

KING COUNTY

WATER QUALITY WORK IN THE SNOQUALMIE BASIN



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Science and Technical Support Section
Water & Land Resources Division
Department of Natural Resources and Parks



Outline of Work

Ambient Monitoring



1 Water Quality



2 Water Quantity



3 Benthos

Special Projects



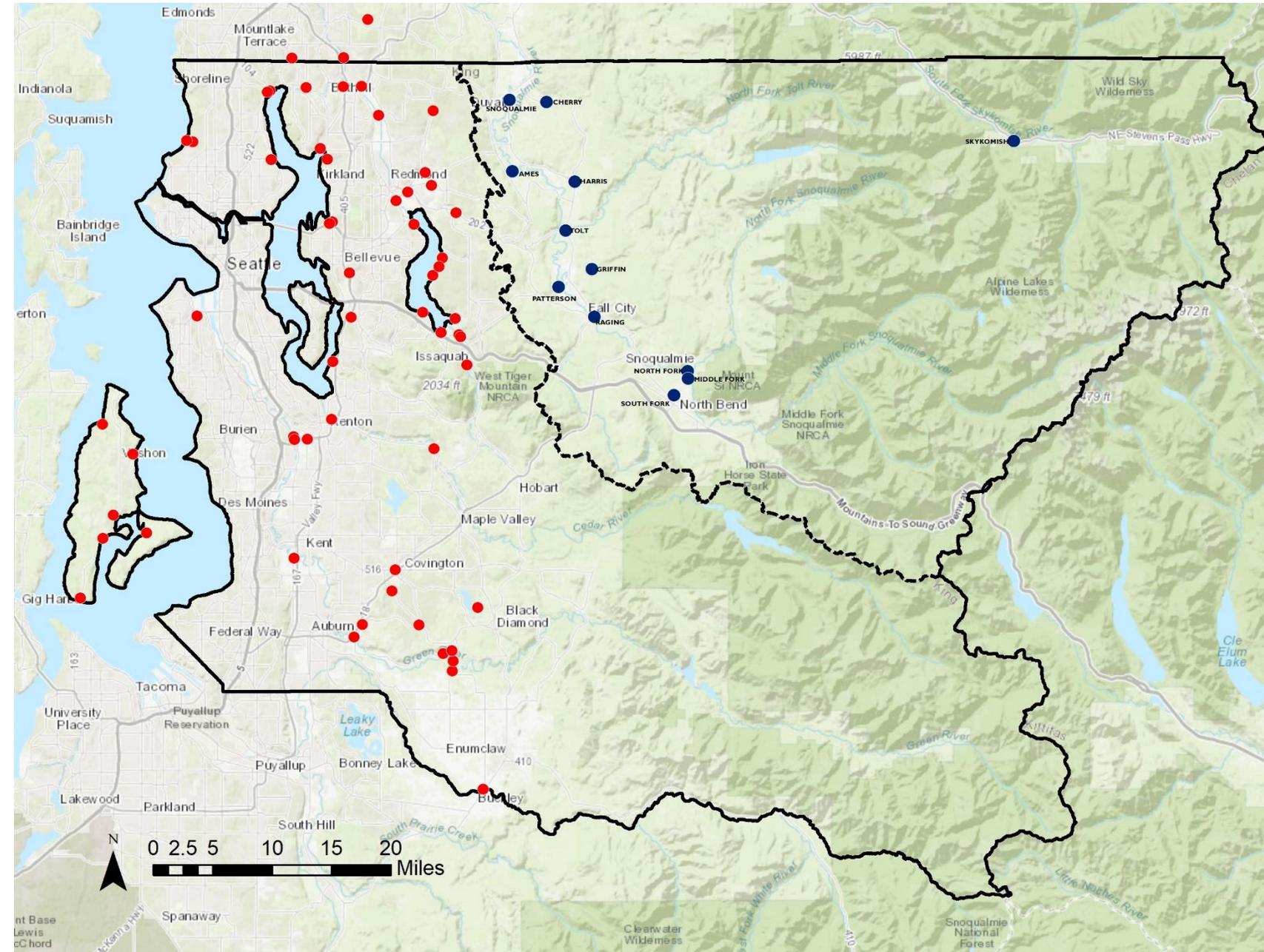
4 Middle Fork Snoqualmie Temperature Monitoring

I Ambient Water Quality Monitoring

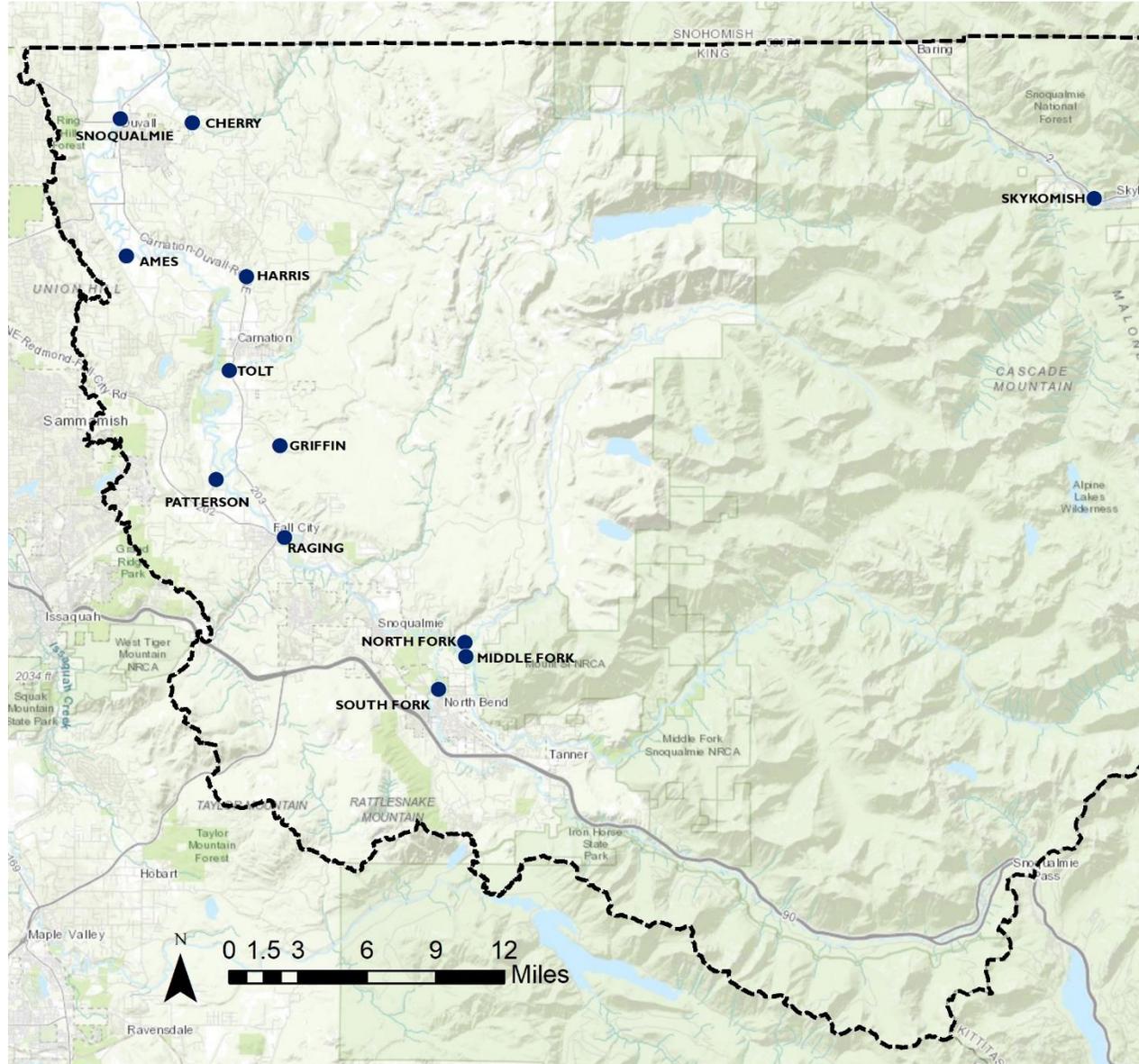
- Monthly samples at 73 sites in King and Snohomish Counties
- Data back to 1971 at some sites

PARAMETERS

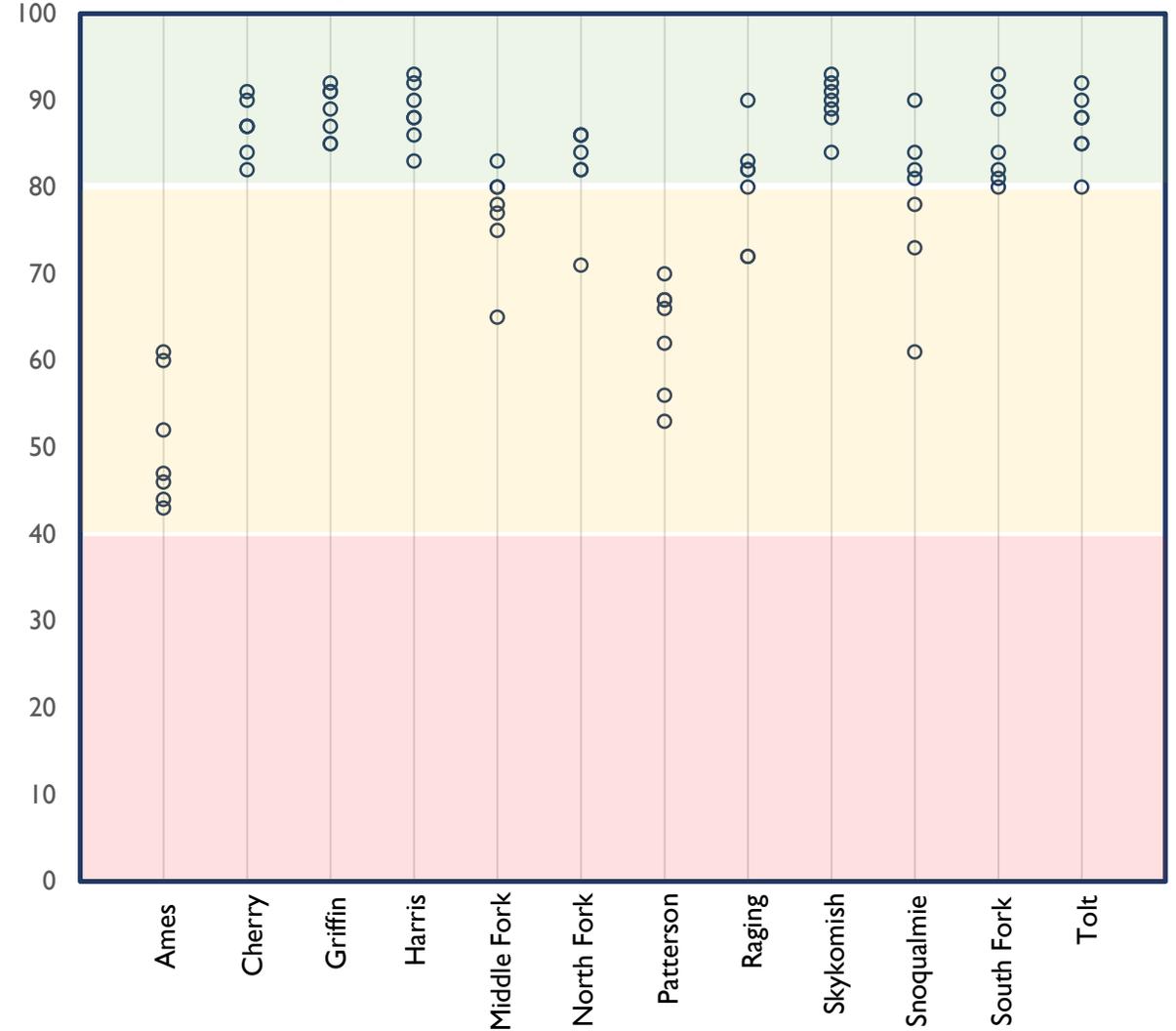
- Conventionals
 - Temperature
 - pH
 - DO
 - Turbidity
 - Conductivity
 - TSS
- Nutrients
 - Total phosphorus
 - Total nitrogen
 - TN/TP ratio
 - Ortho phosphate
 - Ammonia nitrogen
 - Nitrate-nitrite nitrogen
- Bacteria
 - Fecal coliform
- **12 sites in WRIA 7 beginning in 2011**



I Ambient Water Quality Monitoring



Overall WQI by Site 2012 - 2018



I Ambient Water Quality Monitoring

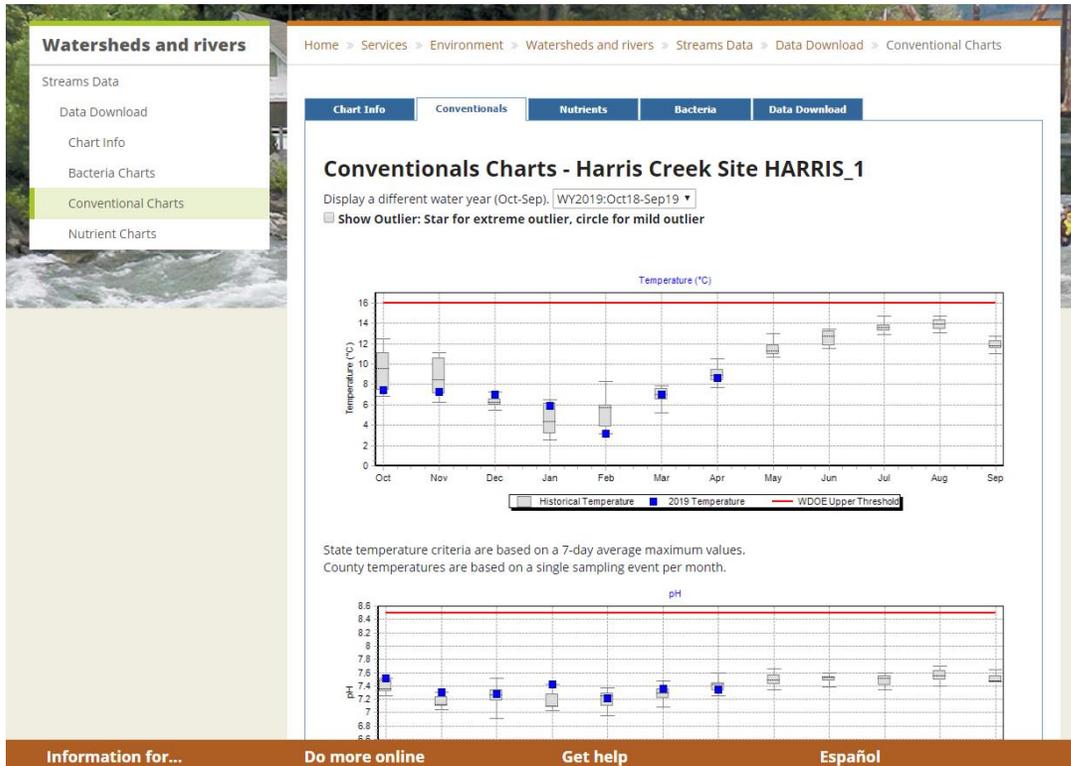
You can access the data at King County's web page:

<https://green2.kingcounty.gov/streamsdata/Default.aspx>

- Download data
- Plot data
- Water Quality Index (WQI) scores
- Stream information

2014 Report by Ray Timm

- First two years of data
- Revisit in 2021?
- <https://your.kingcounty.gov/dnrp/library/2014/kcr2597.pdf>



Water Resource Inventory Area (WRIA) 7 Routine Streams Water Quality Monitoring: Summary of Conditions 2011 – 2013



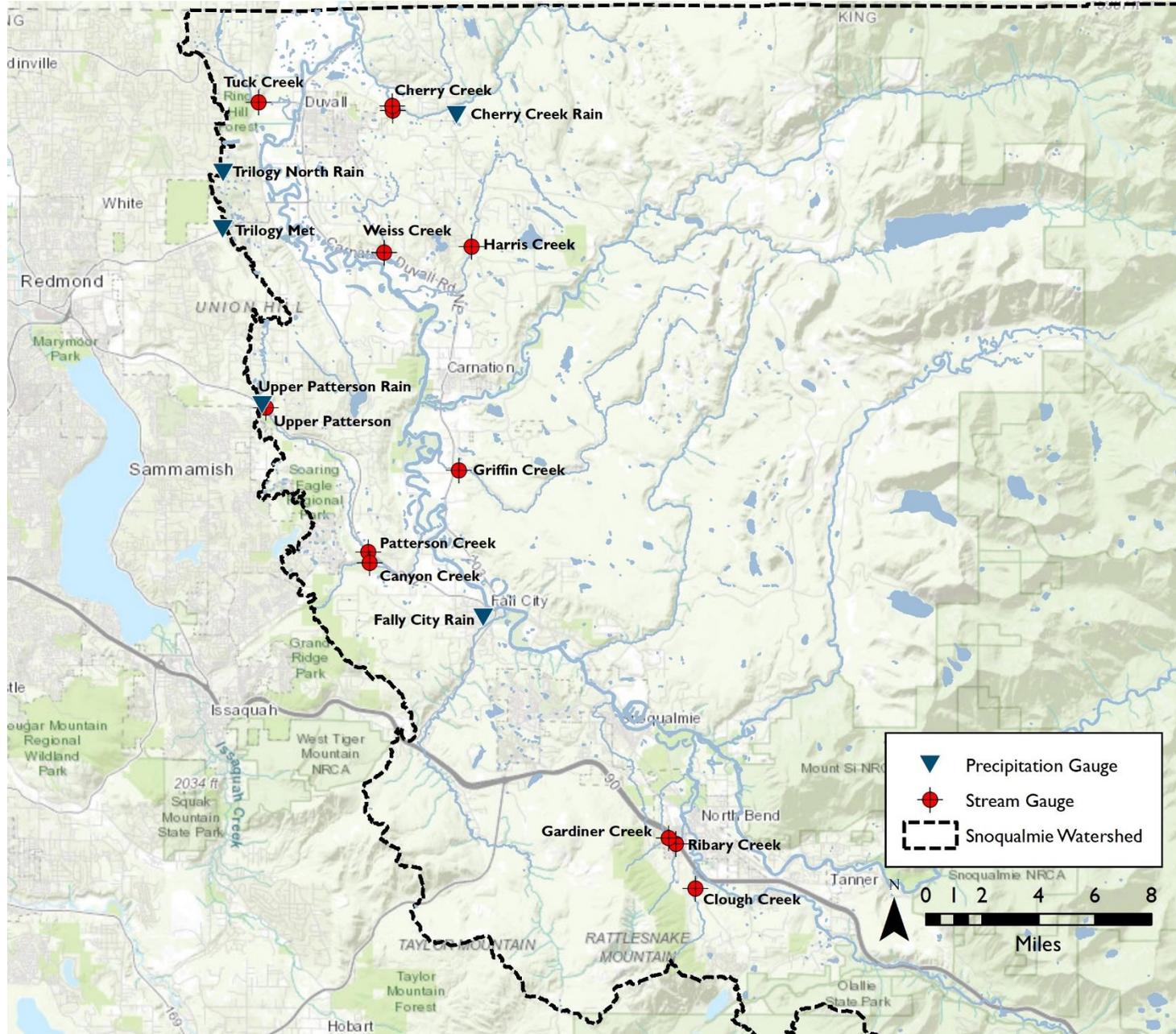
July 2014



King County

Department of Natural Resources and Parks
Water and Land Resources Division

2 Ambient Water Quantity Monitoring



FLOW GAGE

Site Code	Name	Data Since	Other Parameters*
05a	Cherry Creek	2001	WTC, ATC
05b	Cherry Creek trib	2008	WTC, K25
61a	Tuck Creek	2008	WTC
53e	Weiss Creek	2009	WTC
48an	Patterson Creek	2013	WTC
48c	Upper Patterson	1990	WTC
48b	Canyon Creek	1990	WTC, ATC
22a	Harris Creek	2001	WTC, ATC
21a	Griffin Creek	2001	WTC, ATC
55c	Gardiner Creek	2013	
55b	Ribary Creek	2013	
55a	Clough Creek	2013	BAR

RAIN

Site Code	Name	Data Since	
19u	Fall City rain	2010	BAR
48y	Upper Patterson rain	2002	
05u / 05un	Cherry Creek rain	2008	
Trilogy_met	Trilogy met	2005	
02v / 02vn	Trilogy north rain	1989	

* WTC = Water temperature, ATC = air temperature, K25 = conductivity, BAR = barometric pres.

* Also water level gauges on Snoqualmie mainstem for restoration projects

2 Ambient Water Quantity Monitoring

You can access the data at the King County Hydrologic Information Center (HIC) website:

<https://green2.kingcounty.gov/hydrology/>

- View station map
- Download data
- Plot data

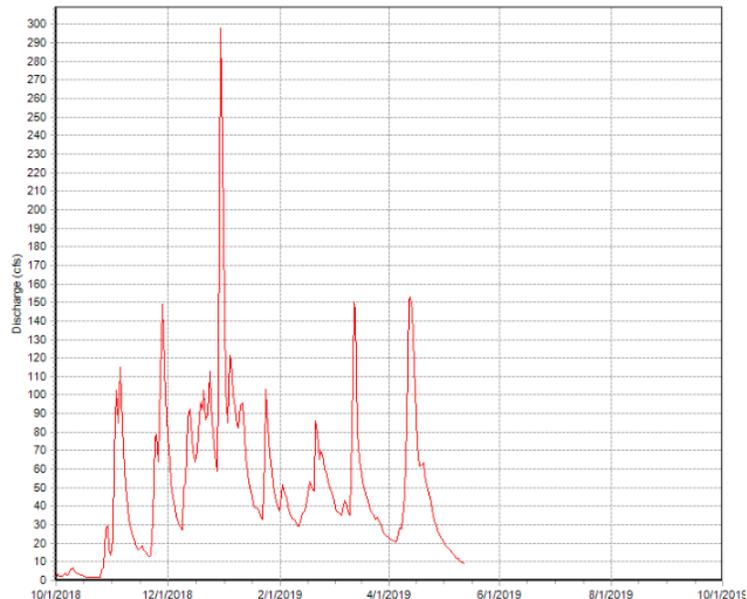
Annual Summary Graph

Daily mean flow rate (cfs) for water year 2019

05A - Cherry Creek Stream Gauge(Recording)

Select a parameter: Stream Flow

Select a water year: 2019



King County

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Home > Services > Environment > Watersheds and rivers > Hydrologic Information Center

Hydrologic Information Center

The Hydrologic Information Center provides public access to rainfall, streamflow and other hydrologic data collected at King County gage sites. Data currently available from this web site include:

1. daily rainfall totals
2. average daily stream discharge rates
3. 15-Minute rainfall and streamflow
4. discrete water quality data

[About the Hydrologic Monitoring Program](#) gives a detailed description of gaging sites, gaging equipment and monitoring procedures.

To Obtain Data:

Please go to the [Hydrologic Data Download Page](#).

Sea-Tac Precipitation Summary

Are we having a wet/dry/average year of precipitation as recorded at Sea-Tac International Airport? The [Sea-Tac precipitation page](#) displays the current daily total precipitation as recorded at Sea-Tac by the National Weather Service.

Hydrology Presentations

View presentations given by King County hydrology staff on the [Science Seminar Web site](#).

If you have question on this site, please contact [David Funke](#) 206-477-4692

Last Updated February 9, 2018

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3 Ambient Benthos Monitoring



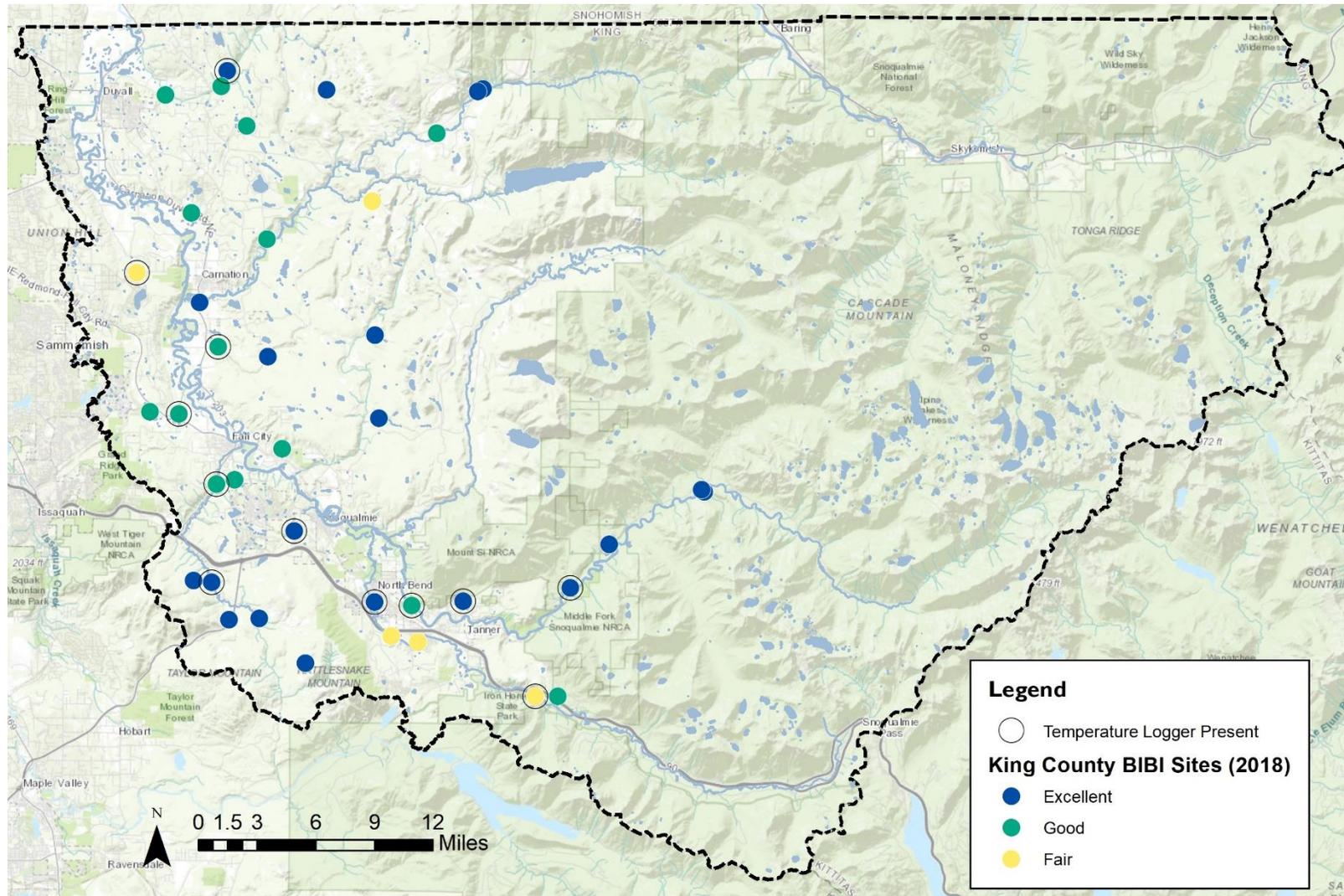
- Benthic macroinvertebrates live in the substrate of streams
- Sample to determine biological health of streams/watersheds
- Aggregated into **BIBI** score
 - Taxa richness
 - Sensitive taxa
 - Long-lived taxa
 - 10 metrics total

3 Ambient Benthos Monitoring

39 Sites in WRIA 7
Mostly in tributaries

Big Picture Thoughts

- Consistently some of the best sites in the ambient monitoring program in King County
 - 34/39 (87%) BIBI excellent or good
 - No poor or very poor sites
- Sites represent working lands compared to other ambient sites impacted by urbanization
- Margaret and Weiss Creeks part of NTA study
 - Excellent sites worth preserving
 - Developing plans for protection



3 Ambient Benthos Monitoring

You can access the data at Puget Sound Stream Benthos website:

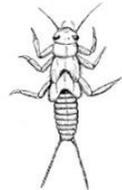
<https://www.pugetsoundstreambenthos.org/>

- Download data
- Map data
- Search by “area” (select WRIA7)



Analyzing Stream Health

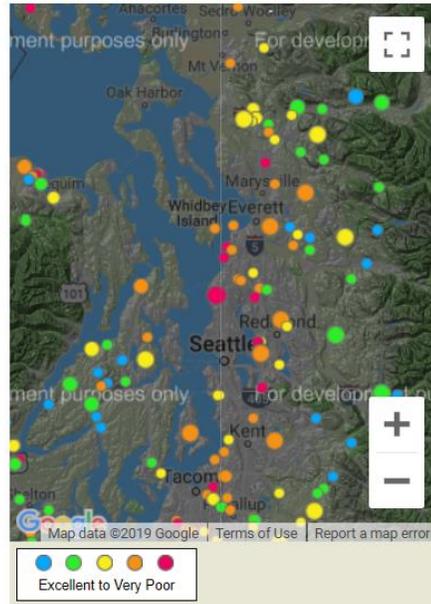
This site analyzes benthic macro-invertebrate community structure to determine the ecological health of streams. [Participating agencies](#) use this site to manage, analyze and share data from their ongoing stream monitoring programs.



etc.

Benthic macroinvertebrates, also known as stream bugs, are animals that can be seen with the naked eye, do not have backbones and live in the stream benthos—in or near the streambed. They include insects, crustaceans, worms, snails, clams,

Plotting Biotic Integrity



[Click here to customize chart.](#)

The B-IBI Scoring System

We use the [Benthic Index of Biotic Integrity \(B-IBI\)](#) scoring system to determine stream health. Since the B-IBI is a standardized scoring system, it can be used to compare and rank the health of different streams.

B-IBI has several variants, and we will support many of them over time. Currently, we are using Puget Sound Lowlands B-IBI. This site allows you to filter the scores by a variety of parameters and then

- [Plot the scores on maps](#)
- [Show the scores in tables](#)

Regional Puget Sound B-IBI Projects

King County worked with regional partners on two Puget Sound B-IBI projects. For more information and to view products related to these efforts please go to:

1. [B-IBI Recalibration](#), 2010-2014. This project enhanced benthic macroinvertebrate monitoring tools for the Puget Sound region.
2. [Restoration Priorities](#), 2013-2015. This project developed a framework for identifying sites and strategies to protect watersheds with “excellent” B-IBI scores or restore watersheds with “fair” B-IBI scores.



Analysis: Benthic Index of Biotic Integrity

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Analysis: **Benthic Index of Biotic Integrity** Show Criteria

Area: All Streams Project: All Projects Location or Keyword:

Aggregation: Don't Aggregate Score Type: 0-100 B-IBI Metric: Overall Score

Replicate Handling: Combine replicates, then calculate Taxonomic Resolution/STE: As Defined by Metadata Taxa at Visit Metrics:

Taxa Attributes: (See lists) Taxa Exclusions: Taxa at Visit Filter:

Fore, Wiseman, 2012 (recommended for 0-100 B-IBI) [See the list](#)

Number of Organisms: Count per Sample Count per Visit Year: Latest per Site in Range All in Range

Min: Max: 500 Flag Omit Omit/Subsample Range from: Earliest through Latest

Open in new tab

Row	Site Code, Location	Year, Project	Quantities										Scores						View Samples							
			Taxa Richness	Ephemeroptera Richness	Plecoptera Richness	Trichoptera Richness	EPT Richness	Clinger Richness	Long-Lived Richness	Intolerant Richness	Percent Dominant	Predator Percent	Tolerant Percent	Organisms	Overall Score	Taxa Richness	Ephemeroptera Richness	Plecoptera Richness		Trichoptera Richness	Clinger Richness	Long-Lived Richness	Intolerant Richness	Percent Dominant	Predator Percent	Tolerant Percent
1	WAM06600-000988, No...	2009, WatershedHealth...	39	4	4	4	12	8	4	4	66.6%	16.0%	0.2%	500	43.4	4.1	4.3	4.3	3.8	0.6	2.5	5.7	0.6	7.5	10.0	Details
2	WAM06600-000992, Ke...	2009, WatershedHealth...	51	4	5	8	17	12	11	4	47.6%	13.9%	1.7%	288	67.5	8.3	4.3	5.7	8.8	2.9	10.0	5.7	5.8	6.5	9.6	Details
3	BI006600-RACE77, Ra...	2017, Ambient Freshwat...	55	10	9	7	26	21	10	14	47.2%	11.4%	0.2%	500	86.4	9.7	10.0	10.0	7.5	8.2	10.0	10.0	5.9	5.2	10.0	Details
4	WAM06600-000672, Ra...	2013, WatershedHealth...	45	10	10	4	24	18	6	11	33.6%	21.4%	0.2%	500	80.9	6.2	10.0	10.0	3.8	6.5	5.0	10.0	9.6	10.0	10.0	Details
5	WAM06600-005232, Ra...	2009, WatershedHealth...	16	5	4	3	12	9	2	5	56.5%	15.3%	0.0%	85	41.3	0.0	5.7	4.3	2.5	1.2	0.0	7.1	3.4	7.2	10.0	Details
6	At Baker Creek, Squalc...	2012, TMDL Studies Pro...	27	1	1	0	2	4	2	0	81.6%	1.8%	63.0%	500	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	Details
7	EPA06600-SQUA01, Sq...	2015, EPA Region 10, O...	37	0	2	2	4	13	8	0	54.8%	12.4%	7.6%	500	34.9	3.4	0.0	1.4	1.2	3.5	7.5	0.0	3.8	5.7	8.2	Details

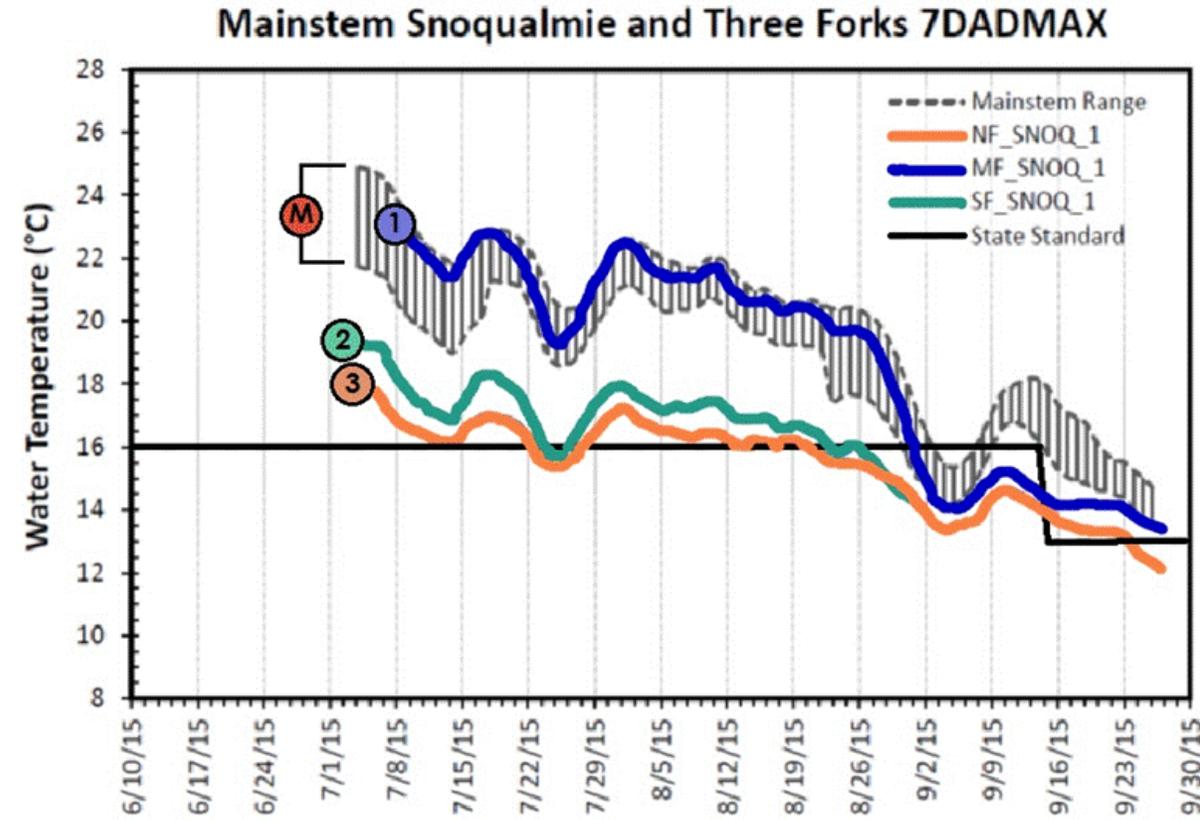
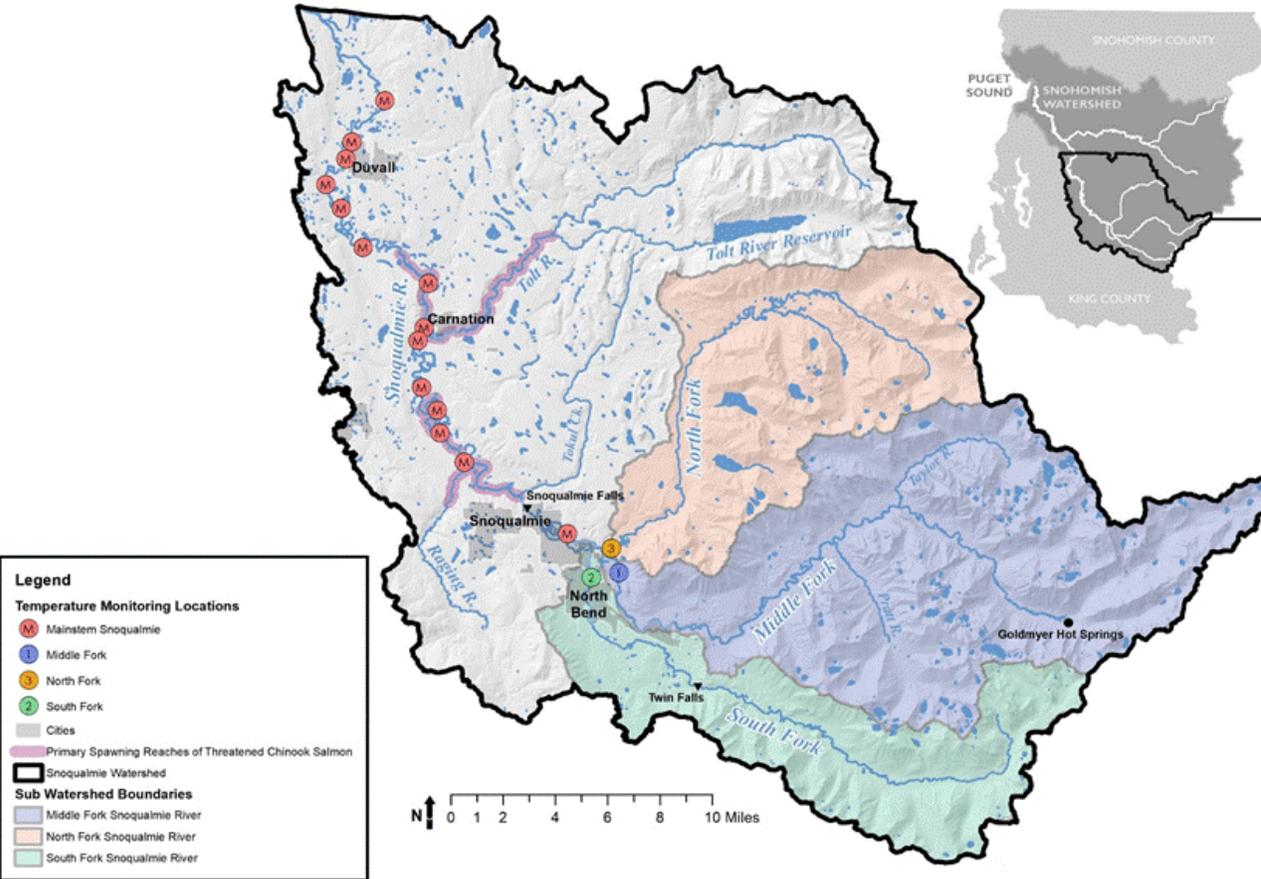
For information on this program, please contact:

Kate Macneale – Kate.Macneale@kingcounty.gov

or

Beth Sosik - esosik@kingcounty.gov

4 Middle Fork Temperature Monitoring

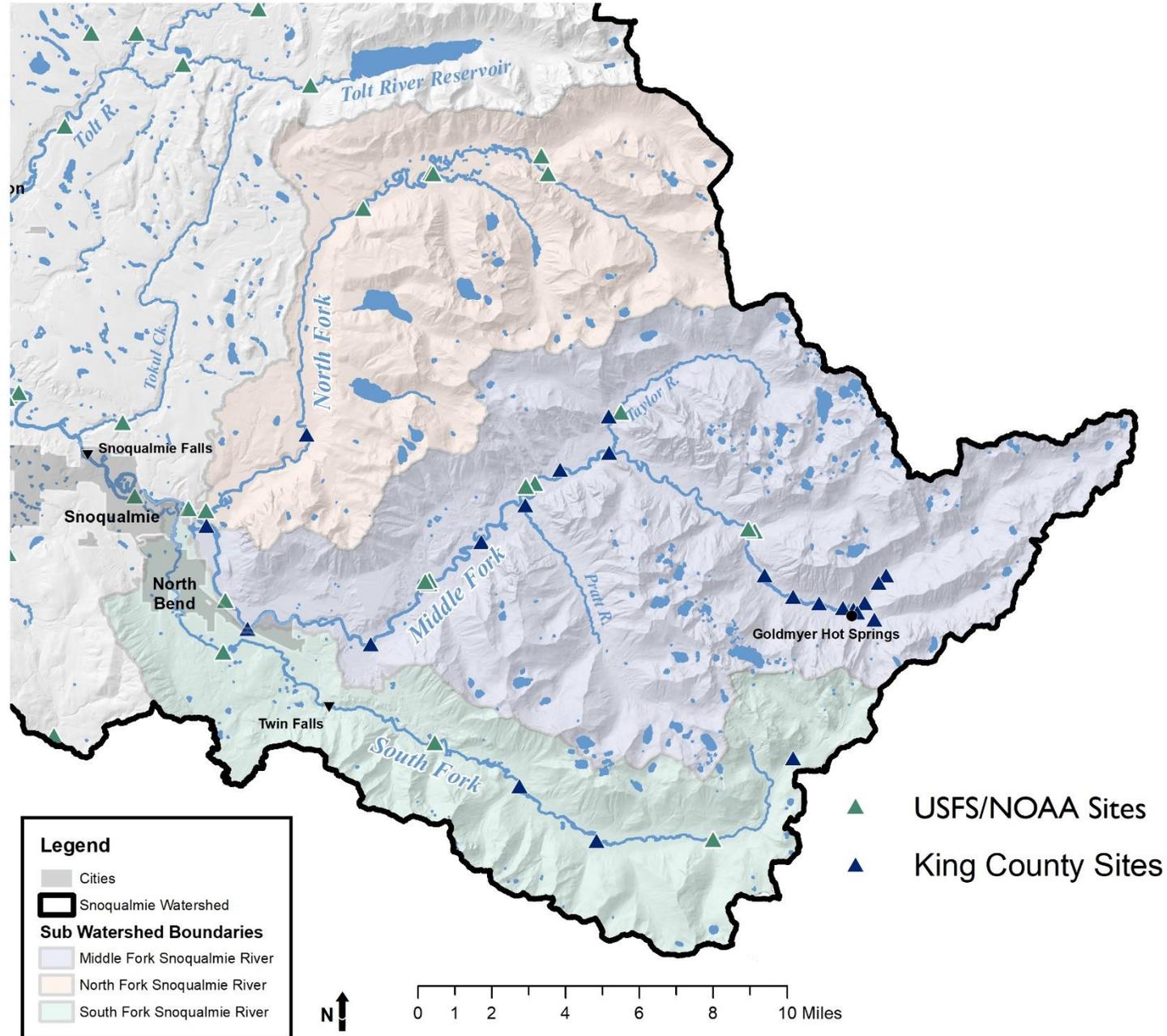


Adapted from King County, 2015

- During summer months, the Middle Fork is warmer than other forks
- The thermal regimes in mainstem below Falls similar to those on Middle Fork
- Temperatures above and below the Falls above State standards, often reach lethal levels

WHY?

4 Middle Fork Temperature Monitoring

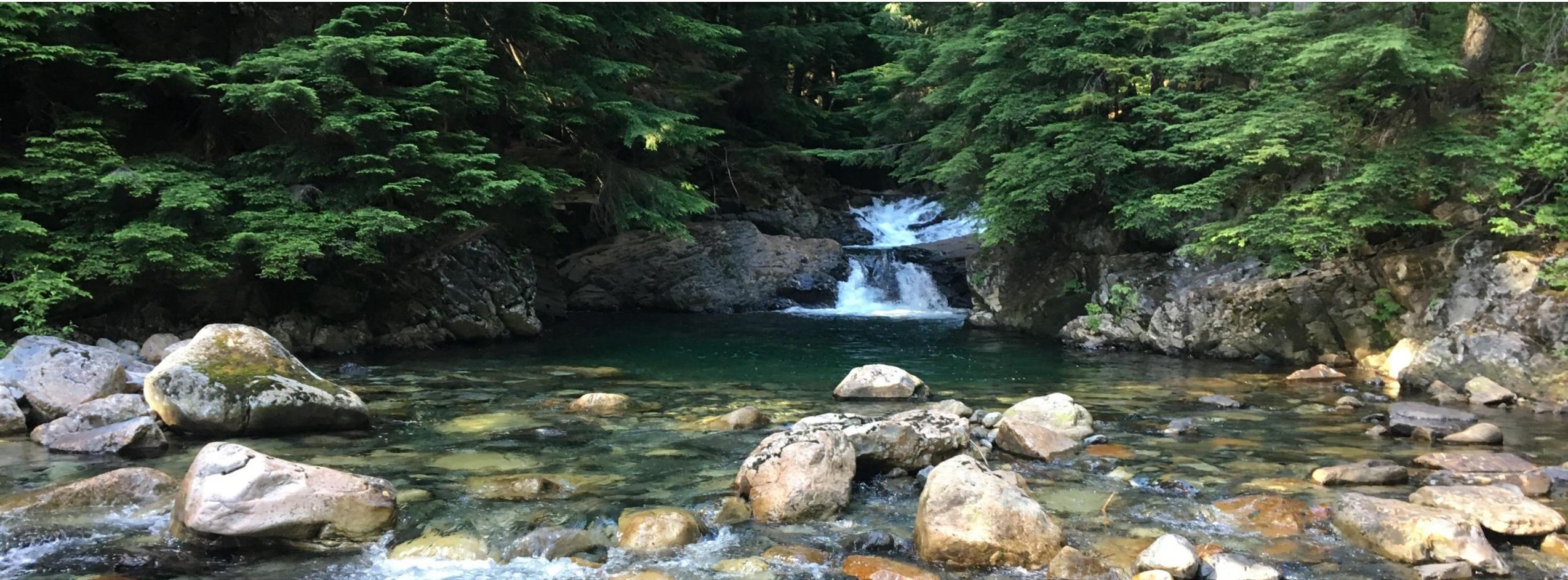


In 2018, deployed 21 loggers in the upper Snoqualmie watershed

- 17 Middle Fork
- 3 South Fork
- 1 North Fork

- Maintain logger network for at least 3 years, hopefully 5 years, maybe beyond.

THANK YOU
QUESTIONS?

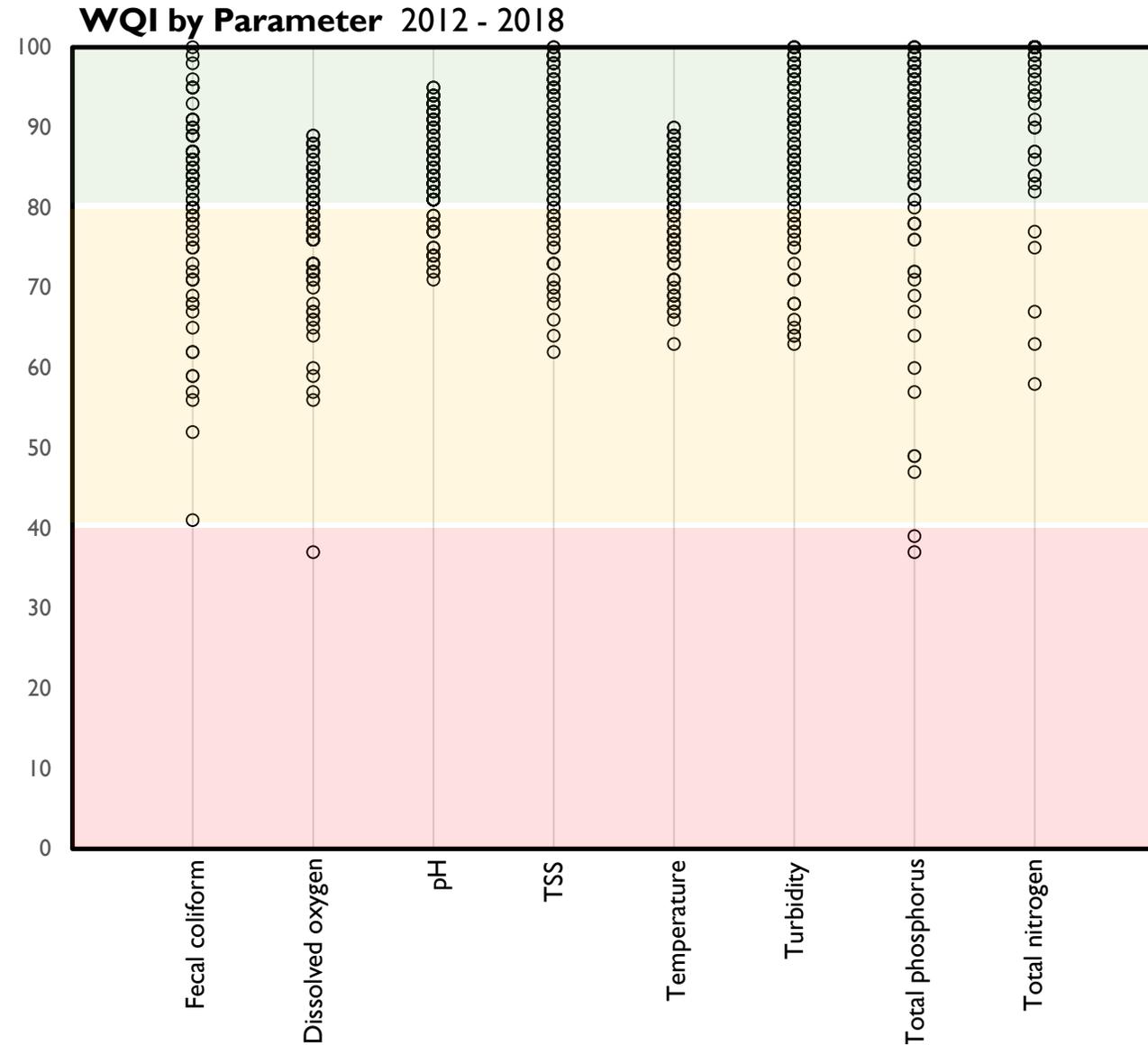
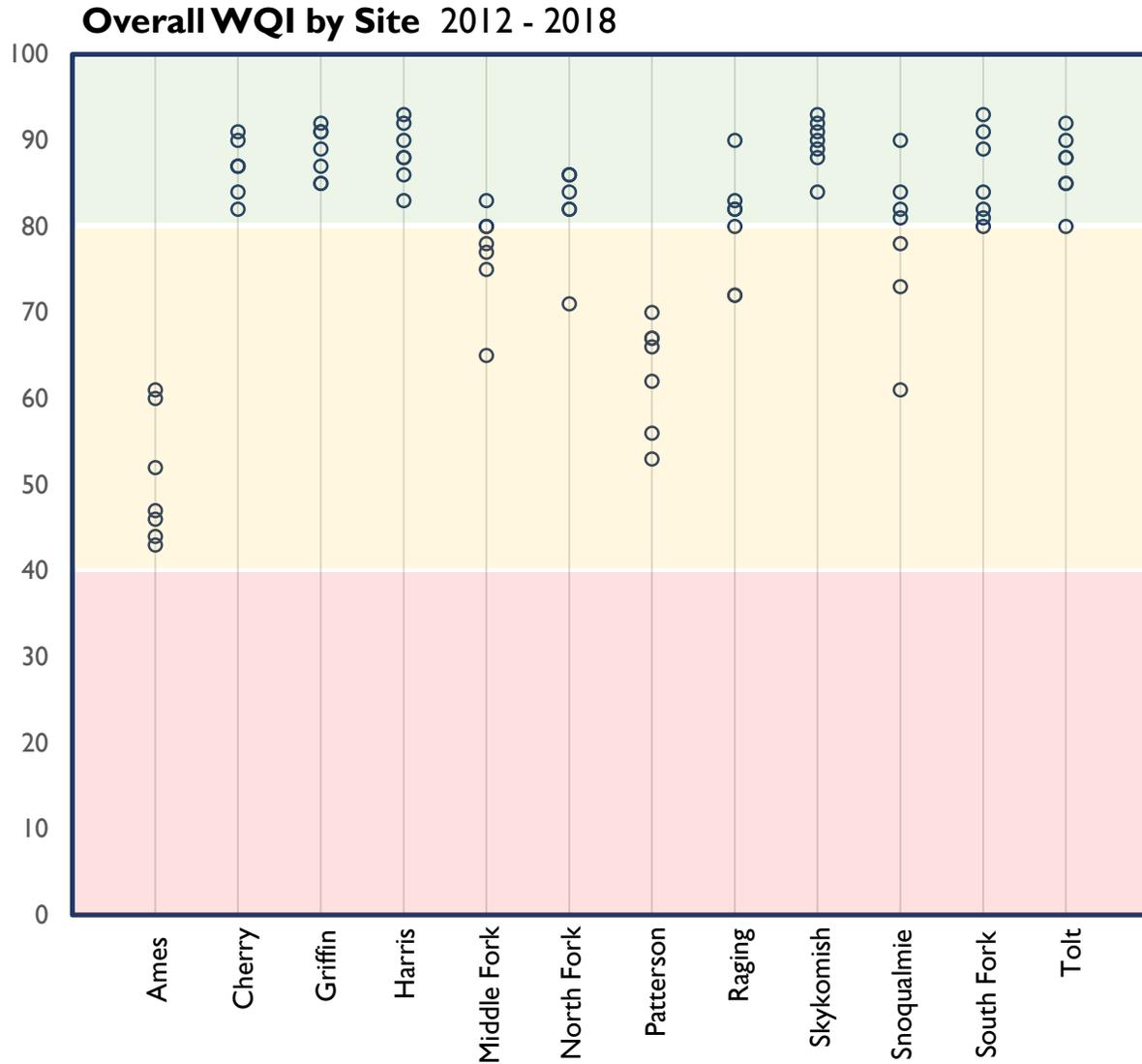


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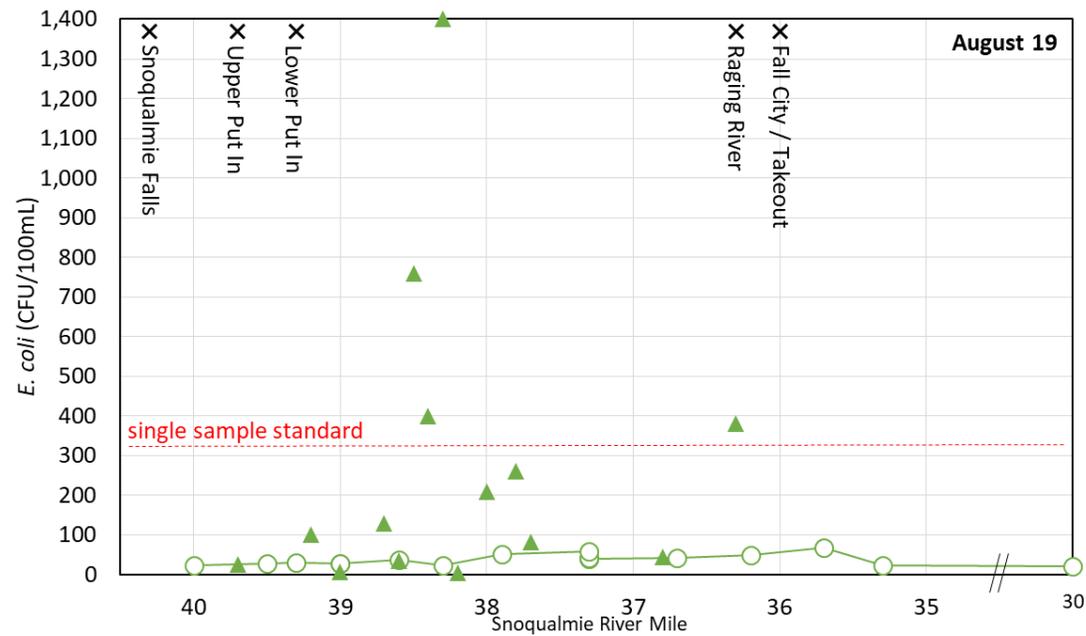
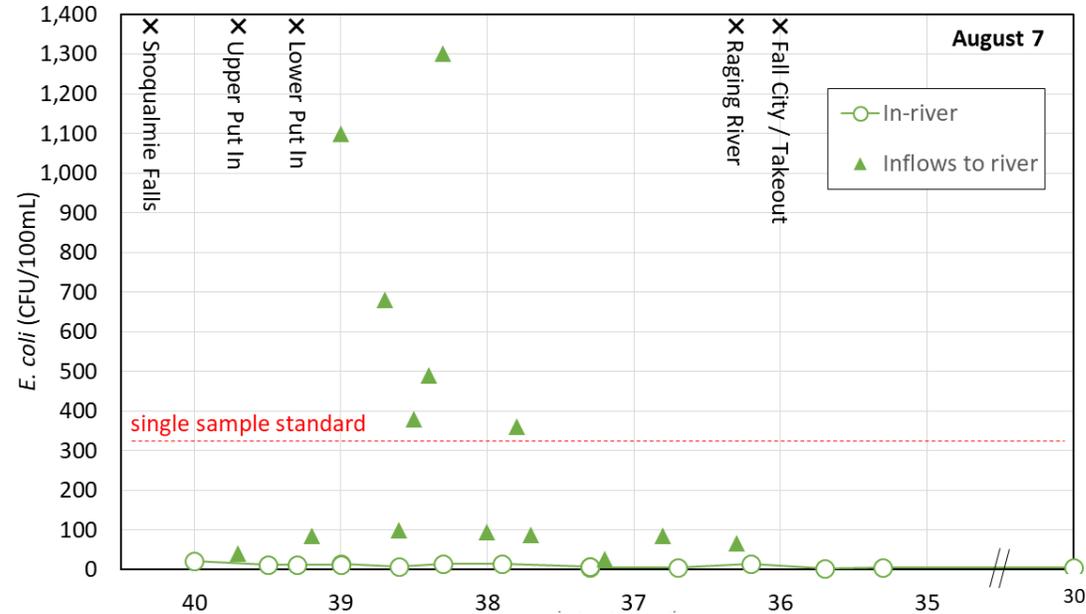
Ambient Water Quality Monitoring



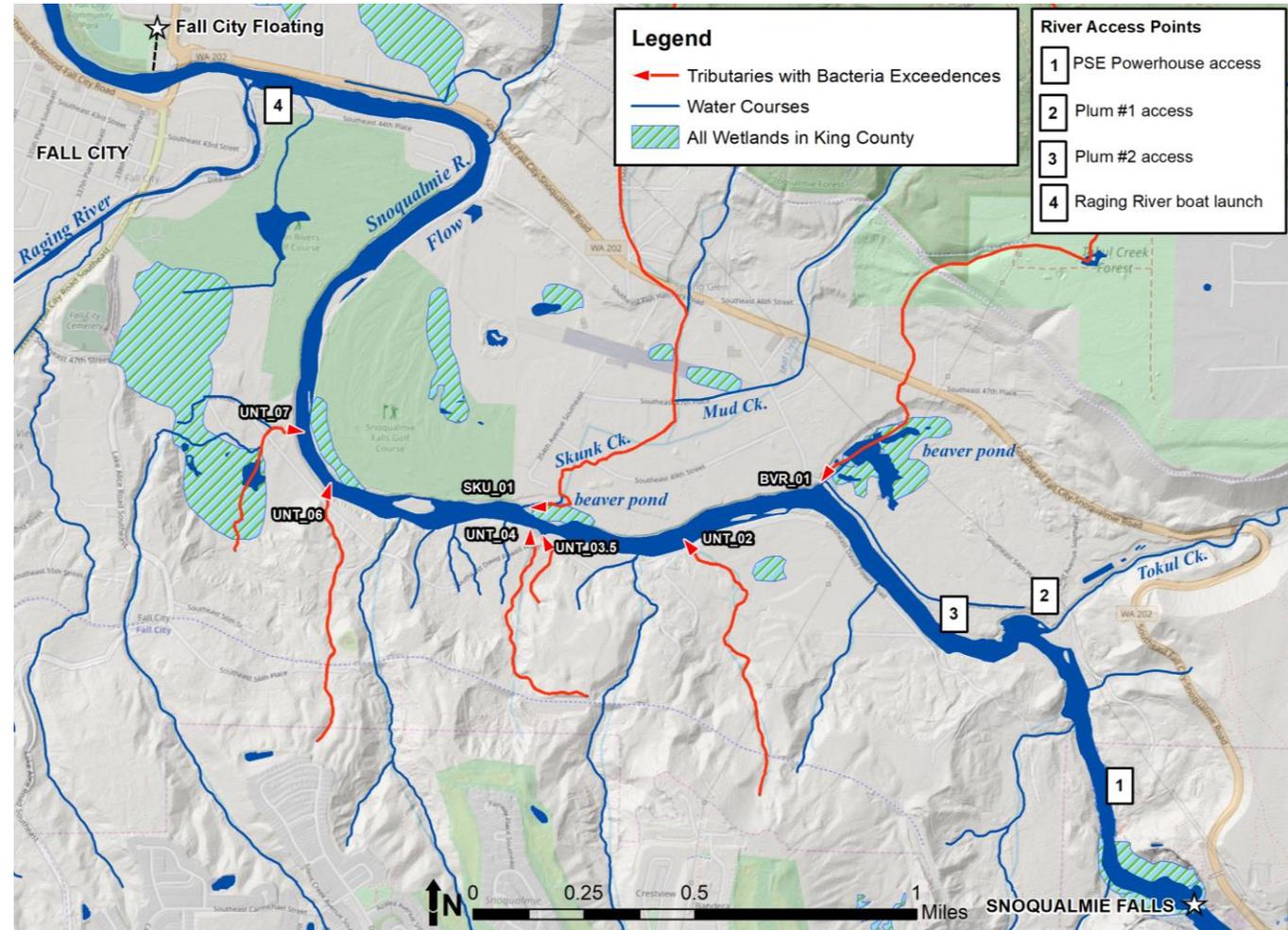
WQI – Water Quality Index – metric developed by WA Dept. of Ecology to turn complex WQ data into a single number



5 Microbial Source Tracking – River Recreation



- All in river samples below state standards for FC/*E. coli*
 - few qPCR markers detected
- A few tributaries well above state standards
 - Quick dilution; few qPCR markers tested



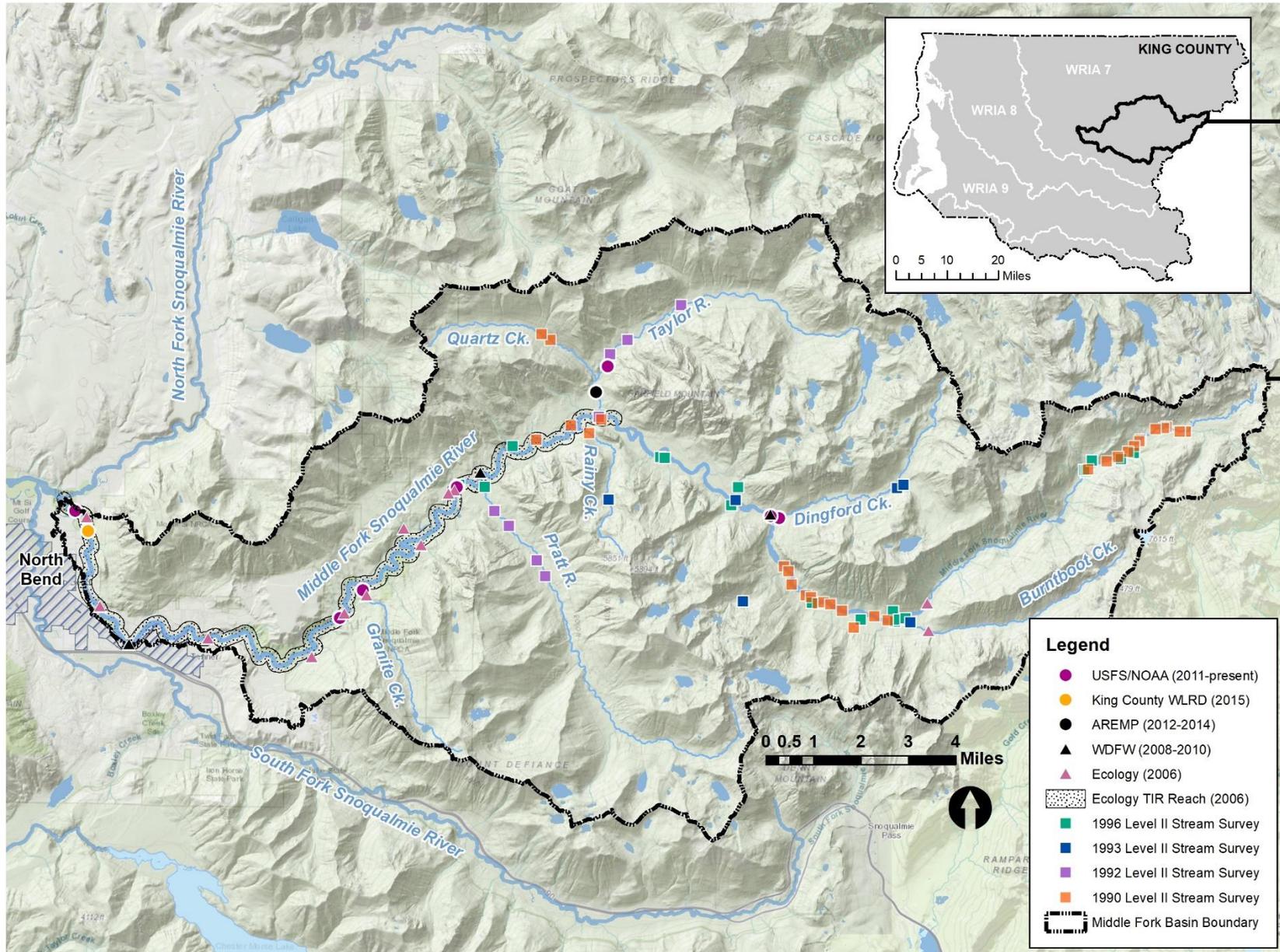
4 Middle Fork Temperature Monitoring

WHY?

Step I: What do we already know?

Technical Memorandum

- Aggregate existing data
- Synthesize findings
- Identify data/knowledge gaps



5 Microbial Source Tracking

2018
River recreation – are floaters exposed to harmful levels of fecal bacteria? Are they contributing fecal bacteria?

2019
River recreation follow-up
Ames Creek

