MADISON RIVER TOTAL MAXIMUM DAILY LOAD PROJECT

Watershed Advisory Group Meeting

August 22, 2018

First Madison Valley Bank, Ennis

DEQ Montana Department of Environmental Quality

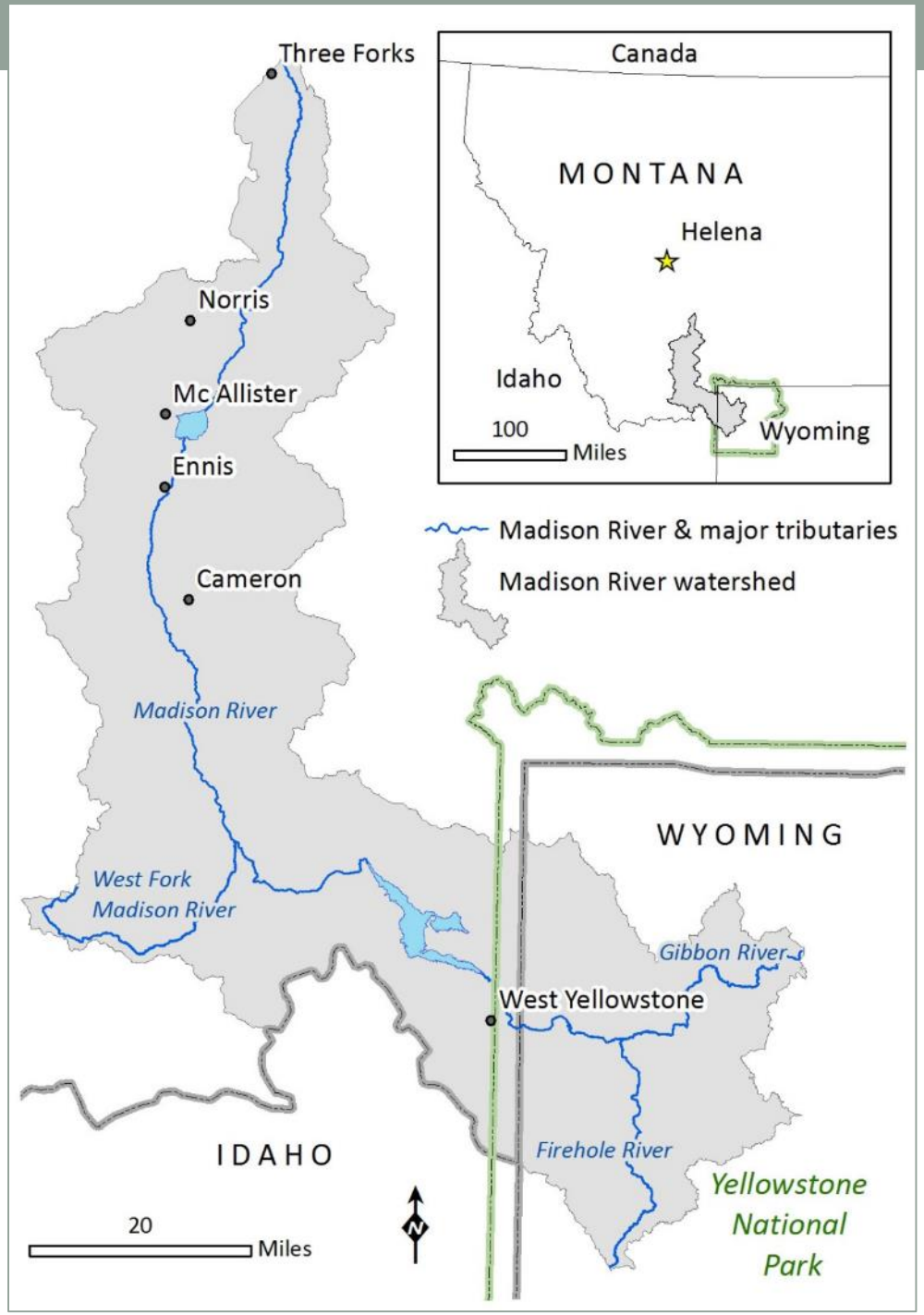
Meeting Purpose

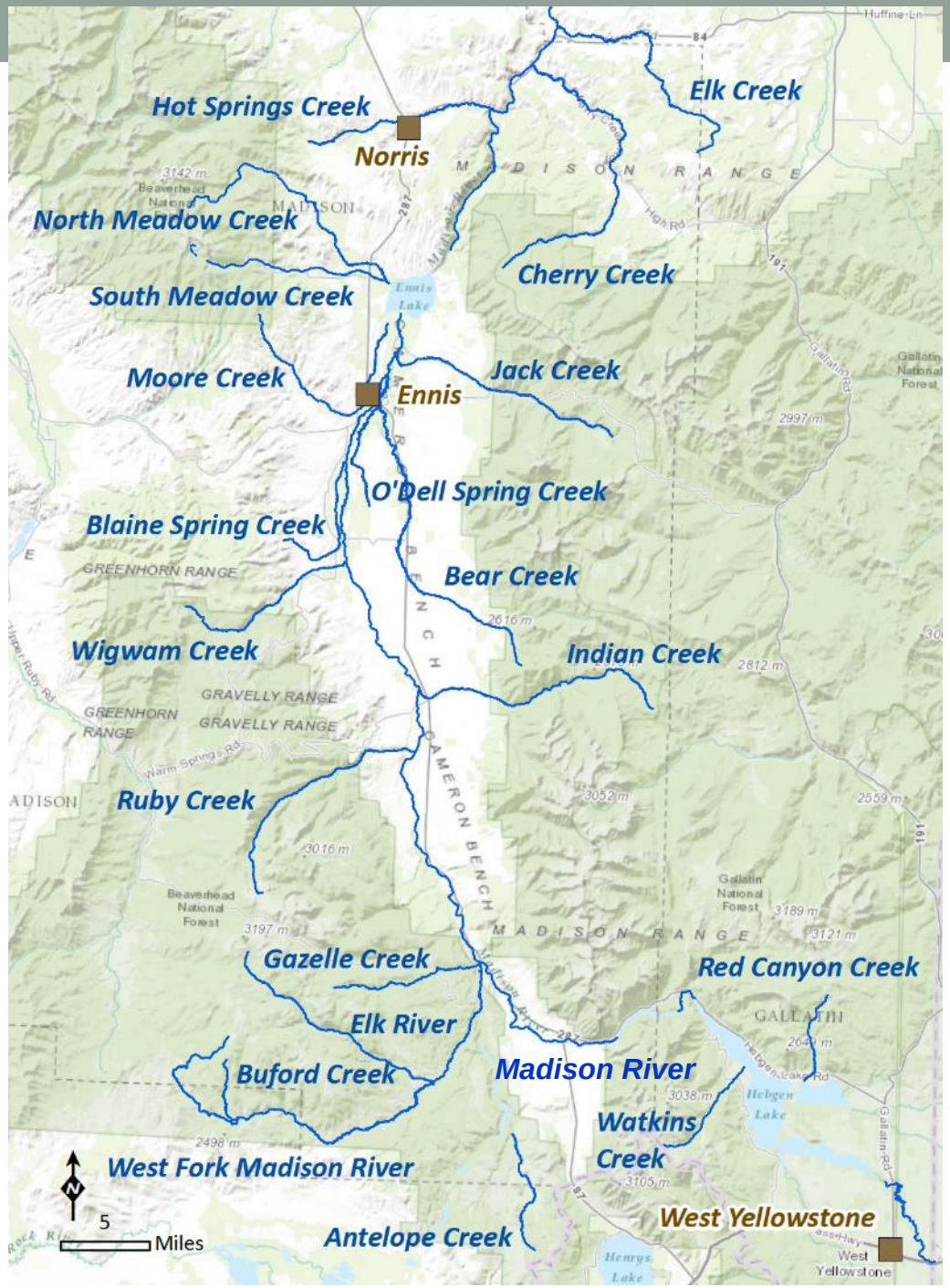
Meeting with the Madison River Watershed Advisory Group to discuss the stakeholder review version of the draft total maximum daily load (TMDL) document containing nutrient, pathogen, and metal TMDLs for tributaries of the Madison River

Presentation Outline

- Project Overview and History
- Overview of the TMDL process
- Nutrient TMDLs
- *E. coli* TMDLs
- Metal TMDLs
- Next Project Steps

Madison River Watershed

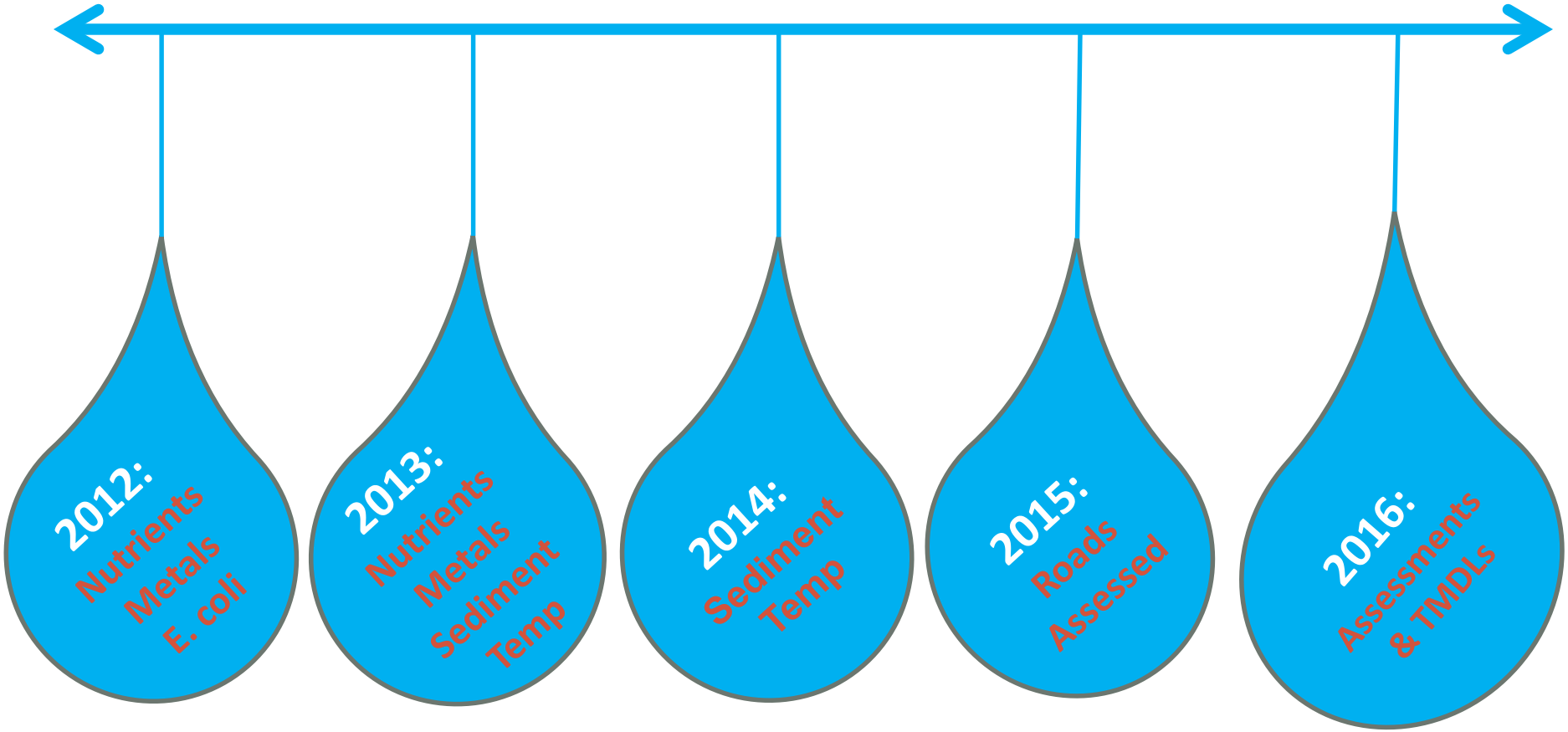




Sampled Streams

- Madison River
- 21 Tributaries
- Ennis Lake

Madison Project History



Madison Project Future

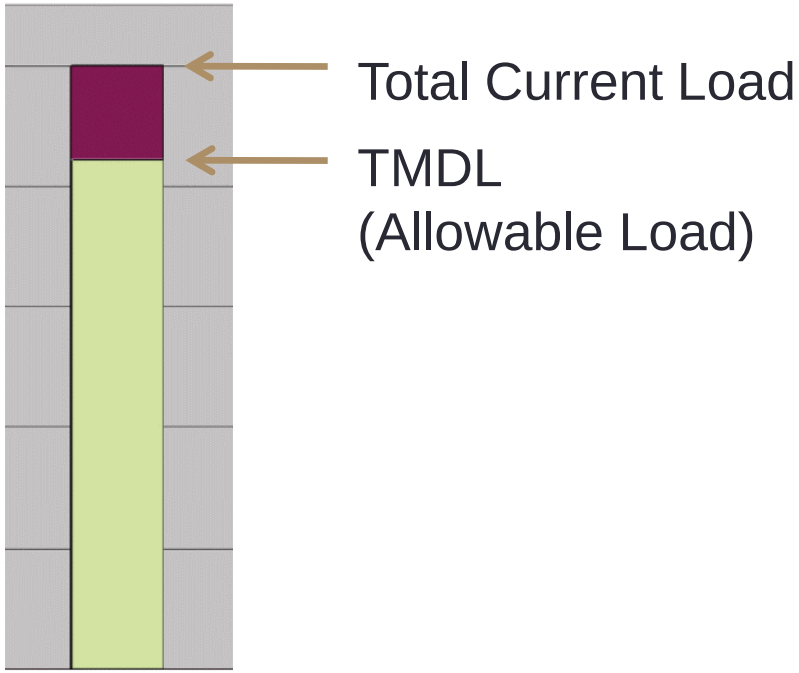
- Two TMDL Documents
- Nutrient, *E. coli*, and Metals TMDLs:
  - Document will go through public comment this Fall
  - Intent is to finalize and submit to EPA for approval by end of 2018
- Sediment and Temperature TMDLs:
  - Under development
  - Completion schedule uncertain

TOTAL MAXIMUM DAILY LOAD PROCESS

Christina Staten

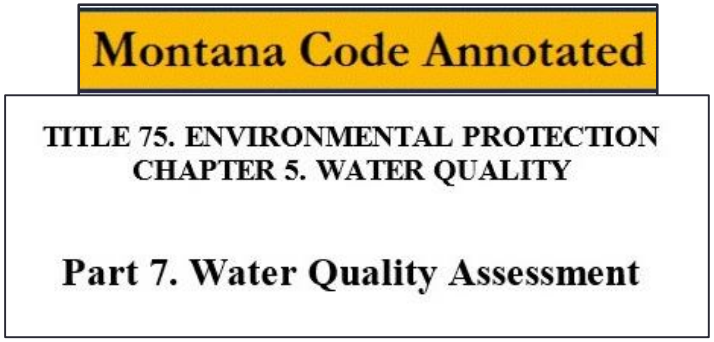
What is a TMDL?

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



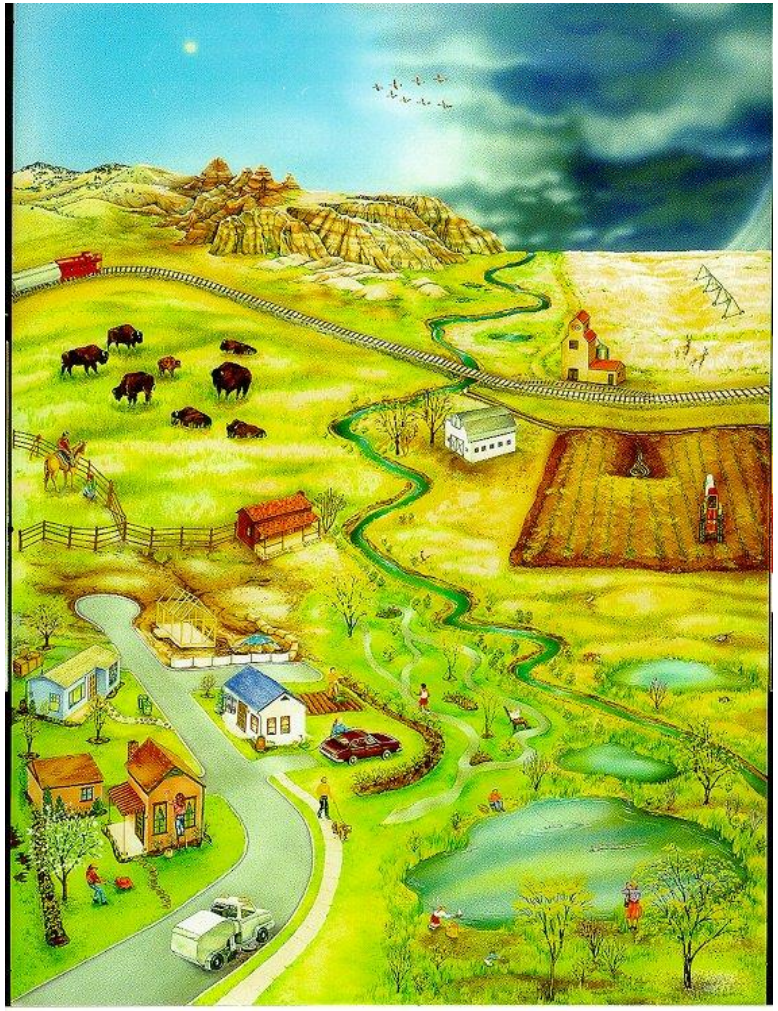
Basic TMDL Facts

- TMDLs are written for pollutant causes of impairment consistent with Montana state law and federal Clean Water Act requirements
- A waterbody may have multiple pollutant impairment causes & therefore multiple TMDLs



Why Do We Need TMDLs?

- Addresses cumulative impacts
- Incorporates multiple source types, both regulated and non-regulated
- Guides future restoration work and prioritization for projects



Madison TMDL Development Steps

1. Define the TMDL water quality target
2. Define the TMDL (allowable loading rate)
3. Determine sources of pollutant loading
4. Determine the TMDL allocations

1. Defining the TMDL Water Quality Target

- TMDL targets represent conditions where the applicable water quality standards are achieved
- Where a numeric standard exists, the numeric standard typically becomes the target
- Where only narrative standards exist, DEQ develops targets that translate the standard

2. Defining the TMDL

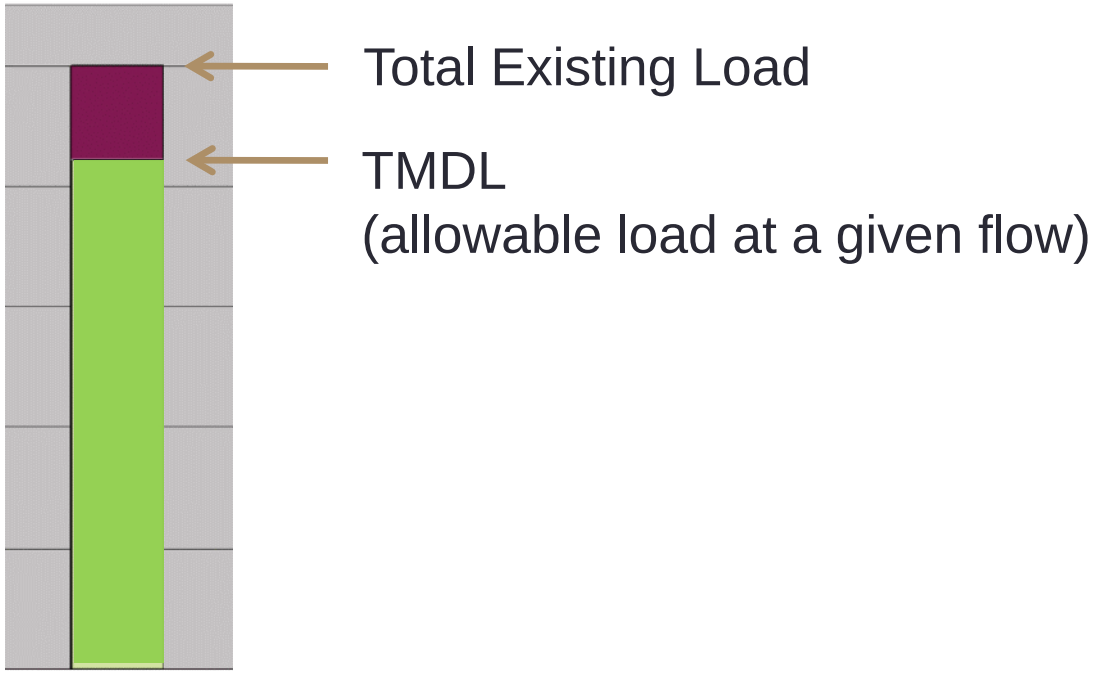
- Varies by pollutant type
- For some pollutants, the TMDL can be determined using the target concentration and stream flow

TMDL (lb/day) = (Stream flow) x (target concentration) x (conversion factor)

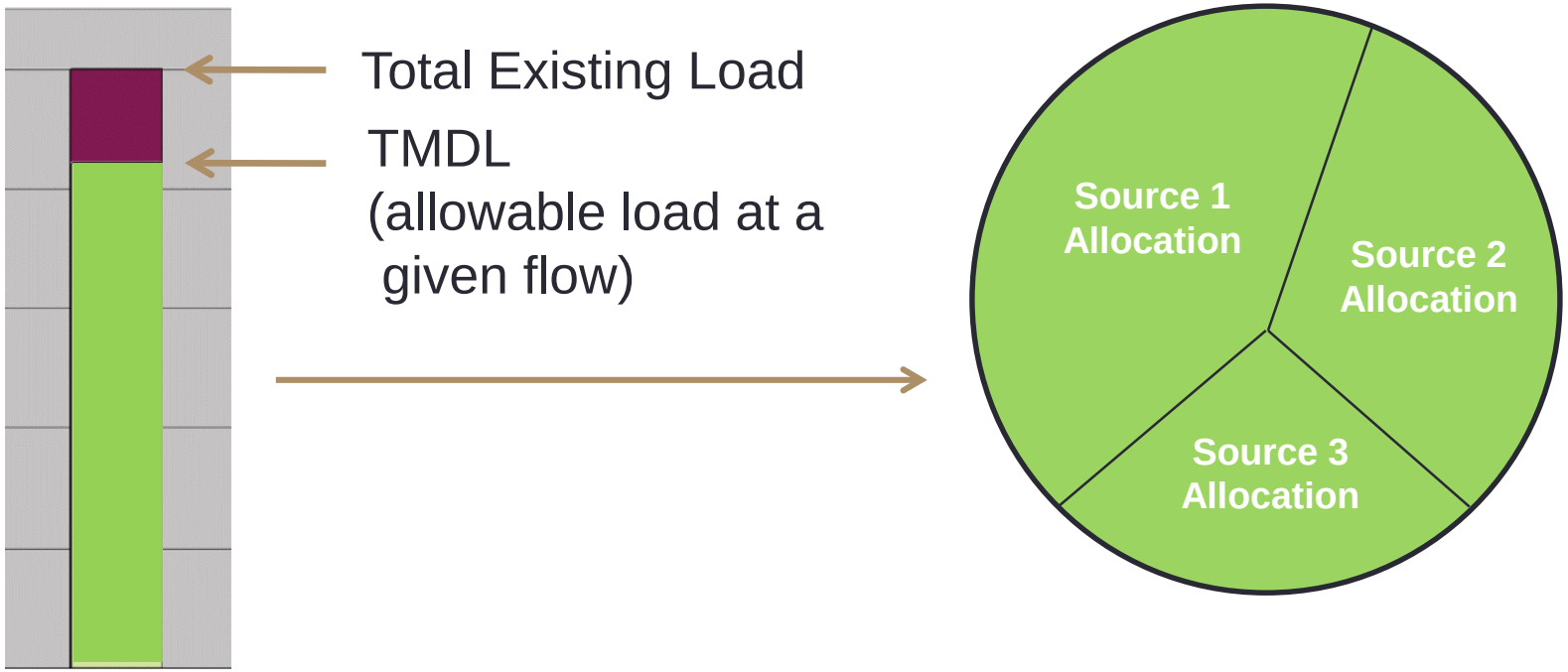
Iron TMDL Example Calculation:
(10 cfs) x (1,000 µg/L) x (0.0054 conversion factor) = 54 pounds/day

3. Sources of Pollutant Loading

- What is the total existing load of the pollutant?
- What are the sources of the elevated loading?



4. TMDL Allocations: Conceptual Diagram



4. TMDL Allocations: Implementation

- Allocations to non-regulated sources, such as agricultural and water management practices, are predominately based on voluntary landowner actions
- Allocations can require changes to discharge limits for permitted facilities, although not the case for this project

DRAFT NUTRIENT TOTAL MAXIMUM DAILY LOADS

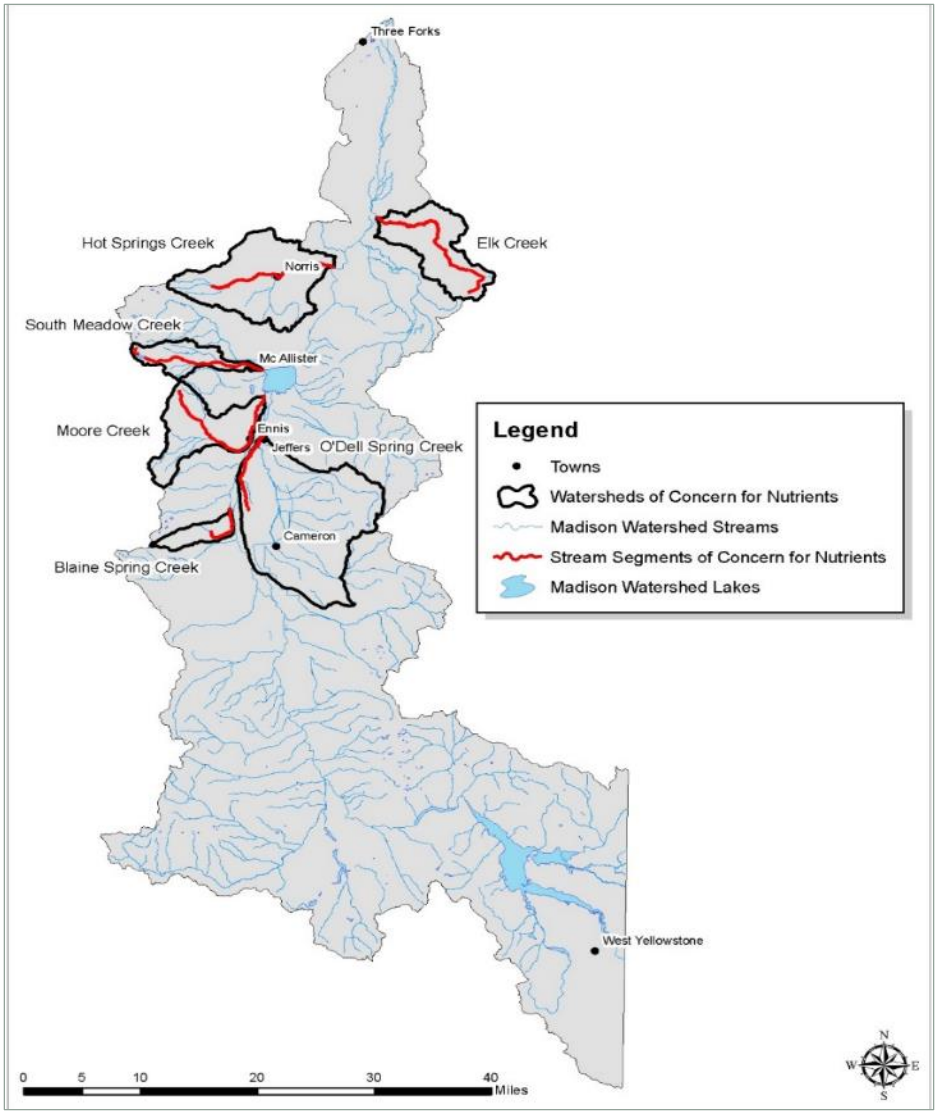
Lou Volpe

Nutrients Streams of Concern

Six waterbodies were assessed
Five require TMDL development

1. Elk Creek
2. Hot Springs Creek
3. South Meadow Creek
4. Moore Creek
5. O'Dell Spring Creek

Blaine Spring Creek was assessed and found to not be impaired by human caused sources. Impairment is a result of naturally occurring nutrients.



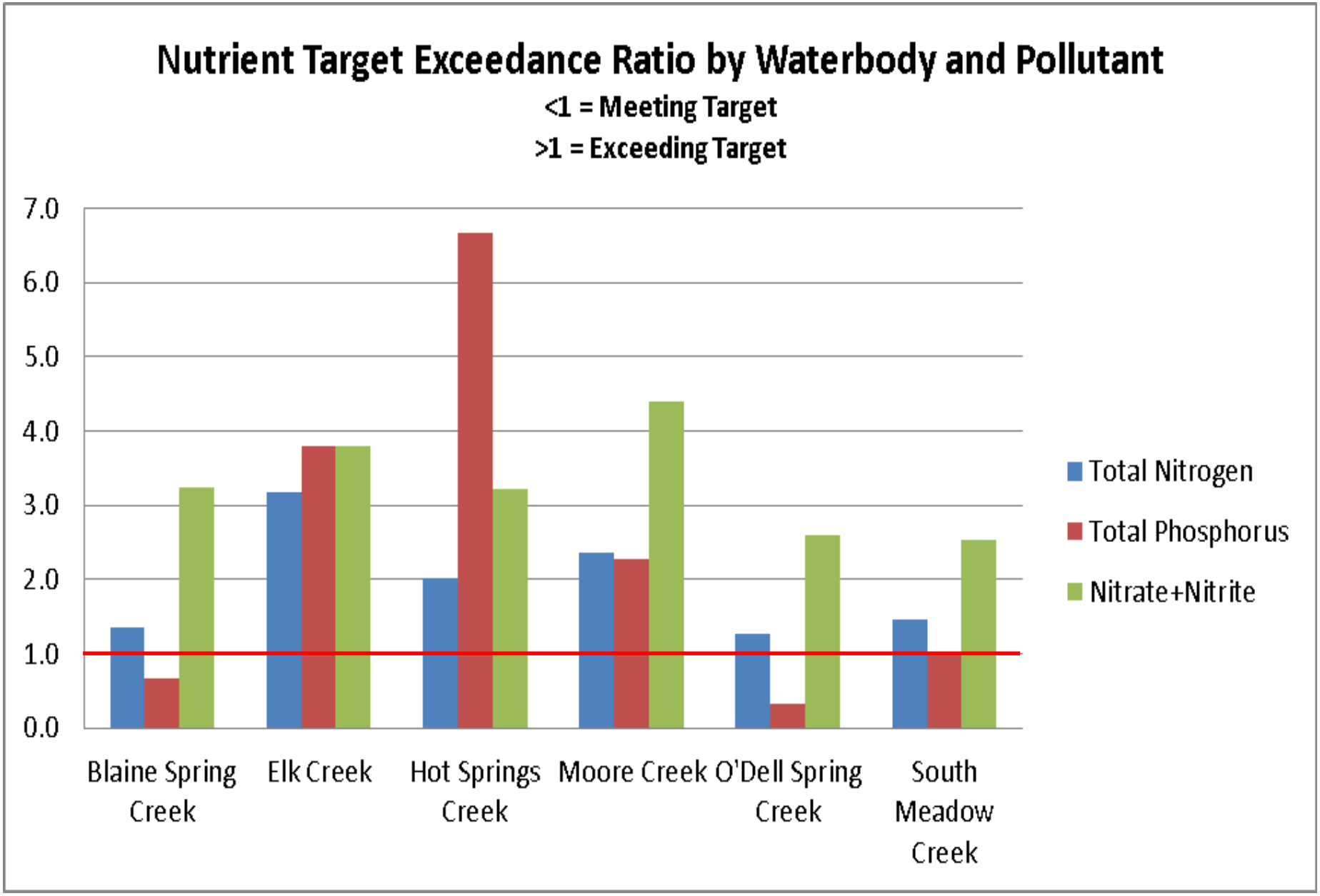
Nutrient Data Collection

- DEQ water quality sampling conducted from 2012-2014
- Sampled and assessed for: Total Nitrogen (TN), Total Phosphorus (TP), Nitrate + Nitrite, Chlorophyll-*a*, Ash Free Dry Mass, and Hilsenhoff's Biotic Index (HBI)
- Each stream sampled at multiple sites at least three times during the period of July 1 through September 30 (algal growing season)
- Beneficial uses considered include:
    - Aquatic Life, Primary Contact Recreation, Human Health

Nutrient Water Quality Targets

- Nutrient targets are determined by ecoregion
- Nutrient targets are seasonal (July 1 to September 30)

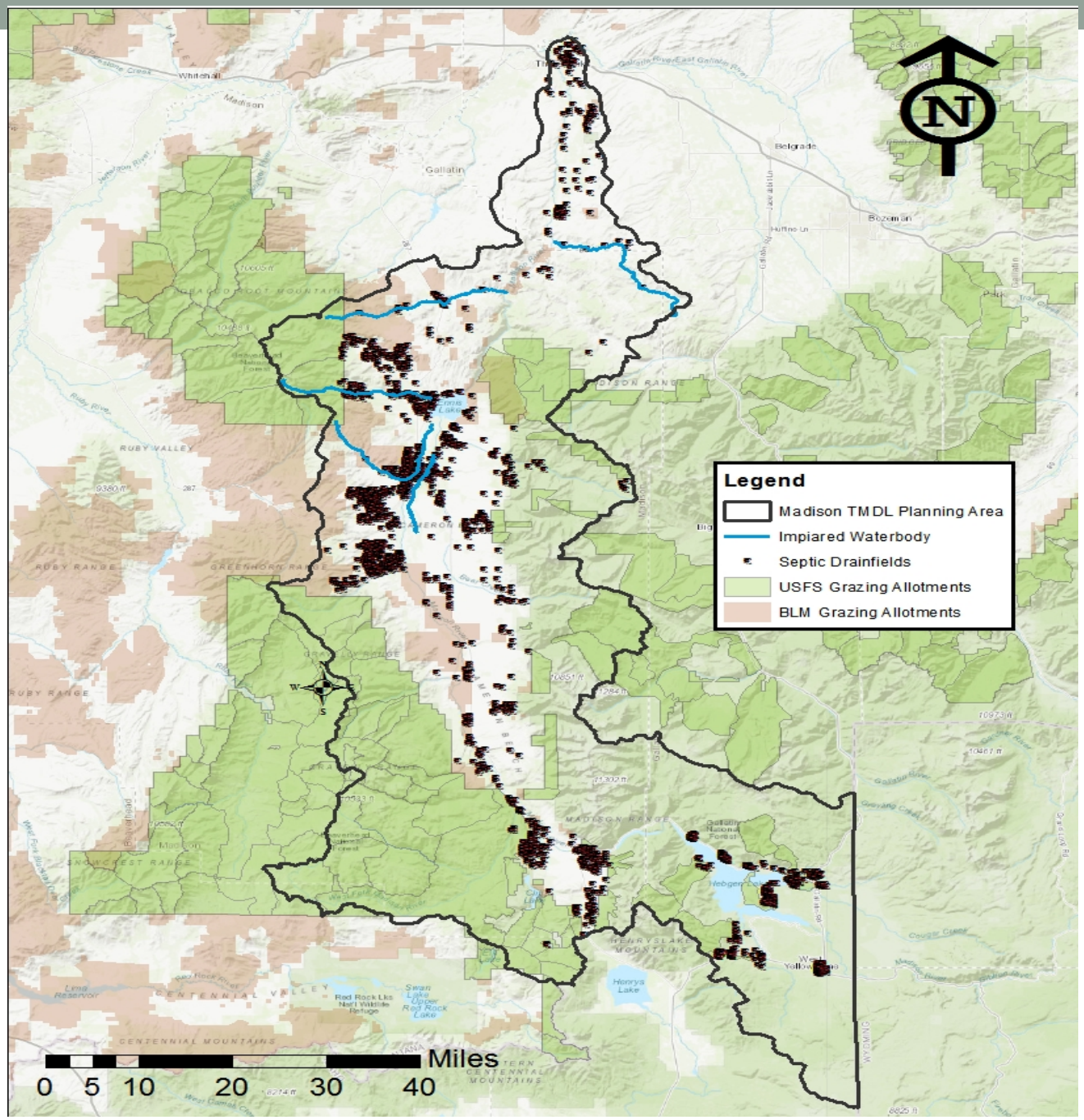
Parameter	Middle Rockies Level III Ecoregion Target Value
Nitrate+Nitrite (NO_3+NO_2)	≤ 0.100 mg/L
Total Nitrogen (TN)	≤ 0.300 mg/L
Total Phosphorus (TP)	≤ 0.030 mg/L
Chlorophyll-a	≤ 125 mg/m^2
Ash Free Dry Mass (AFDM)	≤ 35 g/m^2
Hilsenhoff's Biotic Index (HBI)	< 4.0


Nutrient Target Exceedance Ratio by Waterbody and Pollutant
<1 = Meeting Target
>1 = Exceeding Target
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Blaine Spring Creek
Elk Creek
Hot Springs Creek
Moore Creek
O'Dell Spring Creek
South Meadow Creek
Total Nitrogen
Total Phosphorus
Nitrate+Nitrite

Nutrient Impairment Determinations

Stream	Pollutant and Non-Pollutant Impairments Identified in the 2016 Integrated Report	TMDLs Developed
Blaine Spring Creek	TN, excess algal growth	None
Elk Creek	TN, NO_3+ NO_2, TP	TN, TP
Hot Springs Creek)	TN, TP	TN, TP
Moore Creek	TN, TP	TN, TP
O'Dell Creek	TN	TN
South Meadow Creek	TN, TP, chlorophyll-*a*	TN, TP

Nutrient Sources



Nitrogen Sources

Source Category	Source Descriptions
Natural Background	• soils and local geology • natural vegetative decay • wet and dry airborne deposition • wild animal waste • natural biochemical processes that contribute nitrogen to nearby waterbodies
Nonpoint Sources (Agriculture, residential development and subsurface wastewater disposal and treatment, silviculture, and mining)	• septic • domestic animal waste • fertilizer • loss of riparian and wetland vegetation along streambanks • reduced nutrient uptake due to loss of overstory • anthropogenic activities contributing to runoff from exposed rock or soil containing natural background nitrate • residual chemicals left over from mining practices • residential development

Phosphorous Sources

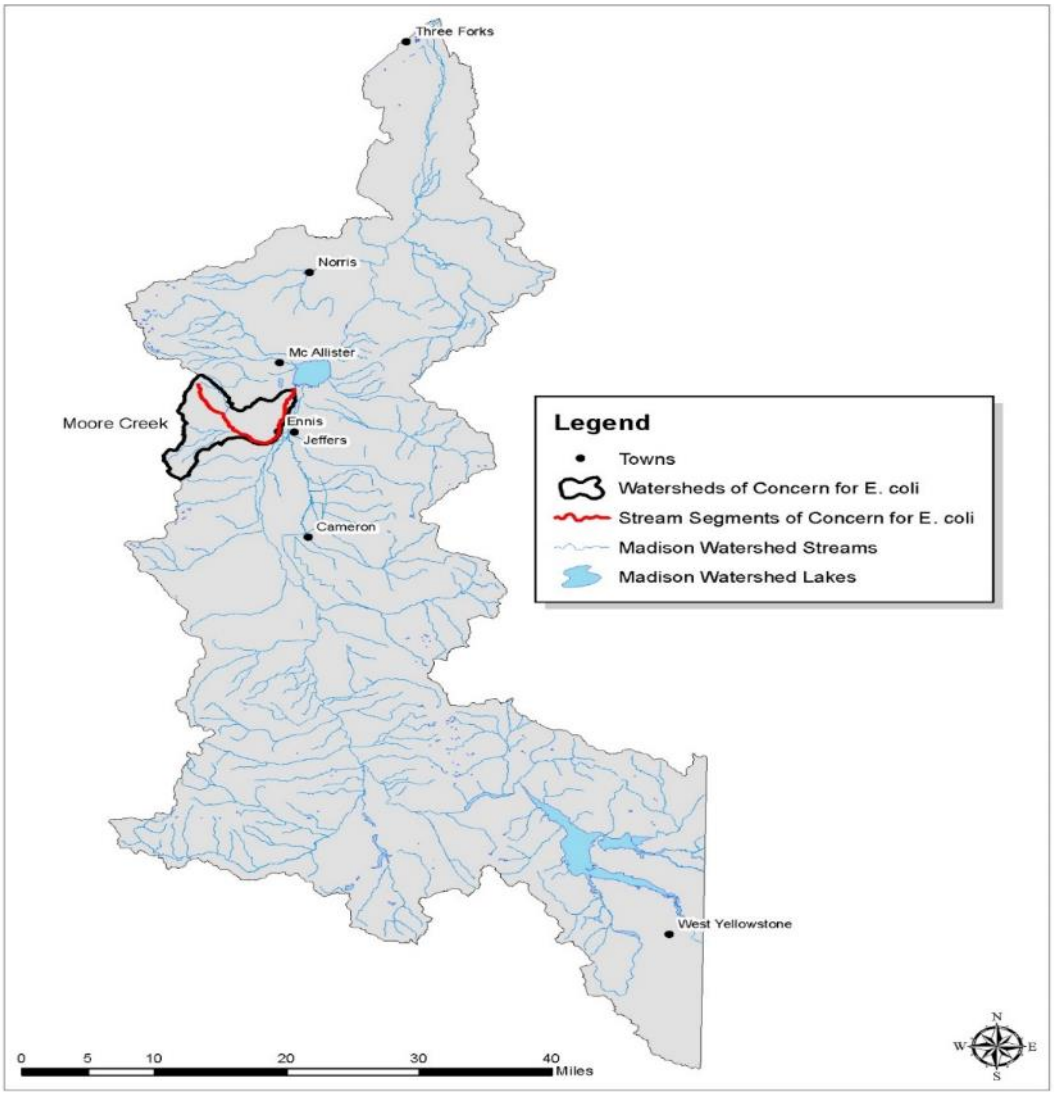
Source Category	Load Allocation Descriptions
Natural Background	• soils and local geology • natural vegetative decay • wet and dry airborne deposition • wild animal waste • natural biochemical processes that contribute phosphorus to nearby waterbodies
Nonpoint Sources (Agriculture, residential development and individual septic systems and treatment, silviculture, and mining)	• septic • domestic animal waste • fertilizer • loss of riparian and wetland vegetation along streambanks • reduced nutrient uptake due to loss of overstory • anthropogenic activities contributing to runoff from exposed rock or soil containing natural background phosphorus

DRAFT *E. COLI* TOTAL MAXIMUM DAILY LOAD

Lou Volpe

E. coli Stream of Concern

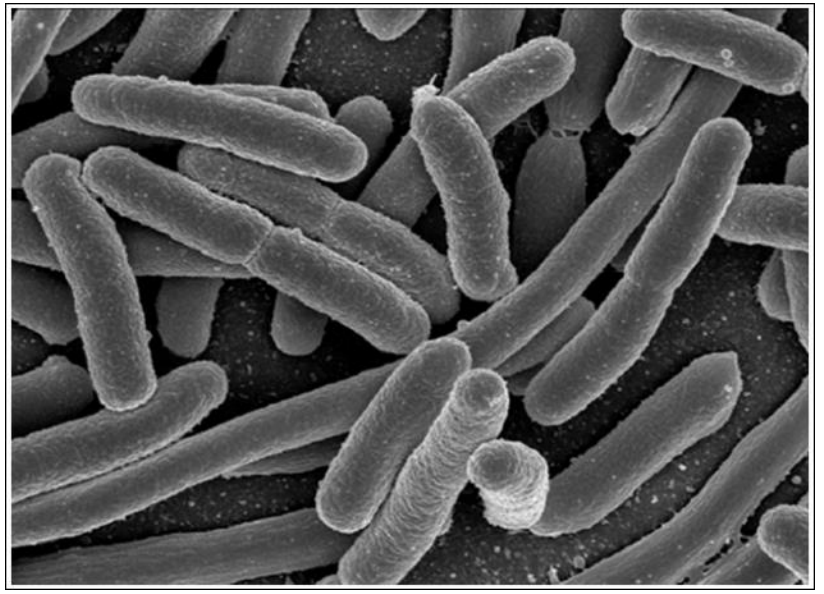
Moore Creek was the only waterbody assessed for *E. coli* impairment



E. Coli Assessment and Impairment Determination for Moore Creek

- Pathogens impairment if either of the following are true:
  - Geometric mean of Colony Forming Units/100 ml exceeds 126
  - 10% of all *E.coli* sampling results exceed 252 CFU/100ml)

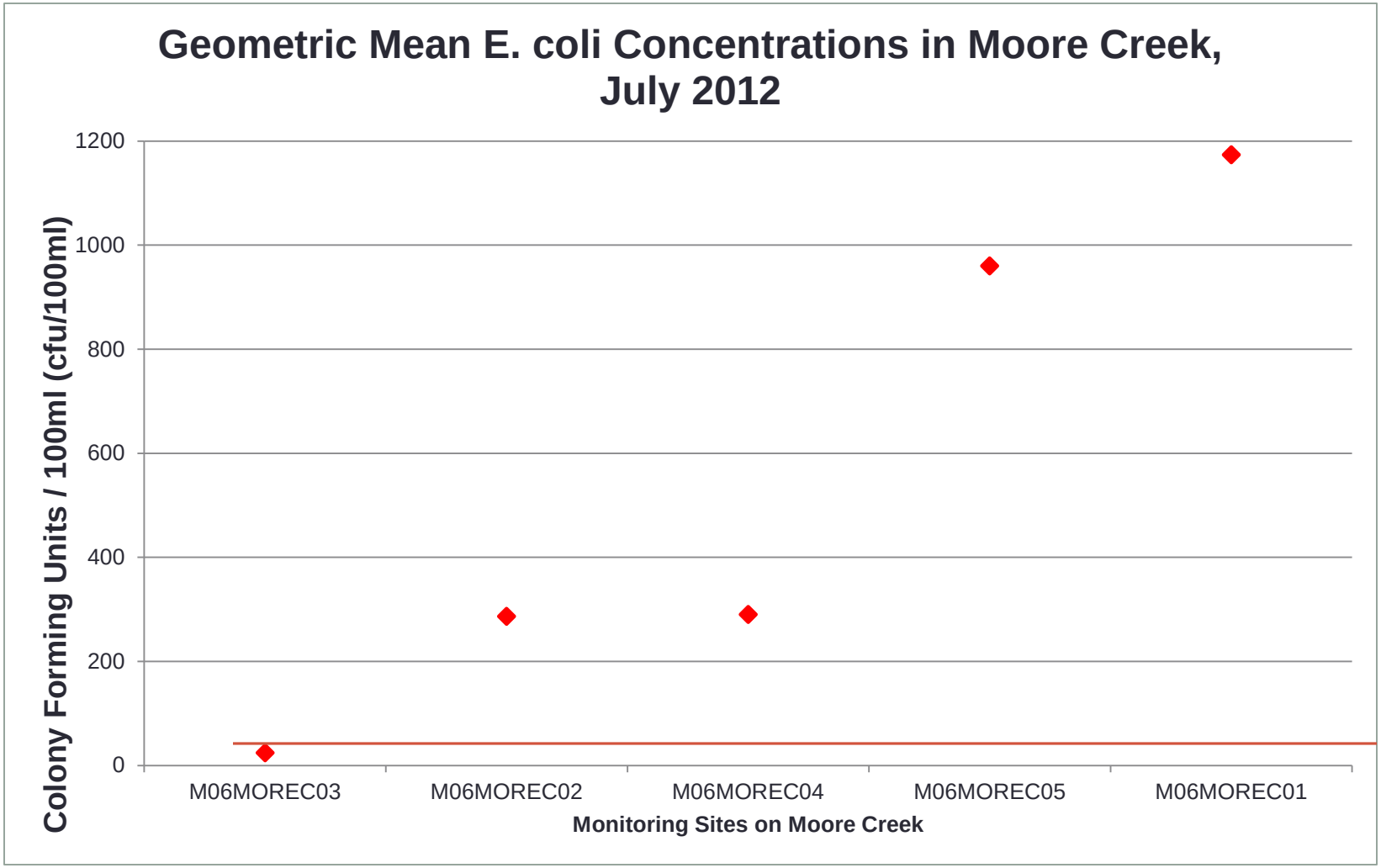
- Beneficial uses impaired:
  - Primary contact recreation



E. coli Water Quality Targets

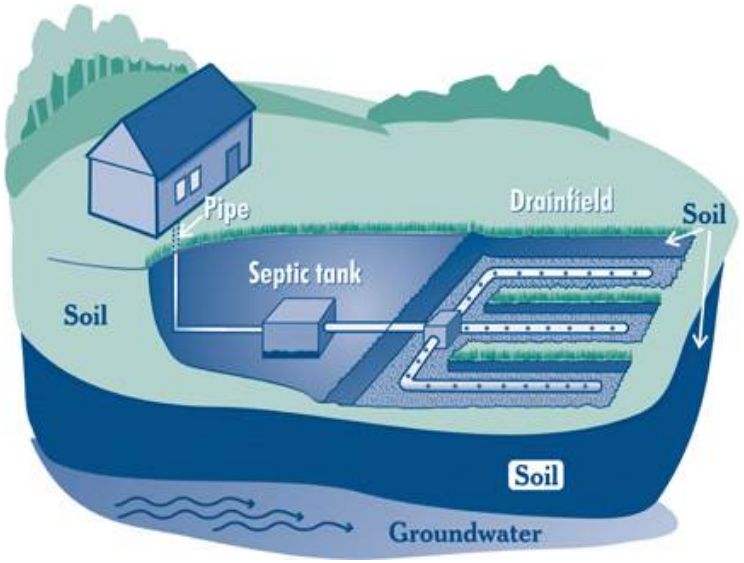
Applicable Period	Standard	Geometric mean of 5 samples collected over a 30-day time period	No more than 10% of the samples shall exceed:
Apr 1 – Oct 31 ("summer")	The geometric mean number of E. coli may not exceed 126 colony forming units per 100 milliliters and 10% of the total samples may not exceed 252 colony forming units per 100 milliliters during any 30-day period.	<126 cfu/100mL	252 cfu/100mL
Nov 1 – Mar 31 ("winter")	The geometric mean number of E. coli may not exceed 630 colony forming units per 100 milliliters and 10% of the samples may not exceed 1,260 colony forming units per 100 milliliters during any 30-day period.	<630 cfu/100mL	1,260 cfu/100mL

Geometric Mean Concentrations



E. coli Sources

- Agriculture land use (irrigated cropping and pasture/rangeland/forest grazing)
- Residential development and subsurface wastewater disposal and treatment (individual and community septic systems)
- Recreation and domestic animals
- Natural background (wildlife)

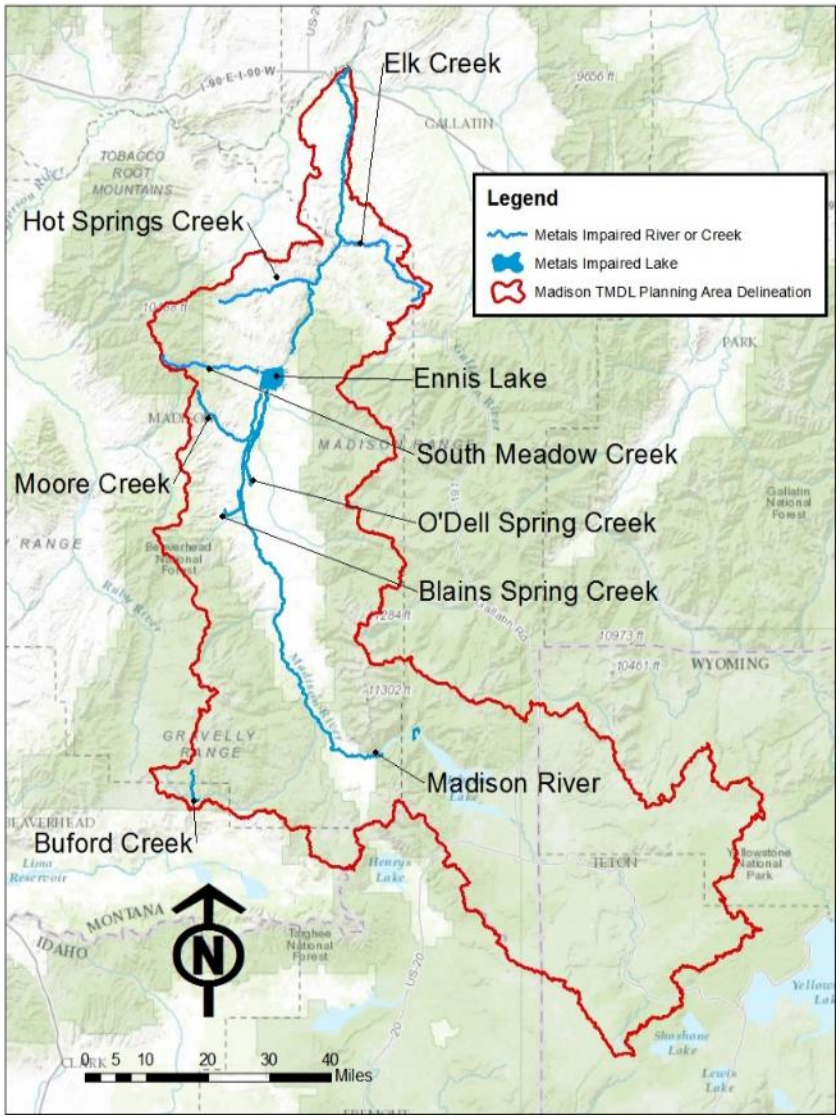


DRAFT METAL TOTAL MAXIMUM DAILY LOADS

Lou Volpe

Metals Streams of Concern

- Hot Springs Creek
- Elk Creek
- Ennis Lake
- O’Dell Spring Creek
- Moore Creek
- Blaine Spring Creek
- Madison River (3 segments)
- Buford Creek
- South Meadow Creek



Metals Data Collection

- DEQ Sampling conducted from 2011-2013
- Sampled and assessed waterbodies for a full suite of metals: Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Selenium, Silver, Zinc and other metals
- Each stream sampled a minimum of 8 times during high and low flow conditions

Metals Impairment Determination

Even with limited data:

- Waterbodies are indicating impairment for some of the originally listed metals
- Addition of some new metals to impairment list
- Removal of some metals from impairment list

Beneficial use considered impaired as a result of assessment:

- Aquatic Life Support

Because of natural sources of arsenic, no arsenic TMDLs were developed

Numeric Water Quality Standards

Copper Example

- Fixed Numeric:
  - Human Health: 1,300 µg/l
- Variable Numeric:

  Acute and Chronic Aquatic Life: (varies with hardness)

  At 25 mg/L hardness-

  Acute: 3.79 µg/l (1 hour mean)

  Chronic: 2.85 µg/l (96 hour mean)

  At 400 mg/L hardness-

  Acute: 51.7µg/l (1 hour mean)

  Chronic: 30.5 µg/l (96 hour mean)

Example Metals Standards

Metals Numeric Water Quality Targets Applicable to the Madison TMDL Planning Area					
Metal of Concern	Aquatic Life Criteria (ug/L) at 25 mg/L Hardness		Aquatic Life Criteria (ug/L) at 100 mg/L Hardness		**Human Health Criteria**
	Acute	Chronic	Acute	Chronic	
Arsenic, TR*	340	150	340	150	**10**
Copper, TR	3.79	2.85	14.00	9.33	**1,300**
Iron, TR	---	1,000	---	1,000	**---**
Lead, TR	13.98	0.54	81.65	3.18	**15**
Selenium, TR	20	5	20	5	**50**
***TR = total recoverable**					

Metals TMDL Development Triggers

- If a single sample exceeds the human health target
- If more than 10% of the samples exceed either chronic or acute aquatic life target, then the waterbody is considered impaired
- There are two exceptions to the 10% aquatic life exceedance rate rule:
  - a) if a single sample exceeds the acute aquatic life standard by more than a factor of two, the waterbody is considered impaired regardless of the remaining data set; and
  - b) if the exceedance rate is greater than 10% but no anthropogenic metals sources are identified, management is consulted for a case-by-case review

Elk Creek Metals Data

Station (Site) Name	Site ID	Activity Date	Hardness (mg/L)	Flow (cfs)	Fe (ug/L) CAL=1,000 ug/L	Se (ug/L) TR AAL= 20 ug/L CAL= 5 ug/L	TSS (ug/L)
Elk Creek	M06ELKC07	8/17/13	131	0.01	190	0.45	1500
Elk Creek near headwaters	M06ELKC05	9/16/13	122	0.21	330	0.45	4500
Elk Creek	M06ELKC02	8/16/13	146	1.0	30	0.45	1000
Elk Creek	M06ELKC02	9/16/13	134	0.23	60	0.45	1500
Elk Creek downstream Norris Road crossing	M06ELKC03	6/19/12	205	2.03	**2060**	3	76000
Elk Creek downstream Norris Road crossing	M06ELKC03	7/25/12	242	0.46	**1140**	3	33000
Elk Creek downstream Norris Road crossing	M06ELKC03	8/28/12	290	0.11	860	4	26000
Elk Creek downstream Norris Road crossing	M06ELKC03	6/12/13	178	2.71	**1550**	3	44500
Elk Creek downstream Norris Road crossing	M06ELKC03	8/15/13	252	0.05	340	**8.1**	6500
Elk Creek downstream Norris Road crossing	M06ELKC03	9/16/13	270	0.001	190	**8**	5250
Elk Creek near mouth (Madison River)	M06ELKC04	6/19/12	176	2.97	680	2	25000
Elk Creek near mouth (Madison River)	M06ELKC04	7/25/12	232	0.47	**1170**	2	32000
Elk Creek near mouth (Madison River)	M06ELKC04	8/28/12	262	0.05	**1000**	2	17000

CAL= Chronic Aquatic Life Standard. AAL = Acute Aquatic Life standard.

Metals TMDL Determinations

Waterbody	Impairment Cause	TMDL Developed
BLAINE SPRING CREEK	Arsenic	None
BUFORD CREEK	Arsenic	None
ELK CREEK	Arsenic, Iron, Selenium	Iron, Selenium
ENNIS LAKE	Arsenic	None
HOT SPRINGS CREEK	Iron, Lead	Iron, Lead
MOORE CREEK	Arsenic	None
O'DELL SPRING CREEK	Arsenic	None
MADISON RIVER, Ennis Dam to mouth (Missouri River)	Arsenic	None
MADISON RIVER, Quake Lake to Ennis Lake	Arsenic	None
MADISON RIVER, Hebgen Dam to Quake Lake	Arsenic	None
SOUTH MEADOW CREEK	Copper	Copper

Metals Sources by Waterbody

Elk Creek:

- Historical mining
  - Galatian Corundum
  - Elk Creek Corundum
- Human caused land disturbances
  - Roads
  - Agricultural land use
- Natural background

Hot Springs Creek:

- Historical mining
  - Boaz
  - Grubstake
- Human caused land disturbances
  - Roads
  - Agricultural land use
- Natural background

Metals Sources by Waterbody

South Meadow Creek:

- Historical mining
  - Missouri
  - SE SE Section 25
- Human caused land disturbances
  - Roads
  - Agricultural land use
    - Grazing allotment
      - South Meadow
      - Miller
      - South Daisy
- Natural background

CLOSING SLIDES

Next Project Steps

- Watershed Advisory Group review and comment
- Public comment period (typically 30 days)
- Public meeting in Ennis during public comment period
- DEQ reviews comments, makes document edits, and writes responses to public comments
- Document submitted to EPA for approval
- Upon approval, final document is posted on DEQ's website

QUESTIONS?

Christina Staten: CStaten@mt.gov, (406) 444-2836

Lou Volpe: LVolpe@mt.gov, (406) 444-6742