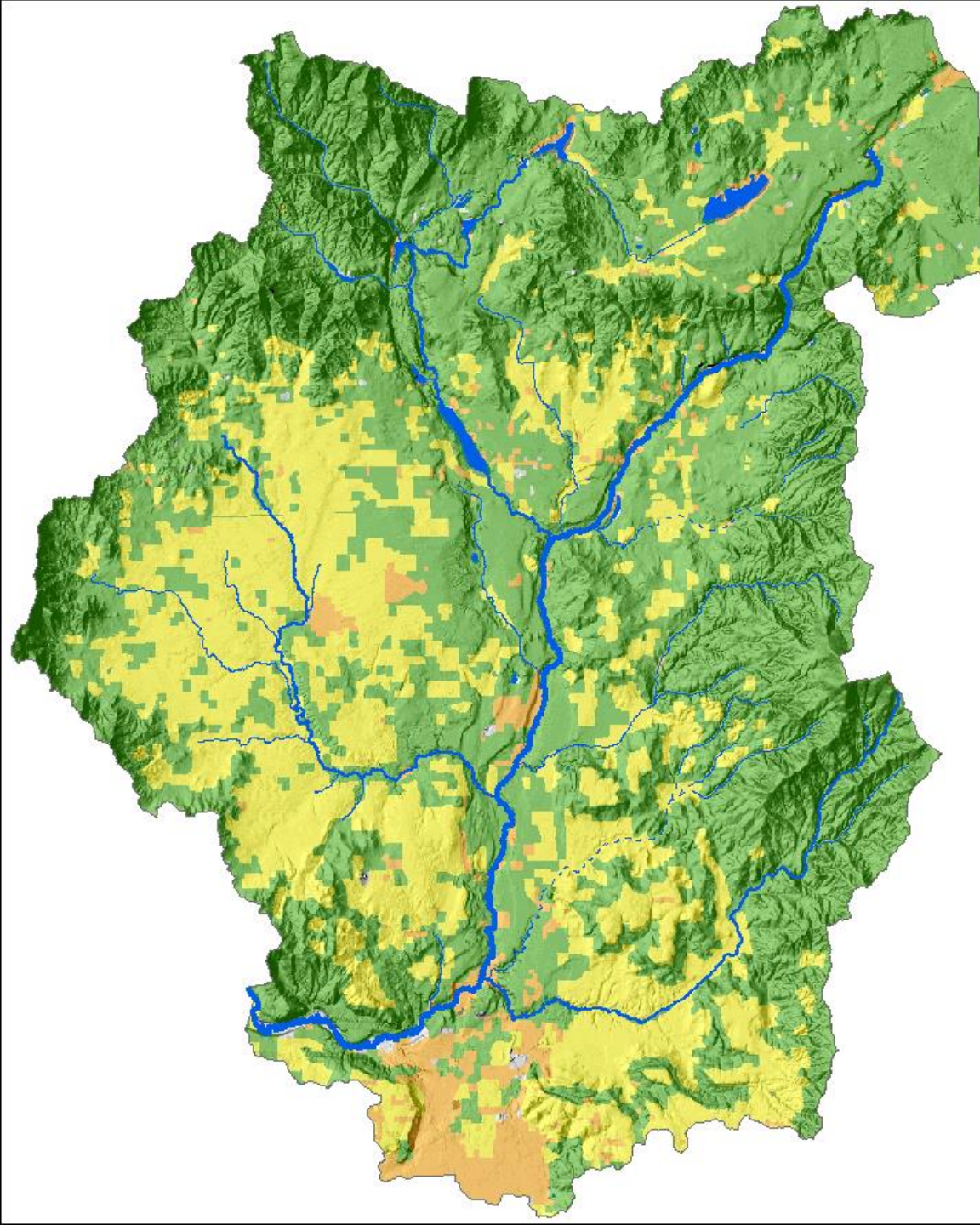




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  - Major tribs (71 mi)
  - Other perennial tribs (142 mi)

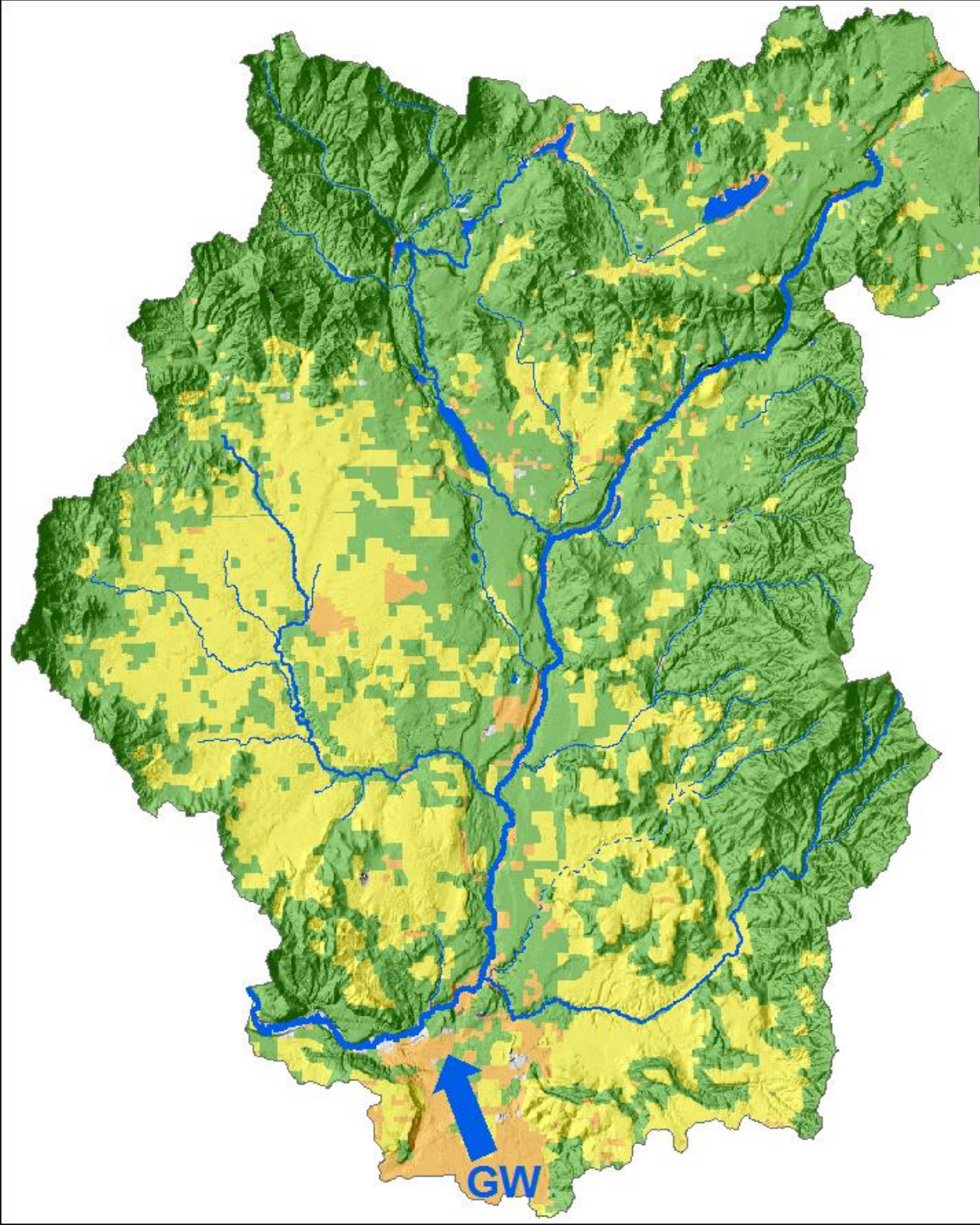




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  - Numerous lakes, wetlands





## Little Spokane Watershed

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- Water bodies
  - LSR mainstem (55 mi)
  - Major tribs (71 mi)
  - Other perennial tribs (142 mi)
  - Numerous lakes, wetlands
- Spokane Valley-Rathdrum Prairie Aquifer











































# Two-pronged approach

Summer Low Flow Study for  
Mainstem and tributary DO/pH problems



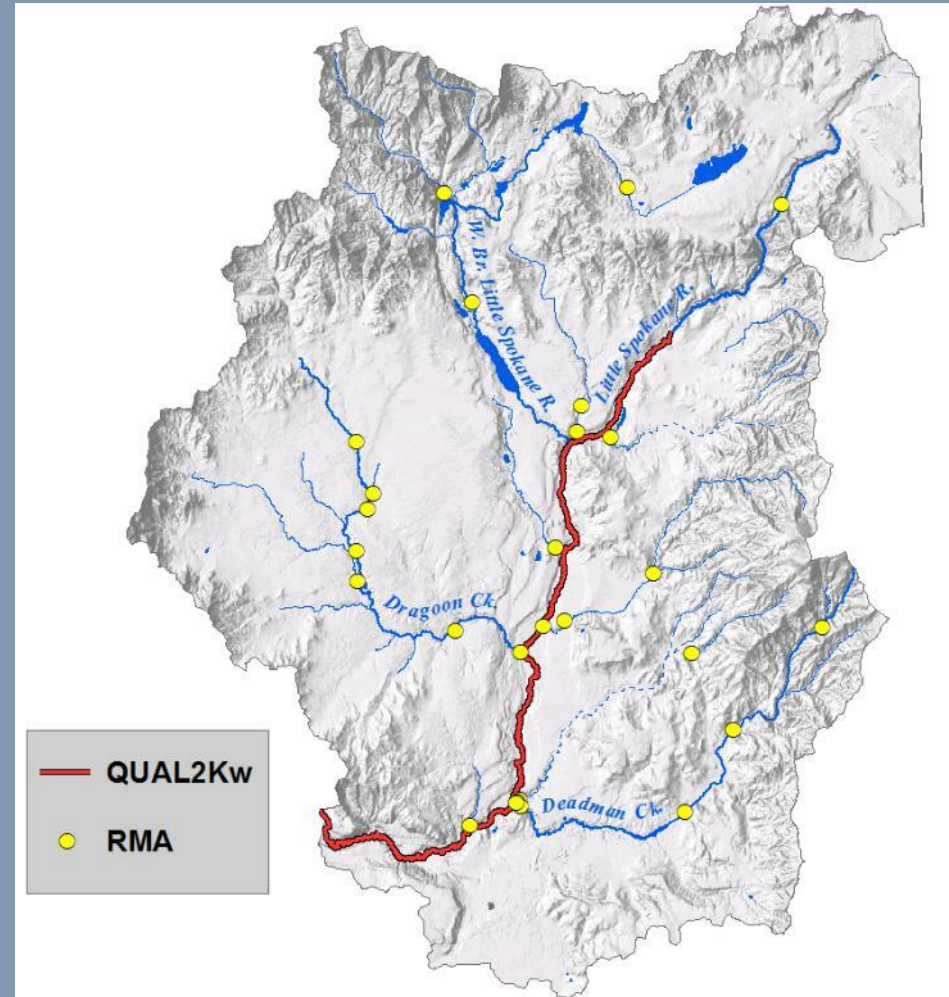
Year-Round Watershed Study for  
LA at Little Spokane R. mouth





# Little Spokane and Tributary DO/pH Impairments Approach

- Focused on critical period – summer low flow
- Modeling to predict causes/sources of impairments
  - Mainstem LSR: QUAL2Kw
  - Tributaries: River Metabolism Analyzer (RMA)



# Dominant processes

- Reaeration
  - High gradient/white water
  - Narrow/more shady
  - Flatter diel curve between highs and lows
- Algal productivity
  - Low-gradient/laminar flow
  - Wide/sunny
  - Larger swings between highs and lows
  - Phosphorus or nitrogen limited depending on the location although P more likely limiting along mainstem
- Temperature
  - More significant impact than nutrients throughout much of the watershed

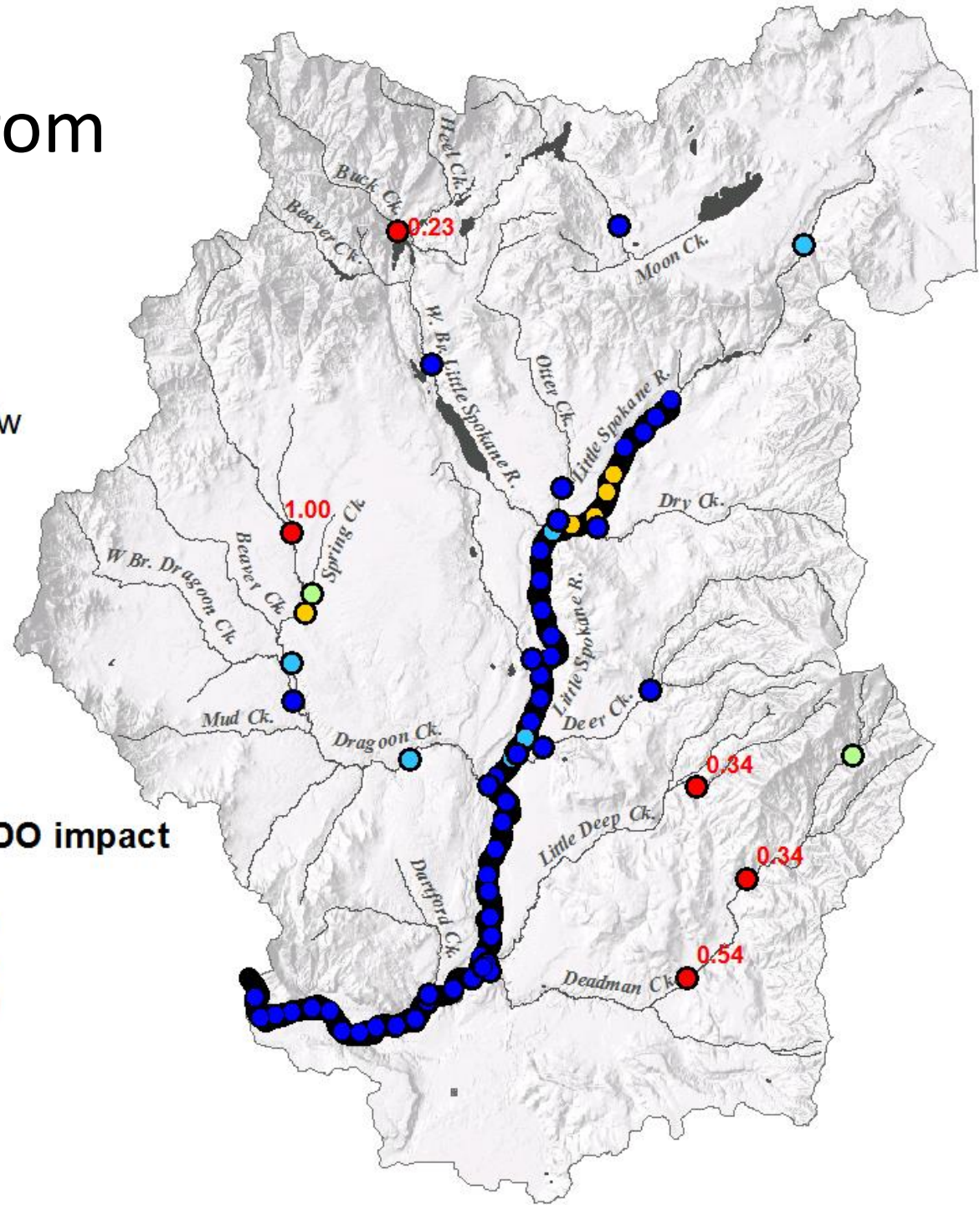
# Impact to DO from *nutrients only*

● RMA  
●●● QUAL2Kw

## Magnitude of DO impact

- > 0.20
- 0.15 - 0.20
- 0.10 - 0.15
- 0.05 - 0.10
- 0 - 0.05

mg/L





# Impact to DO from *temperature only*

Includes:

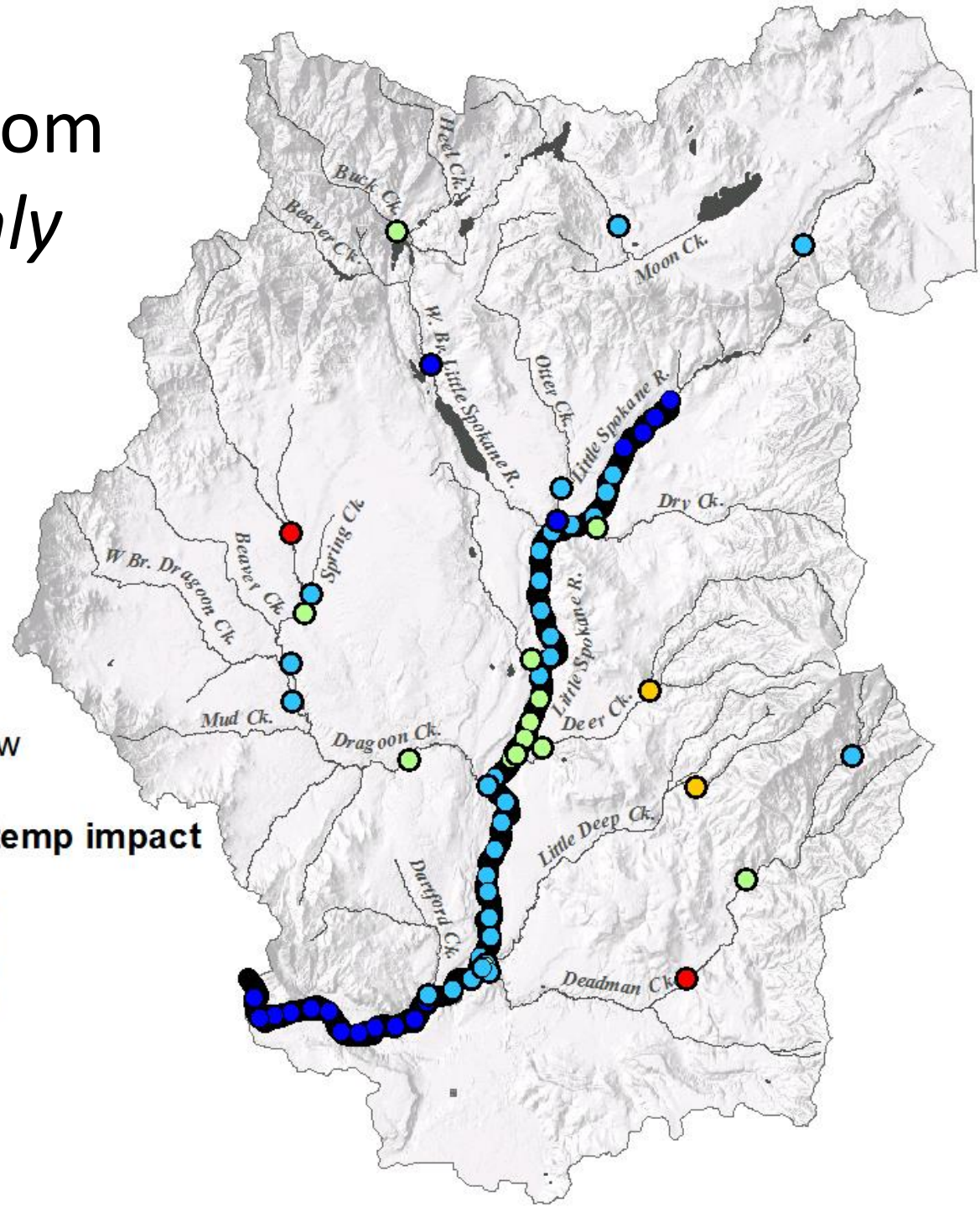
- Shade
- Channel geometry
- Microclimate (Q2K only)
- Flow (Q2K only)

● RMA  
●●● QUAL2Kw

## Magnitude of temp impact

- >1.00
- 0.75 - 1.00
- 0.50 - 0.75
- 0.25 - 0.50
- < 0.25

mg/L





# Summer Low-flow study: key findings

- DO, not pH, is limiting parameter throughout watershed.
- DO is fairly insensitive to nutrient changes at most locations throughout the watershed.
- *However*, there are a few locations that need nutrient reductions to address in-stream DO issues.
- Biggest thing that will improve DO throughout watershed: **reduce temperatures!**

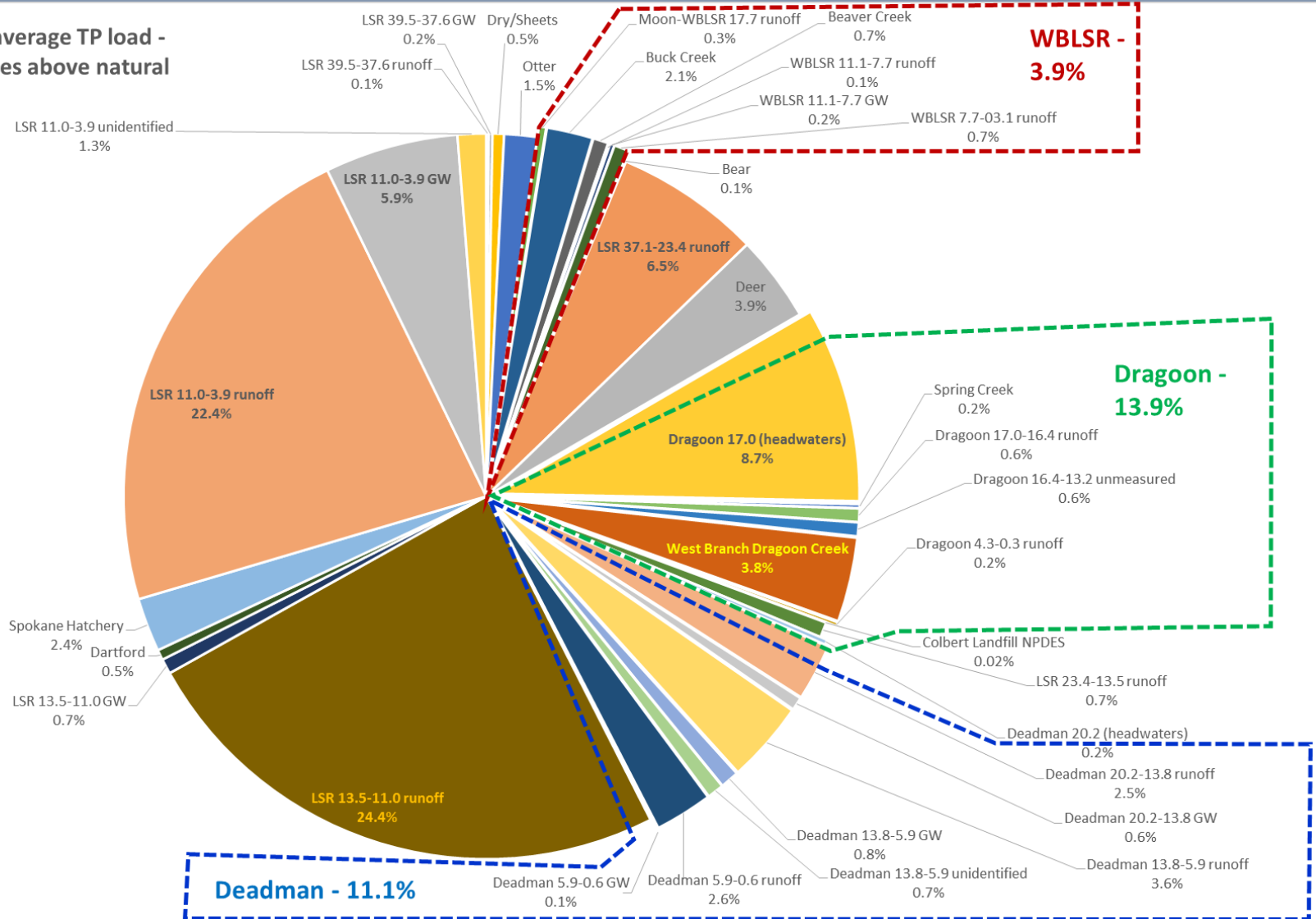


# Watershed Analysis

- Goal: Quantify watershed loading that contributes to the mainstem Spokane River Load Allocation
- Approach: Develop mass balances for flow and nutrients for 13 surveys (Feb 2015 – Mar 2016)
- Determine human source mass balance loading by subtracting out natural loading
- Why not a watershed model?
  - An ideal model was not available
  - The basin has a complex geology and hydrology
  - The WARMF model was tried but didn't work

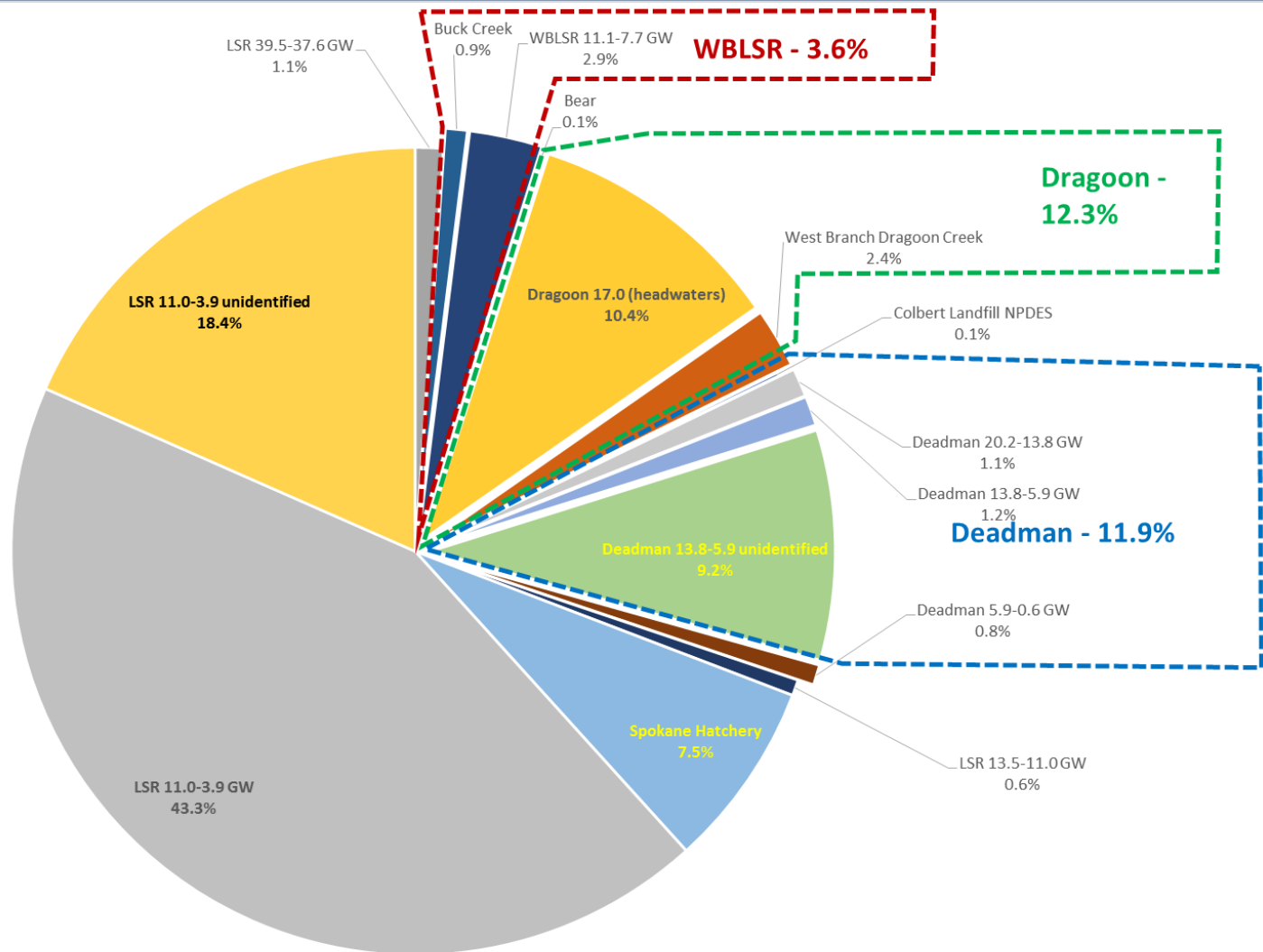
# TP Human Sources: Spring Season (March – May)

March-May average TP load -  
human sources above natural



# TP Human Sources: June

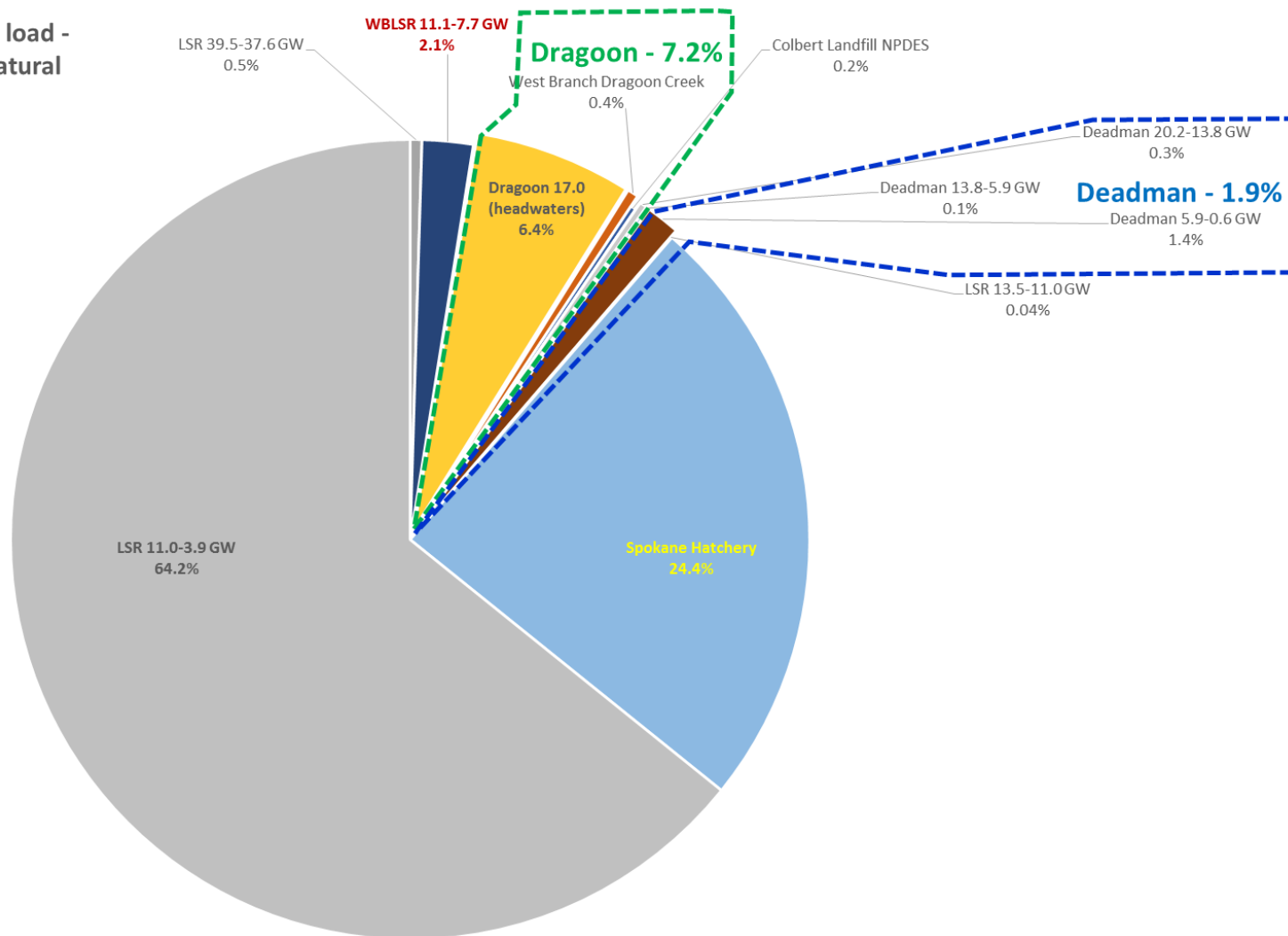
June TP load -  
human sources  
above natural





# TP Human Sources: Summer (July – October)

July-October average TP load -  
human sources above natural



## Watershed Analysis: Key Findings

- For 13 surveys from February 2015 through March 2016:
  - The March surveys were wet w/ high runoff
    - LA at mouth not met
  - Summer was dry – TP loading well below LA at mouth
- Summer load dominated by SVRP Aquifer inflows, Spokane Hatchery, and Dragoon Creek headwaters
- June: same as summer, but add Peone Prairie (middle Deadman), and mainstem from Buckeye to Dartford
- Failure to meet LA in Spring dominated by run-off events
  - Runoff along mainstem in Spokane metro area and between Elk and Chattaroy
  - Runoff in Dragoon, Deadman, and Deer Creeks
- Many areas of human sources agree with low-flow study results

# Hangman Creek



Hangman Creek at  
Keevy Road in the  
Canyon during high and  
low flows

# Hangman Creek

- Launched a new project in May 2017
- Two primary objectives:
  - Assess Hangman Creek watershed's contribution of pollutants affecting DO in Spokane River
  - Determine nutrient and CBOD loads from Tekoa WWTP that will protect DO and pH in Hangman Creek
- 4 studies within this project
  - Watershed-wide springtime runoff study
  - Lower watershed groundwater study
  - Lower watershed low flow study
  - Tekoa receiving water study

# Timeframe

Quality Assurance Project Plan Approved and in final publication

Timeframe	Study
May – October 2017	Tekoa receiving water study
January – May 2018	Watershed spring runoff study
May – October 2018	Lower watershed low flow study
May – October 2018	Lower watershed ground water study

Draft report targeted for early 2020



# Watershed Wide Study Synopsis

- Spring runoff study
  - 6 – 8 gaging stations will record continuous flow & turbidity
  - 20 sites sampled twice-monthly for nutrients and sediment
  - Additional sampling during 1 to 2 storms
- Lower watershed low-flow study
  - Additional gage
  - 16 sites (14 monthly, 2 twice-monthly) for nutrients and sediment
- Lower watershed groundwater study
  - 10 – 20 piezometers installed
  - Sampled monthly for nutrients

# Why not a TMDL?

- Our priority is on addressing nonpoint sediment and phosphorus
- A DO/pH TMDL would focus on in-stream impairments some of which are nitrogen-limited
- As seen from LSR analysis the in-stream DO/pH limitations do not drive or necessarily align with the P allocation at the mouth
- Our watershed wide assessment will better assist with prioritizing where sediment and phosphorus need to be reduced to meet the allocation at the mouth



Questions?

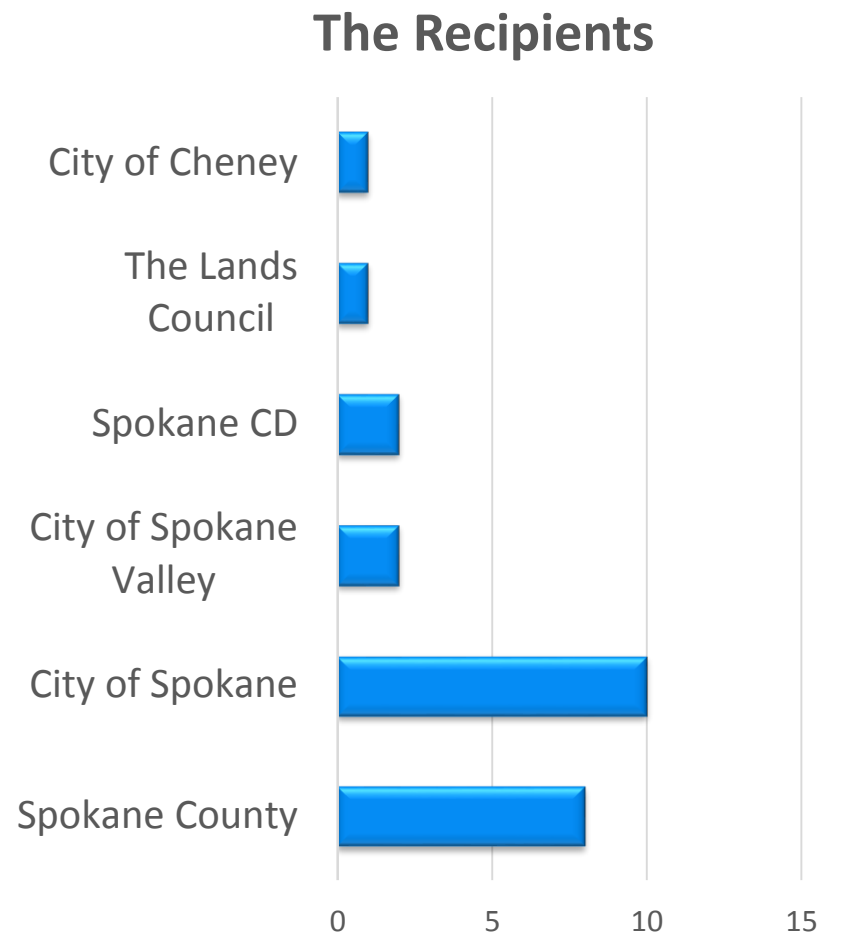
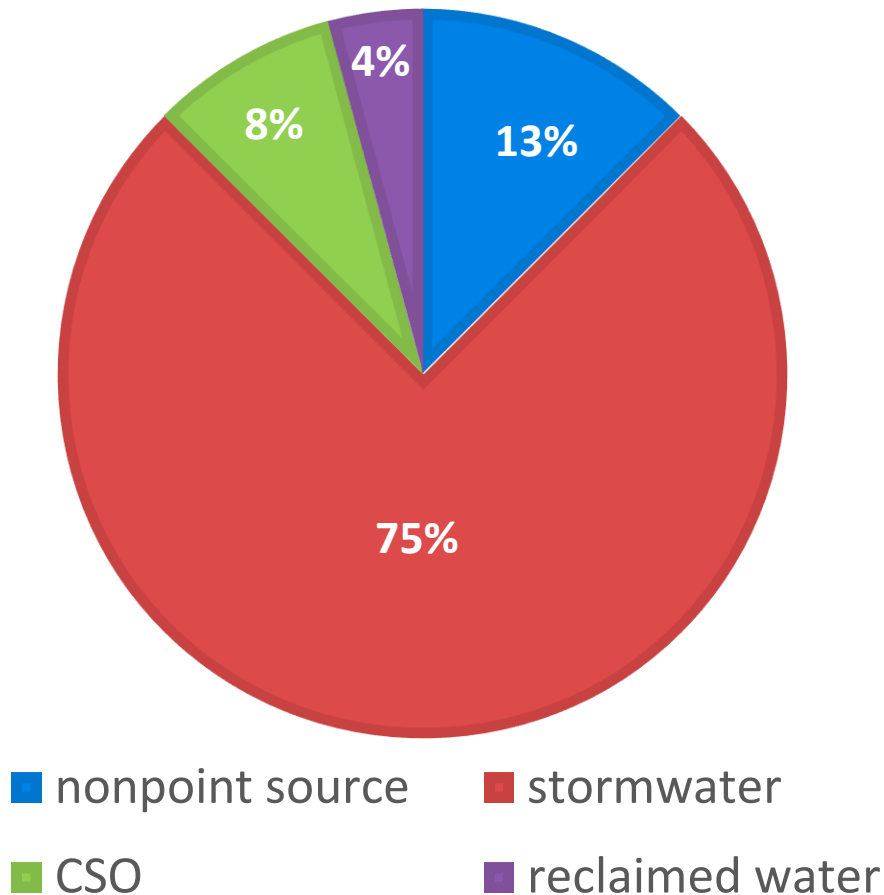


# Grants and Loans

Karin Baldwin  
Water Quality Program

# Proposed Fiscal Year 2018 Funding

24 Projects worth \$57.4 million on draft offer list



# A few contingencies for existing grants & loans...

Following direction from OFM and our agreements, existing recipients will soon receive notification stating:

- If the legislature does not approve a budget by June 30<sup>th</sup>
- they can not spend money or incur financial obligations they will need reimbursed beginning July 1 unless a budget is signed.







# Questions and Discussion





