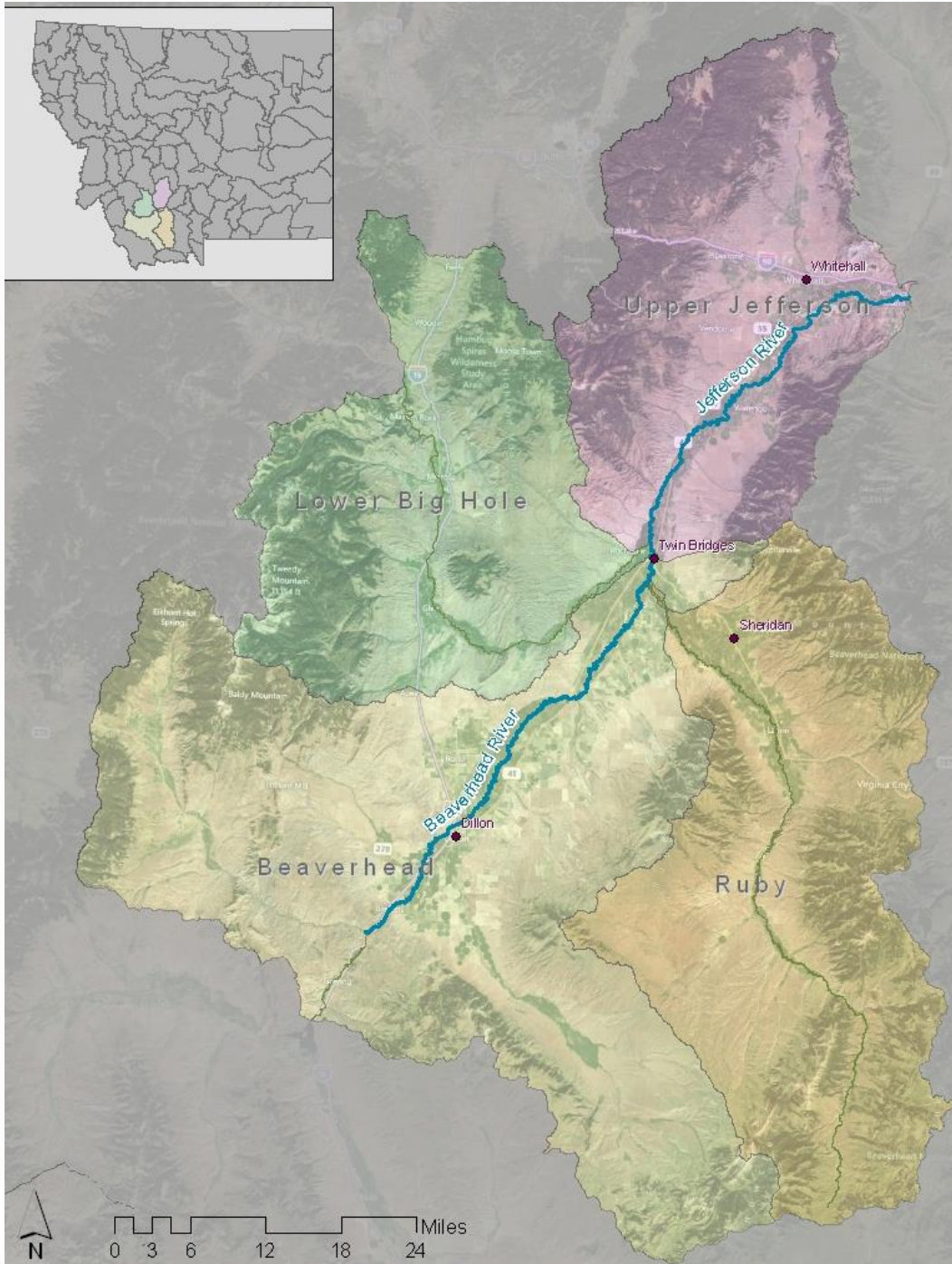


Beaverhead- Jefferson Temperature Document

Watershed Advisory Group Meeting
May 28, 2014

Kristy Fortman
Montana DEQ



Why do we write TMDLs?

Water quality planning tool and Clean Water Act requires states to assess water quality



**Agriculture:
Irrigation**



**Agriculture: Livestock
Water Supply**

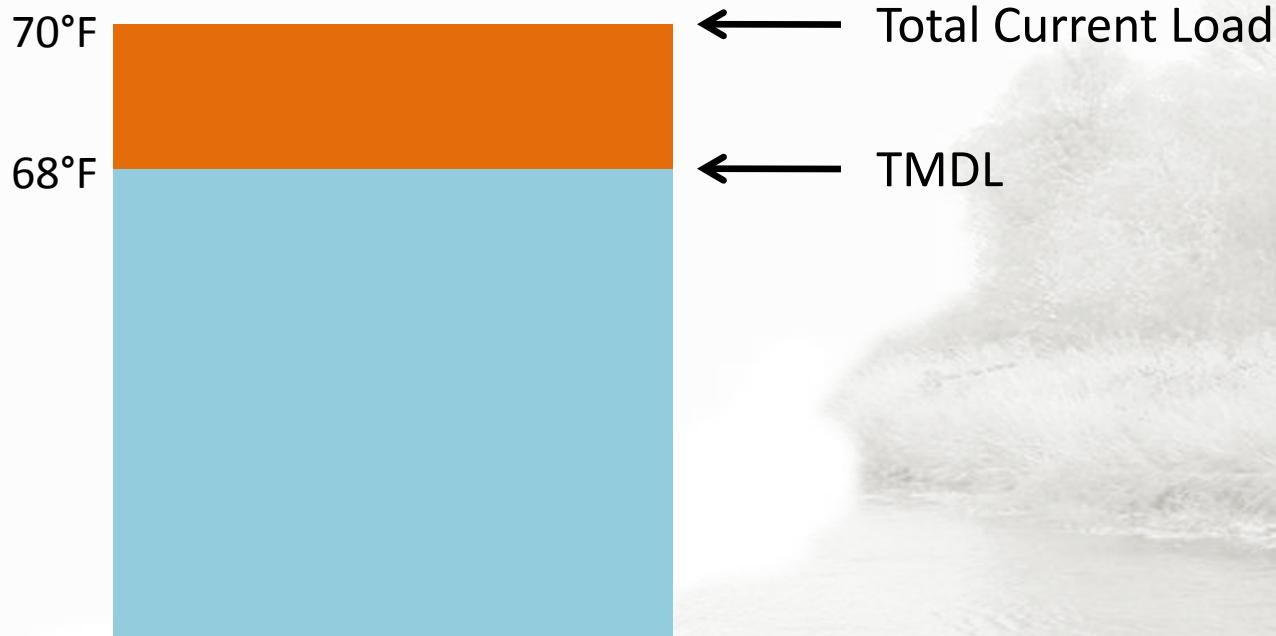


**Aquatic Life:
Coldwater Fish**

Support beneficial uses

What is a TMDL?

Total **M**aximum **D**aily **L**oad is the amount of a pollutant that a stream can receive from all sources and still meet water quality standards



Temperature TMDLs

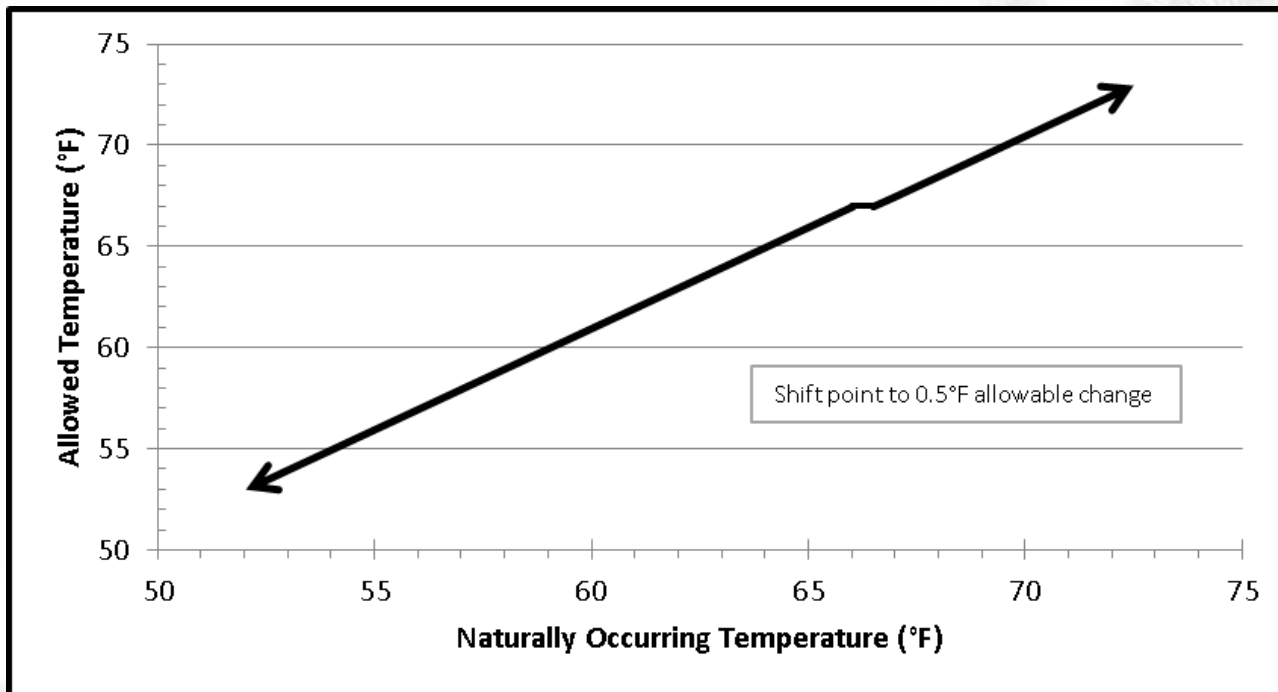
High levels of thermal loading may increase in-stream temperatures to levels that harm fish and other aquatic life populations.



Temperature standard

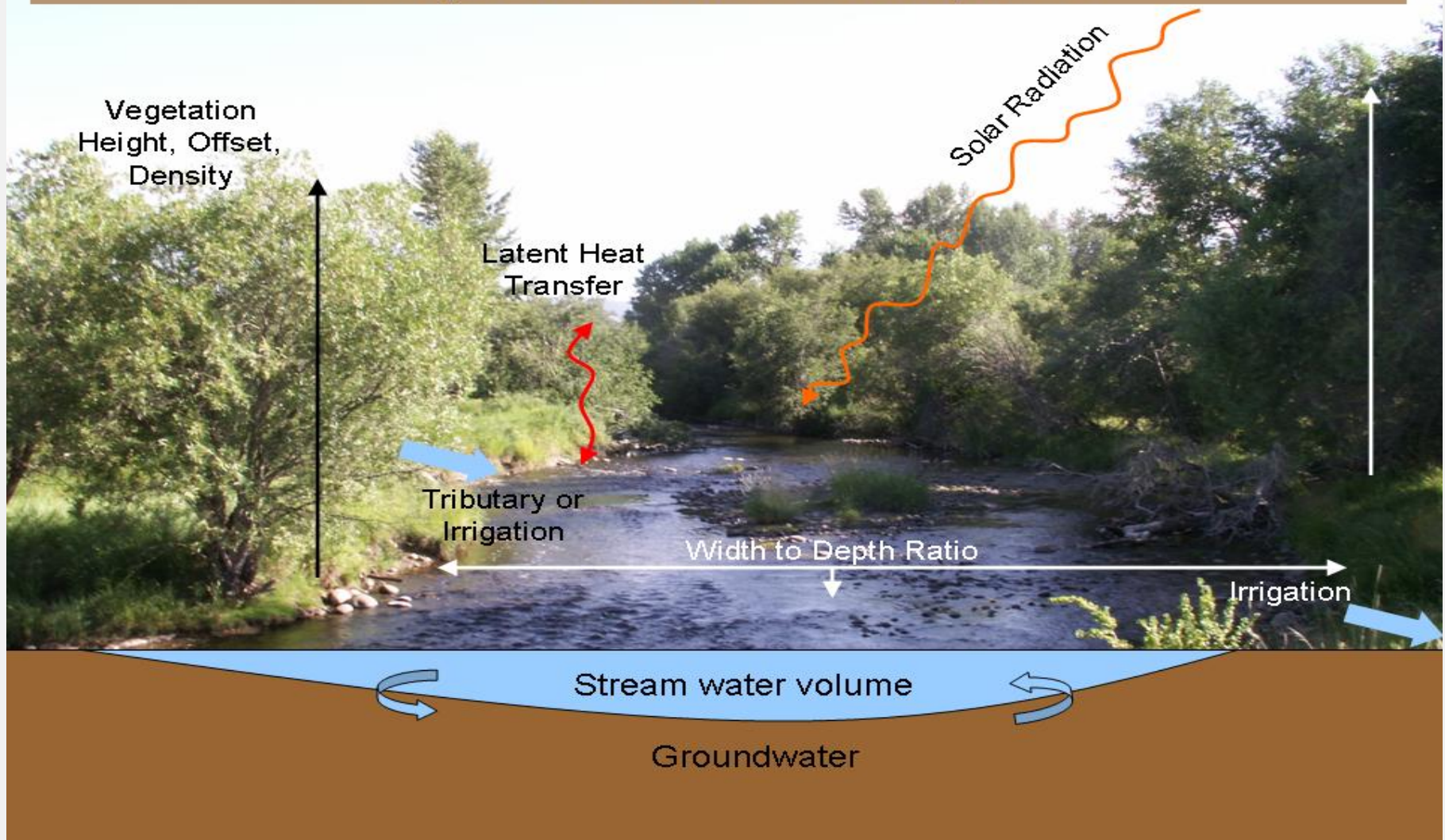
17.30.623(2)(e)

A 1 °F maximum increase above naturally occurring water temperature is allowed within the range of 32 °F to 66 °F; within the naturally occurring range of 66 to 66.5 °F, no discharge is allowed which will cause the water temperature to exceed 67 °F; and where the naturally occurring water temperature is 66.5 °F or greater, the maximum allowable increase in water temperature is 0.5 °F.

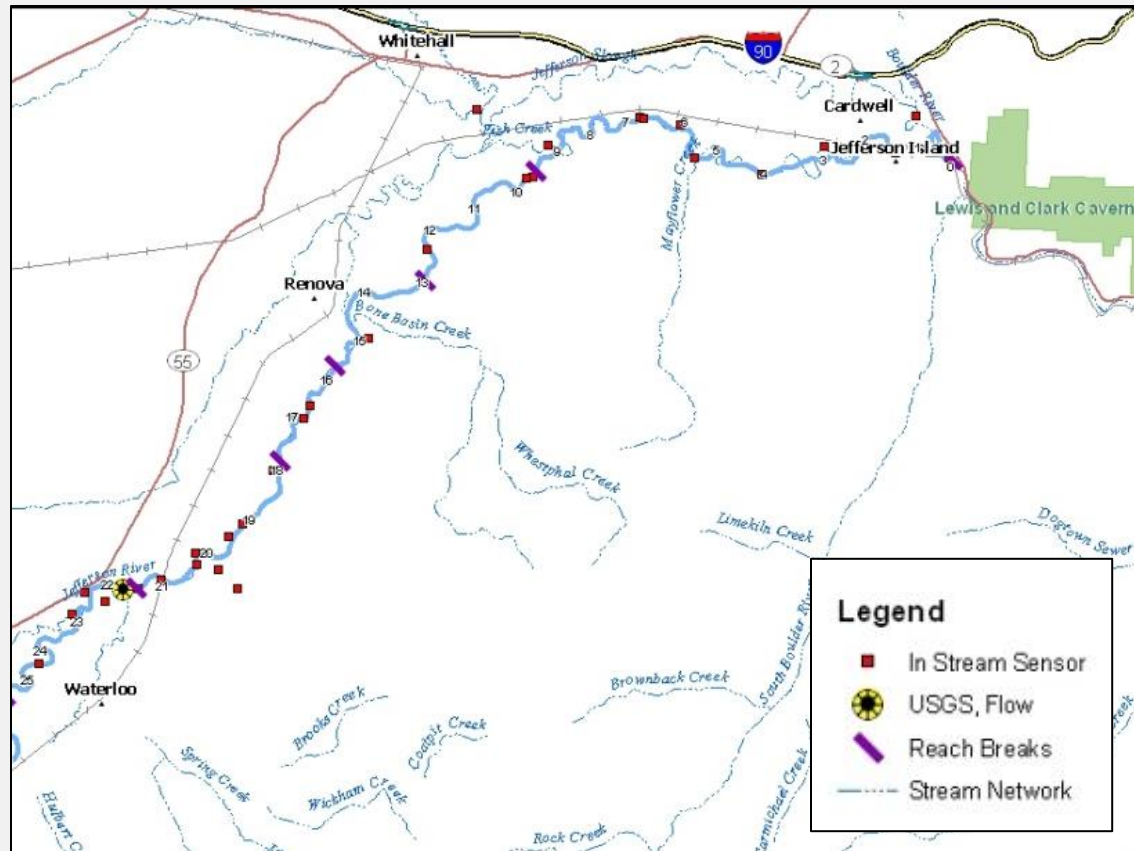
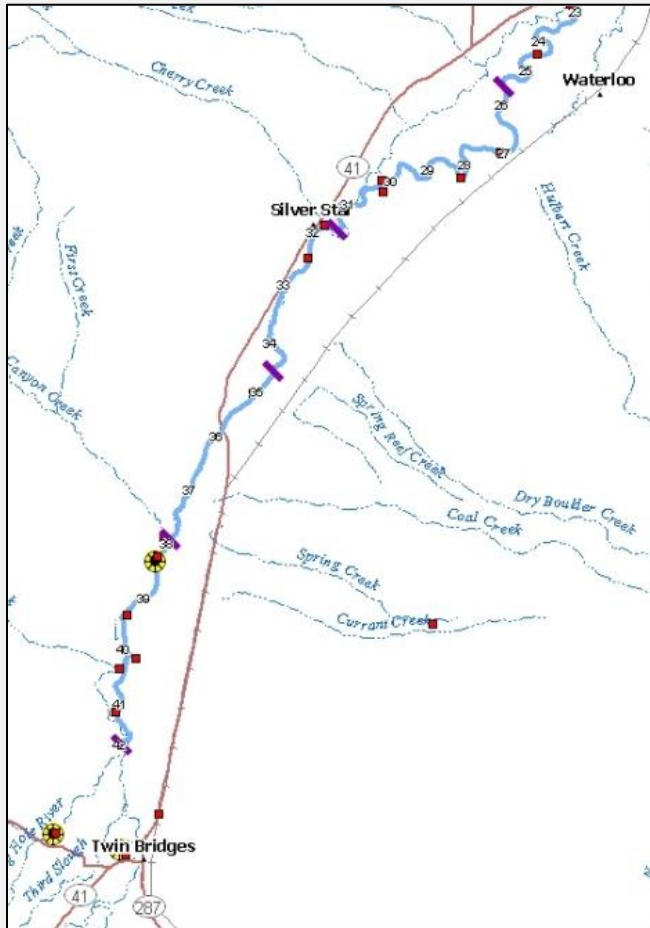


Instream temperature parameters

Temperature TMDL Development



Jefferson River Data Collection



Field Data - 2009

- Continuous temperature monitoring – 49 sites
- Stream flow -63 sites
- Morphology – 5 sites
- Shade/ riparian condition – 24 sites
- Meteorological conditions

Jefferson River Temperature Targets

Target Parameter	Target Value
<i>Primary Target</i>	
Allowable Human-Caused Temperature Change	If the naturally occurring temperature is less than 66°F, the maximum allowable increase is 1°F. Within the naturally occurring temperature range of 66–66.5°F, the allowable increase cannot exceed 67°F. If the naturally occurring temperature is greater than 66.5°F, the maximum allowable increase is 0.5°F.
<i>Temperature-Influencing Targets</i>	
Riparian Health – Shade	Mixed low and high level vegetation with an average daily effective shade ranging between 16-21% (an average height of around 25.5 ft., overhang of around 1.5 ft., and density of 42%)
Instream flow (water use management)	15% reduction in diverted flow from voluntary reductions during low flow conditions – conserved water should be allowed to flow down the upper Jefferson River (any voluntary water savings and subsequent instream flow augmentation must be done in a way that protects water rights)
Reduce headwater temperatures	Decrease headwater temperature using the naturally occurring maximum temperature from the three headwaters streams (Ruby River at mouth= 66.70°F, Beaverhead River at mouth = 72.29°F, Big Hole River at mouth = 77.00°F).
Wastewater Treatment Facilities	No more than a 1.0°F increase when the receiving water is cooler than 66.5°F, no increase above 67°F when the receiving water is 66 – 66.5°F and no more than a 0.5°F increase under conditions where the receiving water is greater than 66.5°F

Jefferson River Temperature Targets

Existing conditions and comparison to targets

Target Parameter		Existing Condition	Target Value
Allowable Human-Caused Temperature Change		Max Δ of 1.39°F	Δ of <0.5°F (under current maximum temperatures)
Effective Shade		15%	16-21%
Water Use		Drought management plan in place	15% water savings from improved irrigation delivery and application efficiencies (any voluntary water savings and subsequent in stream flow augmentation must be done in a way that protects water rights)
HEADWATER TEMPERATURE	Ruby River	69.96°F ($T_{\text{max at mouth}}$)	66.70°F ($T_{\text{max at mouth}}$)
	Beaverhead River	72.86°F ($T_{\text{max at mouth}}$)	72.29°F ($T_{\text{max at mouth}}$)
	Big Hole River	78.06°F ($T_{\text{max at mouth}}$)	77.00°F ($T_{\text{max at mouth}}$)

Jefferson River Source Assessment: QUAL2K

Water Quality (QUAL2K) Model

Uses temperature data from hottest period of the monitoring record (Aug 20th-22nd, 2009) to simulate water temperature change through the system.

Allows scenarios to be conducted to see affects of some parameters on water temperatures.



Jefferson River Source Assessment: QUAL2K

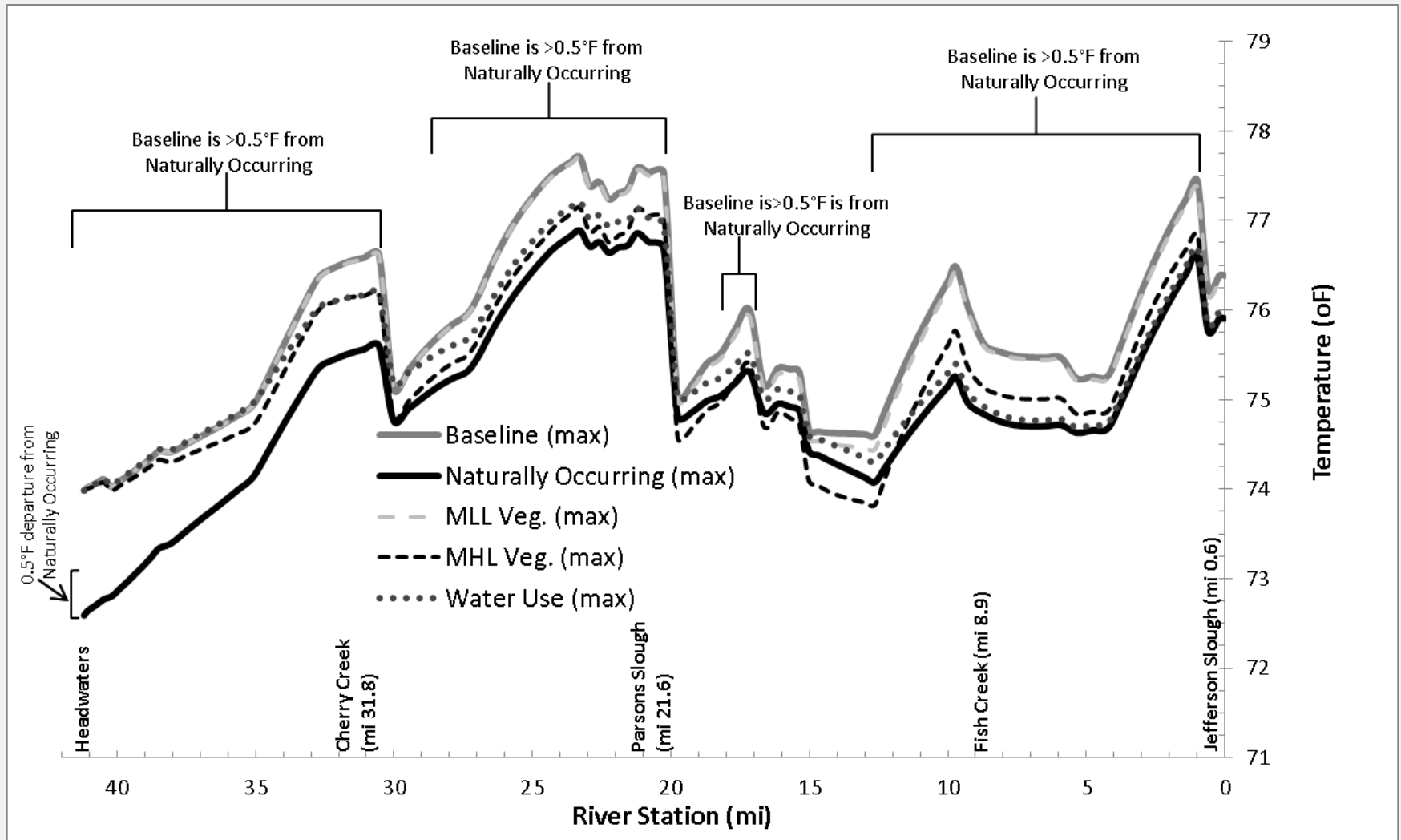
QUAL2K Scenario Development

Scenario	Inputs
Existing conditions (calibration)	Using measured data
Existing conditions with low flow	7Q10 water year
Full potential shade	Shade increased in each reach depending on the vegetation
Improved water management practices	Increased instream flow
Naturally occurring condition	Decrease headwater temperatures, increase shade, and improvement in water management practices



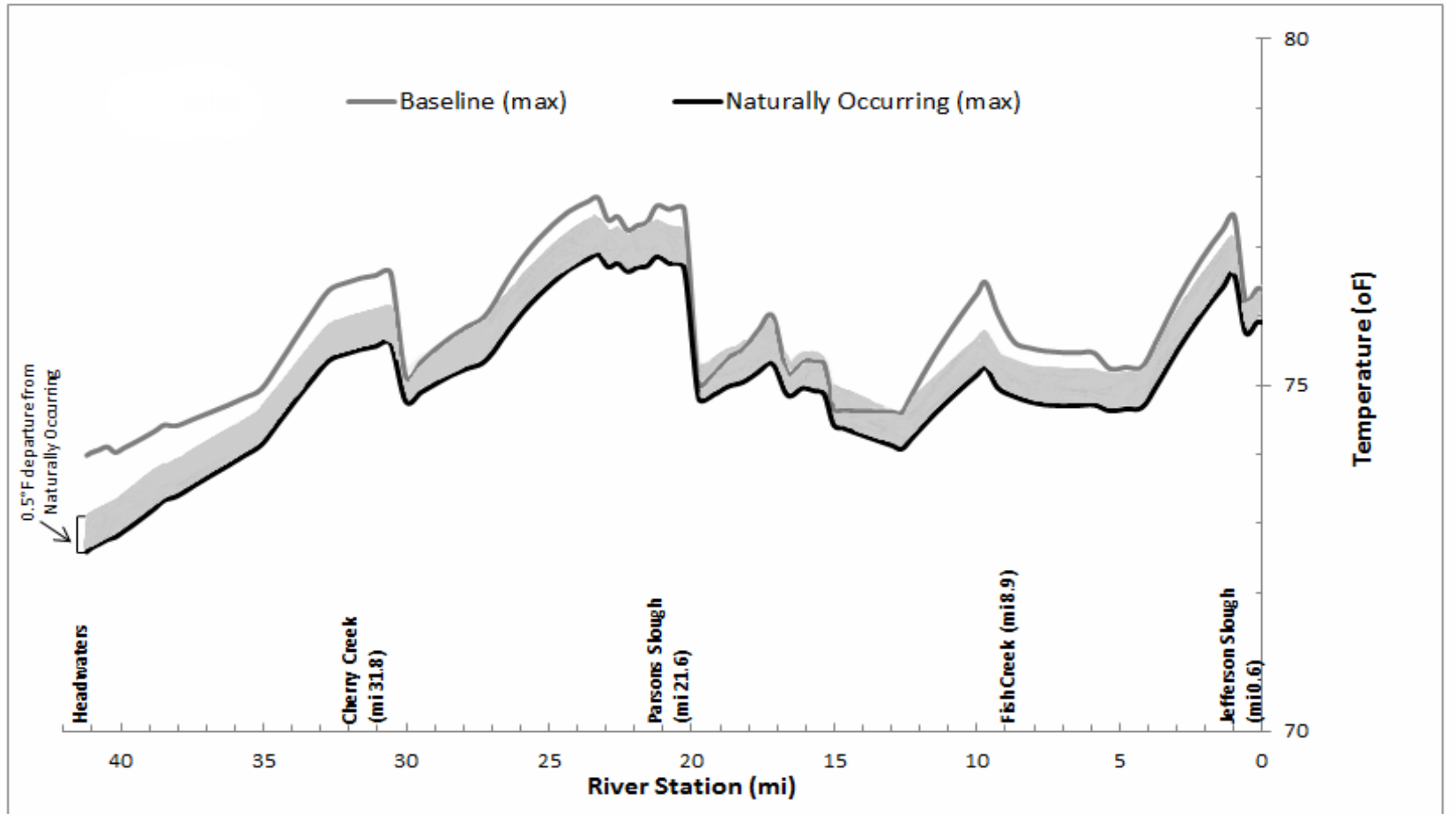
Jefferson River Source Assessment: QUAL2K

QUAL2K Scenario Results



Jefferson River Source Assessment: QUAL2K

QUAL2K Naturally Occurring Scenario Results



Jefferson River TMDLs and Allocations

Example instantaneous and daily load allocations

- Flow of 699 cfs, the flow used in the model, just above Jefferson Slough between August 20-22 (the modeled time period)
- Modeled naturally occurring average temperature of 68.88°F (just above Jefferson Slough).

The example TMDL is therefore:

$$\text{TMDL}_{(\text{instantaneous})} = ((68.88 + 0.5) - 32) * (5/9) * 699 * 28.3 = 410,800 \text{ kcal/s}$$

Converted to a daily load the TMDL is:

$$\text{TMDL} = 410,800 \text{ kcal/s} * 86,400 \text{ s/day} = 35,493,117,408 \text{ kcal/day}$$

To continue with the example at a naturally occurring temperature of 68.88°F and flow of 699 cfs:

$$\text{LA}_{(\text{instantaneous})} = (68.88 - 32) * (5/9) * 699 * 28.3 = 405,305 \text{ kcal/s}$$

Converted to a daily load the LA is:

$$\text{LA} = 405,305 \text{ kcal/s} * 86,400 \text{ s/day} = 35,018,356,608 \text{ kcal/day}$$

The resulting example explicit MOS at 699 cfs is:

$$\text{MOS}_{(\text{instantaneous})} = 409,921 \text{ kcal/s} - 404,426 \text{ kcal/s} = 5495 \text{ kcal/s}$$

Converted to a daily load the MOS is:

$$\text{MOS} = 5495 \text{ kcal/s} * 86,400 \text{ s/day} = 474,760,800 \text{ kcal/day}$$

Jefferson River TMDLs and Allocations

Example instantaneous and daily load allocations

Category	Temperature (°F)	Flow (cfs)	Temperature change from baseline (°F)	Allocation (instantaneous load in kcal/s)	Allocation (daily load in kcal/day)
Nonpoint sources and background (LA)	68.88	699	0.00	405,305	35,018,356,608
Explicit MOS	0.50	0	0.50	5495	474,760,800
Total	69.38	699	0.50	410,800	35,493,117,408 (TMDL)

Jefferson River Document

Document completion steps

- Final draft document will incorporate your comments
- Public comment period (Typically 30 days)
- Response to comments and completion of final document
- Submit to EPA for approval
- Approved plan ready for stakeholder implementation

Jefferson River Implementation



QUESTIONS?

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