MADISON RIVER TOTAL MAXIMUM DAILY LOAD (TMDL) PROJECT

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September 26, 2018

Madison Valley Public Library, Ennis

DEQ Montana Department of Environmental Quality

Who We Are

- Mission of maintaining and improving water health so that it:
  - Supports recreational enjoyment (fishing, swimming, boating, scenic views)
  - Provides clean drinking water for humans and livestock
  - Supports aquatic life (fish, bugs)
  - Is useable for irrigation

- Develop solutions to reduce pollution
- Provide support to local organizations working to improve water quality (stream and lake health)

Meeting Purpose

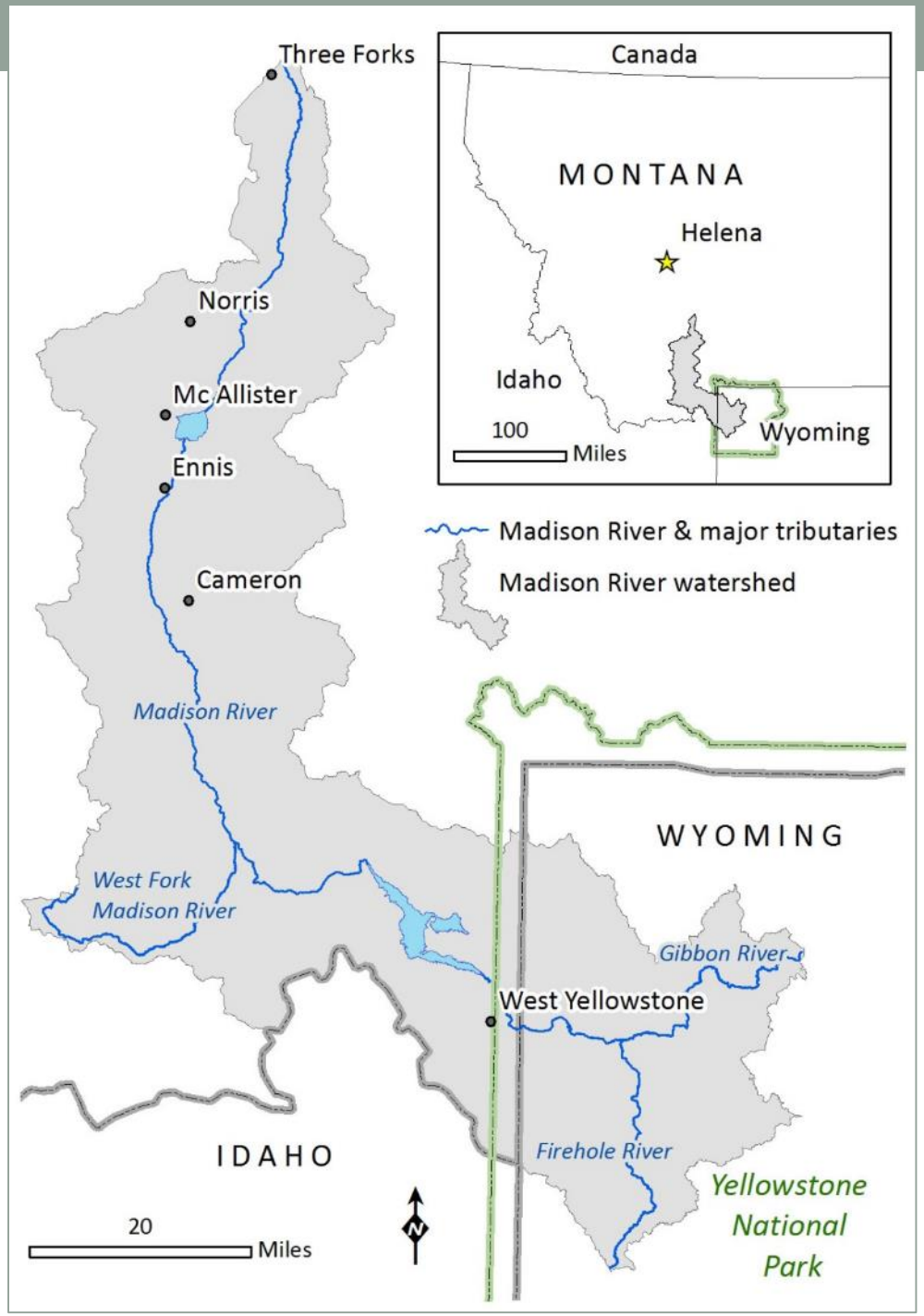
Present information about a document available for a 30-day public comment period and answer questions.

Provide information about a nutrients, pathogens, and metals water quality study conducted on tributaries of the Madison River: what sampling done, the outcomes, and suggestions for improving stream health.

Presentation Outline

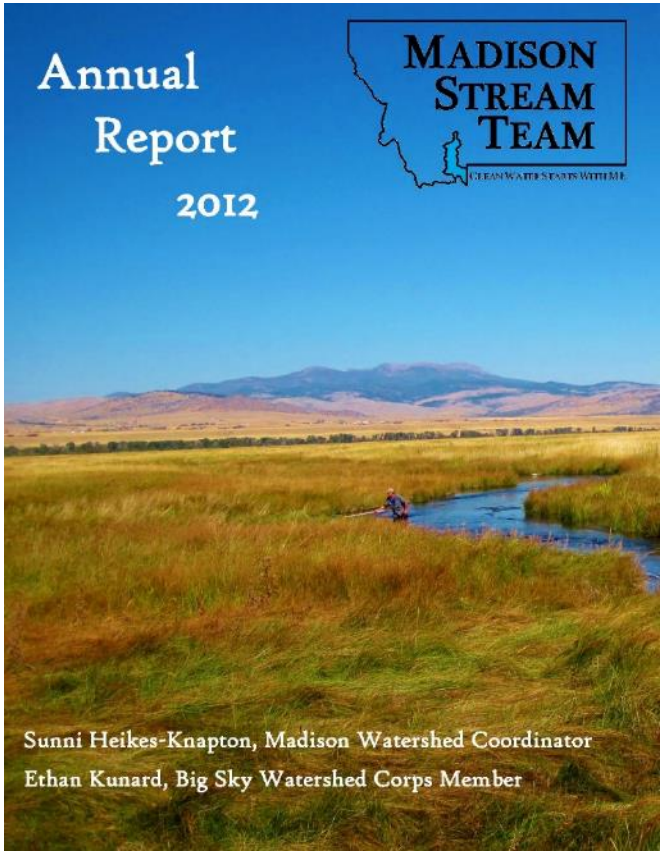
- Project background, goals, and water quality planning steps
- Nutrient, *E.coli*, and metals sampling results, TMDLs written, sources, and reduction practices
- Organization of the TMDL document, and how to submit comments
- Additional water quality studies in the Madison

Madison River Watershed

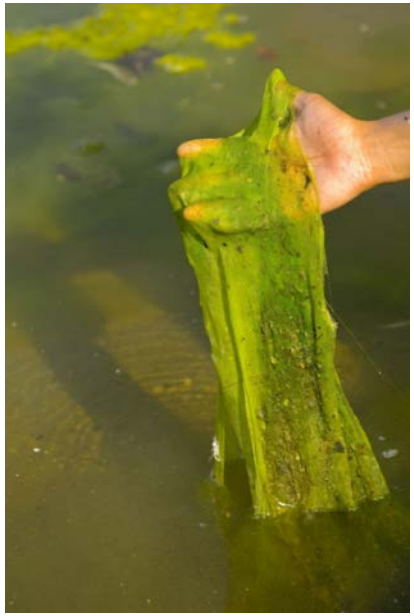


Why the Madison River Watershed

- Important economic resource (fishing, tourism, ranching)
- Very active local organizations with interest in protecting stream health (water quality) and implementing the recommendations in the TMDL document
- Local water quality monitoring program already in place (Madison Stream Team)



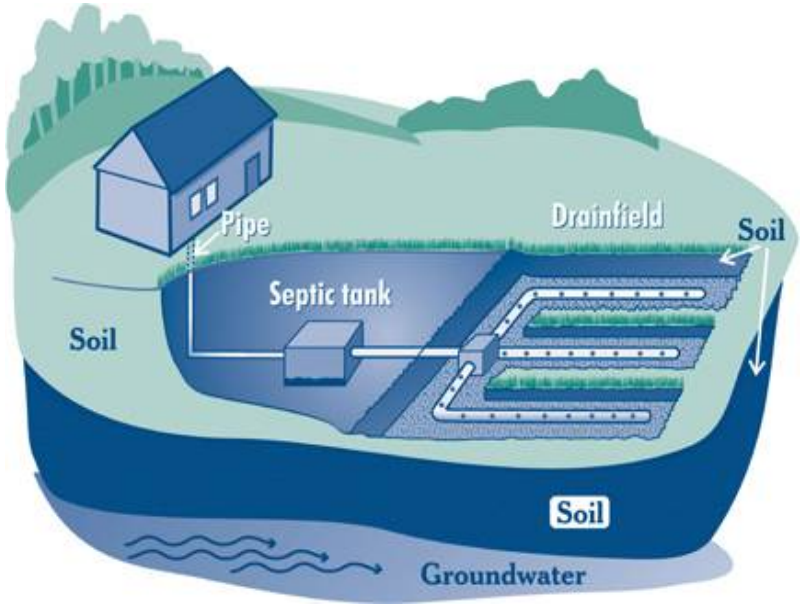
Problem Studied: Nutrients



- Nutrients are essential for life, but …
- Excess nitrogen and phosphorus in a water can cause algae to grow faster than the water can handle – a process called eutrophication
- Excess nutrients “fertilize” the stream
- Aesthetically unappealing
- Kills fish

Problem Studied: Pathogens

- Pathogens (bacteria, viruses, and protozoans) often transmitted by fecal contamination
- E.coli is a nonpathogenic indicator bacterium associated with pathogens
- Excess E.coli is associated with waterborne illnesses



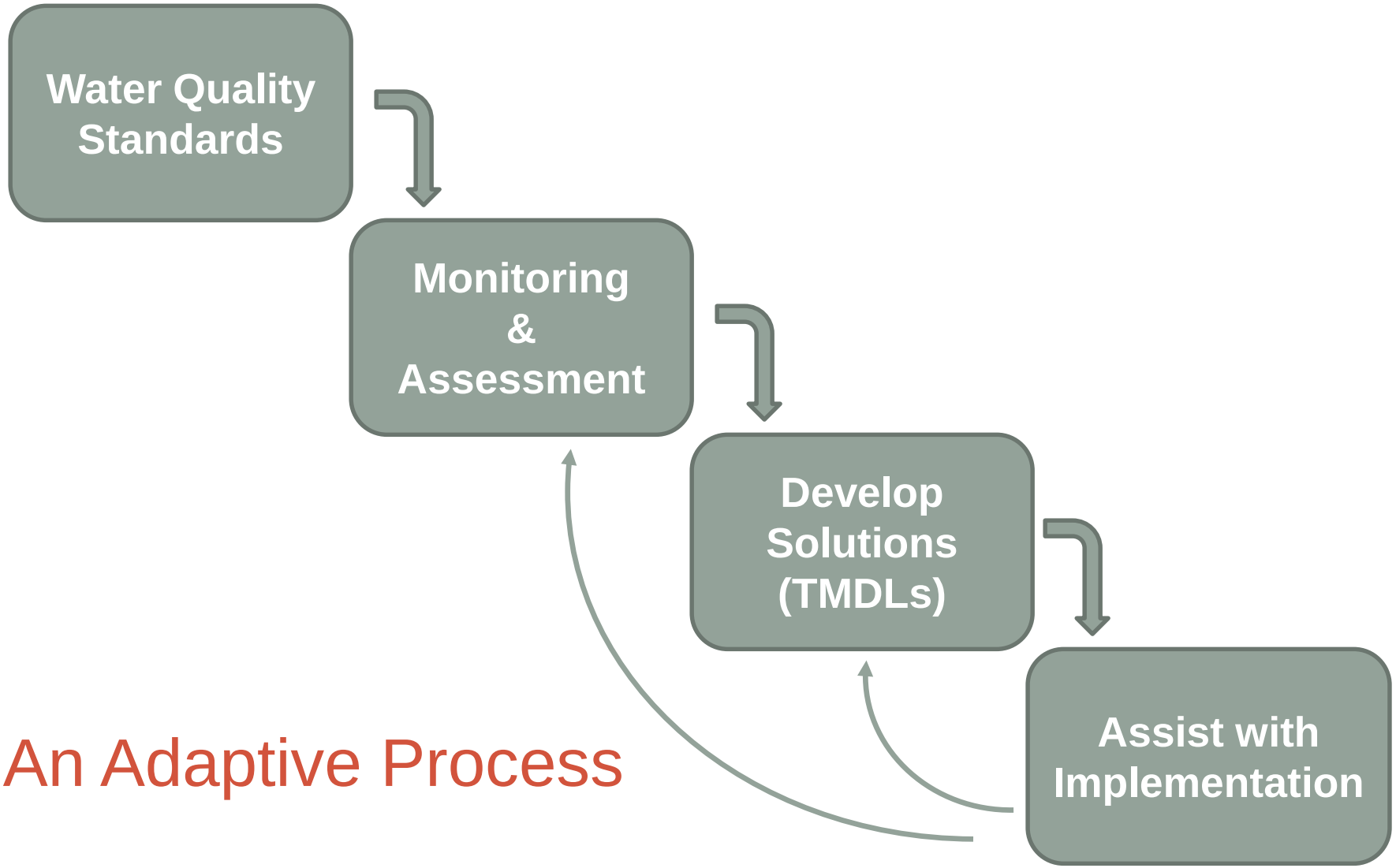
Problem Studied: Metals

- Elevated concentrations of metals can have toxic, carcinogenic, or bioconcentrating effects on aquatic life
- Humans and wildlife consuming water or fish with elevated metals may suffer acute or chronic health effects

Project Goals

- Provide information that will help protect water quality in the Madison River watershed
- Provide water quality restoration suggestions
- To help achieve these goals, DEQ develops water quality improvement plans (TMDLs)

DEQ's Water Quality Planning Steps



An Adaptive Process

Water Quality Standards

- Numeric (numbers) or narrative (description)
- Protect designated water quality uses for the Madison River watershed

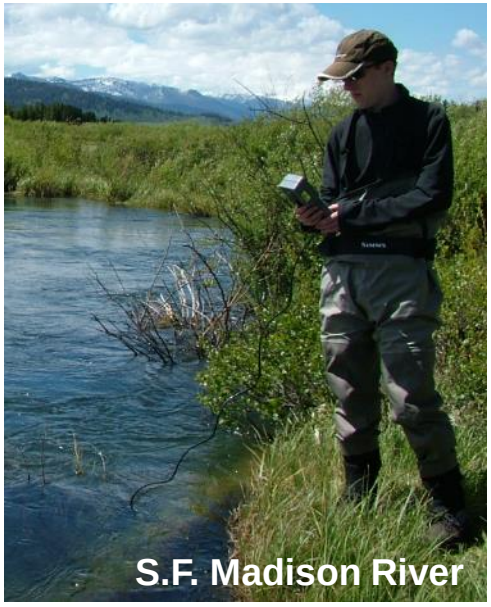
Primary Contact Recreation

Aquatic Life: Cold Water Fish

Drinking Water

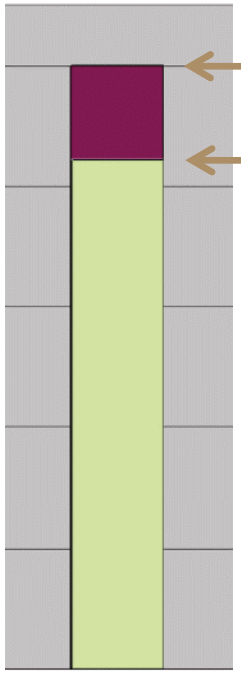
Water Quality Sampling

- If a waterbody is not meeting a water quality standard, then it is impaired for one or more causes
- Information is tracked via an impaired waters list that includes the waterbody – pollutant impairment causes that require TMDL development (the 303(d) list)



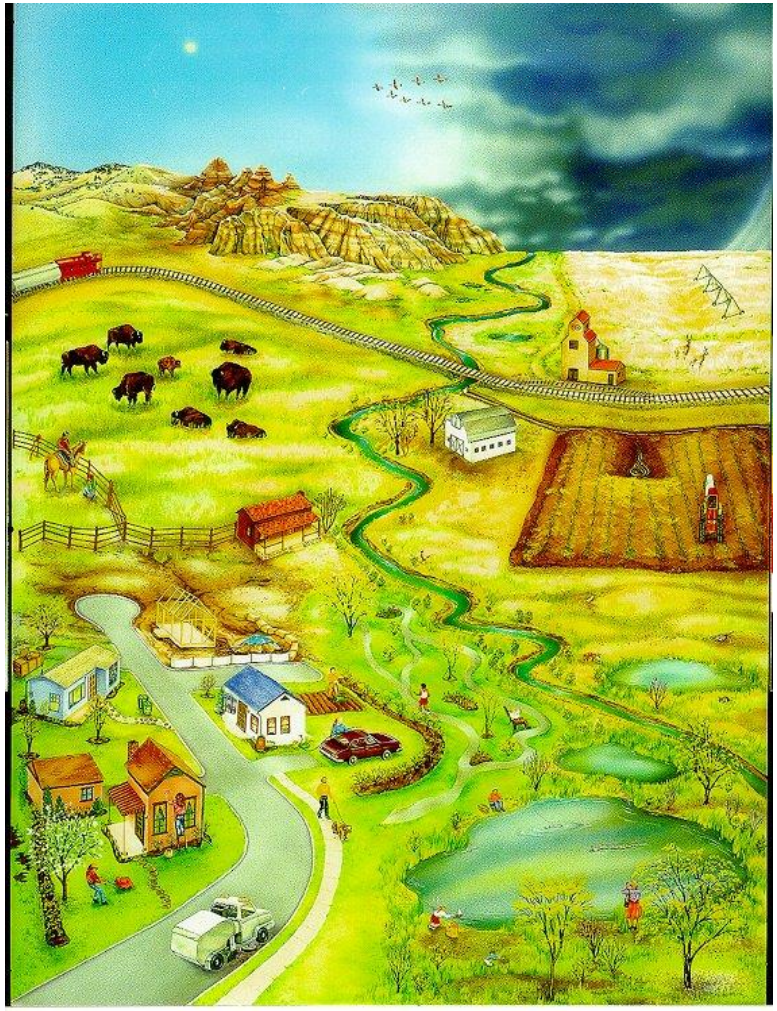
The definition of a TMDL

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



Why TMDLs are Useful

- Address cumulative impacts
- Incorporate multiple source types, both regulated and non-regulated
- Guide future restoration work and prioritization for projects
- Help landowners identify ways to protect water quality



NUTRIENT TOTAL MAXIMUM DAILY LOADS

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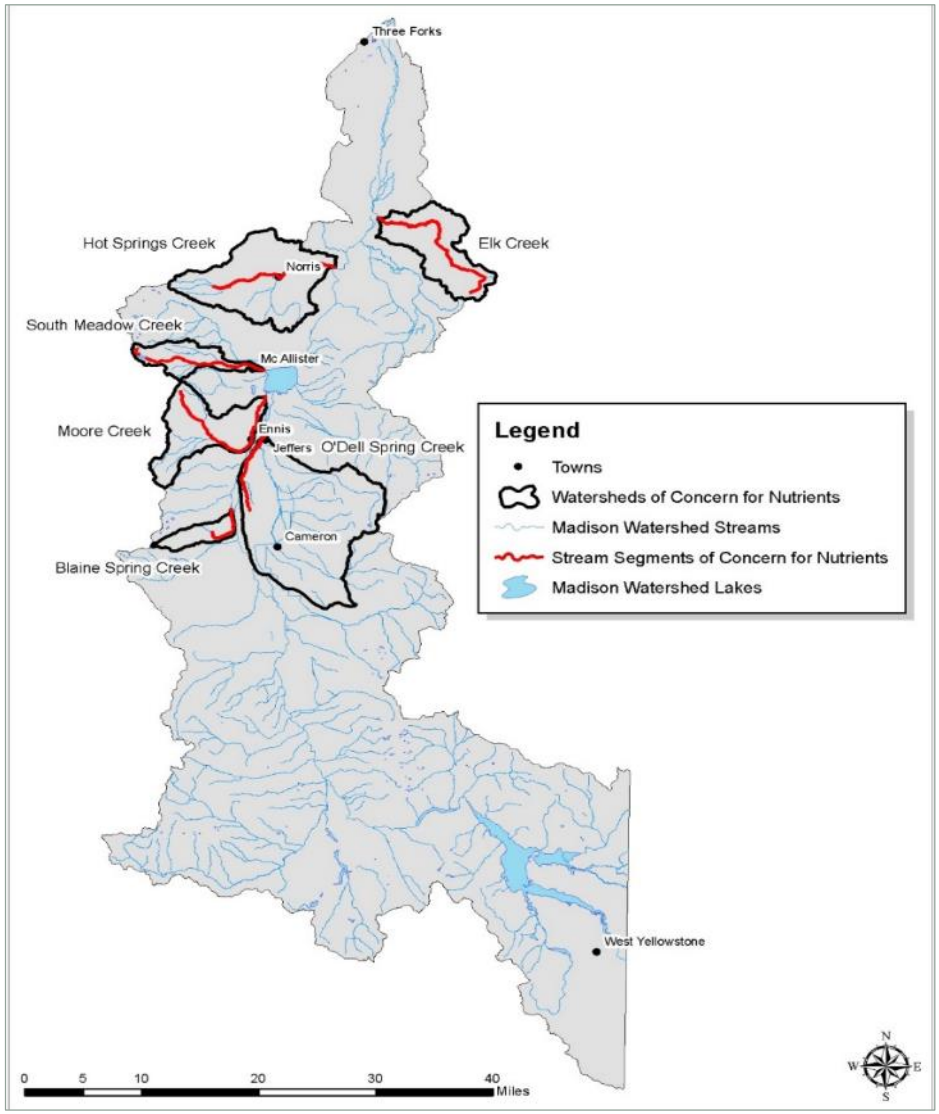
Nutrients Streams of Concern

- Six streams were assessed
- Five required TMDL development

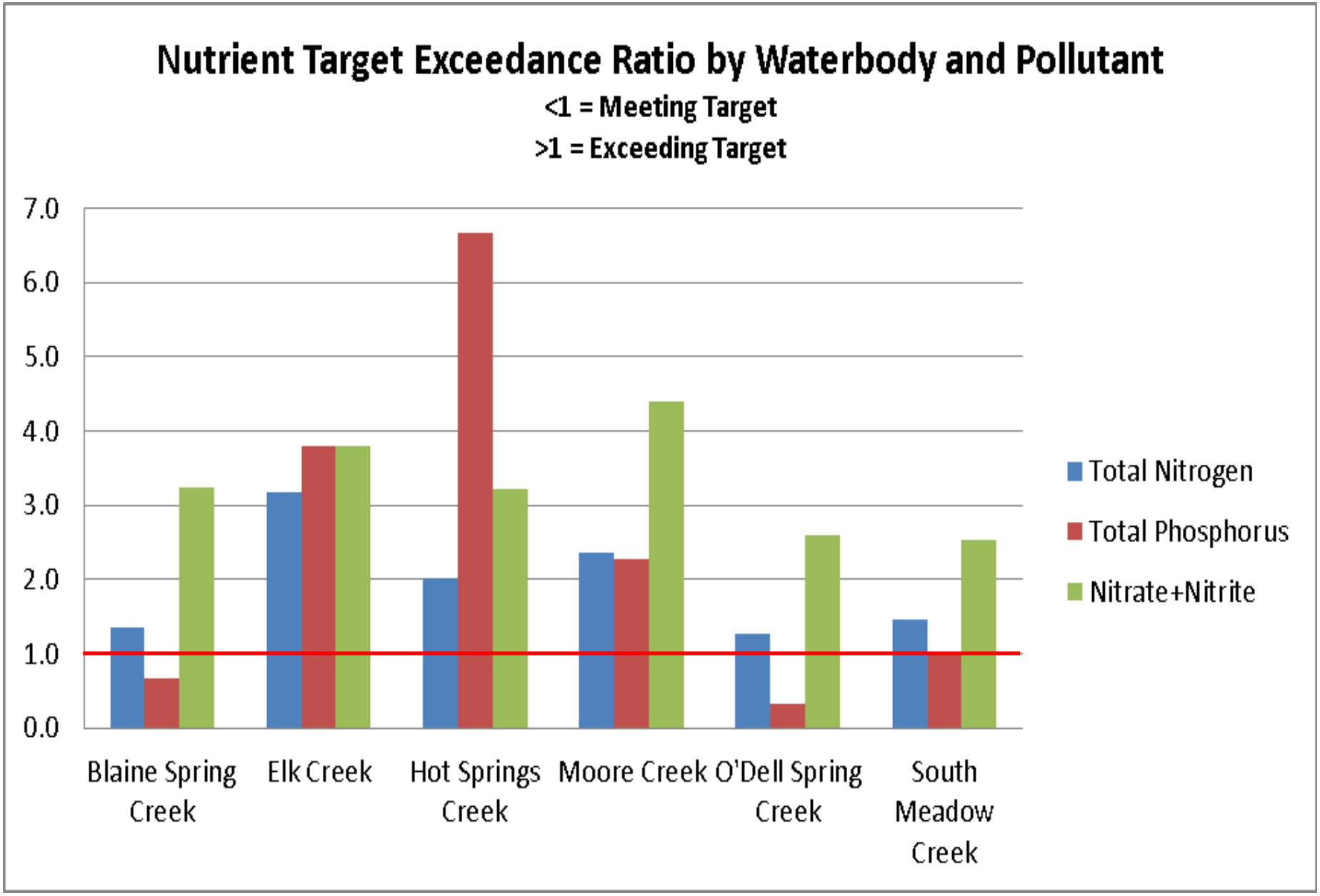
1. Elk Creek
2. Hot Springs Creek
3. South Meadow Creek
4. Moore Creek
5. O'Dell Spring Creek

Blaine Spring Creek was assessed and no TMDL was written as a result of elevated naturally occurring nitrogen in the headwaters.

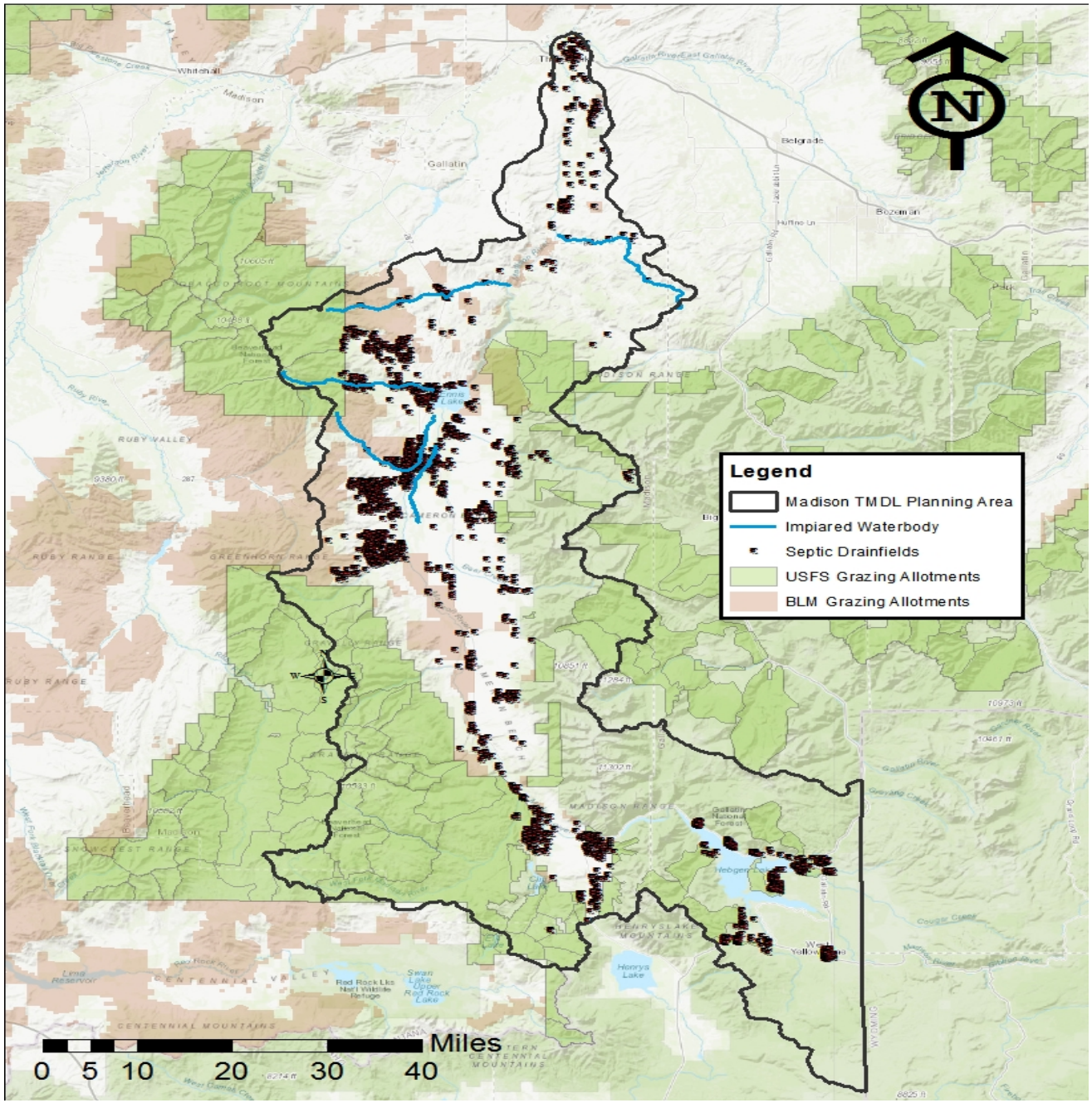


Nutrient Data Collection

- DEQ water quality sampling conducted from 2012-2014
- Sampled and assessed for: Total Nitrogen (TN), Total Phosphorus (TP), Nitrate + Nitrite
- 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 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 Sources



Note that private land ownership (white areas on map) includes ranching and farming operations in addition to BLM and USFS allotments indicated on map legend

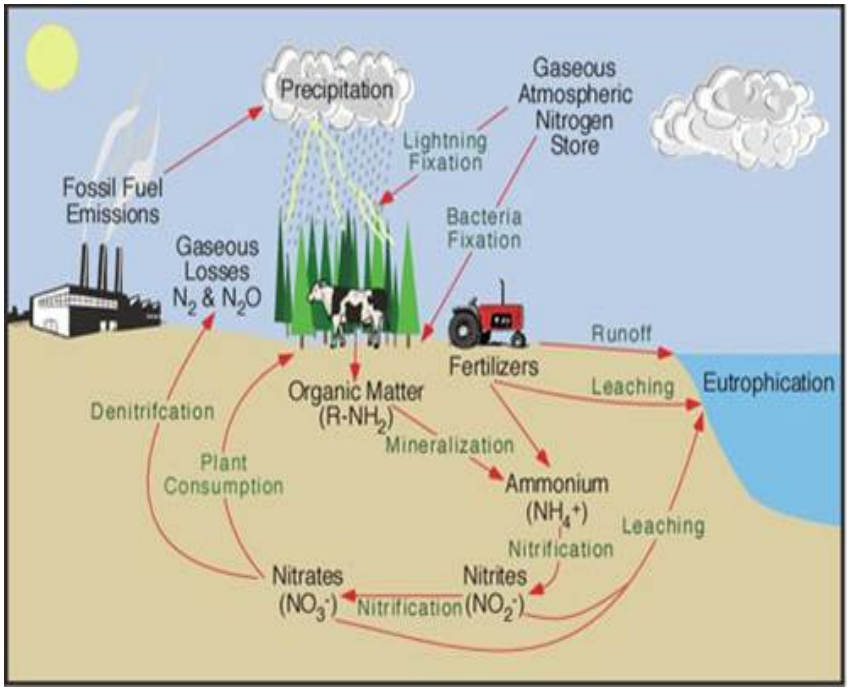
Naturally Occurring Nutrient Sources

Soils and local geology

Wildlife excrement

Human-Related Nutrient Sources

- Farming
- Ranching
- Historical Mining
- Residential development
- Septic systems



Nutrient TMDLs

Stream	TMDLs Developed
Elk Creek	TN, TP
Hot Springs Creek	TN, TP
Moore Creek	TN, TP
O'Dell Spring Creek	TN
South Meadow Creek	TN, TP

TN = Total Nitrogen
TP = Total Phosphorus

Reductions Needed to Meet TMDLs

Stream	TMDL Written	Percent Reduction Needed
Elk Creek	TN	57%
	TP	68%
Hot Springs Creek	TN	40%
	TP	72%
Moore Creek	TN	48%
	TP	47%
O'Dell Spring Creek	TN	19%
South Meadow Creek	TN	35%
	TP	15%

TN = Total Nitrogen
TP = Total Phosphorus

Load Reductions by Source

- Natural background:
  - zero percent reduction
- Combination of all human sources:
  - reduction needed to meet the water quality standards

Nutrient Reduction Practices

- Develop nutrient and grazing management plans
- Alternate feeding and watering areas
- Limit runoff from high concentration areas to surface or groundwater

Nutrient Reduction Practices

- Improve Riparian Area Management:
  fencing, water gaps, streamside buffering
- Erosion Control: vegetation and streambank protection

Nutrient Reduction Practices

- Septic maintenance
- Mine remediation

E. COLI TOTAL MAXIMUM DAILY LOAD

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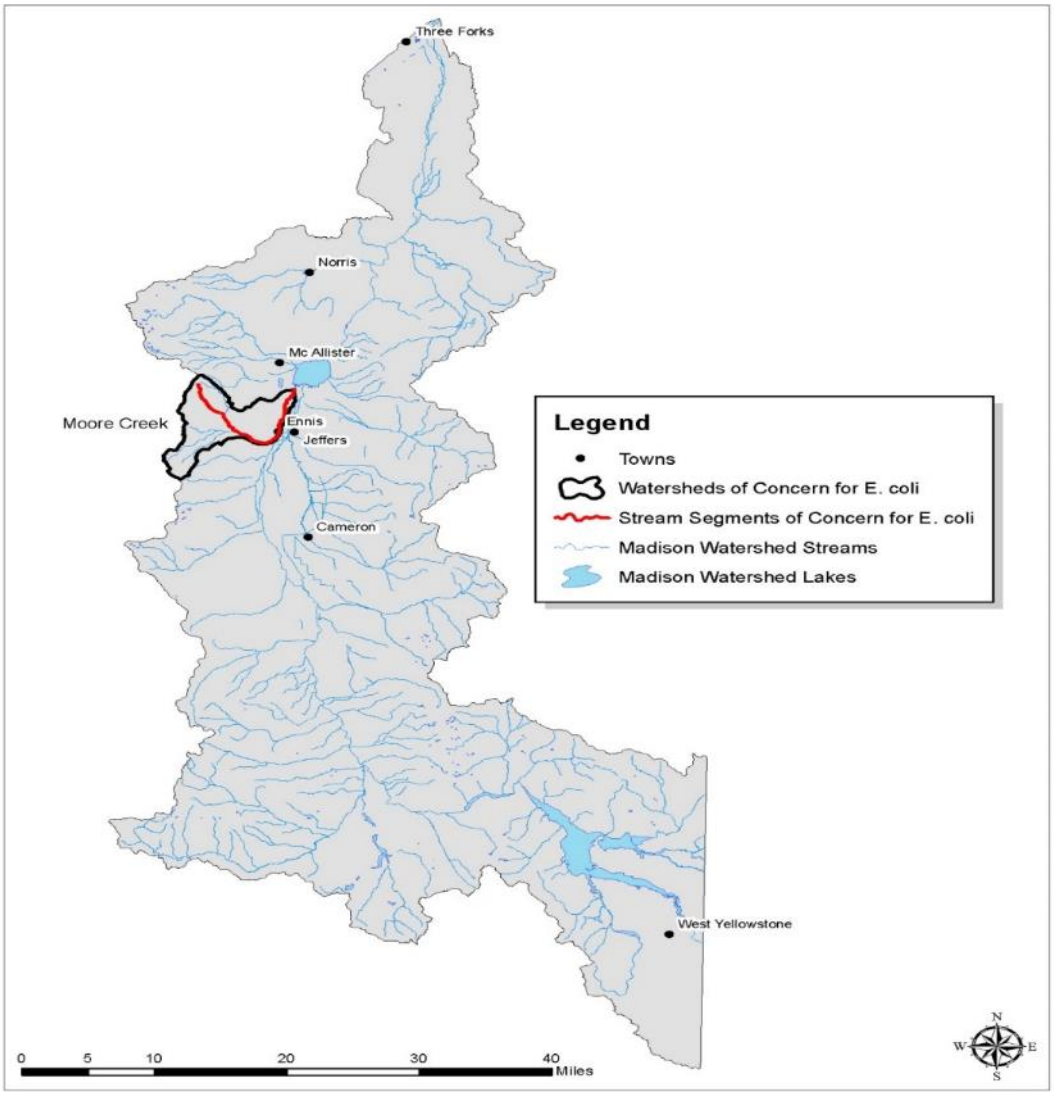
E. coli Stream of Concern

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

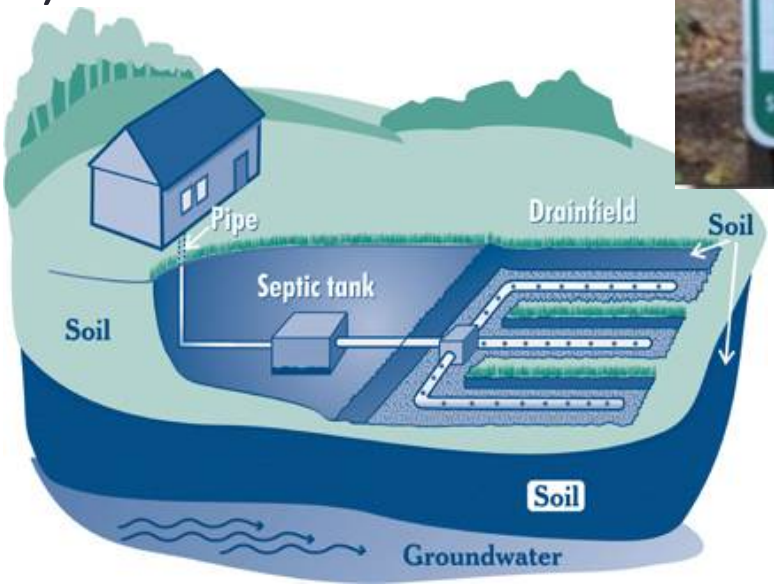


Moore Creek *E. Coli* Data

Site ID	Data Collection Date	Result Value (cfu[1]/100 ml)	Geometric Mean (cfu[1]/100 ml)	Water Quality Targets[2]		Assessment Rationale Per Site
				Geometric mean < 126 cfu[1]/100 ml	10% of E.coli samples < 252 cfu[1]/100 ml	
Moore Creek upper site (M06MOREC03)	7/18/2012	21.5	24.6	Yes (Pass)	Yes (Pass)	Site meets targets
	7/19/2012	12				
	7/20/2012	18.3				
	7/21/2012	52.9				
	7/22/2012	35.9				
Moore Creek at Hwy 287 crossing (M06MOREC02)	7/18/2012	228.2	286.4	No (Fail)	No (Fail)	Site does not meet targets
	7/19/2012	167				
	7/20/2012	325.5				
	7/21/2012	378.4				
	7/22/2012	410.6				
Moore Creek just north of Ennis (M06MOREC04)	7/18/2012	435.2	290.2[3]	No (Fail)	No (Fail)	Site does not meet targets
	7/19/2012	193.5				
Moore Creek at Feeds-N-Needs (M06MOREC05)	7/18/2012	547.5	995.9	No (Fail)	No (Fail)	Site does not meet targets
	7/19/2012	517.2				
	7/20/2012	1553.1				
	7/21/2012	2419.6				
	7/22/2012	920.8				
Moore Creek north of Ennis (M06MOREC01)	7/18/2012	866.4	1173.8	No (Fail)	No (Fail)	Site does not meet targets
	7/19/2012	980.4				
	7/20/2012	1553.1				
	7/21/2012	1299.7				
	7/22/2012	1299.7				

E. coli Sources

- Agriculture land use (irrigated cropping, pasture/rangeland/forest grazing)
- Residential development and subsurface wastewater disposal and treatment (individual and community septic systems)
- Domestic animal waste
- Natural background (wildlife)

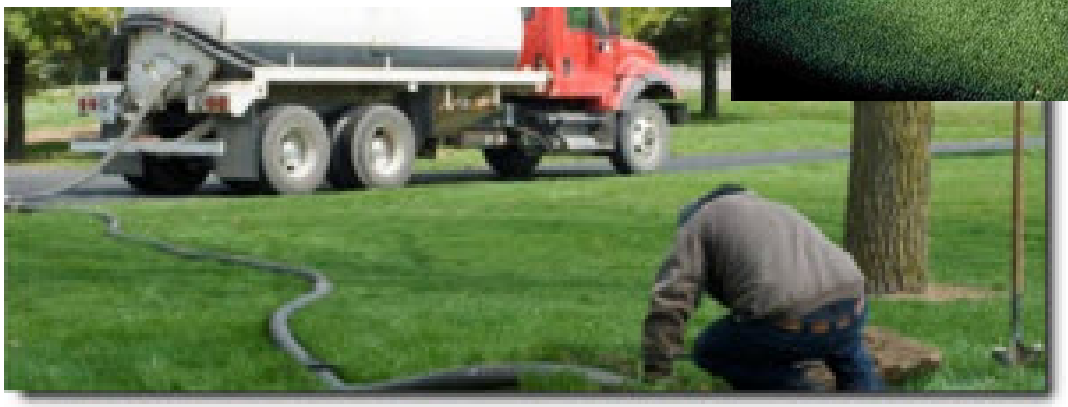


Reduction Needed to Meet the *E. coli* TMDL

Moore Creek Source Category	**Percent Reduction Needed**
Natural Background	0%
Human-caused	87%

E. coli Reduction Practices

- Farming and ranch management:
  - Improve riparian areas with streamside fencing, use of water gaps, and increasing streamside buffer width and health
  - Limit runoff from high concentration areas to surface or groundwater
- Septic maintenance
- Pet waste disposal



METALS TOTAL MAXIMUM DAILY LOADS

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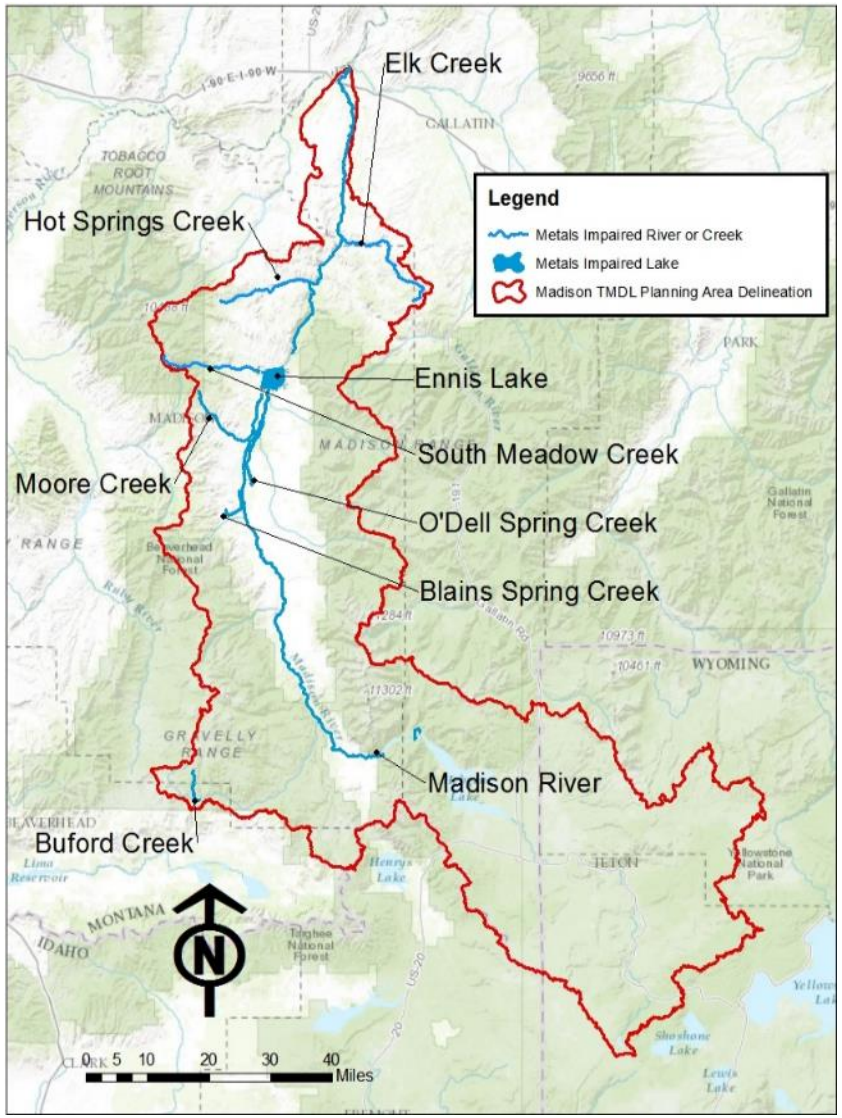
Metals Streams of Concern

- 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 streams 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
- Beneficial use considered impaired as a result of assessment: Aquatic Life Support
- Because of natural sources of arsenic, no arsenic TMDLs were developed

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	1,500
Elk Creek near headwaters	M06ELKC05	9/16/13	122	0.21	330	0.45	4,500
Elk Creek	M06ELKC02	8/16/13	146	1.0	30	0.45	1,000
Elk Creek	M06ELKC02	9/16/13	134	0.23	60	0.45	1,500
Elk Creek downstream Norris Road crossing	M06ELKC03	6/19/12	205	2.03	**2060**	3	76,000
Elk Creek downstream Norris Road crossing	M06ELKC03	7/25/12	242	0.46	**1140**	3	33,000
Elk Creek downstream Norris Road crossing	M06ELKC03	8/28/12	290	0.11	860	4	26,000
Elk Creek downstream Norris Road crossing	M06ELKC03	6/12/13	178	2.71	**1550**	3	44,500
Elk Creek downstream Norris Road crossing	M06ELKC03	8/15/13	252	0.05	340	**8.1**	6,500
Elk Creek downstream Norris Road crossing	M06ELKC03	9/16/13	270	0.001	190	**8**	5,250
Elk Creek near mouth (Madison River)	M06ELKC04	6/19/12	176	2.97	680	2	25,000
Elk Creek near mouth (Madison River)	M06ELKC04	7/25/12	232	0.47	**1170**	2	32,000
Elk Creek near mouth (Madison River)	M06ELKC04	8/28/12	262	0.05	**1000**	2	17,000

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

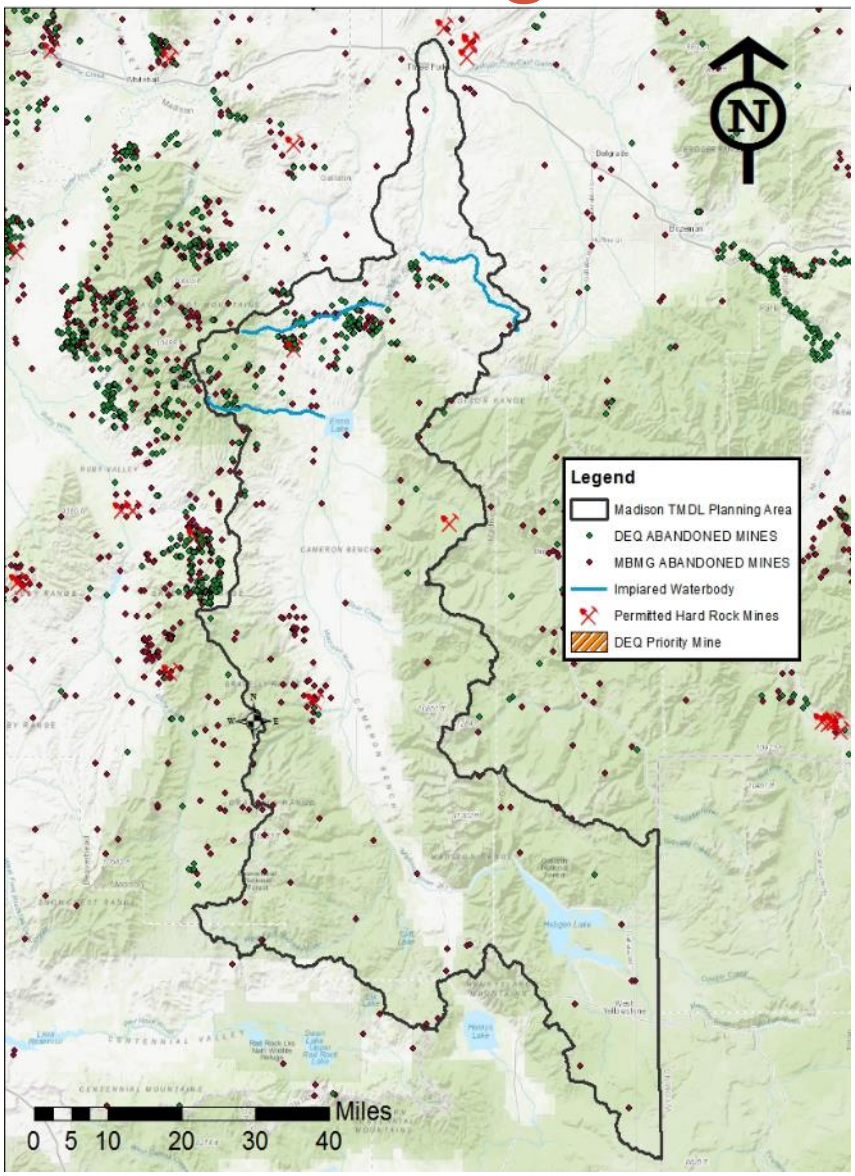
Metals Sources: Historical Mining

185 abandoned mines in the watershed:

- Galatian Corundum
- Elk Creek Corundum

Four Priority Abandoned Mines:

- Boaz
- Grubstake
- Missouri
- SE SE Section 25



Other Metals Sources

- Land Disturbances Associated with Agriculture:
  - Private land grazing
  - USFS and BLM grazing allotments
- Human-Caused Land Disturbances
- Naturally Occurring Sources

Metal TMDLs

Stream	TMDL Developed
Elk Creek	Iron, Selenium
Hot Spring Creek	Iron, Lead
South Meadow Creek	Copper

Reductions Needed to Meet TMDLs

Stream	Parameter	Flow	Percent Reduction Needed
Elk Creek	Iron	High	51%
		Low	51%
	Selenium	Low	38%
South Meadow Creek	Copper	High	64%
		low	28%
Hot Springs Creek	Iron	High	50%
		Low	50%
	Lead	High	20%

Load Reductions by Source

- Natural background
  - Zero percent reduction
- Human-caused
  - Reduction needed to meet the water quality standards

Metals Reduction Practices

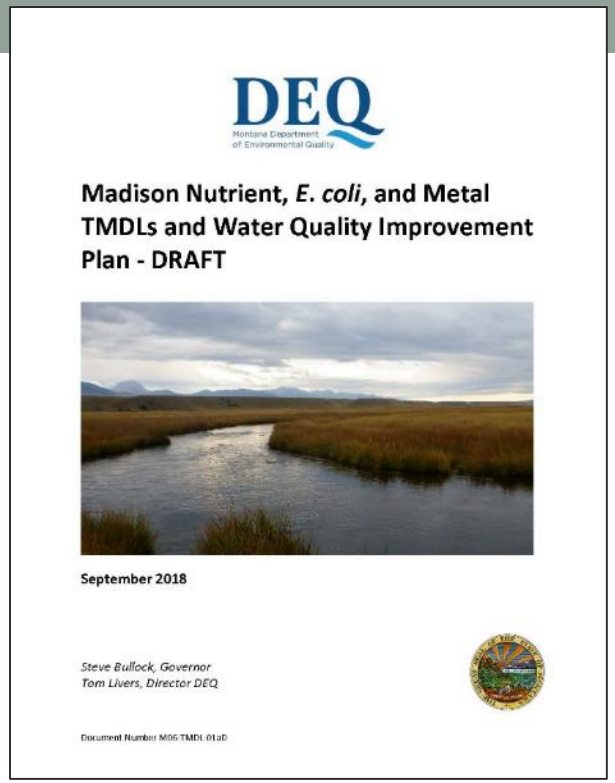
- Mine remediation
- Erosion prevention

TMDL Document Organization

Document Sections	Information Type
1.0: Project Overview 2.0: Madison River Watershed Description 3.0: Montana Water Quality Standards 4.0: Explanation of the TMDL Process	Introductory
5.0: Nutrient TMDLs 6.0: E.coli TMDLs 7.0: Metal TMDLs	Technical details
8.0: Water Quality Improvement Recommendations 9.0: Monitoring Recommendations	Implementation and adaptive management information
10.0: Public Participation Process 11.0: References	Responses to public comments

How to Comment

Deadline: 5:00 p.m., Friday, October 19, 2018


DEQ
Montana Department of Environmental Quality

Madison Nutrient, *E. coli*, and Metal TMDLs and Water Quality Improvement Plan - DRAFT

September 2018

Steve Bullock, Governor
Tom Livers, Director DEQ

Document Number M06-TMDL-01ab

Document Locations:

- Madison Valley Public Library
- http://deq.mt.gov/Public/publiccomment

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Ongoing Work in the Madison

- Sediment and temperature total maximum daily load (TMDL) document is under development by DEQ
- Public comment and public meeting for sediment and temperature TMDL document anticipated for 2019
- Madison Conservation District is developing a watershed restoration plan that will include monitoring and restoration components to reduce impacts from nutrients, *E.coli*, metals, sediment, and temperature