Boulder – Elkhorn TMDL Project

TMDL Document – Public Comment Meeting

June 27, 2013

Montana Department of Environmental Quality

Presentation Outline:

- What are TMDLs?
- Boulder – Elkhorn TMDL Project Area
- What's in a TMDL document?
- Sediment Overview
- Temperature Overview
- Nutrient Overview
- Next Steps and Wrap-Up

TMDL Overview

Presented by: Dean Yashan, DEQ TMDL Section Supervisor

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)

Water Quality Standards

- Numeric or Narrative (Descriptive)
- Protect Designated Uses Such as Agriculture & Aquatic Life

Agriculture: Irrigation

Agriculture: Livestock Water Supply

Aquatic Life: Coldwater Fish

Why Do We Write TMDLs?

- 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.

Why Do We Write TMDLs?

- Water quality standards form the basis for determining whether a waterbody is supporting its beneficial uses
- DEQ uses monitoring data to assess water quality & compare to applicable water quality standards
- Waterbodies not meeting water quality standards, and therefore not supporting one or more beneficial uses, are placed on a list of impaired waters

Why Do We Write TMDLs?

- Per CWA & Montana state law, TMDLs must be developed for each waterbody - pollutant cause of impairment

- Consistent with DEQ's water quality protection goals

Major Types of Pollutants

TMDL Implications

- Does *NOT* create or impose new regulations
  - Can help implement existing regulations, mainly for point source surface water discharges

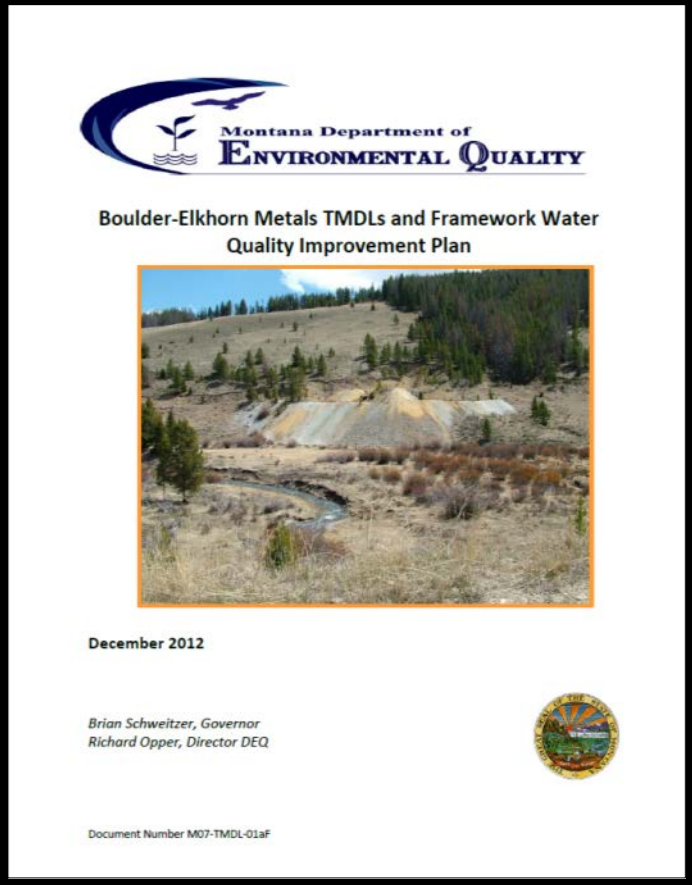
- *Voluntary* for the majority of non-point sources activities, including agriculture
  - Application of water quality improvement practices is a landowner's decision

How Many TMDLs?

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

Montana TMDL Program History

- More than 1,000 Approved TMDLs (1998 – present)
- Close to 50 TMDL Documents Completed as of June 2013
- Boulder-Elkhorn is one of the final remaining TMDL areas to be completed in the Upper Missouri basin


Montana Department of Environmental Quality

Boulder-Elkhorn Metals TMDLs and Framework Water Quality Improvement Plan

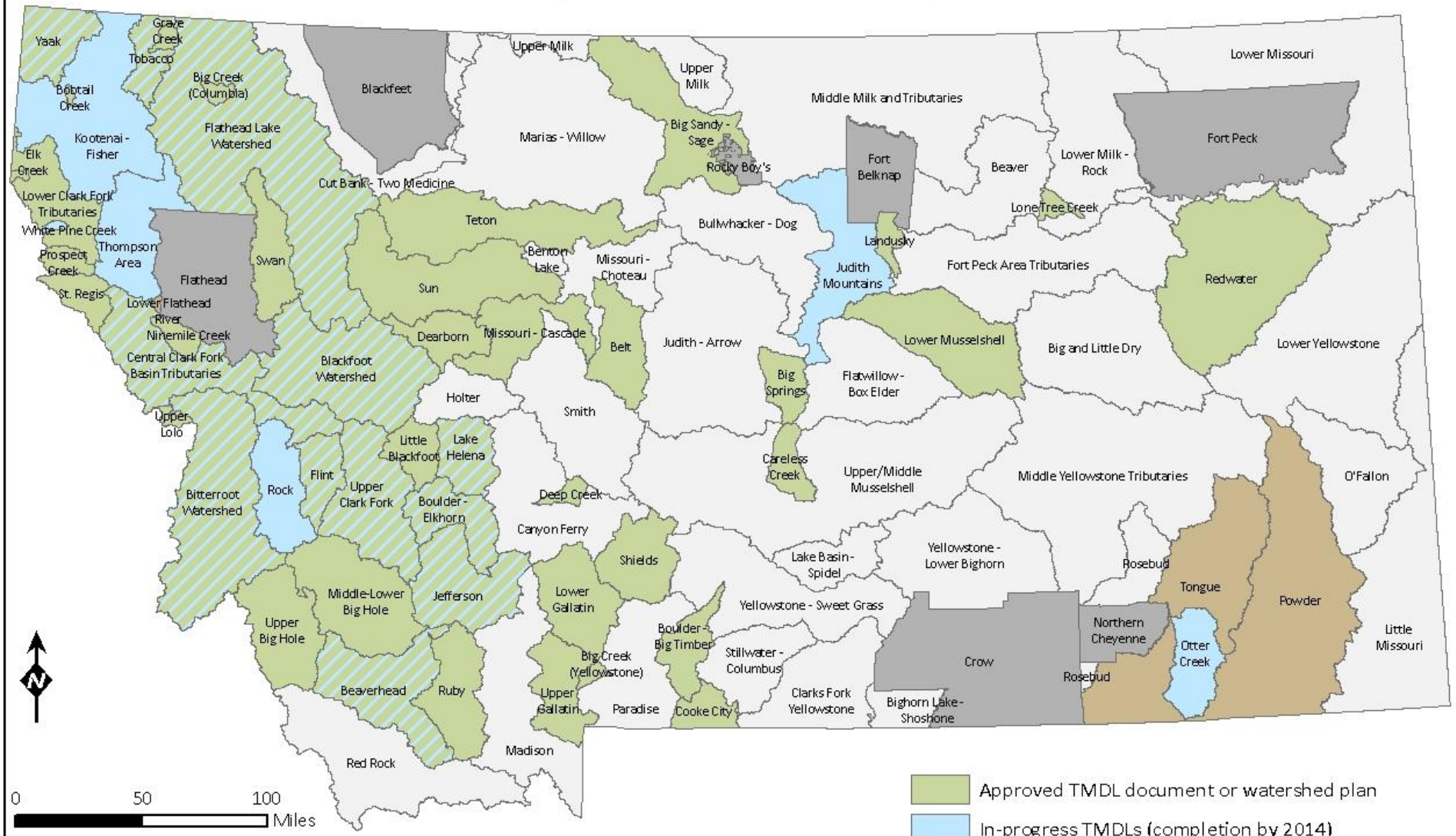
December 2012

Brian Schweitzer, Governor
Richard Opper, Director DEQ

Document Number M07-TMDL-01aF

http://deq.mt.gov/wqinfo/TMDL/finalReports.mcpx

Montana TMDL Project Areas & 2014 TMDL Completion Schedule



Approved TMDL document or watershed plan

In-progress TMDLs (completion by 2014)

Combination approved & in-progress TMDLs

Additional TMDL priority areas (completion after 2014)

Not included in 2014 schedule

Tribal (not under state jurisdiction)

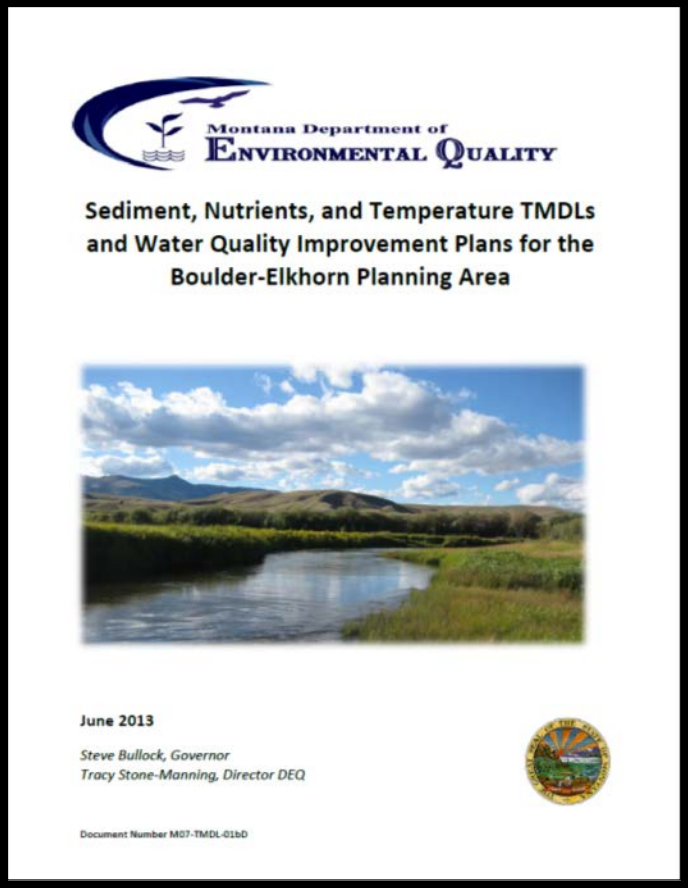
TMDLs are specific to a waterbody segment - pollutant combination. Some planning areas with completed TMDLs may still require TMDL development for additional waterbody - pollutant combinations. Contact the DEQ at 406-444-5317 or refer to the final TMDL documents at http://deq.mt.gov/wqinfo/TMDL/finalReports.mcpx for additional details.

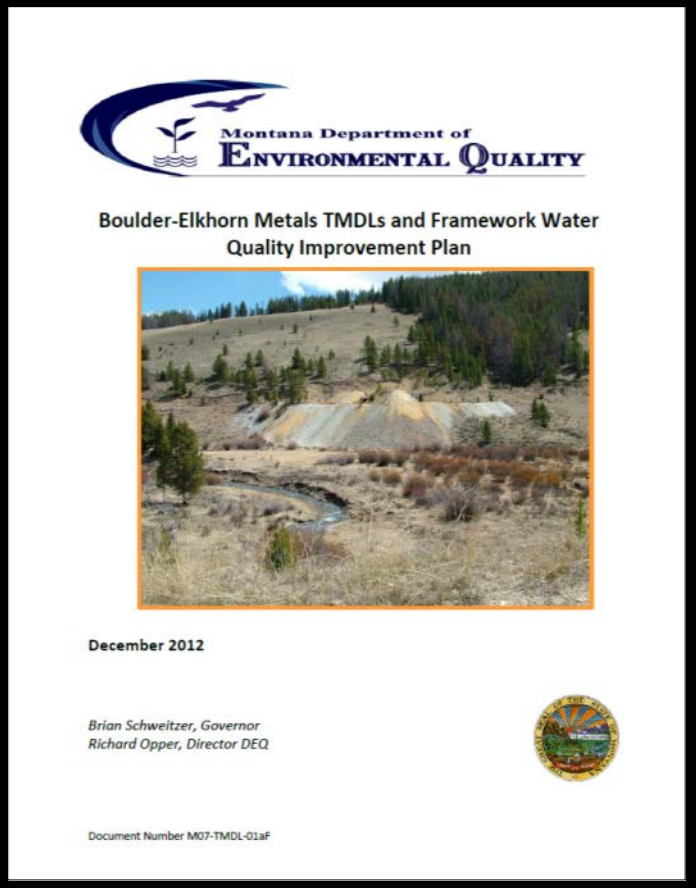
In addition to the watersheds shown on this map, some large rivers and their associated reservoir systems represent separate TMDL project areas. These include the Clark Fork River, the Missouri River, and the Yellowstone River. Pre-TMDL development support work is underway in the Yellowstone River and Missouri River, while the Clark Fork River has a combination of approved and in-progress TMDLs.

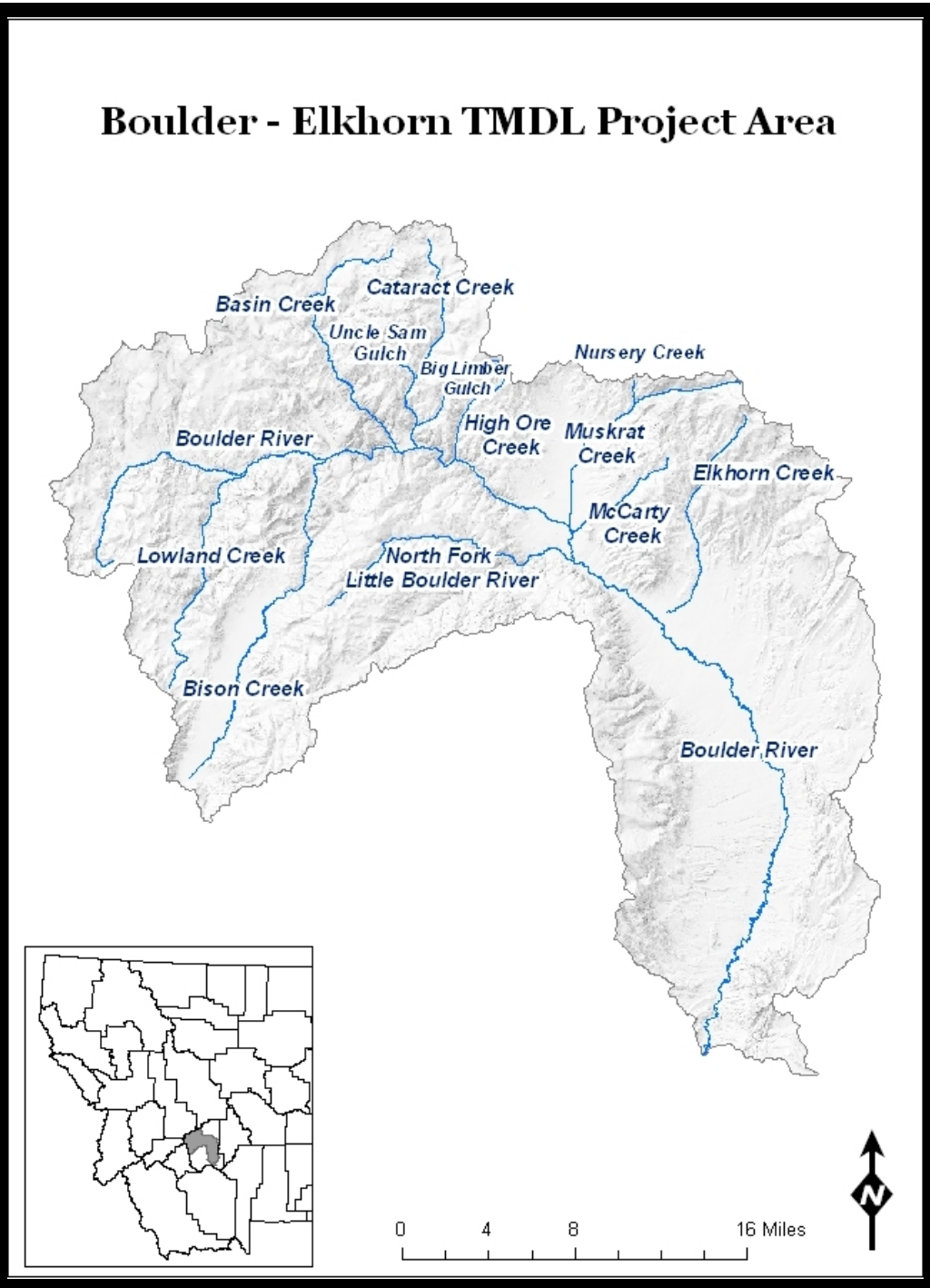
Map updated 5/31/2013

TMDLs for the Boulder River Watershed

Two TMDL documents have been produced for this project







Included Streams

Basin Creek

Big Limber Gulch

Bison Creek

Boulder River

Cataract Creek

Elkhorn Creek

Little Boulder River

NF Little Boulder River

Lowland Creek

McCarty Creek

Muskrat Creek

Nursery Creek

Uncle Sam Gulch

Sediment TMDL Streams

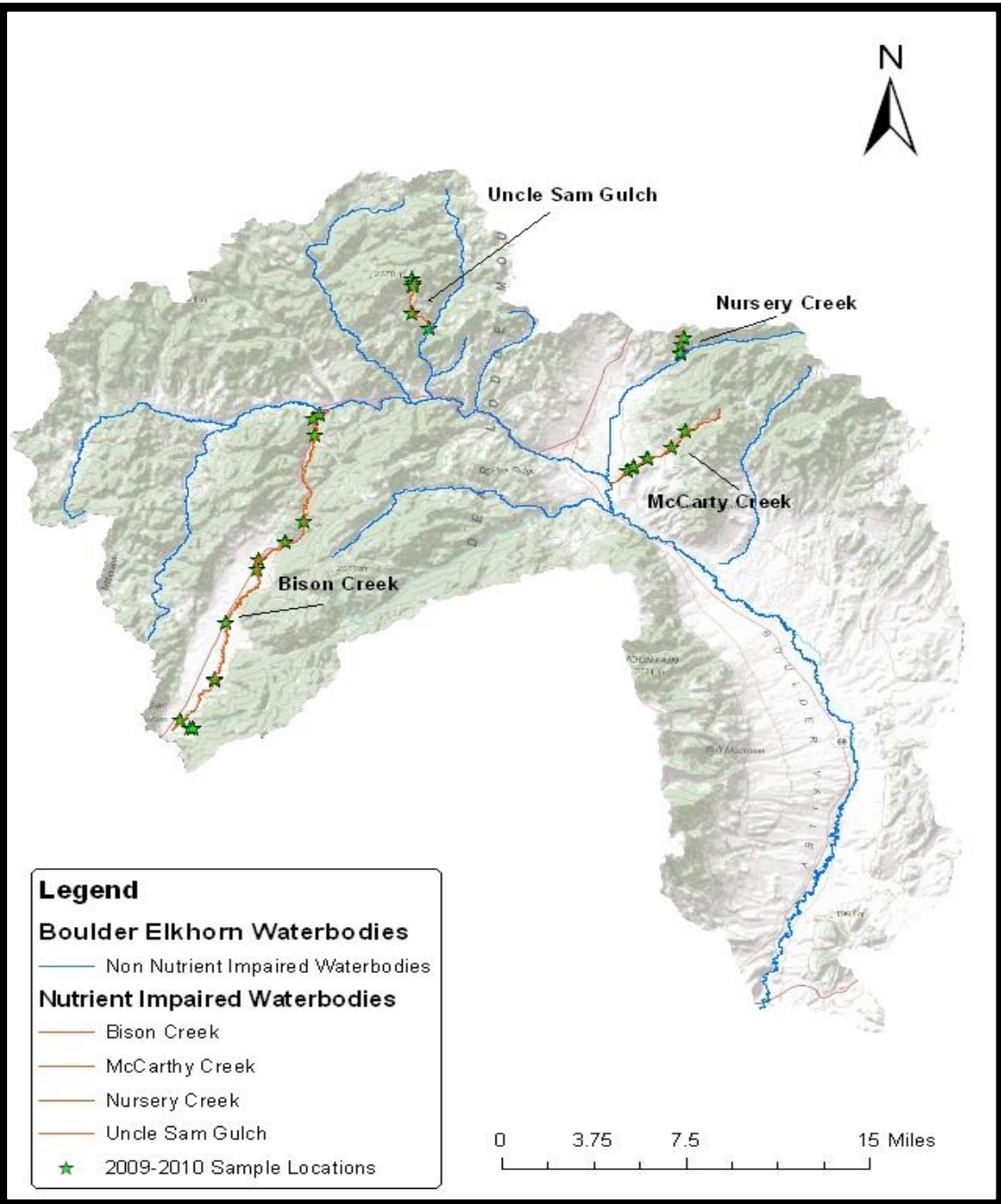
- Basin Creek
- Bison Creek
- Boulder River (City of Boulder to the mouth)
- Cataract Creek
- Elkhorn Creek
- High Ore Creek
- McCarty Creek
- Muskrat Creek
- North Fork Little Boulder River
- Nursery Creek
- Uncle Sam Gulch

Temperature TMDL Streams

- Boulder River (City of Boulder to the mouth)
- High Ore Creek

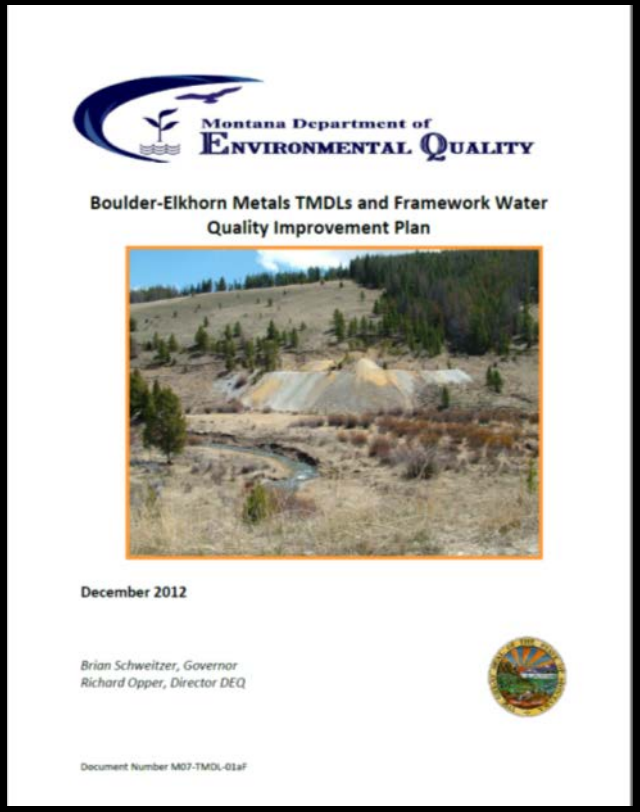
Nutrient TMDL Streams

- Bison Creek
- Uncle Sam Gulch
- Nursery Creek
- McCarty Creek



What's In a TMDL Document?

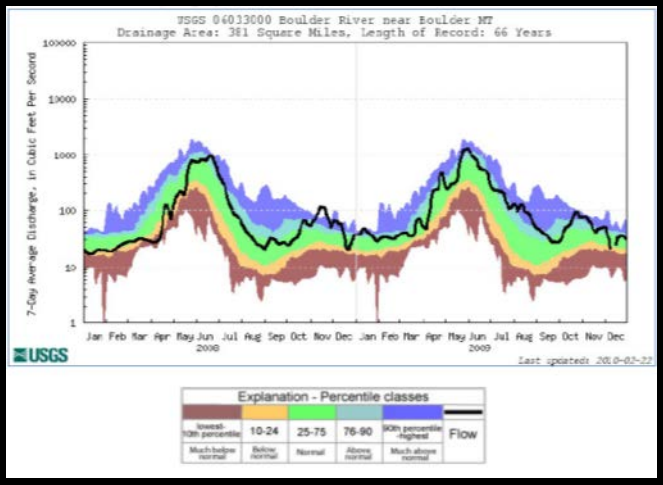
- Watershed description
- Applicable water quality standards
- Water quality/habitat targets to meet standards
- Description of streams and how they compare to targets
- Source assessment and pollutant quantification
- The TMDL – the amount of pollutant a stream can handle and still meet standards
- Allocation (distribution of the TMDL among sources)
- General concepts and framework suggestions to meet the TMDL

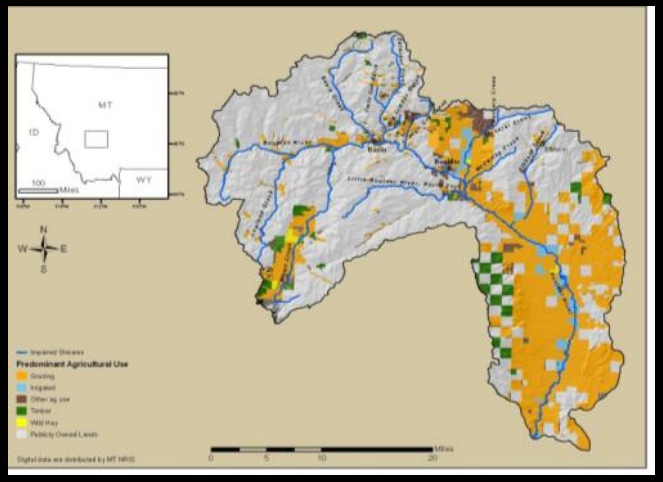


Watershed Description

General description of physical, biological, and cultural characteristics in the watershed to put the discussions in context

- Geology
- Soils
- Climate
- Hydrology
- Land Use
- Fisheries
- And more…





Water Quality Standards

General description of water quality standards applicable to Boulder-Elkhorn TMDL Planning Area streams

- Numeric or Narrative (Descriptive)
- Protect Designated Uses Such as Agriculture & Aquatic Life
- Designated Uses are Based on Classification

Agriculture: Irrigation

Agriculture: Livestock Water Supply

Aquatic Life: Coldwater Fish

Pollutant Sections

Detailed description of conditions, quantities, and effects of pollutants on specific streams in the watershed, including the TMDLs and load allocations.

This document contains sections that describe:

- Sediment
- Temperature
- Nutrients

Concepts and Guidelines To Achieve the TMDLs

General overview of potential monitoring and implementation strategies that may help track and improve water quality issues in the Boulder Elkhorn TPA.

Sediment TMDL Overview

Presented by: Jim Bond, Sediment Project Manager

Applicable Standards: Affect on Beneficial Uses (Aquatic Life)

These standards guide the assessment process, which determines which streams are affected by which pollutants.

Excess sediment may:

- Alter channel form and function (over-widen); reduce habitat
- Interfere with reproduction and survival of fish and aquatic macroinvertebrates (bugs)
- Reduce availability of suitable spawning habitat

Sediment impairments typically relate to impacts to aquatic life and fisheries beneficial uses

Applicable Standards for Sediment

- 17.30.623(2)(f) No increases are allowed above naturally occurring concentrations of sediment or suspended sediment, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, livestock, or wildlife.

- 17.30.637(1) State surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will:

  - 17.30.637(1)(a) Create concentrations or combinations of materials that are toxic or harmful to human, animal, plant, or aquatic life.

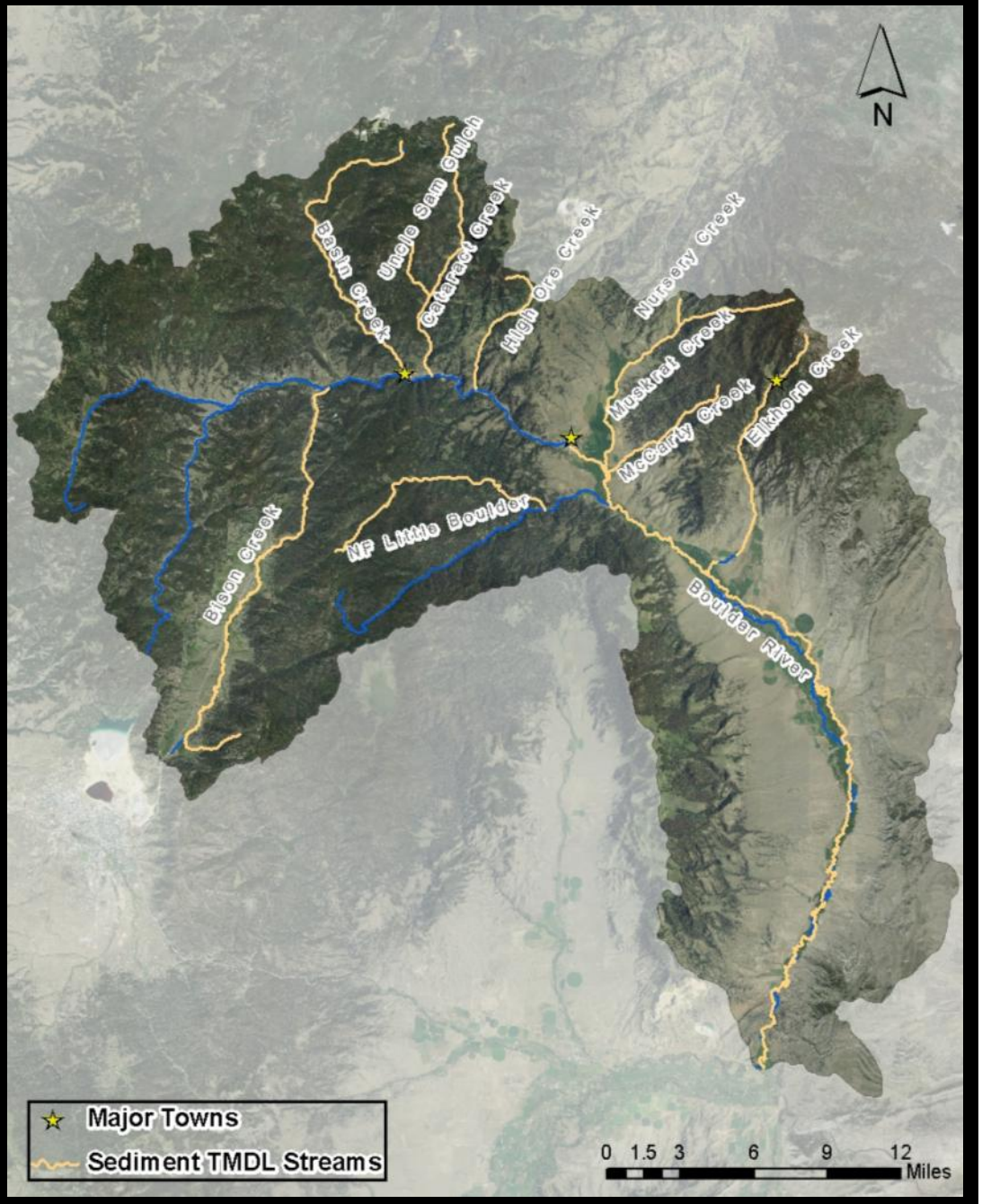
Applicable Standards for Sediment: Key Definitions

- 17.30.602(19) “Naturally occurring” means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied.

- 17.30.602(25) “Reasonable land, soil, and water conservation practices” means practices that protect beneficial uses. These practices include to structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.

Sediment TMDL Streams

- Basin Creek
- Bison Creek
- Boulder River (City of Boulder to the mouth)
- Cataract Creek
- Elkhorn Creek
- High Ore Creek
- McCarty Creek
- Muskrat Creek
- North Fork Little Boulder River
- Nursery Creek
- Uncle Sam Gulch



Sediment and Habitat Targets

Targets are values that translate the narrative standard into something measurable. For sediment, we often look at habitat and in-stream quality measures.

Sediment and Habitat Targets: Field Investigations

Parameters of Interest

- 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)
- Bank Erosion
  (Number of banks, loads, and associated causes and severity)

Parameters of interest 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

Sediment Source Categories

Natural erosion

- Result of climatic and hydrologic processes

Human influenced sediment/erosion

- Streambank erosion
  - Streamside Vegetation Removal
  - Unnatural Flow Fluctuations
  - Livestock trampling
- Sediment from unpaved roads & road crossings
  - Non-"BMP'ed" roads and crossings
  - Culvert failure

- Sediment from land use (upland sediment)
  - Grazing practices
  - Timber harvest
  - Streamside Vegetation Removal
  - Crop Production
  - Development
- Point Sources
  - Permitted entities

TMDL & Allocations

- The TMDL – the amount of pollutant a stream can handle and still meet water quality standards
- Allocation (distribution of TMDL among sources)

Table 5-43. Sediment Source Assessment Loads, Allocations and TMDL for Basin Creek			
Sediment Sources	Current Estimated Load (tons/year)	Total Allowable Load (tons/year)	Load Reductions (% reduction)
Roads	3.93	0.17	96
Eroding Banks	597	389	35
Upland Erosion	195	134	31
Point Source	0	0	0
Watershed Sediment Load (Total)	796	523	34

TMDL & Allocations: Sediment Reduction Ranges

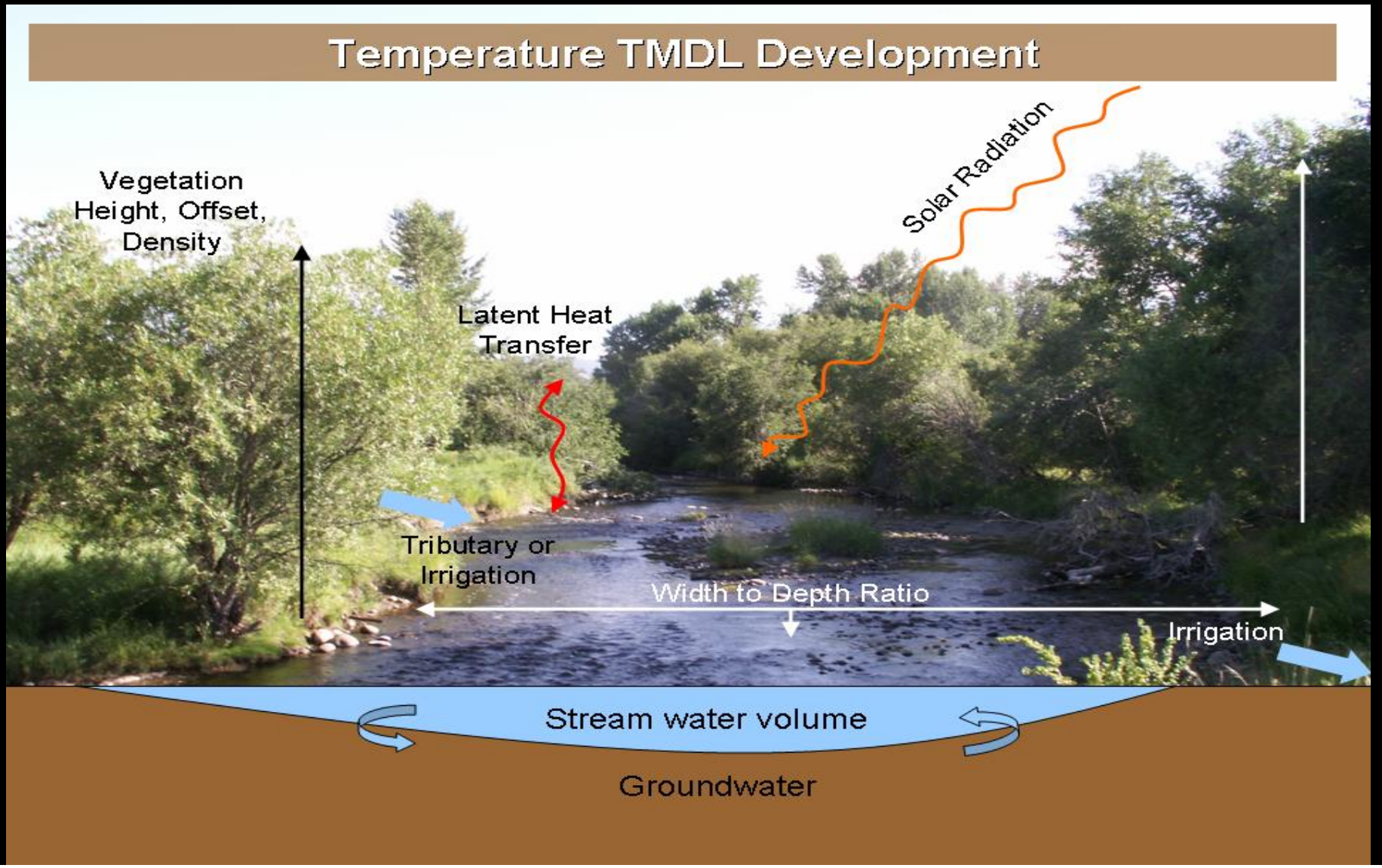
- Roads: 71-98%
- Upland: 22-64%
- Bank Erosion: 18-40%

- *Watershed-wide: 29-46%*

Temperature TMDL Overview

Presented by: Jim Bond, Temperature Project Manager

Temperature TMDLs



Applicable Standards for Temperature & Key Definitions

- 17.30.623(2)(e) No increase above 1 ^{0}F of naturally occurring water temperature is allowed as it pertains to the potential harm to the beneficial uses

(Temperature impairments typically relate to harm to aquatic life and fisheries beneficial uses.)

- 17.30.602(19) “Naturally occurring” means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied.

- 17.30.602(25) “Reasonable land, soil, and water conservation practices” means practices that protect beneficial uses. These practices include to structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.

Temperature TMDL Streams

- Boulder River (City of Boulder to the mouth)
- High Ore Creek

Boulder River Source Assessment

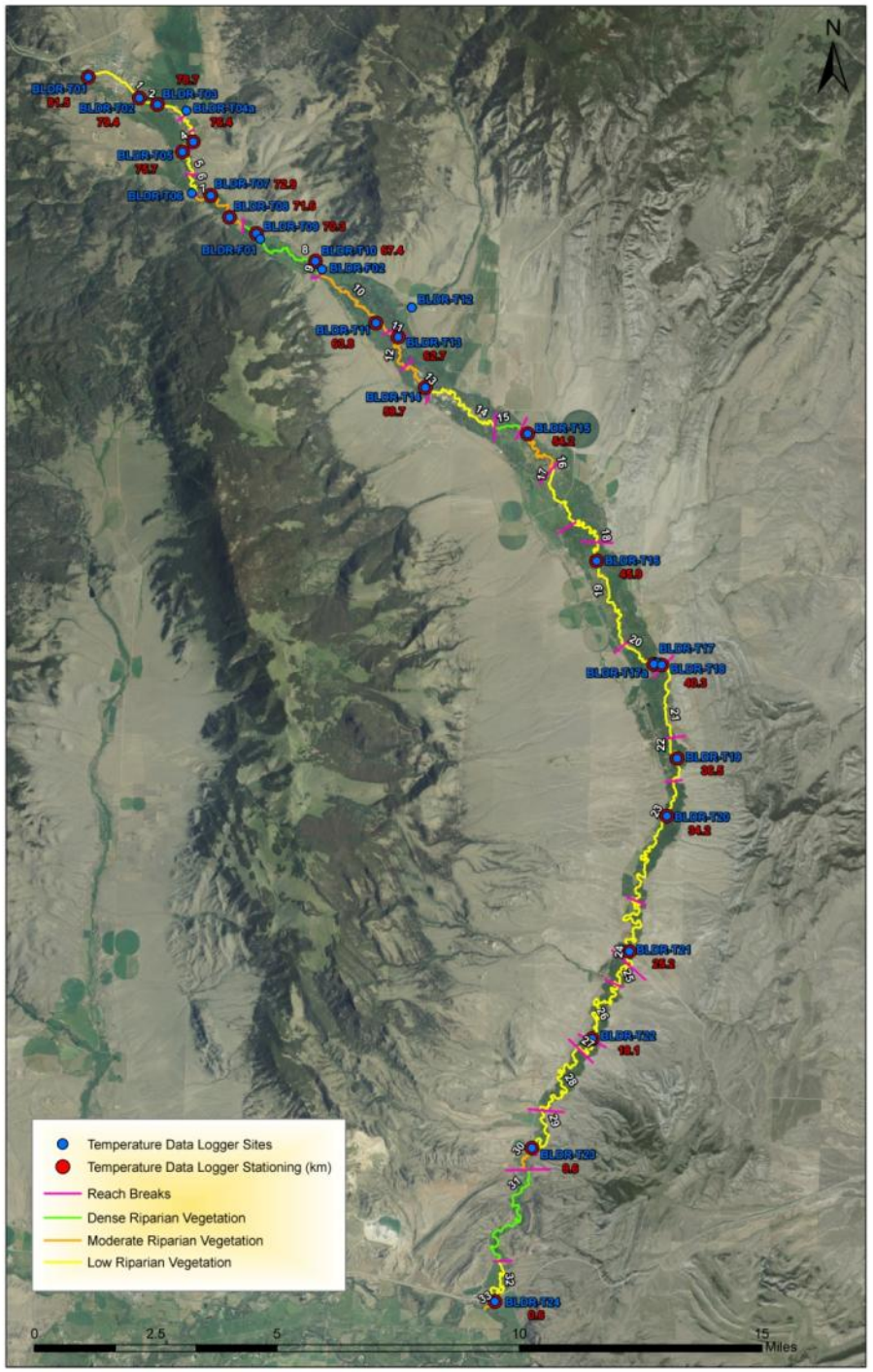
Field Data

- Continuous Temperature Monitoring
- Shade
- Stream Flow
- Riparian Condition

Water Quality (QUAL2K) Model

Uses temperature data from hottest period of the monitoring record to simulate water temperature change through the system.

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



Boulder River Source Assessment: QUAL2K

Existing Conditions – used the field data and riparian assessment categories to simulate conditions over a period of hot, summer-time weather

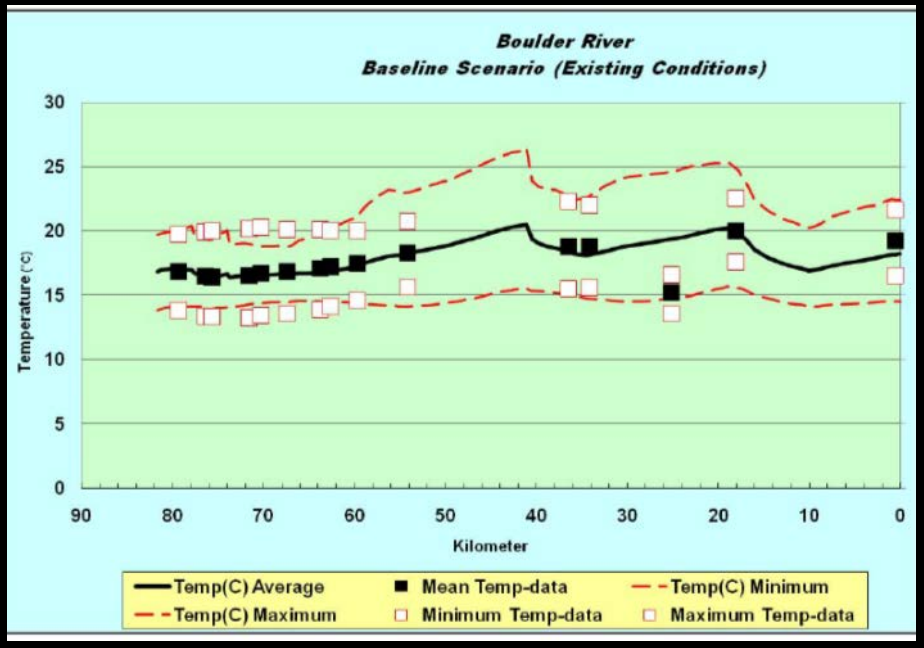


Figure 2-2. Boulder River Temperature Data, July 24th-26th, 2010.

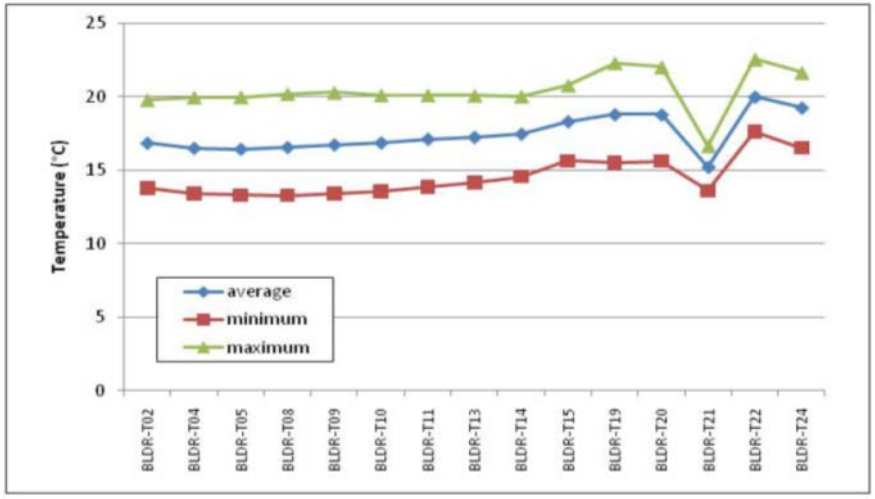
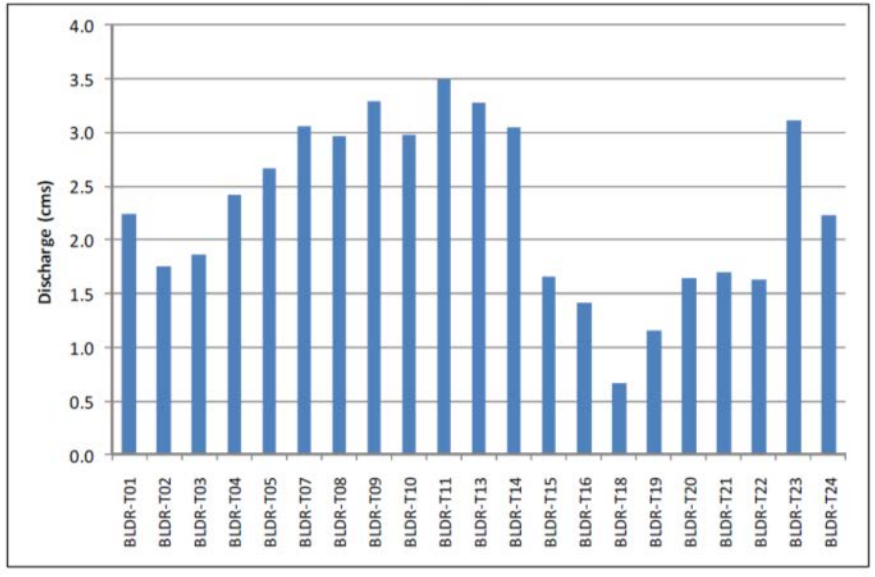


Figure 2-3. Boulder River Streamflow Data, August 4th-6th, 2010.



Boulder River Source Assessment: QUAL2K Scenarios

TMDL ANALYSIS SCENARIOS

Shade Scenario – Improve riparian conditions
Showed departure from existing conditions of 0.7 – 2.7 ^{o}F.

*__Naturally Occurring__ – Shade Scenario and 15% less water withdrawal
Showed departure from existing conditions of 0.7 – 3.6 ^{o}F.

Data Logger Site	Q2K Existing Conditions			Q2K Naturally Occurring Scenario			Departure from Existing Conditions	Departure from Existing Conditions
	Distance (km)	Maximum Temperature (°C)	Maximum Temperature (°F)	Distance (km)	Maximum Temperature (°C)	Maximum Temperature (°F)		
BLDR-T02	79.1	20.1	68.1	79.1	20.1	68.1	0.0	0.0
BLDR-T04	76.3	19.5	67.1	76.3	19.2	66.5	-0.4	-0.7
BLDR-T05	75.6	19.4	66.8	75.6	19.0	66.1	-0.4	-0.7
BLDR-T08	71.4	19.0	66.2	71.4	18.6	65.4	-0.4	-0.8
BLDR-T09	70.4	18.8	65.9	70.4	18.5	65.4	-0.3	-0.5
BLDR-T10	67.4	18.8	65.9	67.4	19.0	66.2	0.2	0.3
BLDR-T11	63.7	20.0	67.9	63.7	19.3	66.7	-0.7	-1.2
BLDR-T13	62.7	20.1	68.3	62.7	19.4	66.9	-0.8	-1.4
BLDR-T14	59.8	21.0	69.9	59.8	20.0	68.0	-1.1	-1.9
BLDR-T15	54.1	23.0	73.4	54.1	21.8	71.2	-1.2	-2.2
BLDR-T19	36.5	22.8	73.0	36.5	21.8	71.2	-1.0	-1.8
BLDR-T20	34.5	22.5	72.6	34.5	21.5	70.7	-1.0	-1.9
BLDR-T22	18.8	25.3	77.5	18.8	23.3	73.9	-2.0	-3.6
BLDR-T24	1.0	22.5	72.5	1.0	20.6	69.1	-1.8	-3.3
Grey highlighted values indicate that the model scenario predicts a potential decrease in temperature greater than 0.5°F.								

Boulder River TMDL and Allocations

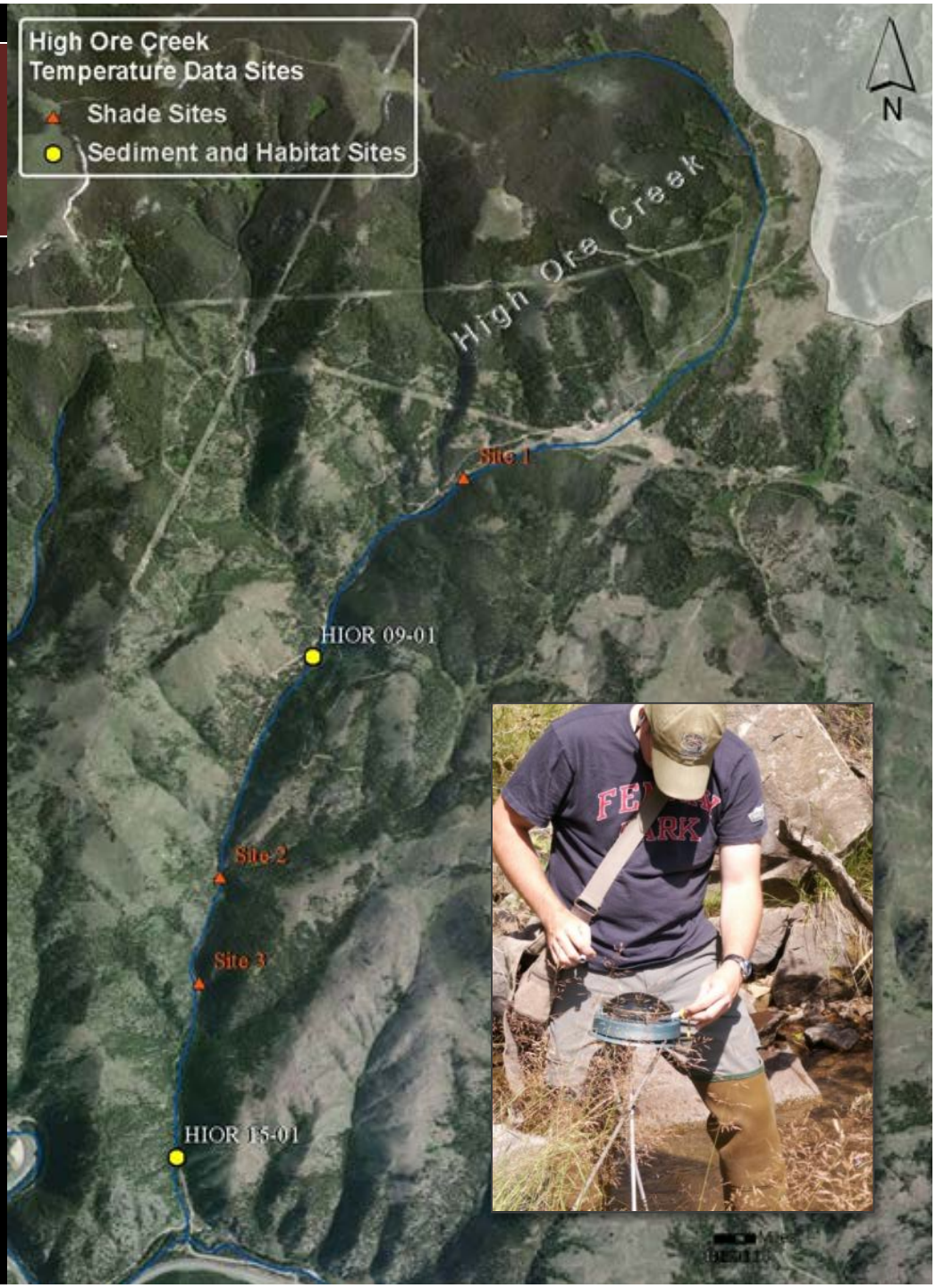
In lieu of expressing allocations based on numeric temperatures or thermal loads, the TMDL and allocations are expressed via conditions that, if met, would comply with the temperature standard.

- Improve riparian conditions to improve shade where riparian health is diminished
- Improve width-depth relationships where stream is overwidened
- Reduce inefficient conveyance and/or inefficient use of water from the Boulder River where practical and possible
- No permitted discharges in exceedance of the temperature standard conditions

High Ore Creek Source Assessment

Field Data Only

- Limited Temperatures & Stream Flows
- Shade
- Channel Measurements
- DEQ & BLM Data



High Ore Creek TMDL and Allocations

In lieu of expressing allocations based on numeric temperatures or thermal loads, the TMDL and allocations are expressed via conditions that, if met, would comply with the temperature standard.

- Maintain or improve riparian conditions to improve effective shade
- Improve width-depth relationships where stream is overwidened
- Reduce inefficient conveyance and/or inefficient use of water where practical and possible (if water-use occurs)

Nutrient TMDL Overview

Presented by: Lou Volpe, Nutrients Project Manager

Nutrients

Nutrients : naturally occurring chemical elements required for a functioning aquatic ecosystem.

Occurrences:

Typically occur in the forms of nitrogen and phosphorous

Excess Inputs of Nutrients May:

Accelerate algal growth
-Aesthetics

Depletion of dissolved oxygen
-creates toxic conditions for fish and bugs

Nutrient Target Values

- **Targets:** Translation of the applicable numeric or narrative water quality standard(s) for each pollutant. For pollutants with established numeric water quality standards, the numeric value(s) are used as the TMDL targets.
- **Target values are a result of:**
  - **Water quality standards:**
    - NO3+NO2 is based on narrative standards
    - TN and TP based on draft numeric nutrient criteria.
  - **Technical studies in pursuit of draft numeric criteria for nutrients**
    - Public perception of what level of algae is perceived as "undesirable", {Suplee, 2009}.
    - Outcomes of nutrient stressor-response studies that determine nutrient concentrations that will maintain algal growth below undesirable levels {Suplee, 2008}.

Nutrient Targets for the Boulder Elkhorn TPA	
Parameter	**Target Value**
Nitrate + Nitrite (NO_3+NO_2)	≤ 0.100 mg/L
Total Nitrogen (TN)	≤ 0.300 mg/L
Total Phosphorus (TP)	≤ 0.030 mg/L
Chlorophyll-*a* (or Ash Free Dry Weight)	≤ 120 mg/m² (≤35 g AFDW/m²)

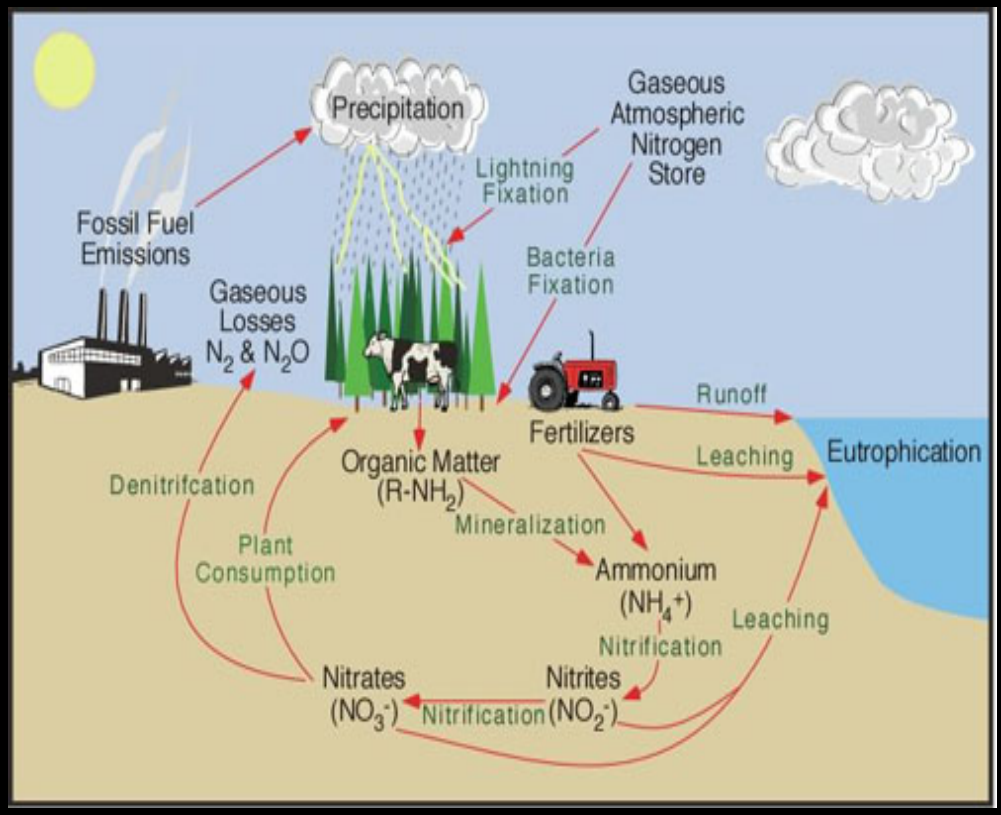
Nutrient Source Categories

Natural Sources

- Result of regional and local geology, soils, climatic and hydrologic processes
- Natural biochemical processes
- Natural vegetative decay

Human Caused Sources

- Agricultural Land Use
  - Grazing practices
  - Domestic animal waste
  - Vegetative decay from feeding operations
- Historical Mining and Milling
  - 1860's- 1960's (lead, zinc, gold, silver, Iron)
  - Waste rock and tailings still present
- Silvicultural Practices
  - Timber harvest
  - Forest Fires/Prescribed Burns
- On Site Septic Systems
  - Majority is Low density (<50/sq mile)
  - Minor contributions of moderate and high density (50-300 and > 300 /sq mile)



Nutrient Impaired Streams

TMDLs Developed (per updated assessments)

- Bison Creek: Total Nitrogen, Total Phosphorous (TN, TP)
- Uncle Sam Gulch: Nitrate + Nitrite (NO2+NO3)
- Nursery Creek (TN, TP, NO2+NO3)
- McCarty Creek (TP)

Cataract Creek & North Fork Little Boulder River not impaired per updated assessment results

Most Significant Human Caused Nutrient Sources

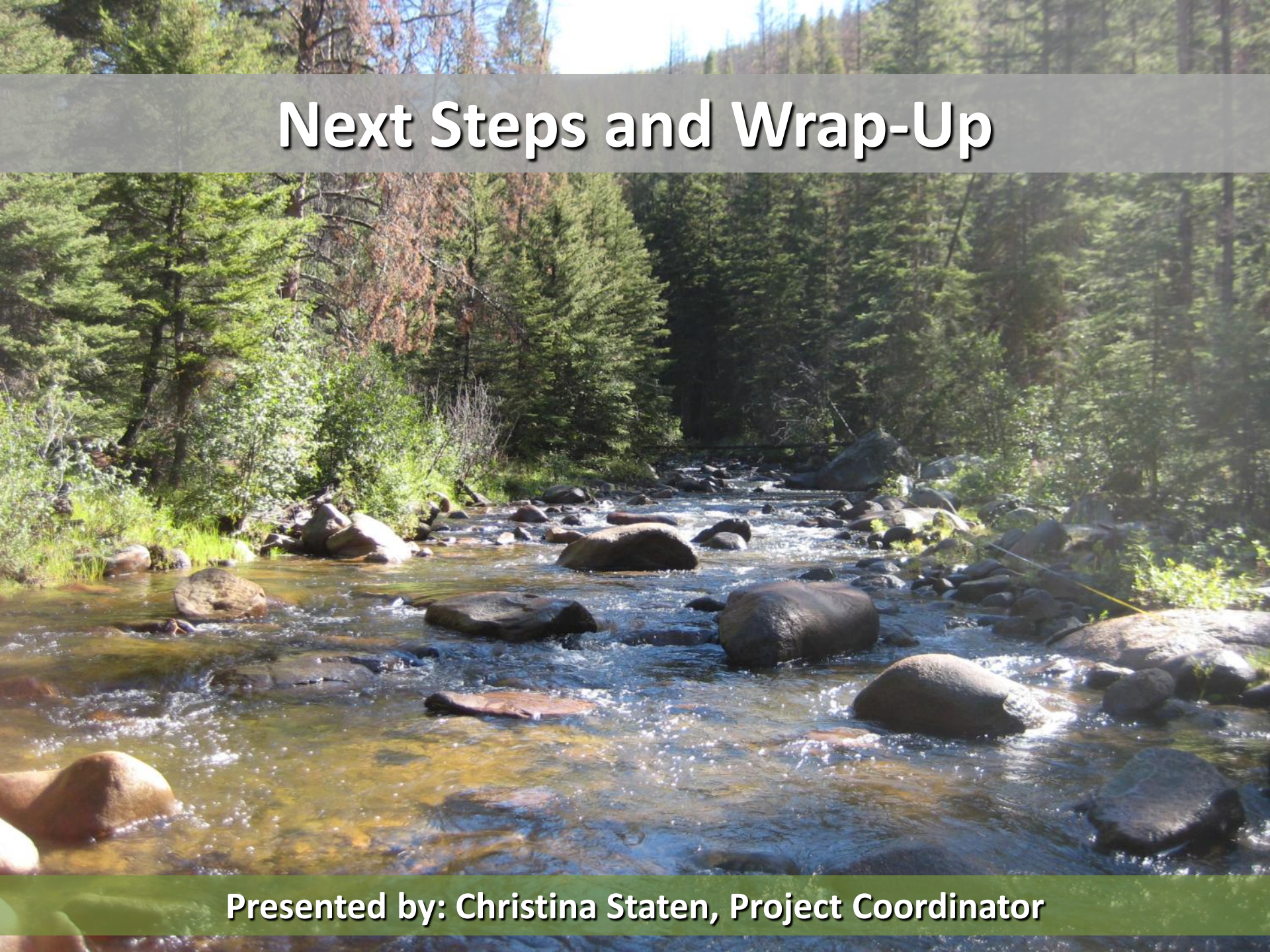
- Bison Creek
  - Agricultural land use
  - On-site septic systems
- Uncle Sam Gulch
  - Historical mining
- Nursery Creek
  - Agricultural land use
- McCarty Creek
  - Agricultural land use

% Reductions Needed

- Bison Creek:
  - Total Nitrogen: 59%
  - Total Phosphorous: 48%
- Uncle Sam Gulch
  - Nitrate + Nitrite: 0%

  (TMDL development result of elevated algal growth)
- Nursery Creek
  - Total Nitrogen: 79%
  - Nitrate + Nitrite: 88%
  - Total phosphorous: 75%
- McCarty Creek
  - Total Phosphorous: 66%

Next Steps and Wrap-Up



Presented by: Christina Staten, Project Coordinator

Boulder-Elkhorn TMDL Project

Ultimate goal of the TMDLs is to protect water quality in the Boulder River watershed

TMDL Implementation

- A completed TMDL provides information on water quality problems and strategies to reduce pollutants by changing land and water management activities
- The TMDL document provides a basis for action, but TMDLs are not self-implementing
- It is up to local stakeholders, organizations, and government agencies to determine how to best use the information and implement a restoration strategy

TMDL Implementation

Adaptive Management Approach

An adaptive management approach works in cooperation with monitoring, and as new information is collected, it allows for adjustments to restoration goals or pollutant targets, TMDLs, and/or allocations

How to Meet TMDLs

- Reduce sediment and nutrient inputs to surface water and groundwater:
  - Increase the filtering and uptake capacity of riparian vegetation areas
  - Limit the transport of sediment and nutrients from rangeland, cropland, and historically impacted areas (mining)
  - Improve bank stability and stream function through riparian improvement
- Reduce direct thermal loading and improve thermal capacity
  - Increase shade through quality riparian management
  - Increase summertime in-stream flow via water use and supply efficiency improvements where appropriate

Agricultural Land Management

Livestock Management

Develop a Grazing Management Plan

- Timing of grazing (seasonal)
- Lower intensity (duration)
- Distribute stock (frequency)

Agricultural Land Management

Livestock Management

Riparian Area Protection

- Fencing
- Water Gaps
- Off-stream Watering

Agricultural Land Management

Cropping Practices

- Develop a Nutrient Management Plan
- Streamside Buffers

Land Management Practices

Erosion Control

- Streambank Protection & Restoration
- Riparian Grazing Management
- Eliminate Invasive Weeds

DEQ's Watershed Protection Program

Helps With or Provides:

- Technical Assistance
- Funding
- Monitoring Assistance
- Watershed Group Assistance
- TMDL Implementation Evaluations

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