Bitterroot TMDL Planning Area

Public Meeting

May 5, 2011

PRESENTED BY:

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Presentation Outline:

- What are TMDLs?
- Bitterroot TMDL Project Area
- Development of Sediment TMDLs for Tributaries of the Bitterroot River
- Development of Temperature TMDLs for the Bitterroot River & Tributaries

What is a TMDL?

- **T**otal **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

- Basically the allowable loading rate or loading capacity of the stream (think of loading as a supply or amount)

What is a TMDL?

TMDLs are expressed as a load per given time (e.g., 16 pounds/day, 2.6 tons/year)

May also be expressed as a percent reduction (e.g., 30% total load reduction)

- Beneficial Uses
- Water Quality Standards
- Pollutants
- Pollutant Sources

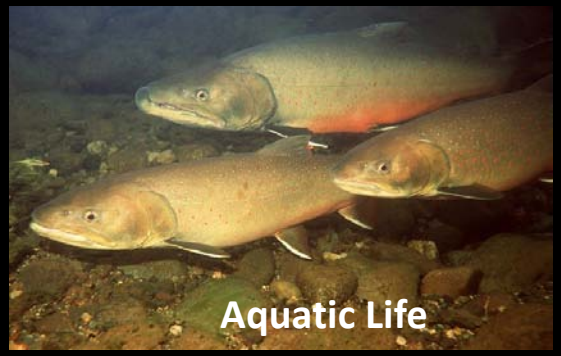
What is a TMDL?

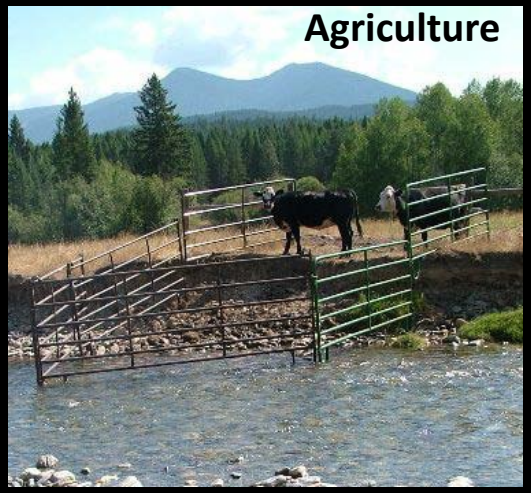
- The Clean Water Act (CWA) requires states to assess the quality of their waters
- The goal of the CWA is to ensure that the quality of all surface waters is capable of supporting designated beneficial uses.

- Beneficial Uses
- Water Quality Standards
- Pollutants
- Pollutant Sources

What is a TMDL?

All streams in the Bitterroot River watershed are classified B-1 meaning they must support the following types of beneficial uses:





- Beneficial Uses
- Water Quality Standards
- Pollutants
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What is a TMDL?

- Water quality standards form the basis for determining whether a waterbody is supporting its beneficial uses

- Waterbodies not meeting water quality standards, and therefore not supporting one or more beneficial uses, are placed on a list (the 303(d) list) and are called “impaired”

- Impairments are identified by comparing existing water quality conditions to the water quality standards

Montana Department of Environmental Quality

Clean Water Act Information Center

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2010 Water Quality Information

www.cwaic.mt.gov

Water Information

Waterbody Id	MT76H004_110	**Water Type**	RIVER
Name	Willow Creek	**Hydro Unit**	17010205 - Bitterroot
Size (Miles/Acres)	17.2	**Basin**	Columbia
Ecoregion	Middle Rockies	**Watershed**	Upper Clark Fork
County	RAVALLI	**Use Class**	B-1
TMDL Planning Area	Bitterroot	**Trophic Status and Trend**	NA
Location	WILLOW CREEK, headwaters to mouth (Bitterroot River)		
Water Quality Category	5 - One or more uses are impaired and a TMDL is required.		

Beneficial Use Support Information

Use Name	Fully Supporting	Partially Supporting	Not Supporting	Threatened	Insufficient Information	Not Assessed
Agricultural	✓					
Aquatic Life		✓				
Cold Water Fishery		✓				
Drinking Water	✓					
Industrial	✓					
Primary Contact Recreation		✓				

Impairment Information

Probable Causes	Probable Sources	Associated Uses	TMDL Completed
Alteration in stream-side or littoral vegetative covers	Irrigated Crop Production Loss of Riparian Habitat Silviculture Activities	Aquatic Life Cold Water Fishery	NO
Chlorophyll-a	Irrigated Crop Production Silviculture Activities Source Unknown	Primary Contact Recreation	NO
Sedimentation/Siltation	Loss of Riparian Habitat Natural Sources Silviculture Activities	Aquatic Life Cold Water Fishery	NO
Temperature, water	Flow Alterations from Water Diversions Irrigated Crop Production Loss of Riparian Habitat	Aquatic Life Cold Water Fishery	NO
Total Kjehldahl Nitrogen (TKN)	Irrigated Crop Production Silviculture Activities Source Unknown	Aquatic Life Cold Water Fishery Primary Contact Recreation	NO

- Beneficial Uses
- Water Quality Standards
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What is a TMDL?

Per CWA & Montana law, TMDLs must be developed for waterbodies with pollutant causes of impairment

What is a TMDL?

- Beneficial Uses
- Water Quality Standards
- Pollutants
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- Beneficial Uses
- Water Quality Standards
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- Pollutant Sources

What is a TMDL?

Where Do Pollutants Come From?

- Point Sources
- Nonpoint Sources
- Natural Sources

- Beneficial Uses
- Water Quality Standards
- Pollutants
- Pollutant Sources

What is a TMDL?

Point Sources: discharge to water from a specific point

Point sources come from permitted entities such as waste water treatment plants and industrial facilities.

- Beneficial Uses
- Water Quality Standards
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What is a TMDL?

Nonpoint Sources: pollutants do not originate from a specific point, but from a diffuse area

<u>Examples</u>:
- Agriculture Fields
- Grazing
- Timber Harvest Areas
- Lawns

- Beneficial Uses
- Water Quality Standards
- Pollutants
- Pollutant Sources

What is a TMDL?

Natural Sources: not caused by human activity

<u>Examples</u>:

•Bare ground after a forest fire

•Naturally eroding streambanks

•Natural saline seeps

- Beneficial Uses
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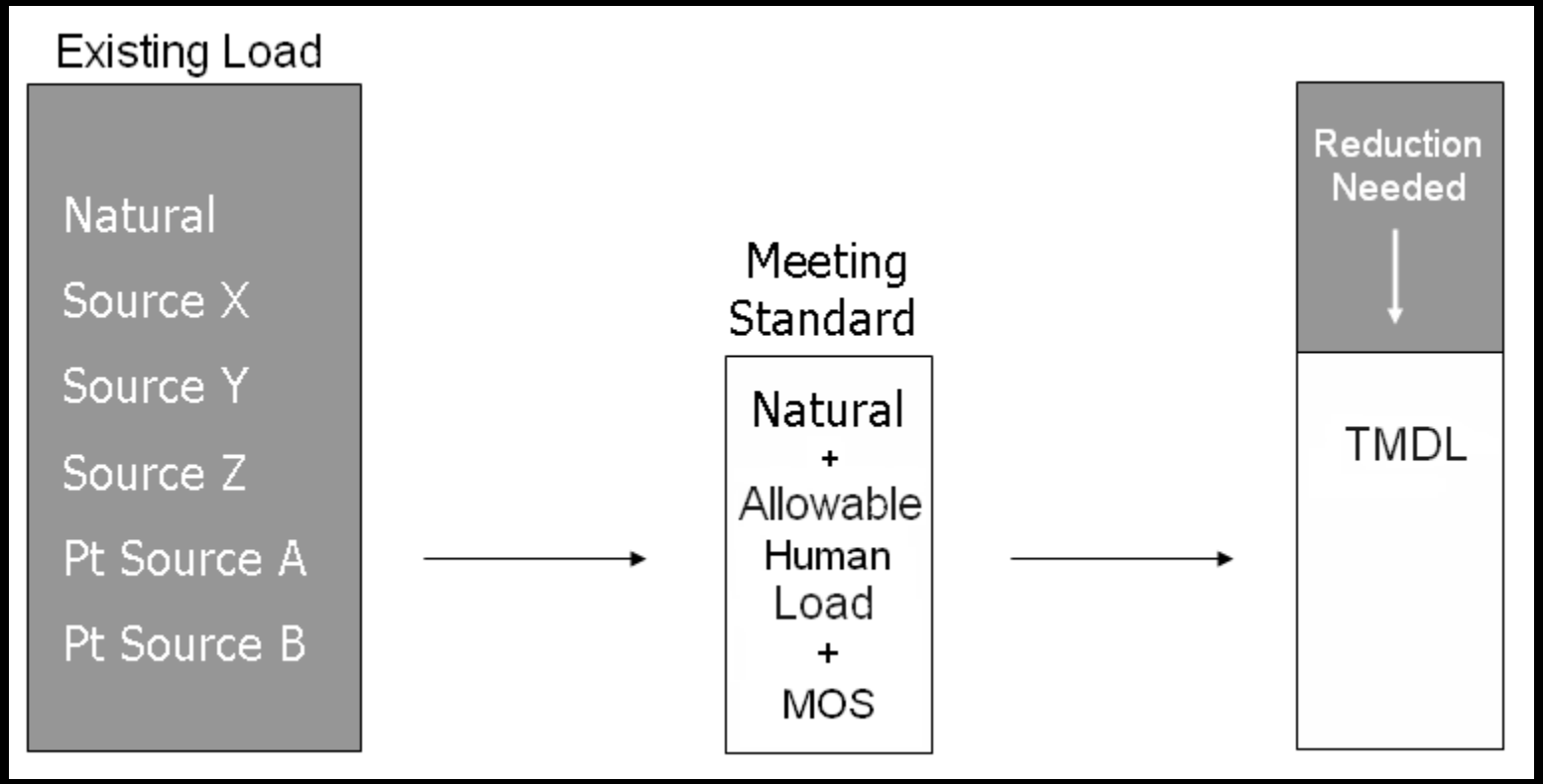
What is a TMDL?

TMDL = The maximum amount of a pollutant that a stream can receive from all sources and still meet water quality standards



MOS = Margin of Safety

- Beneficial Uses
- Water Quality Standards
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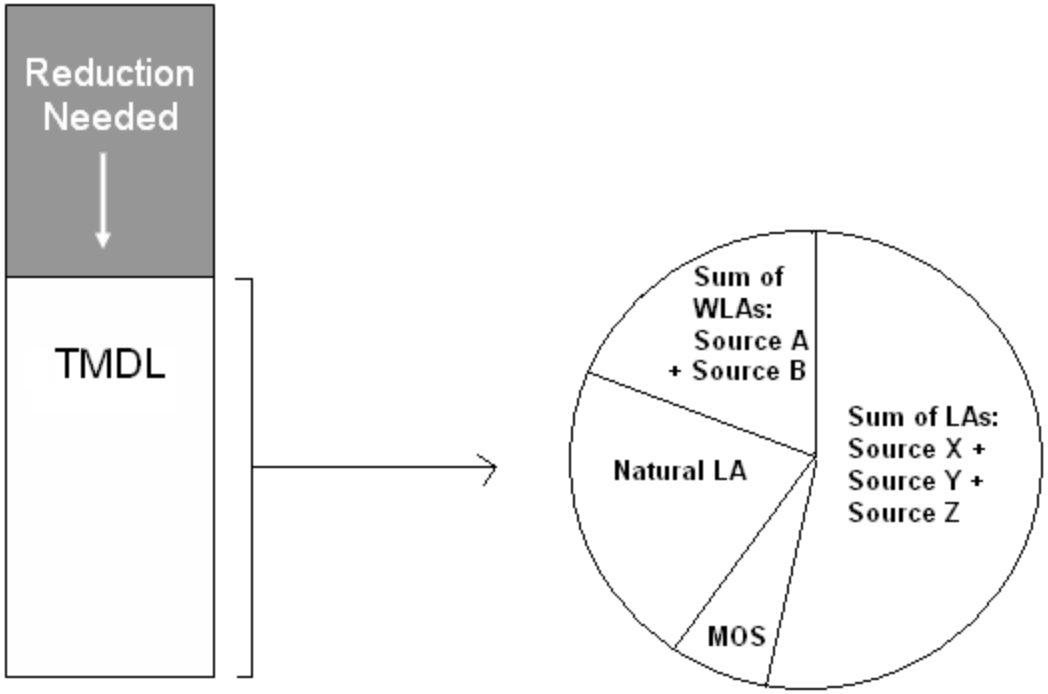
- Pollutant Sources

What is a TMDL?



WLA = Waste Load Allocation

LA = Load Allocation

MOS = Margin of Safety

TMDL = Sum of WLAs for point sources + Sum of LAs for nonpoint sources + MOS that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving stream

How Many TMDLs?

- A TMDL is developed for each pollutant cause of impairment for a stream
- One stream may have multiple segments all listed for the same pollutant, and therefore have multiple TMDLs for that pollutant
- Additionally, a stream segment may have multiple TMDLs if it is listed for more than one pollutant

EXAMPLE:

Lolo Creek is broken into 3 segments

Each segment is listed for sediment

Lolo Creek has 3 sediment TMDLs

Cumulative source assessment

What Does a TMDL Do?

- In Montana, TMDLs are developed at a watershed scale to address multiple waterbody impairments

- Presented within the context of a scientifically based plan (not a mandate) that identifies a clean-up or restoration strategy for a specific waterbody and pollutant

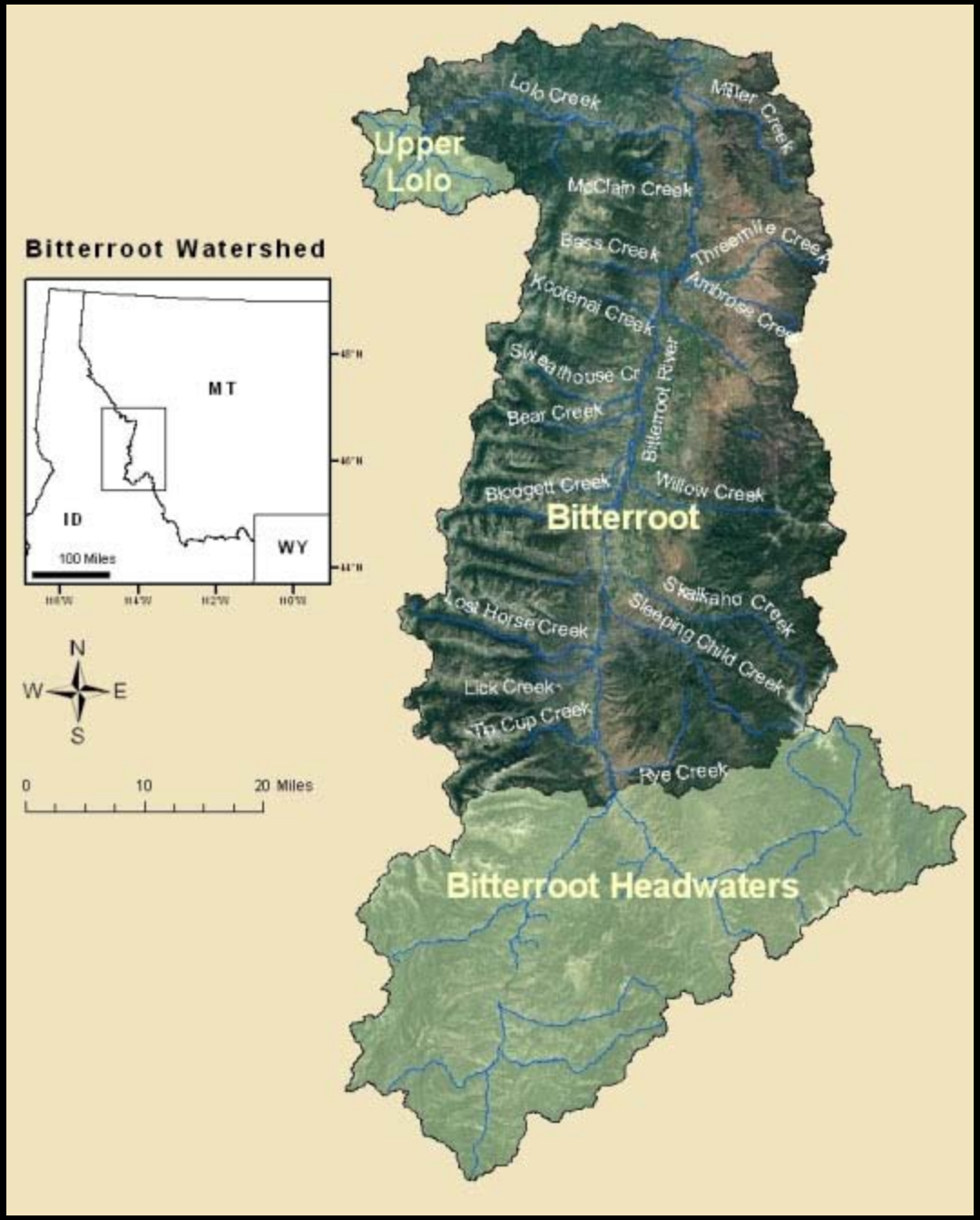
What Does a TMDL Do?

- A TMDL does not create or impose new regulations; but may affect how existing regulations are implemented
- The majority of pollution causing activities are unregulated

  Exceptions:

  - Point Source Discharges
  - Streamside Management Zones
  - 310 Permits
  - Stormwater Discharges

- Implementation of BMP practices and restoration projects are voluntary



Project Boundaries

The Bitterroot River watershed is divided into three TMDL Planning Areas (TPAs)

TMDL Planning Area	TMDL Status
Upper Lolo Creek: Headwaters of Lolo Creek (area above Lolo Hot Springs)	Sediment TMDLs completed April, 2003
Bitterroot Headwaters: Headwater streams of the Bitterroot River	Sediment & temperature TMDLs completed October, 2005
Bitterroot: •The Bitterroot River •The Bitterroot River tributaries •Lolo Creek	Sediment & temperature TMDLs completion: 2011 Nutrient TMDLs completion: 2012

Sediment TMDL Development for Tributaries to the Bitterroot River

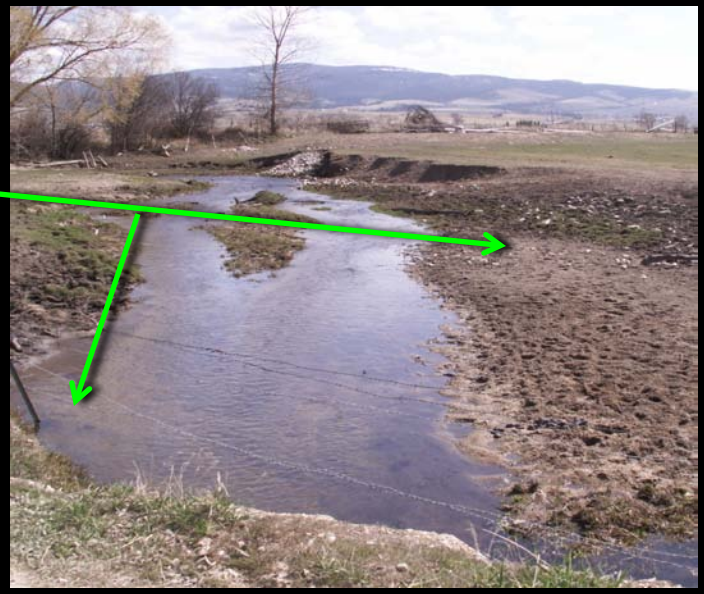
Sediment TMDLs

Sediment: naturally occurring component of healthy and stable stream ecosystems

Sediment is a natural input of the stream system, but too much sediment may cause imbalance in the stream; as sediment plays a factor in channel shape and habitat diversity.

Excess inputs of sediment may:

- alter channel form and function (over-widen)
- cause excess sediment to accumulate in fish and aquatic life habitats
  - interfere with reproduction and survival of fish and macroinvertebrate
  - reduce availability of suitable spawning habitat

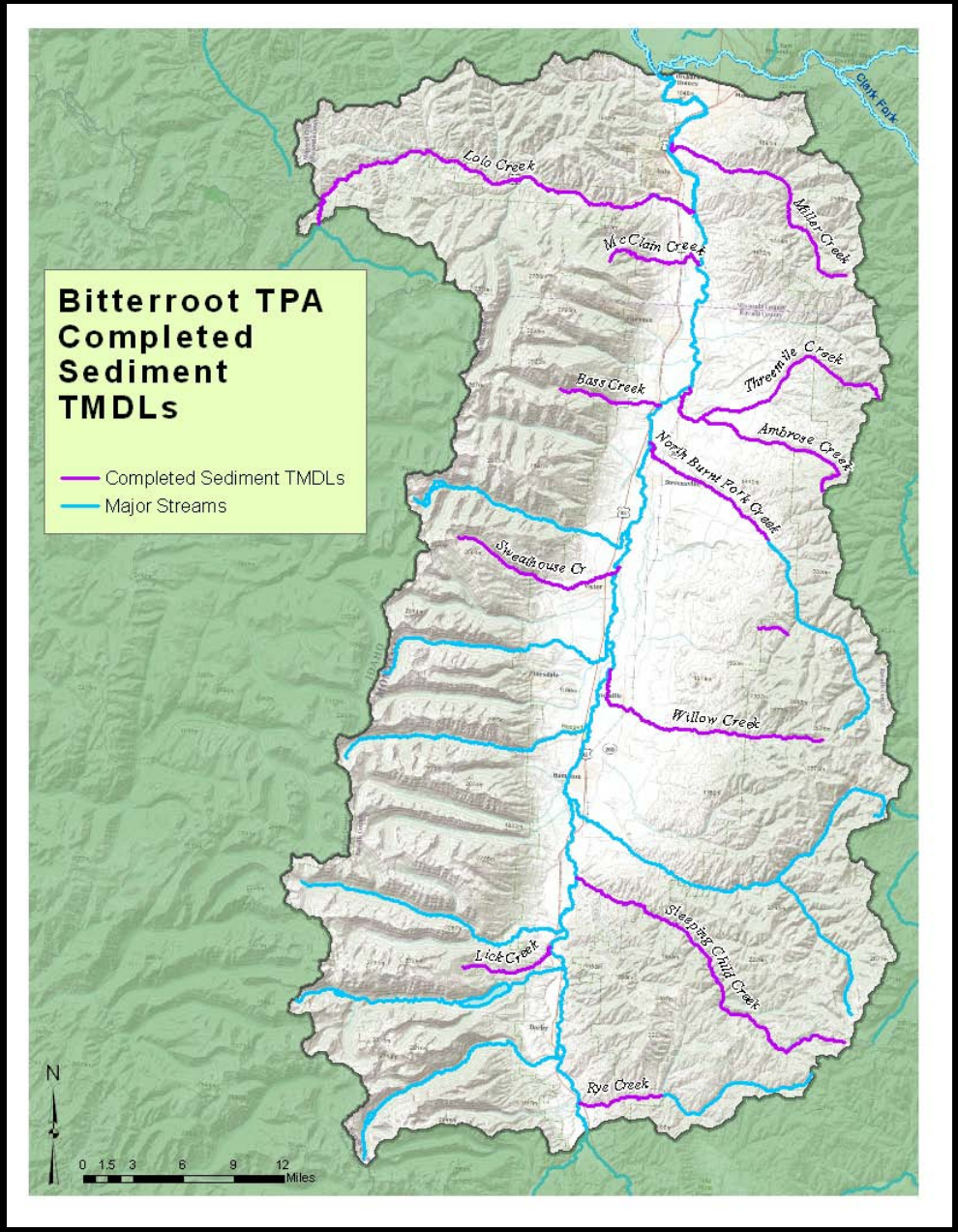


High concentrations of suspended sediment in streams may effect recreational use and increase filtration costs for water treatment.

Sediment TMDLs

Completed TMDLs

- Ambrose Creek
- Bass Creek
- Lick Creek
- Lolo Creek (3 segments)
- McClain Creek
- Miller Creek
- Muddy Spring Creek
- North Burnt Fork Creek
- Rye Creek
- Sleeping Child Creek
- Sweathouse Creek
- Threemile Creek
- Willow Creek



Sediment TMDLs

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
4. Monitoring & Restoration

1. Water Quality Targets
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Why develop water quality targets?

Sediment narrative standards

No increases are allowed above naturally occurring concentrations of sediment or suspended sediment, (except as permitted in 75-5-318, MCA), settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife.

"Naturally occurring" = conditions or material present from runoff or percolation over which humans have no control or from developed land where all reasonable land, soil and water conservation practices have been applied

To aid in the translation of the narrative standard, water quality targets are developed for a suite of sediment related parameters.

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
4. Monitoring & Restoration

Sediment target parameters

Parameters

- Fine sediment
  (<6mm and <2mm in riffles and in pools)
- Channel form stability
  (W/D ratio and entrenchment)
- Instream habitat
  (LWD, pools/mile, and pool depth)
- Riparian health
  (% understory shrub cover)
- Sediment supply and sources
  (% eroding banks and riffle stability index)

Target parameters are selected for their ability to display response to increases or decreases in sediment loading, and their linkage to effects upon aquatic life/cold water fish.

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
4. Monitoring & Restoration

Developing targets

- Develop targets using reference data, DEQ data, and literature values
- Compare targets to current conditions to help assess the level of impact
- Establish a starting point to measure future water quality restoration success

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
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Sediment source categories

Natural erosion

- Result of climatic and hydrologic processes

Human influenced sediment/erosion

- Sediment from roads and road crossings
- Sediment from land use (upland sediment)
  - Grazing practices
  - Timber harvest
  - Streamside Vegetation Removal
  - Crop Production
  - Development
- Streambank erosion
  - Streamside Vegetation Removal
  - Unnatural Flow Fluctuations
  - Livestock trampling
- Point Sources
  - Permitted entities

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
4. Monitoring & Restoration

Why conduct sediment source assessments?

- Assessments provide estimated amounts of sediment that are getting to the stream
  - Road erosion
  - Upland erosion
  - Streambank erosion
- Loads are also estimated with best management practices (BMPs) in place

÷

= X

1-X*100 =
% reduction needed

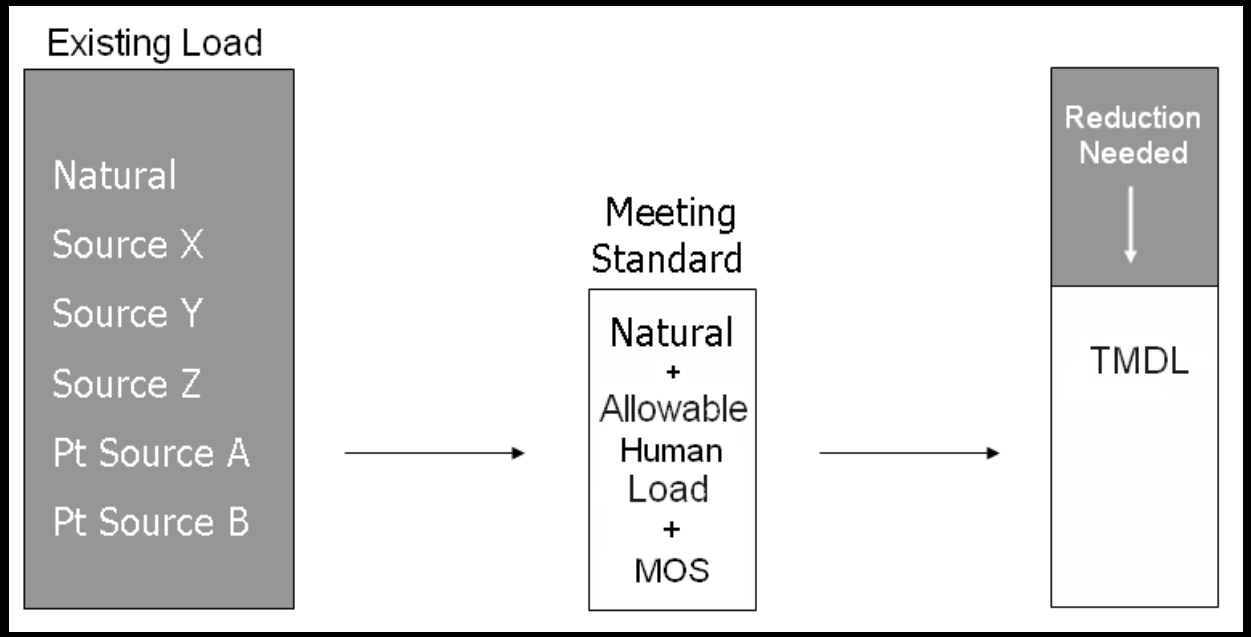
Desired condition

Existing condition

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
4. Monitoring & Restoration

How the TMDL is determined

The TMDL for each stream is expressed as the sum of the sediment loads from all sources assuming all reasonable land, soil, and water conservation practices are in place.



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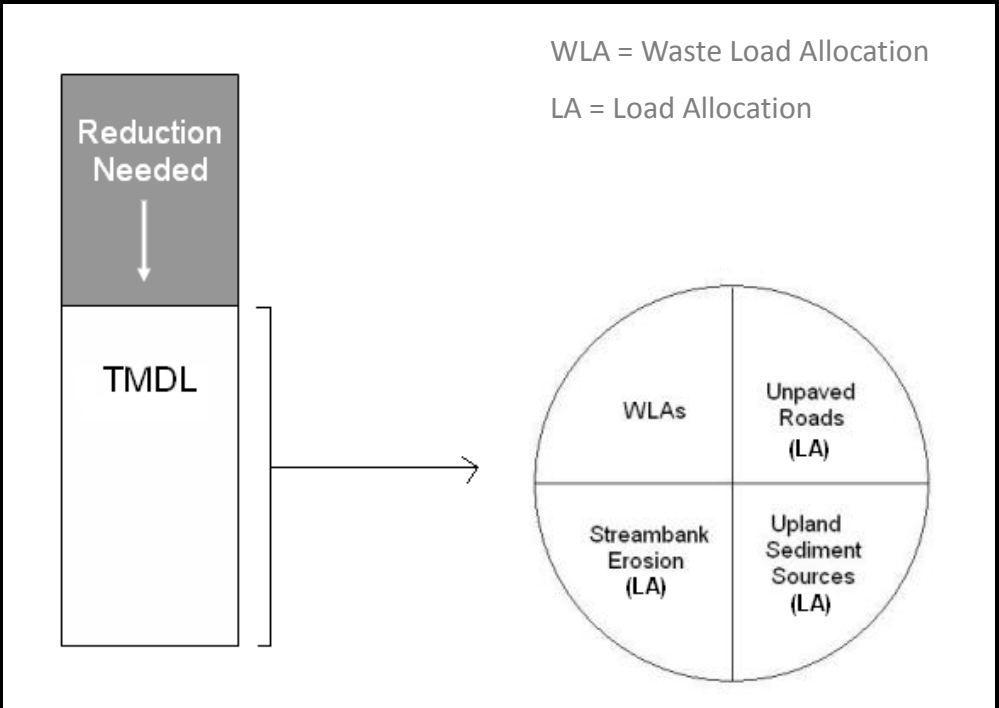
Allocations



Natural loads and margins of safety are incorporated into the Bitterroot sediment allocations

- Allocations are derived based on data analysis, model assumptions, and best professional judgment
- Given the methods used for the source assessment, these allocations represent the maximum load that each source type can contribute and achieve water quality standards
- Allocations take into account all reasonable land, soil, and water conservation practices

1. Water Quality Targets
2. Sediment Source Assessments
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Basis for allocations

- Road sediment:

  Reduce contributing lengths of road to 200 feet maximum for each road crossing and 500 feet for each parallel length

- Upland sediment:

  The sediment load associated with improved grazing/agriculture practices and improved riparian condition

- Streambank erosion:

  The sediment from bank erosion that occurs under stable bank conditions – moderate bank erosion and low near bank stress

1. Water Quality Targets
2. Sediment Source Assessments
3. TMDLs and Allocations
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Example TMDL with allocation

Ambrose Creek Sediment TMDL

Sediment Sources		Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Roads		11	4	65%
Eroding Banks	Anthropogenically Influenced	721	296	44%
	Natural	238	238	
Upland Erosion	All Land Uses	590	338	43%
Point Source	Stormwater Construction	0	11*	0%
Total Sediment Load		1560	887	43%

* This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit. Full compliance with all conditions of the permit should achieve a load less than this amount.

1. Water Quality Targets
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Monitoring

- Additional monitoring or assessment may be necessary in some cases to further refine and identify restoration needs

- Monitoring is also an essential component to measure success over time as projects are developed

1. Water Quality Targets
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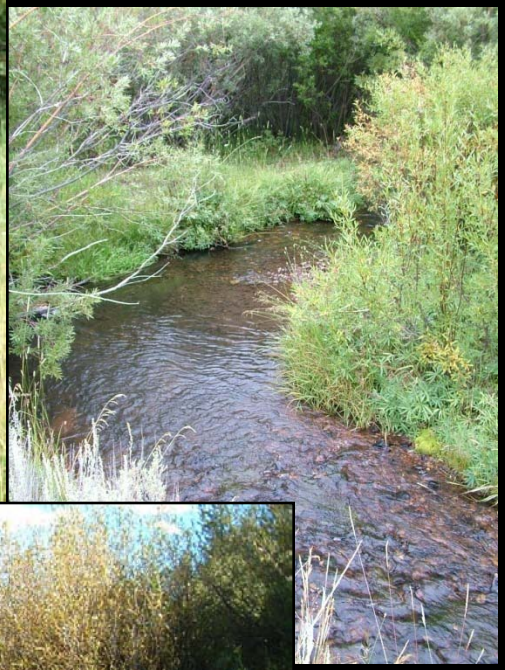
Restoration and implementation

Implementation recommendations

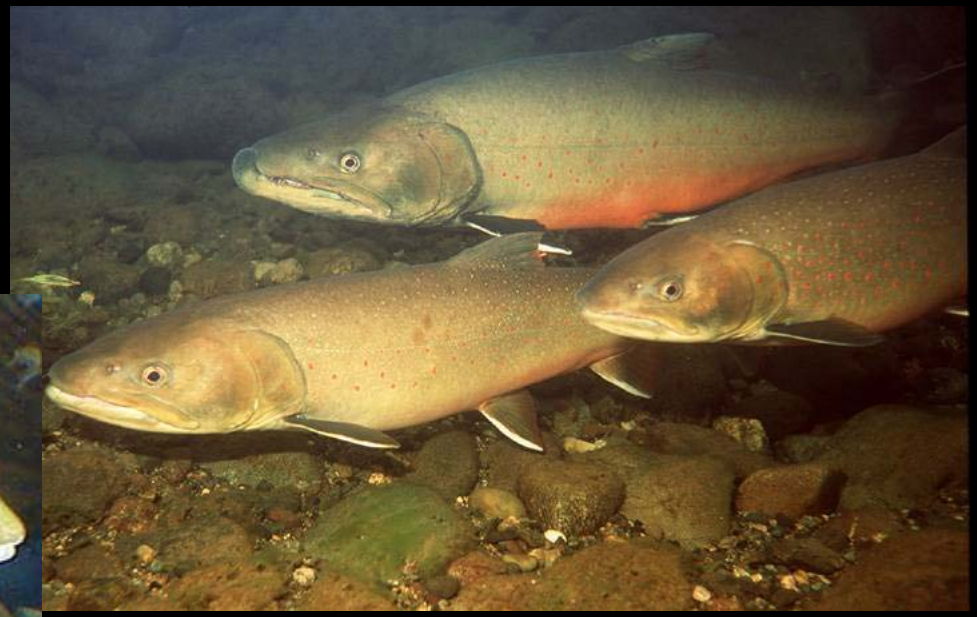
- Improve ground protection in disturbed areas on small acreages, develop and implement grazing management plans, reduce the amount of erodible soil and runoff rate from agricultural lands
- Improve and restore streamside vegetation to provide shade, filter sediment, and stabilize eroding streambanks and floodplains
- Install all appropriate BMPs to road and road crossing networks and maintain & upgrade culverts to reduce the risk of failure in large events

Temperature TMDLs



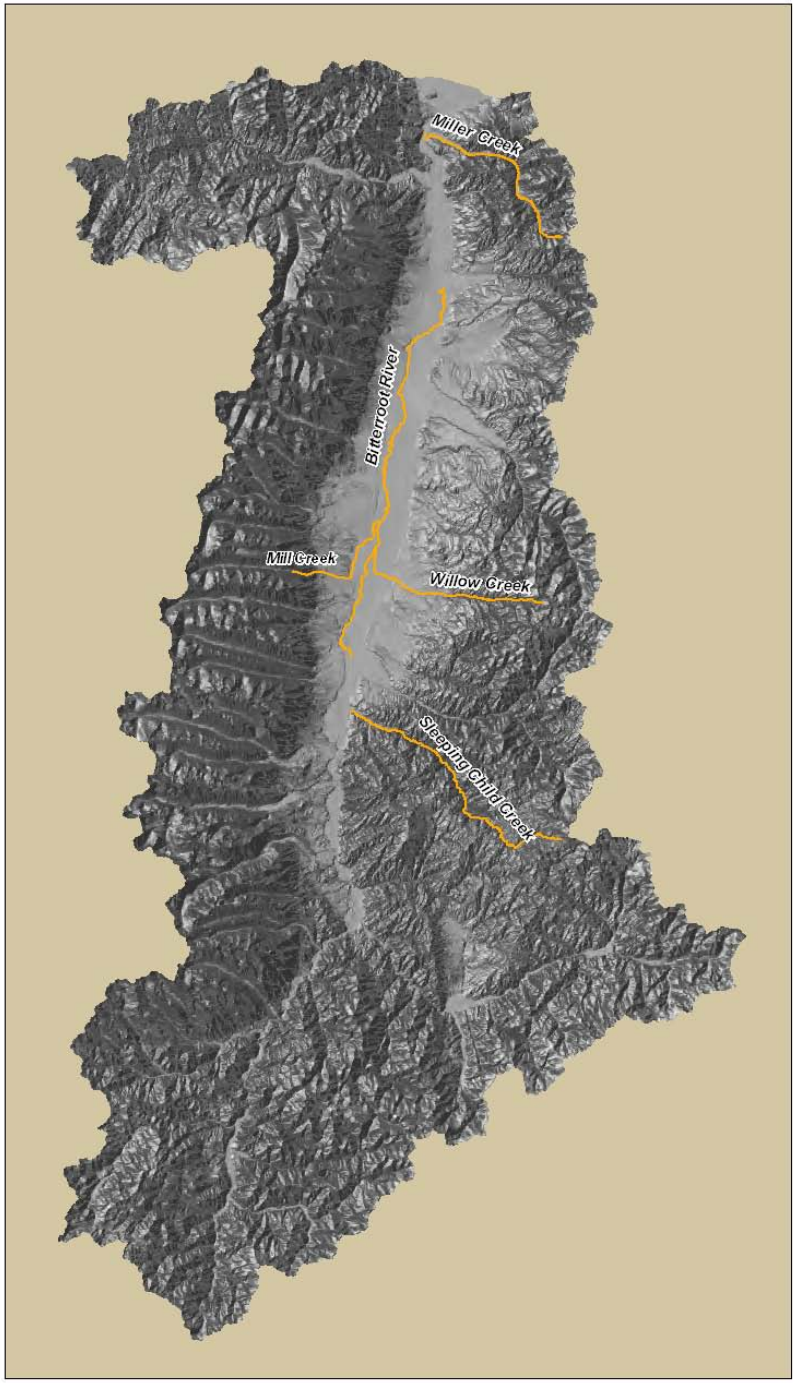
Temperature TMDL Project Scope

- Of all designated uses, fish are generally the most sensitive to temperature conditions



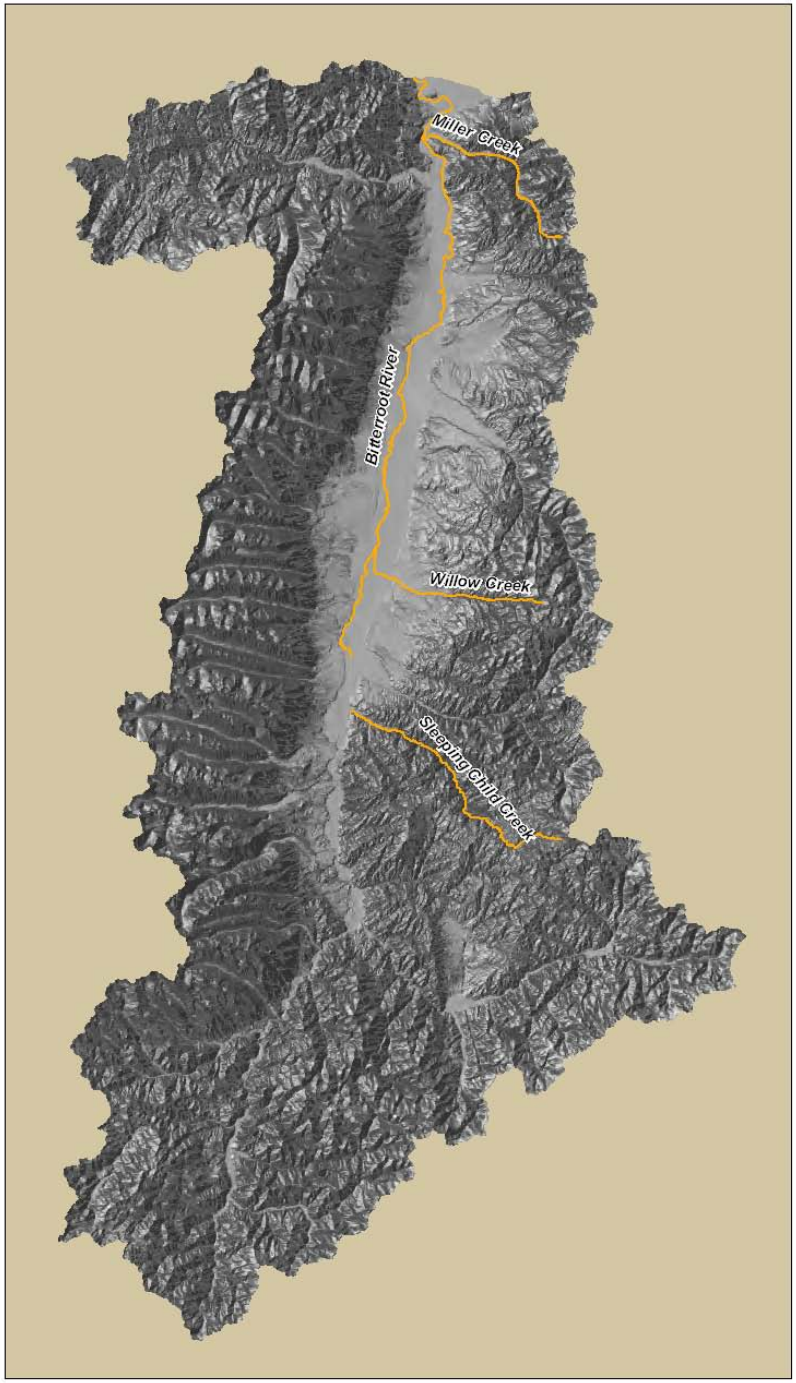
Temperature TMDL Project Scope

- Impaired Streams
- Headwaters in different TMDL planning area with prior temperature TMDLs completed



Temperature TMDL Project Scope

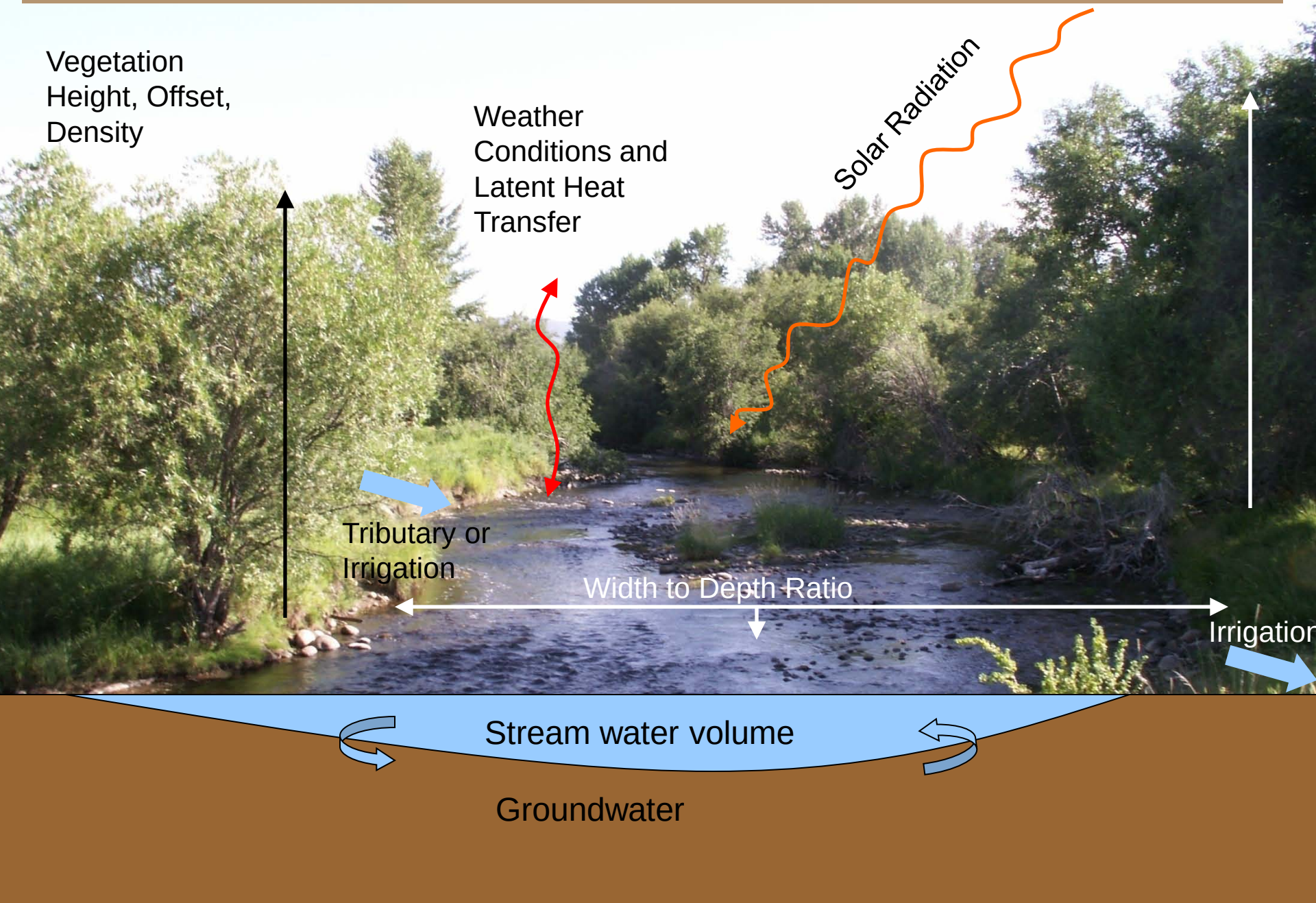
- TMDLs



Montana's Temperature Water Quality Standard

- Partially numeric and partially narrative
  - ½ or 1˚F above naturally occurring temperature
  - Water quality standards can not divest or imperil water rights

Stream Temperature Influences



Process for Temperature TMDLs

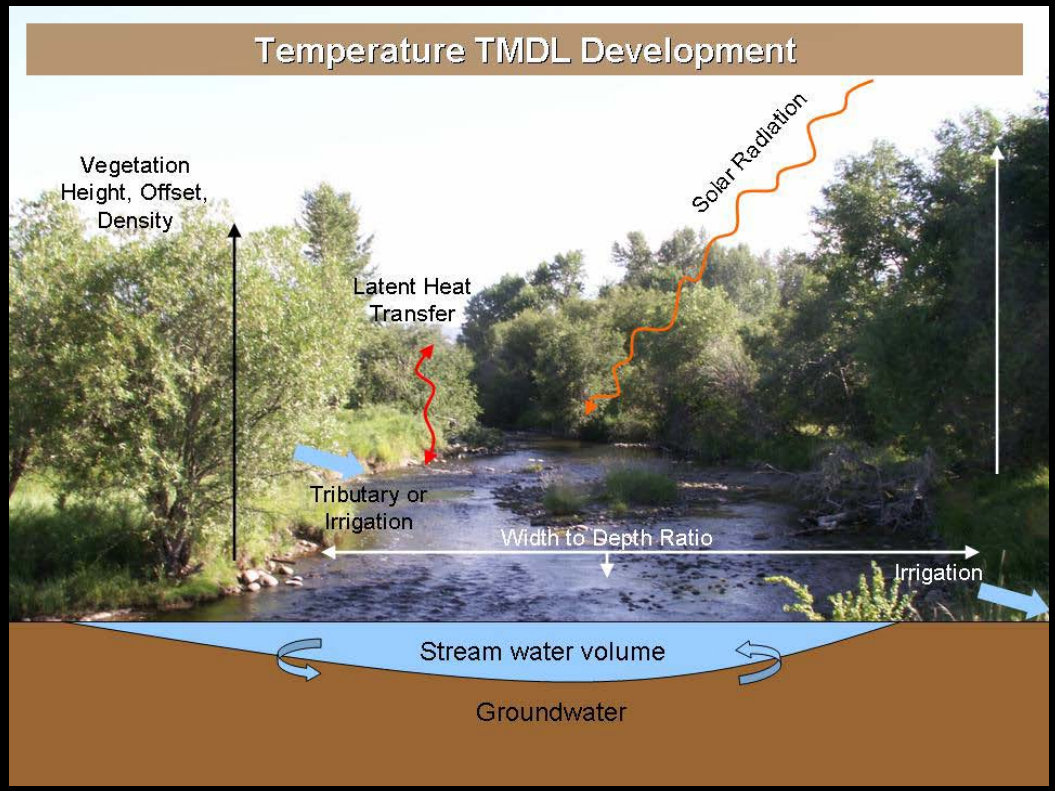
1. Monitoring
2. Data Review
3. Temperature Modeling
4. TMDL Document Writing

Data Collection

- Temperature and Stream Flow
- Stream Side Vegetation and Shade
  - Aerial Photo Interpretation, Fieldwork
- Stream Channel Width/Depth
- Irrigation Network Assessment
- Wastewater Treatment Facility Data

Water Quality Modeling Steps

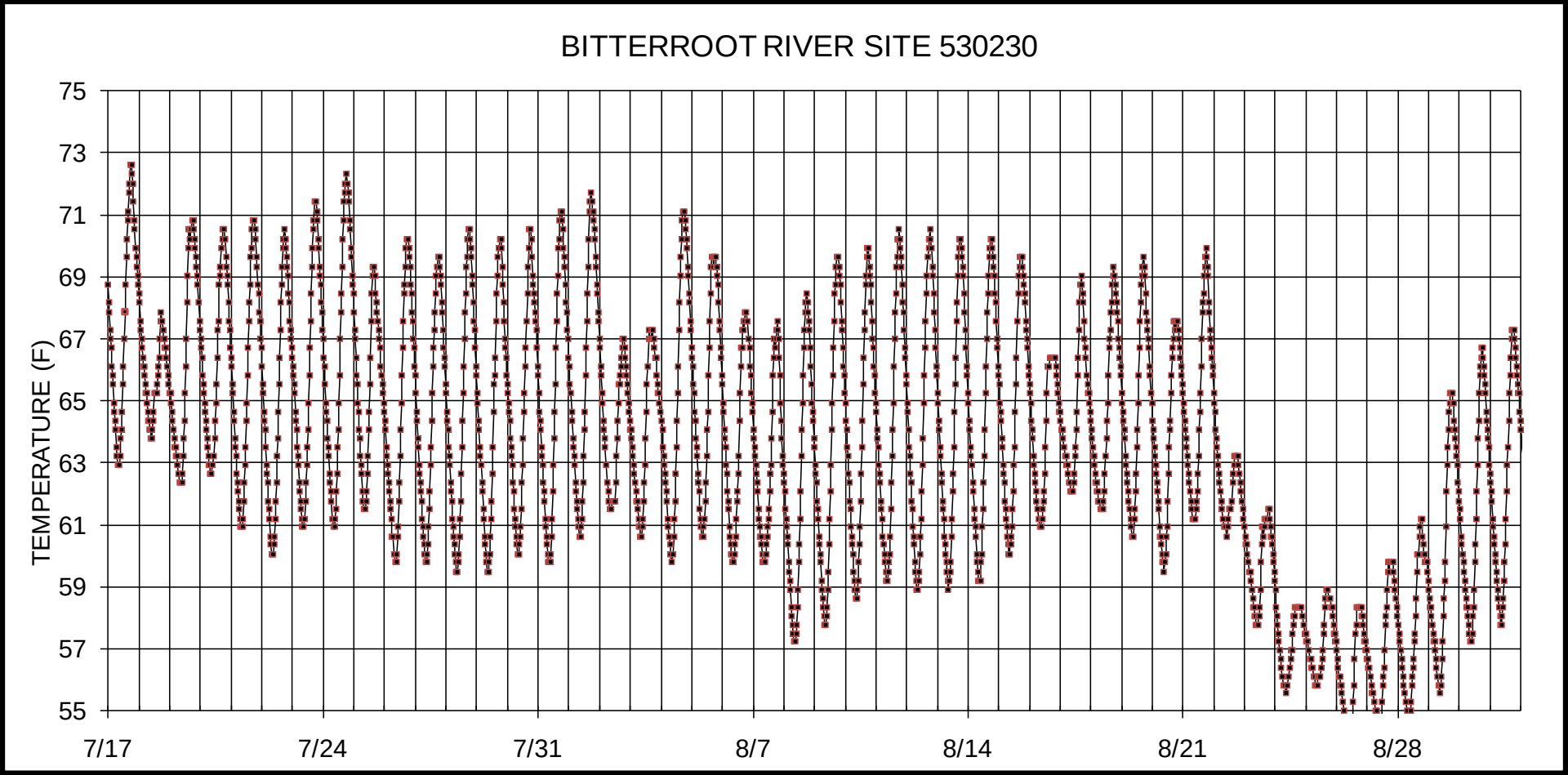
- Calibrate
- Restoration scenarios
- Compare existing to restoration scenario temperatures



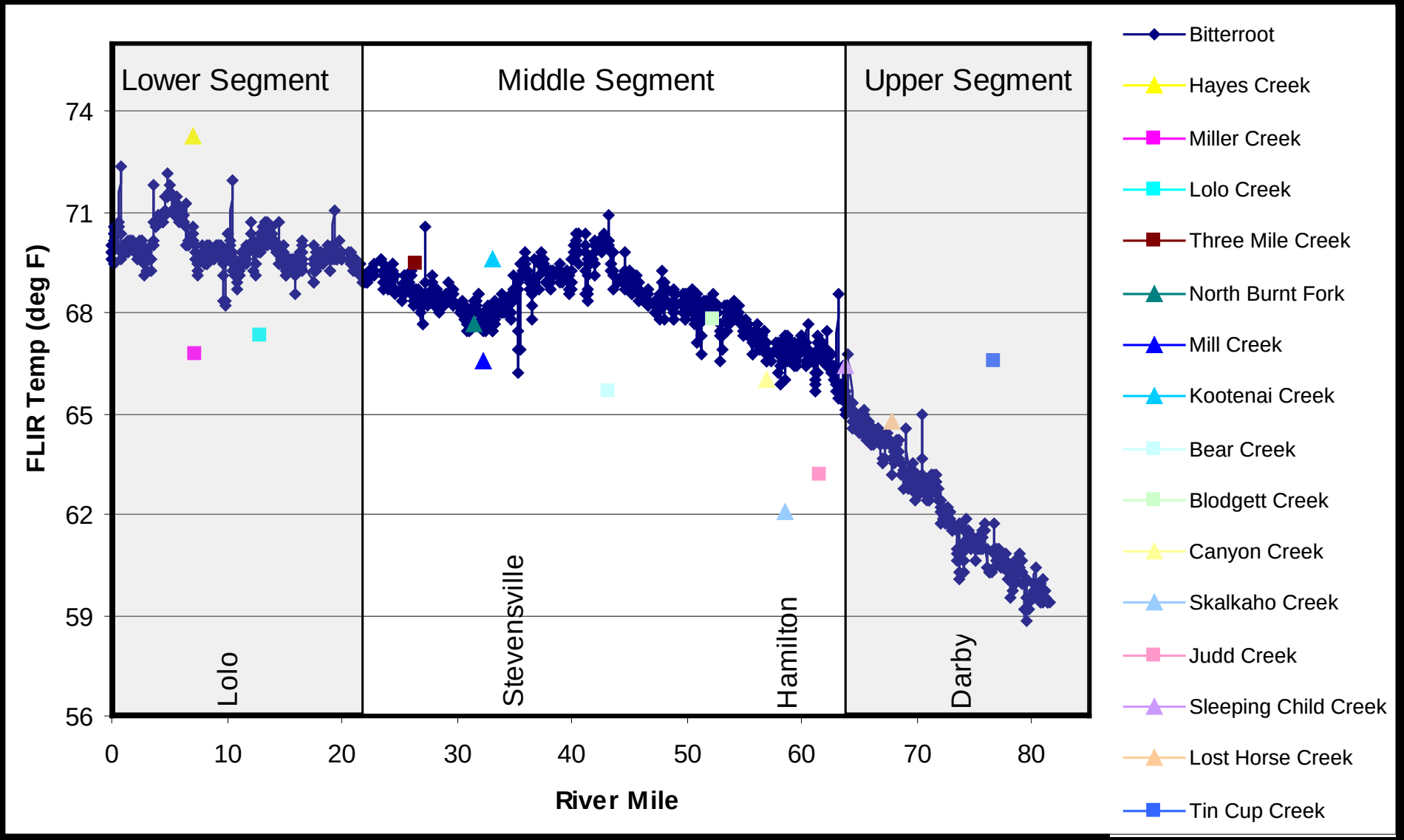
Bitterroot River Example

- Temperature TMDLs - middle and Lower segments
- We will review middle segment for an example

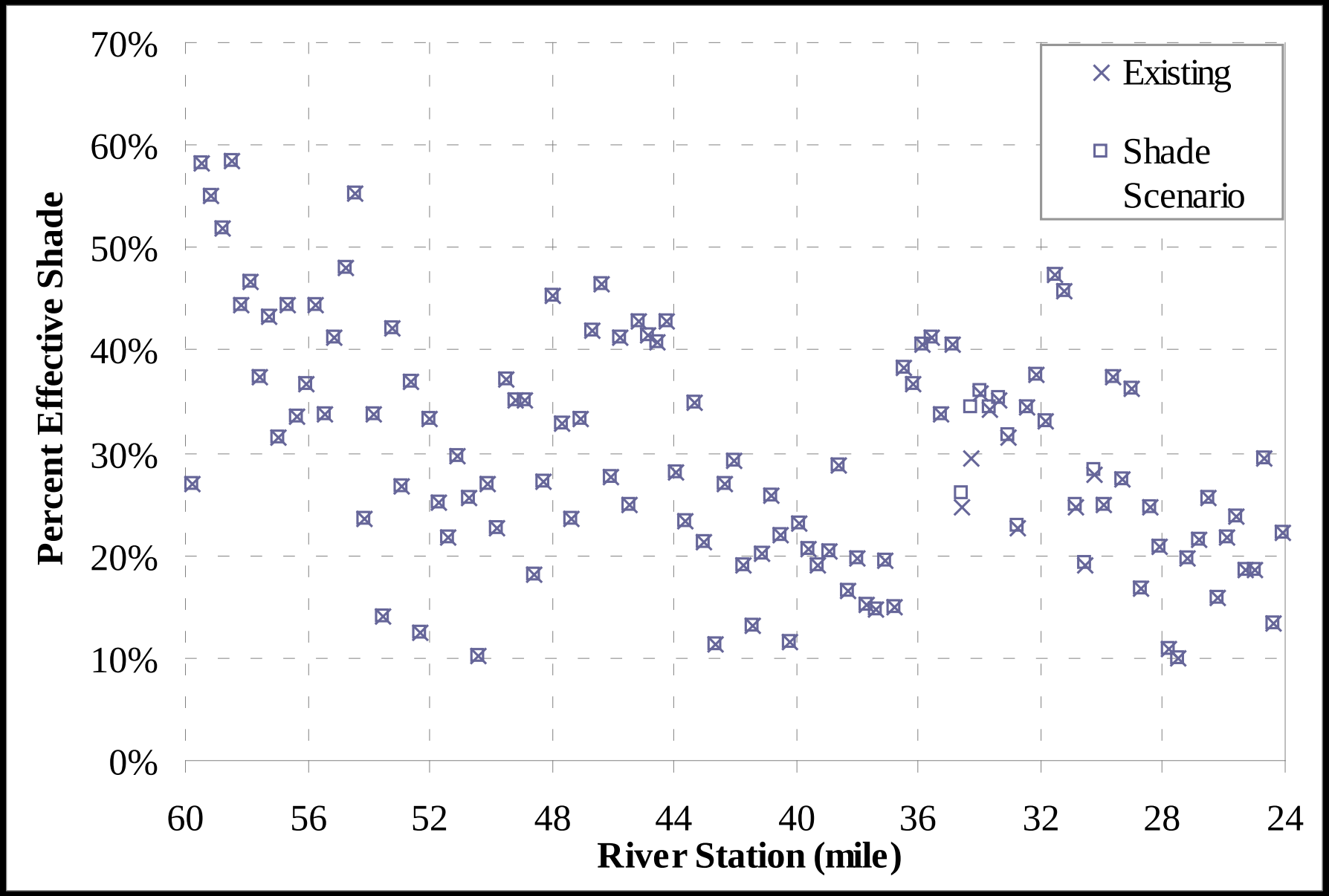
Bitterroot River Example
Data Recording Evaluation



Bitterroot River Thermal Infrared



Middle Bitterroot River Shade



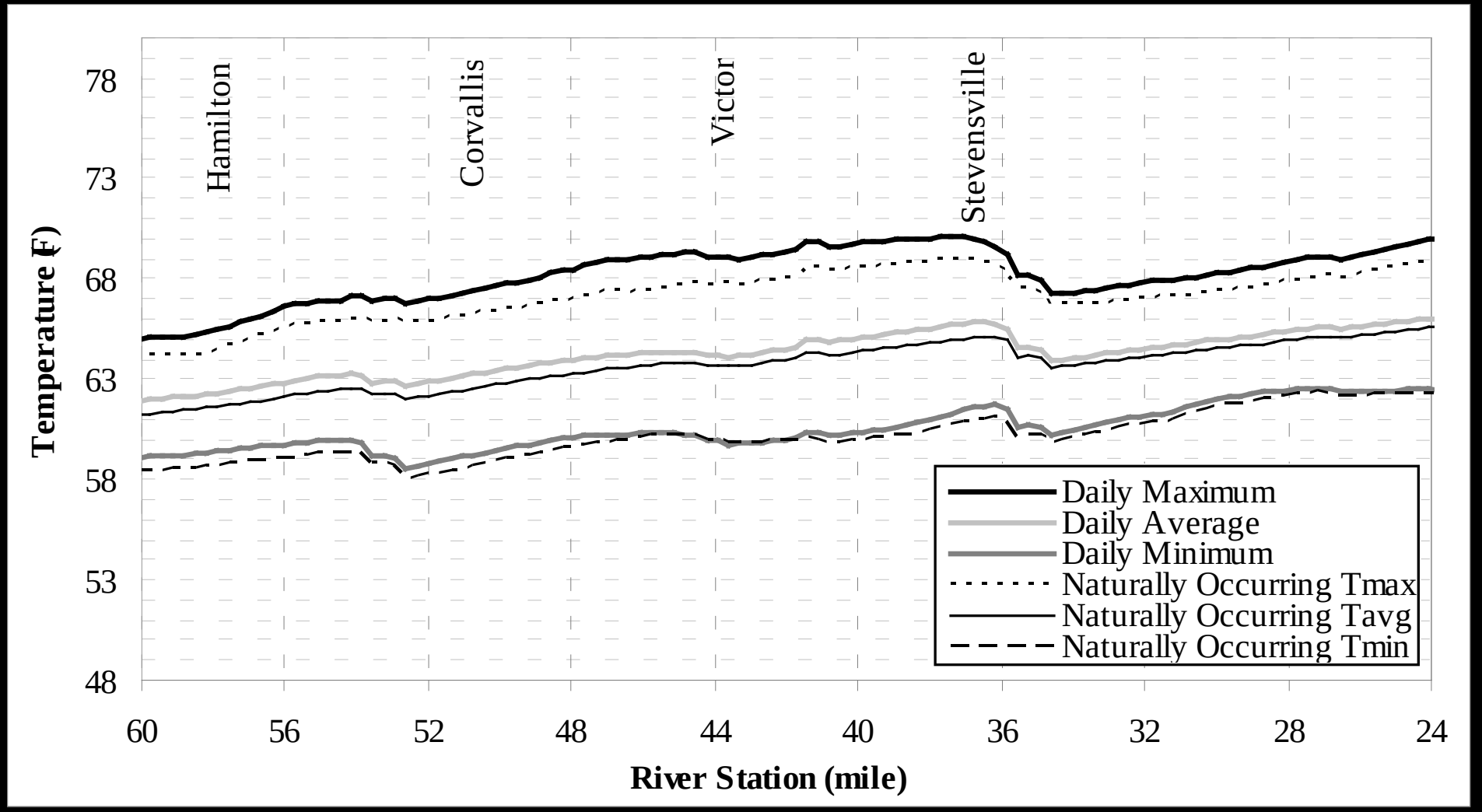
Middle Bitterroot River Temperature Targets

- Montana's Water Quality Temperature Standard - reduce temps by ~1.5˚F

Or meet all in combination:

- Bitterroot Headwaters Shade = follow TMDLs
- Other tributaries = average of 1˚F reduction
- Irrigation efficiencies = 15% efficiencies applied to summer stream flow
- Irrigation Return Flow = no more than 0.1 ˚F cumulatively
- Shade = slight increase in shade
- Channel width to depth ratio = no change
- WWTP loads = Cap at discharge rates that will cumulatively increase in stream temperature < 0.25˚F

Middle Bitterroot River Modeling



Average Summer Afternoon

Middle Bitterroot River Restoration

- Cool headwaters and tributaries
- Irrigation efficiencies and water savings applied in-stream

- Shade along main channel
- WWTP
- Irrigation return flow

Lower Bitterroot River Restoration

- Cool headwaters and tributaries
- Irrigation efficiencies and water savings applied in-stream

- Shade along main channel
- WWTP
- Irrigation return flow
- Missoula Stormwater

Other Tributary Results

- Sleeping Child, Willow and Miller Creeks
  - Streamside Shade
  - Irrigation efficiencies
  - Channel restoration in places

QUESTIONS?

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