Upper Klamath and Lost River Subbasins Temperature TMDL Development

Technical Approach Overview

Temperature TMDL Advisory Committee

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Presentation Overview

TMDL Elements

Stage 1 Waterbodies

Stage 2 Waterbodies

TMDL Elements

Waterbody Name and Location

Pollutant

Water quality standard and beneficial uses

Loading Capacity

Excess Load

Sources or Source categories

Wasteload Allocations

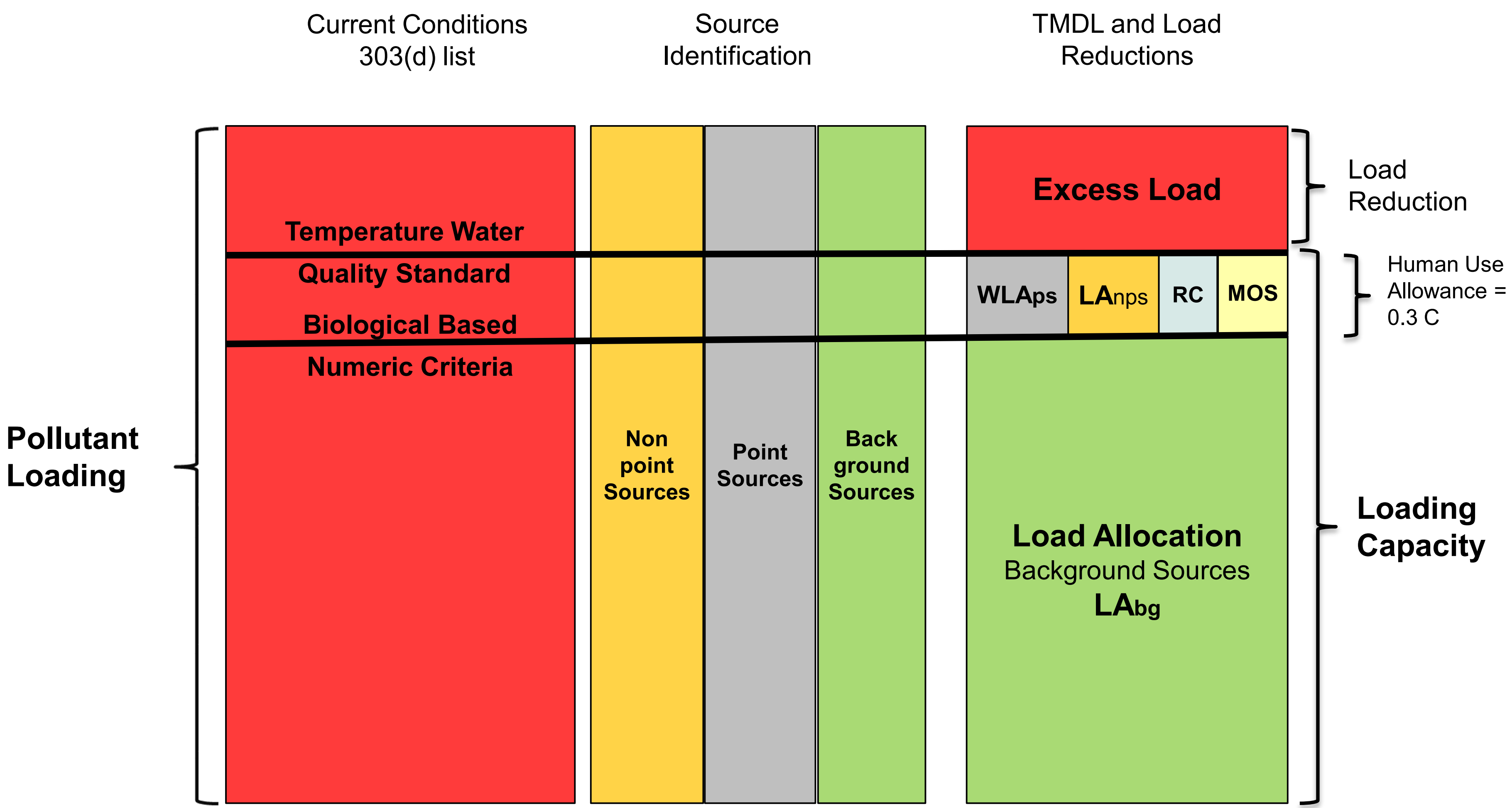
Load Allocations

Margin of Safety

Seasonal Variation

Reserve Capacity

$\mathbf{TMDL = WLA_{ps} + LA_{nps} + LA_{bg} + MOS + RC}$



Stage 1 Temperature Impaired Waters

Subbasin	303(d) ID	Stream Name	Length (River Miles)
Lost River	24458	Antelope Creek	14.1
	2182	Antelope Creek	1
	12738	Barnes Valley Creek	14
	12737	Ben Hall Creek	8.7
	12766	Buck Creek	12.8
	24459	East Branch Lost River	2.4
	2166	Horse Canyon Creek	2.2
	12726	Lapham Creek	4
	12732	Long Branch Creek	4.6
	24463	Lost River	60.6
	1994	North Fork Willow Creek	2.3
	12729	Rock Creek	4.3
Upper Klamath River	12872	Beaver Creek	5.5
	2158	Grizzly Creek	3
	2180	Hoxie Creek	3.6
	2159	Johnson Creek	9.4
	2163	Keene Creek	7.2
	2178	Keene Creek	2.2
	2168	Mill Creek	3.9
	2181	South Fork Keene Creek	3.1
	12815	Spencer Creek	18.9

Stage 1 Waterbodies

No modeling in draft 2010 TMDL

Modeling of management scenarios shows attainment of applicable criteria (e.g. Spencer Creek)

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Stage 2 Temperature Impaired Waters

Subbasin	303(d) ID	Stream Name	Length (River Miles)
Lost River	1993	Miller Creek	9.6
Upper Klamath River	1984	Jenny Creek	17.8
	12840	Klamath River	24.1

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Stage 1 Waterbodies
TMDL Loading Capacity Equation

$$LC = (T_C + HUA) \times Q_R \times C_F$$

LC =	Loading Capacity (kilocalories/day).
T_C =	The applicable temperature criteria (°C).
HUA =	The 0.3°C human use allowance allocated to point sources, nonpoint sources, margin of safety, or reserve capacity.
Q_R =	The daily average river flow rate, upstream (cubic feet per second [cfs]).
C_F =	Conversion factor using cfs: (2,446,622 kcal-s/°C-ft^3-day) $\frac{1\,m^3}{35.314\,ft^3} \times \frac{1000\,kg}{1\,m^3} \times \frac{86{,}400\,sec}{1\,day} \times \frac{1\,kcal}{1\,kg \times 1°C} = 2{,}446{,}622$

Loading Capacity Stream Flow Ranges

Flow Condition	Statistical Representation	Applicable River Flow Range	Description
Low	7Q10	Q_R < 95th percentile	Lowest 7-day average flow that occurs (on average) once every 10 years (7Q10).
Dry	95th percentile	95th percentile ≤ Q_R < 50th percentile	Flow that is exceeded approximately 95%, or the vast majority, of the time.
Mild	50th percentile	50th percentile ≤ Q_R < 25th percentile	Flow that is considered within the typical or *normal* range; includes the median flow for a stream.
Moderate	25th percentile	25th percentile ≤ Q_R < 10th percentile	Flow that is exceeded only 25% of the time, considered to be *above* the normal range.
High	10th percentile	10th percentile ≤ Q_R < 5th percentile	Flow that is exceeded only 10% of the time, considered to be *far above* the normal range; often associated with the rainy season and higher storm flows.
Very High	5th percentile	Q_R ≥ 5th percentile	Flow that is infrequently exceeded; represents very high flows that do not occur often.

Stream Flow Data Sources

USGS/OWRD Gaged Stream (e.g. Spencer Creek)

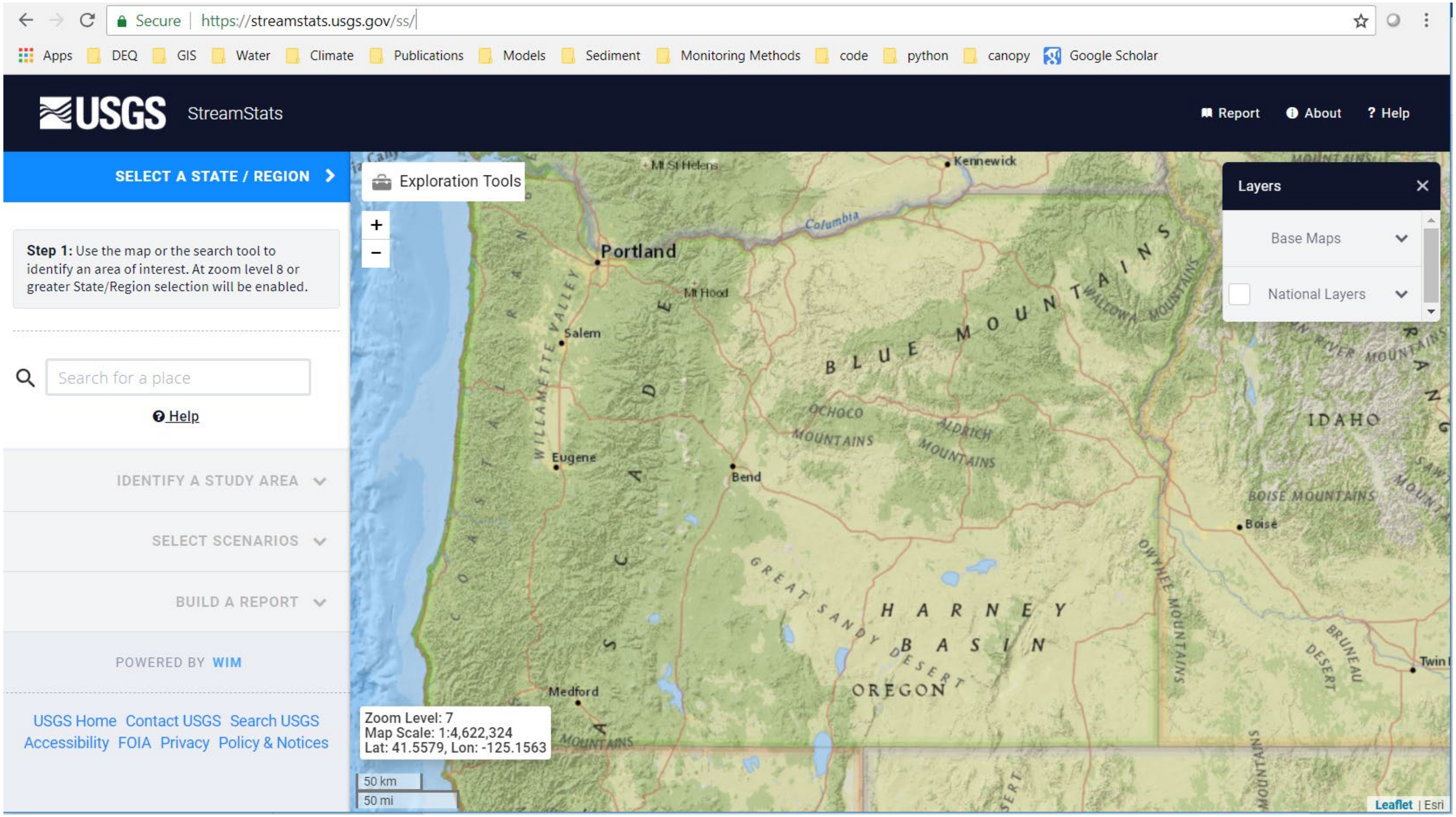
Ungaged Sites

- USGS StreamStats - Cooper (2005) and Risley et al. (2008)
- Model Outputs (e.g. Lost River CE-QUAL-W2)

Cooper, R. M., 2005, Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon: U. S. Geological Survey Scientific Investigations Report 2005-5116, 134 p.

Risley, J., Stonewall, A., and Haluska, T., 2008, Estimating flow-duration and low-flow frequency statistics for unregulated streams in Oregon: U.S. Geological Survey Scientific Investigations Report 2008-5126, 22 p.

USGS StreamStats



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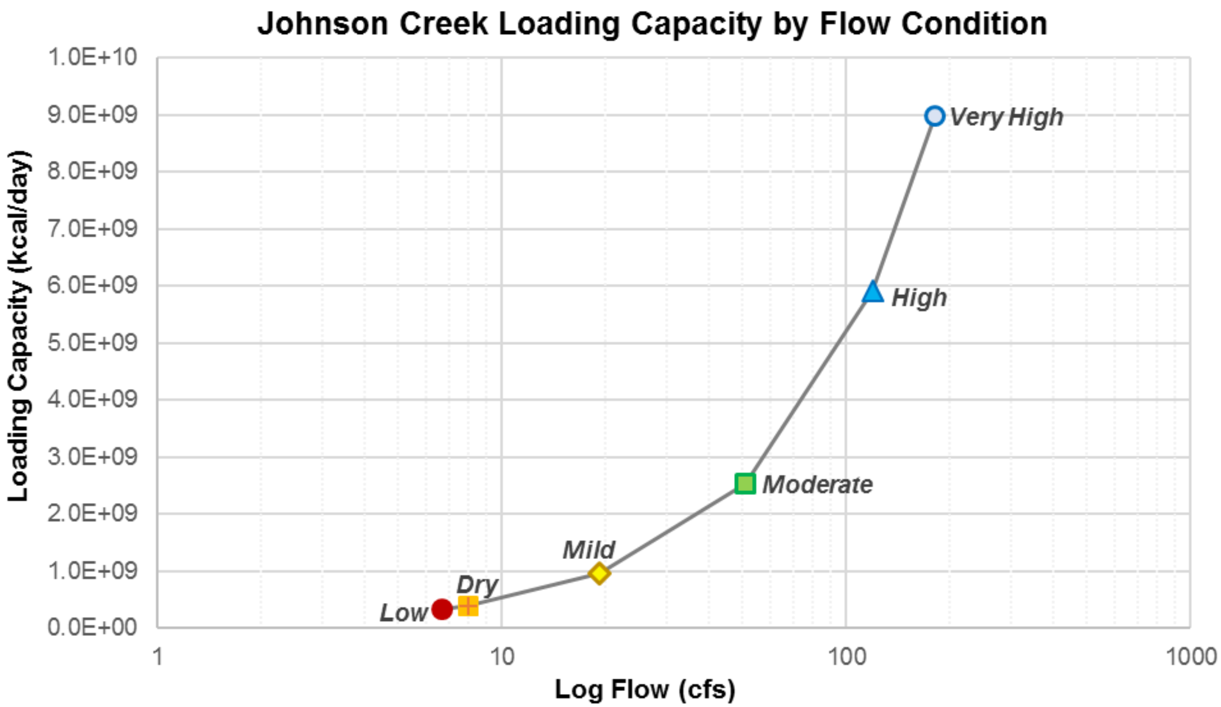
Johnson Creek Loading Capacity (Draft)



Flow Condition	Representative Flow Estimate (cfs)	Applicable Flow Range	Thermal Loading Capacity (kcal/day)
Low	7	<8 cfs	3.33E+08
Dry	8	8 cfs to <19 cfs	3.97E+08
Mild	19	19 cfs to <51 cfs	9.54E+08
Moderate	51	51 cfs to <119 cfs	2.54E+09
High	119	119 cfs to <181 cfs	5.91E+09
Very High	181	≥181 cfs	8.99E+09

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Stage 1 Waterbodies Next Steps

Allocations and Human Use Allowance

Complete TMDL and WQMP Draft Document

Advisory Meeting in September

Stage 2 Waterbodies Next Steps

Jenny and Miller Creeks

Update NTP model scenario
- Boundary temperatures
- Channel morphology

BBNC is met → Incorporate into Stage 1 TMDL Timeline

BBNC is not met → September 2018 QAPP Update/ Identify additional management scenarios → Develop new model inputs; conduct model scenarios → Define range of natural conditions; ROC Analyses → Stage 2: Draft TMDL or Components of the TMDL

Current Work

Klamath River (Link to CA)

Update T1BSR model scenario
- Boundary temperatures

BBNC is met → Address as Stage 1 TMDL → QAPP Update/ Define scenarios for allocations, etc. → Conduct scenarios to support TMDL → April 2019 Draft TMDL or Components of the TMDL

BBNC is not met → September 2018 Decision on temperature approach QAPP Update/ Identify additional management scenarios → Develop new model inputs; conduct model scenarios → Define range of natural conditions; ROC Analyses → Stage 2: Draft TMDL or Components of the TMDL

Potential Management Strategies Considered for Revised Model Scenarios

Streamside vegetation (site potential; includes microclimate)

Natural flows for headwaters and tributaries (surface withdrawals returned, no groundwater pumping, no diversions), including associated temperature changes

No dams or modified dam management

Channel morphology improvements

No point sources discharges to waterbody

Climate change factors (e.g. air temperatures)

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Thank you!

Extra Slides

Klamath River Model Overview