# Madison River TMDL Project

Watershed Advisory Group Meeting

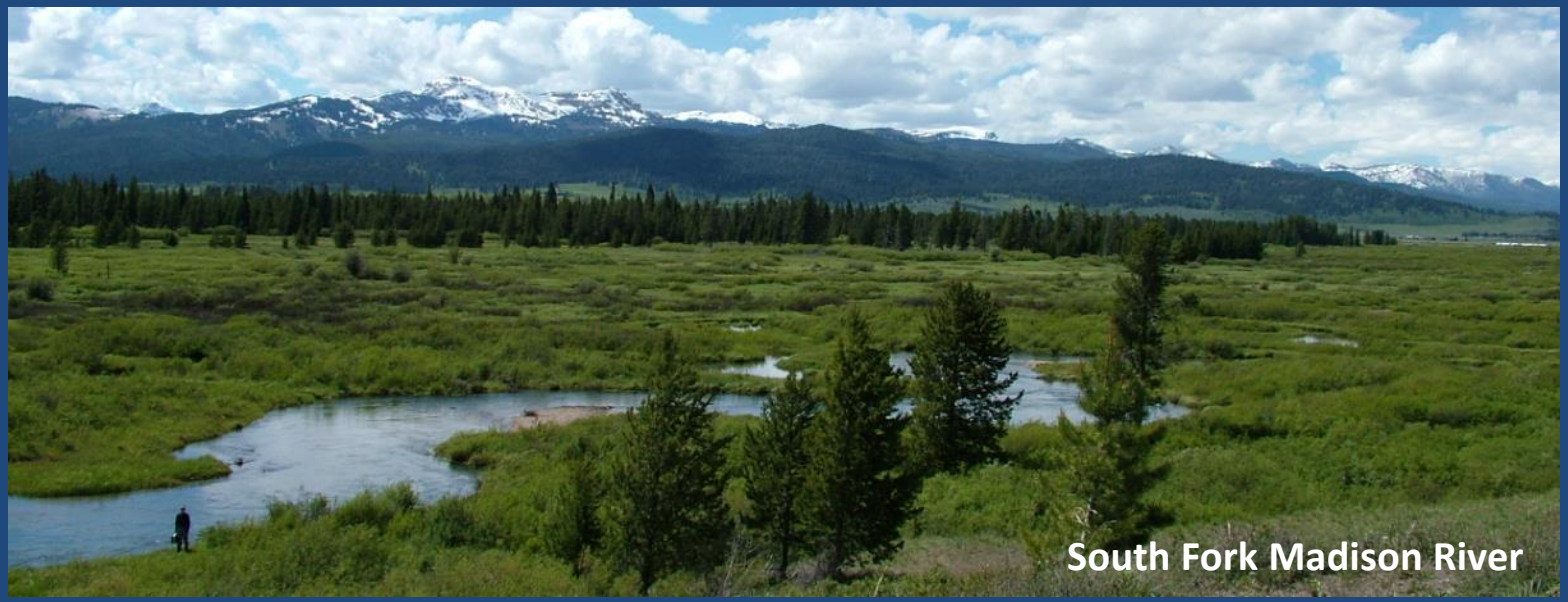
September 14, 2016

Ennis

DEQ Montana Department of Environmental Quality

# Meeting Purpose

Meet with Madison River Watershed Advisory Group to provide and discuss total maximum daily load (TMDL) project information for the Madison River and its tributaries



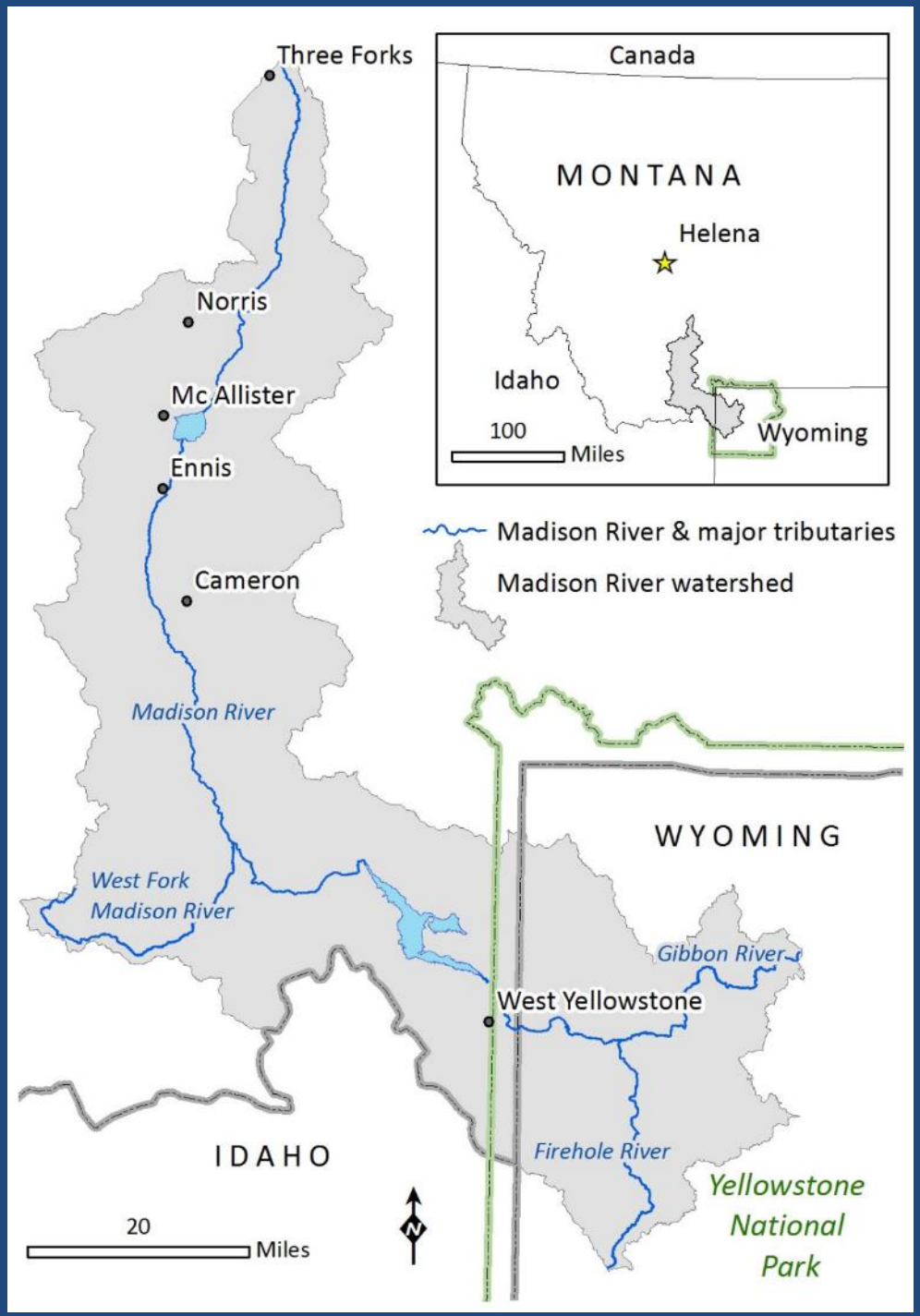
South Fork Madison River

# Role of the Watershed Advisory Group

- DEQ relies on input from those who live and work in our project areas to improve the quality of our work
- State law requires DEQ to consult with local CDs and representatives from various interest groups during the TMDL development process
- Participation is at your discretion
- Provide comments on information in this presentation and in the draft document

# Presentation Outline

- Project Overview
- Water Quality Planning Process
- Total Maximum Daily Load Development Process
- Nutrient and *E. coli* Data and Sources
- Metal Data and Sources
- Sediment and Temperature Data and Sources
- Watershed Restoration Planning
- Next Steps




# Project Location

# Why the Madison River Watershed

- Important economic resource (fishing, tourism, ranching)
- Very active watershed group with interest in water quality protection and TMDL implementation
- Local water quality monitoring program already in place
- DEQ monitoring and water quality assessments completed

Jack Creek bank restoration

# Project Goals

- Develop nutrient, pathogen, metal, sediment, and temperature TMDLs
- Provide information that will help protect water quality in the Madison River watershed
- Provide water quality restoration suggestions

# Water Quality Planning Process

- Identify appropriate water quality standards
- Evaluate water quality relative to the standards
- Characterize the problems and develop solutions (Current Project Phase)
  - Often involves total maximum daily load (TMDL) development
- Water quality restoration and protection

# Water Quality Planning Process – Water Quality Standards

# Water Quality Standards

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

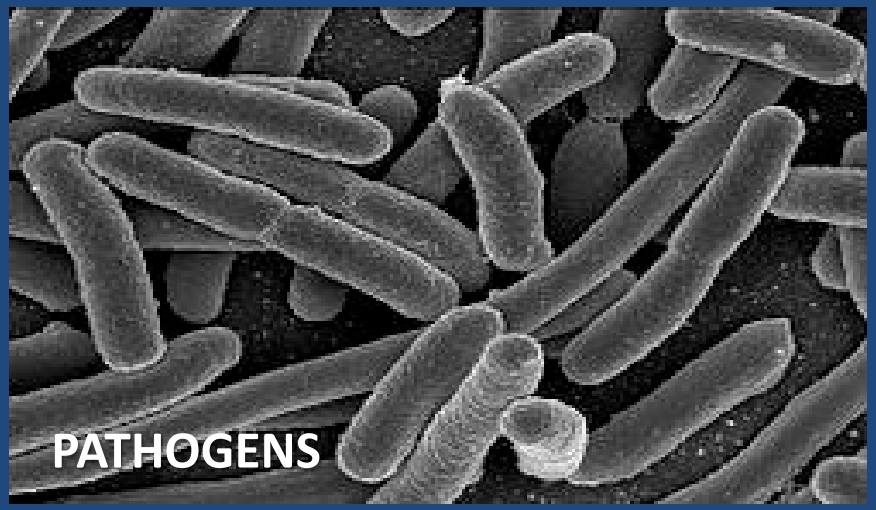
Agriculture:
Irrigation

Aquatic Life:
Cold Water Fish

Drinking Water

# Water Quality Planning Process – Analyze Water Quality & Compare to Standards

# Pollutants Evaluated in this Project

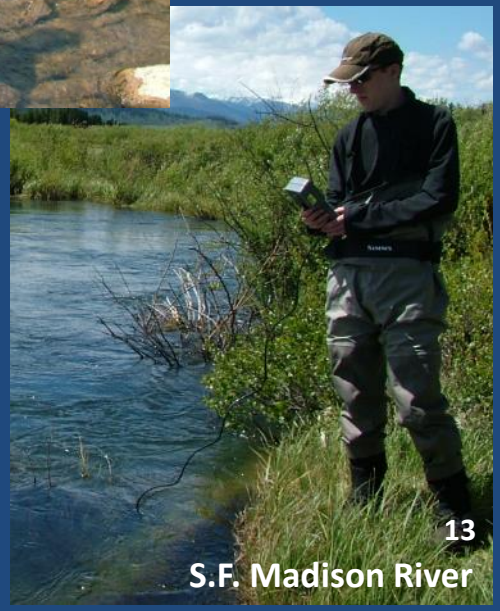


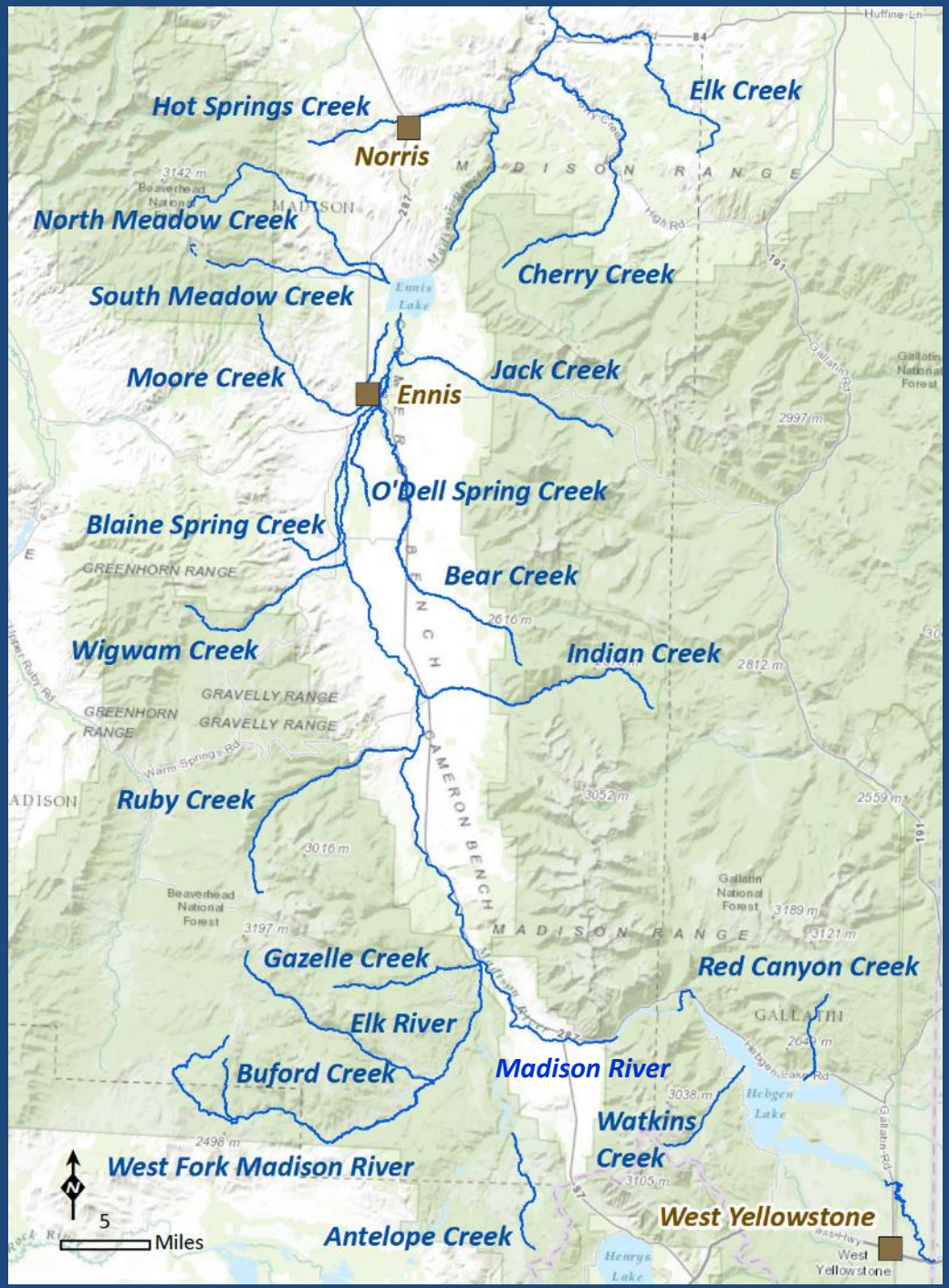



# Water Quality Sampling

- 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)



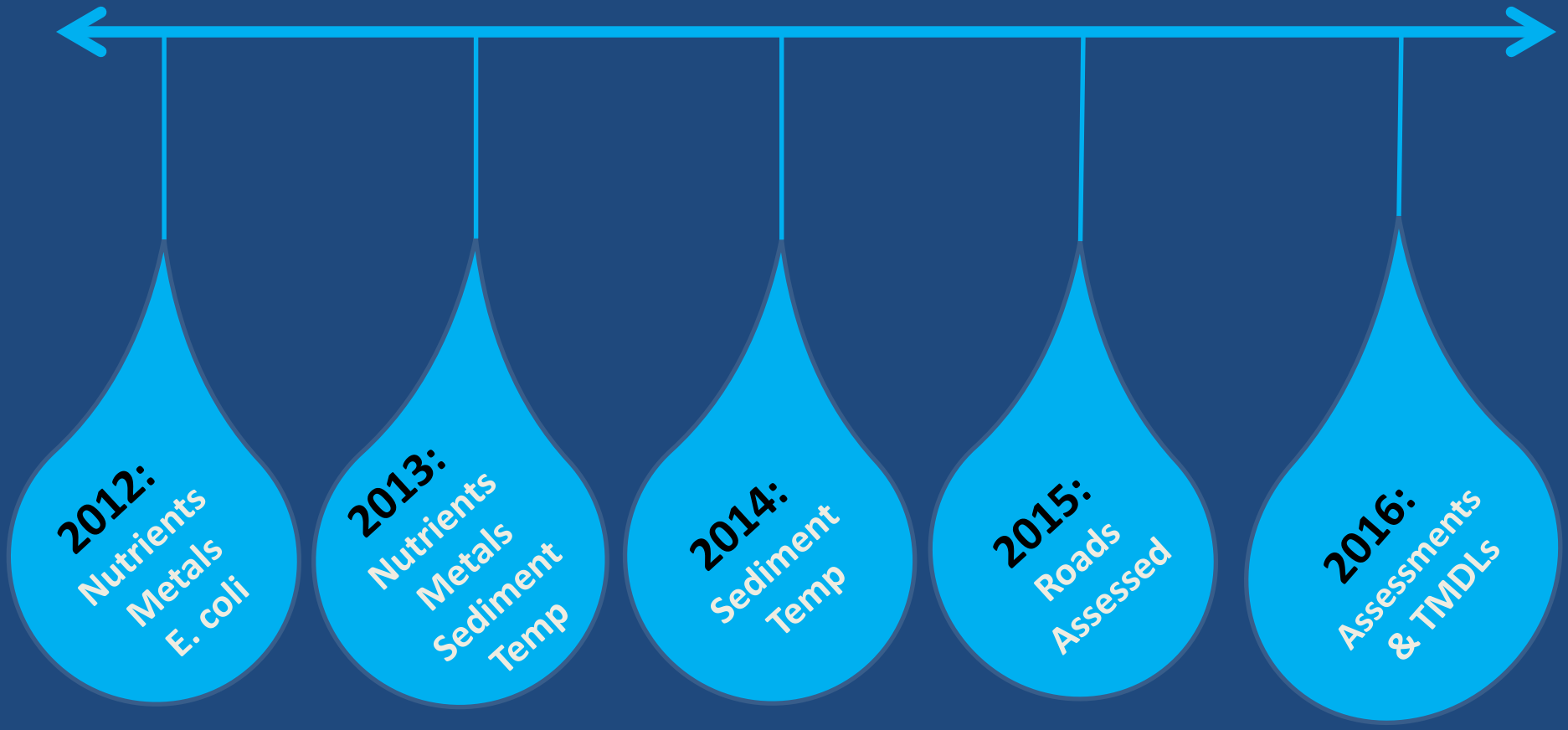





# Sampled Streams

- Madison River
- 21 Tributaries
- Ennis Lake

# Water Quality Sampling: Madison Project History



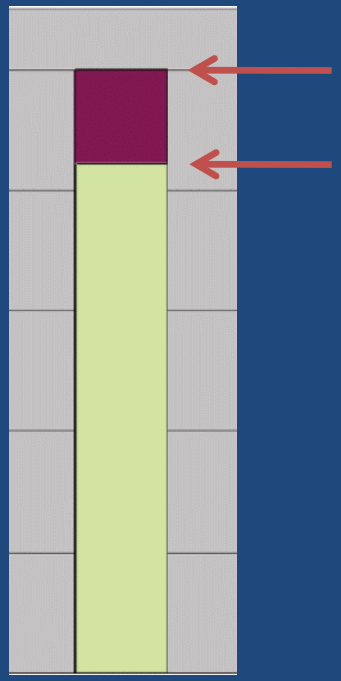
# Sampling Results

- 5 waters evaluated with no impairment causes identified
- 27 impairment causes removed from impaired waters list
- 50% of streams evaluated for nutrients show no excess nutrient problem
- 20% of streams evaluated for sediment and aquatic habitat conditions show no excess sediment problem
- 34 pollutant impairment causes undergoing TMDL development

# Water Quality Planning Process – TMDL Development

# What is a TMDL?

**T**otal **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

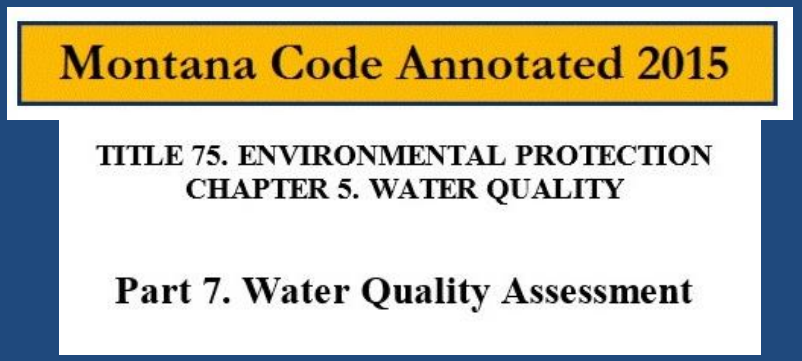


Total Current Load

TMDL
(Allowable Load)

# 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

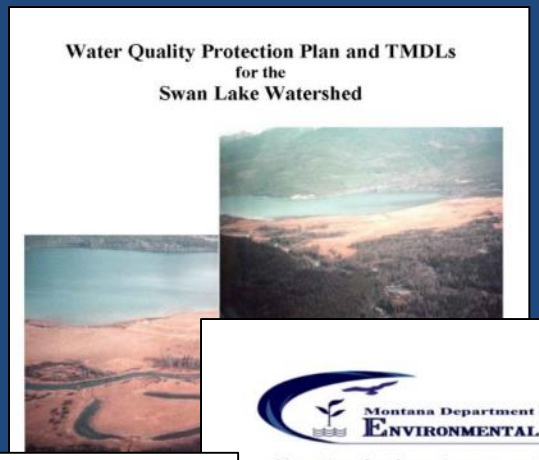


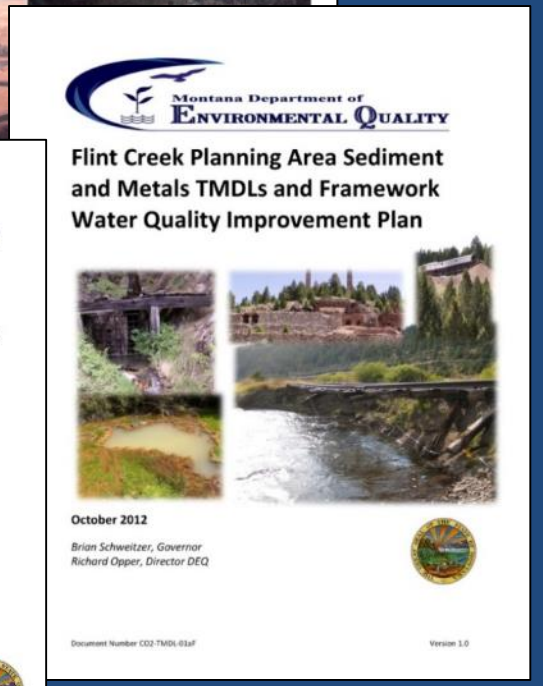
# Why Do We Need TMDLs?

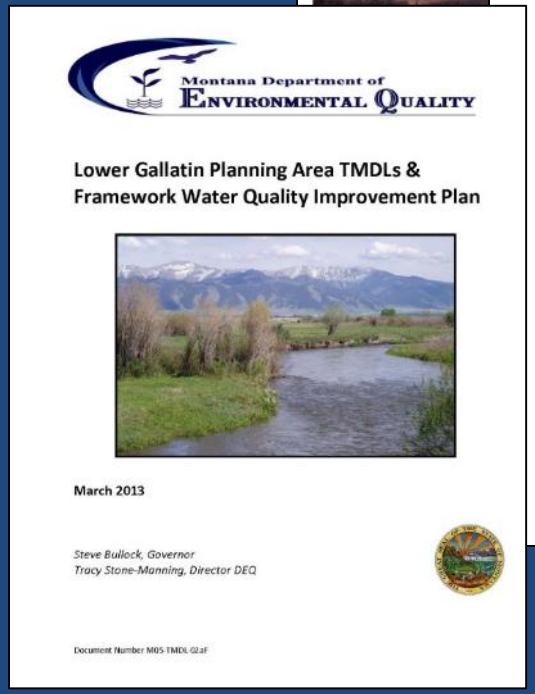
- Addresses cumulative impacts
- Incorporates multiple source types, both regulated and non-regulated
- Guides future restoration work and prioritization for projects

# Montana TMDL Program History

- More than 1,400 approved TMDLs (1998 – present)
- Over 70 completed TMDL documents
- Most apply to watersheds in western Montana

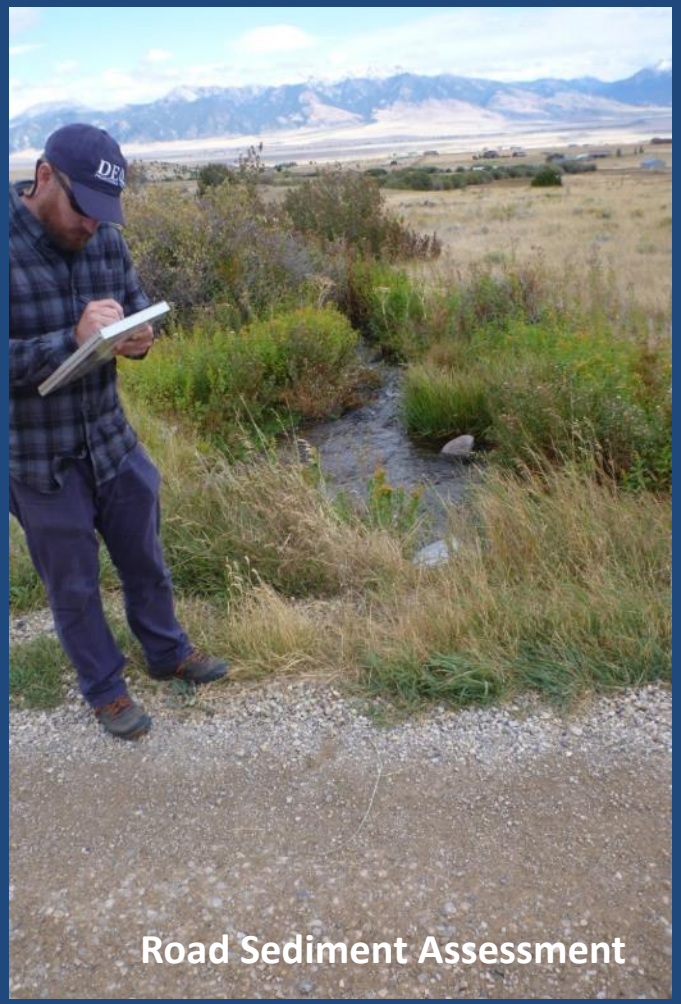


# Madison River Watershed TMDL Development Steps

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


Road Sediment Assessment

# 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

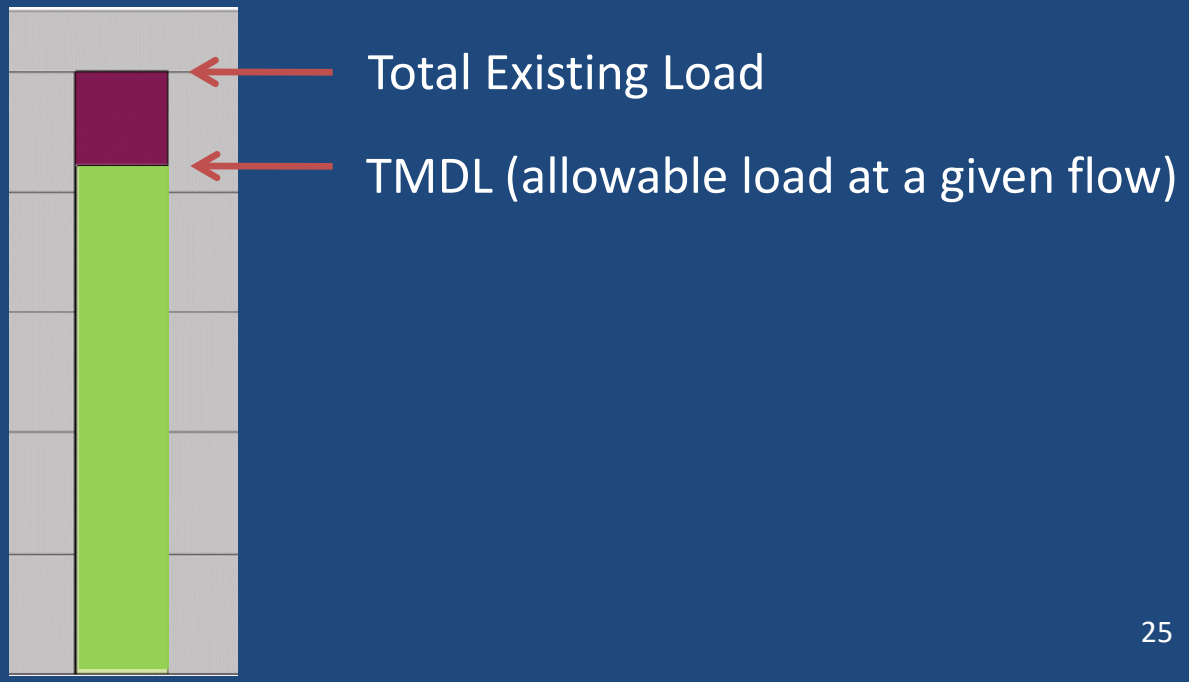
# 2. Defining the TMDL

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

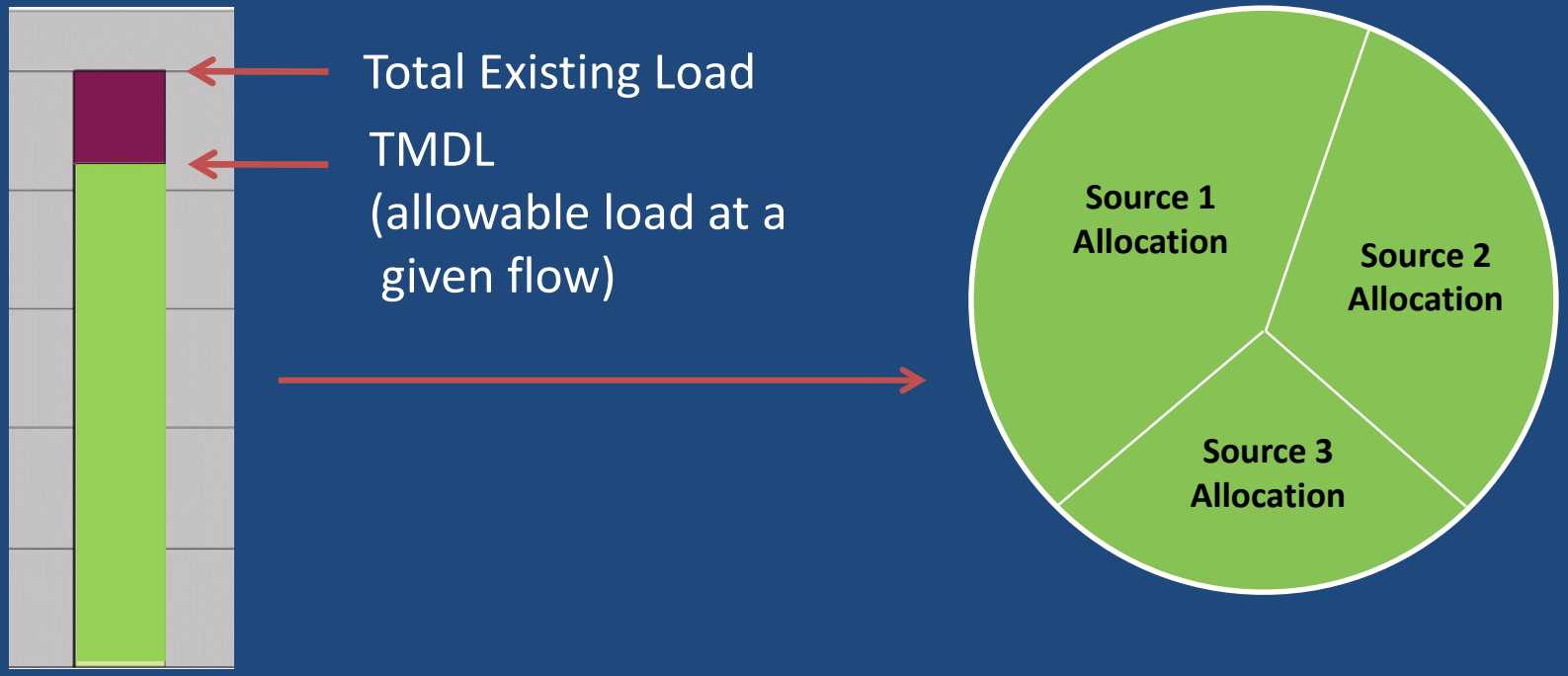
TMDL (lb/day) = (Stream flow) x (target concentration) x (conversion factor)

# 3. Sources of Pollutant Loading

- Where is the total existing load coming from?
- What are the sources of the elevated loading?



# 4. TMDL Allocations: Conceptual Diagram



# TMDL Allocations: Implementation

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

# Water Quality & Fish Habitat Improvement Activities

- Most watersheds where TMDL development is initiated already have a history of landowner water quality (& fish habitat) improvement

- We are interested in identifying these as part of this project

JACK CREEK BIOENGINEERING PROJECT

# Questions?

# Madison Watershed Nutrient TMDLs

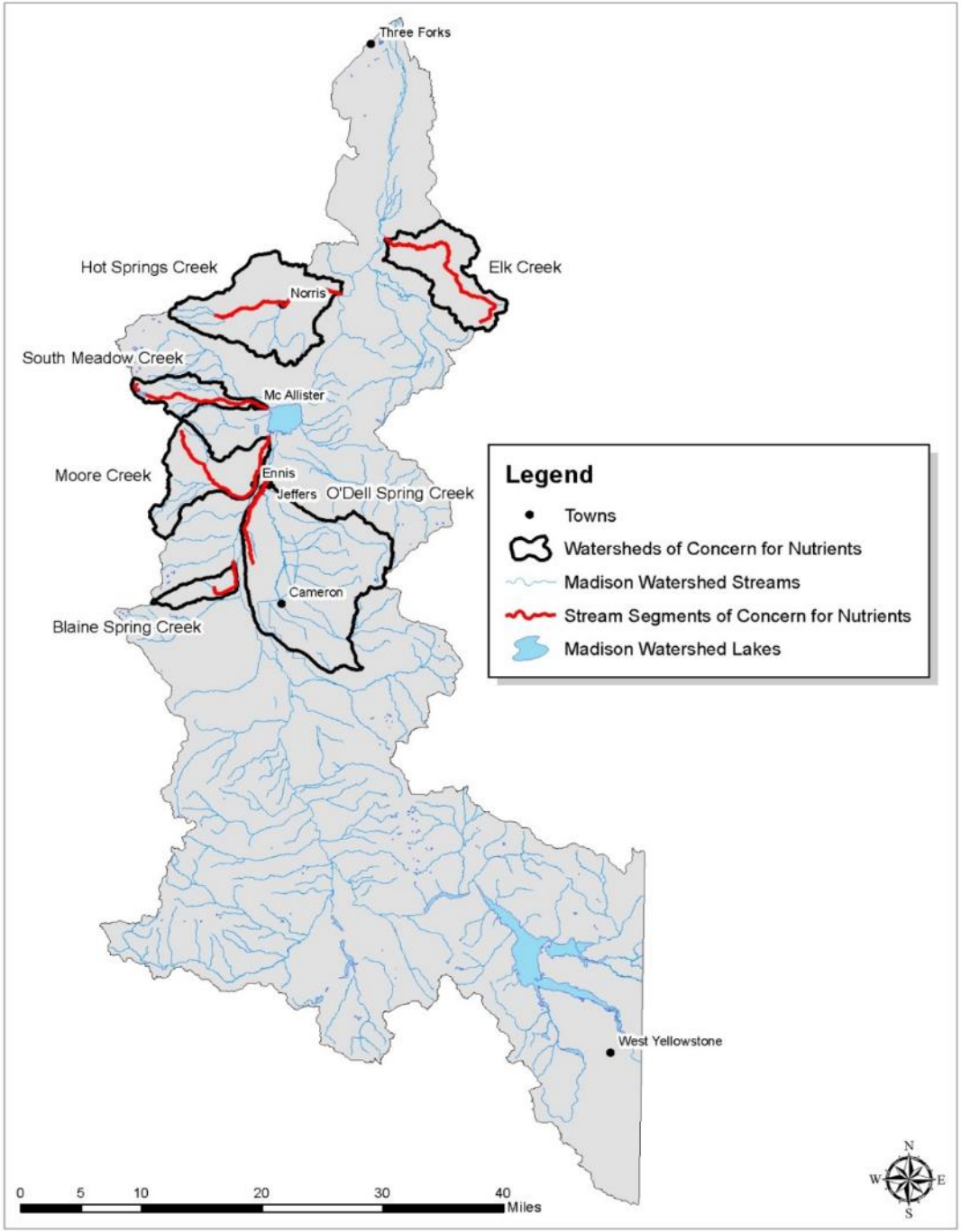
# Problems with Excess Nutrients

- Excess nitrogen and phosphorus in a waterbody can cause:
  - Nuisance algal growth affecting recreational uses and infrastructure
  - Depletion of dissolved oxygen
  - Harm to fish and aquatic life
  - Shifts in fish and macroinvertebrate communities
  - Blue baby syndrome in infants by inhibiting normal hemoglobin function.

# Hot Springs Creek

# Nutrient Waterbodies of Concern

| Stream Segment | Nutrient Related Impairments |
|---|---|
| **Blaine Spring Creek** | TN, excess algal growth |
| **Elk Creek** | TN, $NO_3$+$NO_2$, TP |
| **Hot Springs Creek** | TN, TP |
| **Moore Creek** | TN, TP |
| **O'Dell Spring Creek** | TN |
| **South Meadow Creek** | TN, TP, Chlorophyll-*a* |


Three Forks
Hot Springs Creek
Norris
Elk Creek
South Meadow Creek
Mc Allister
Moore Creek
Ennis
Jeffers
O'Dell Spring Creek
Cameron
Blaine Spring Creek
West Yellowstone
Legend
Towns
Watersheds of Concern for Nutrients
Madison Watershed Streams
Stream Segments of Concern for Nutrients
Madison Watershed Lakes
0
5
10
20
30
40
Miles
N
W
E
S

# Water Quality Targets

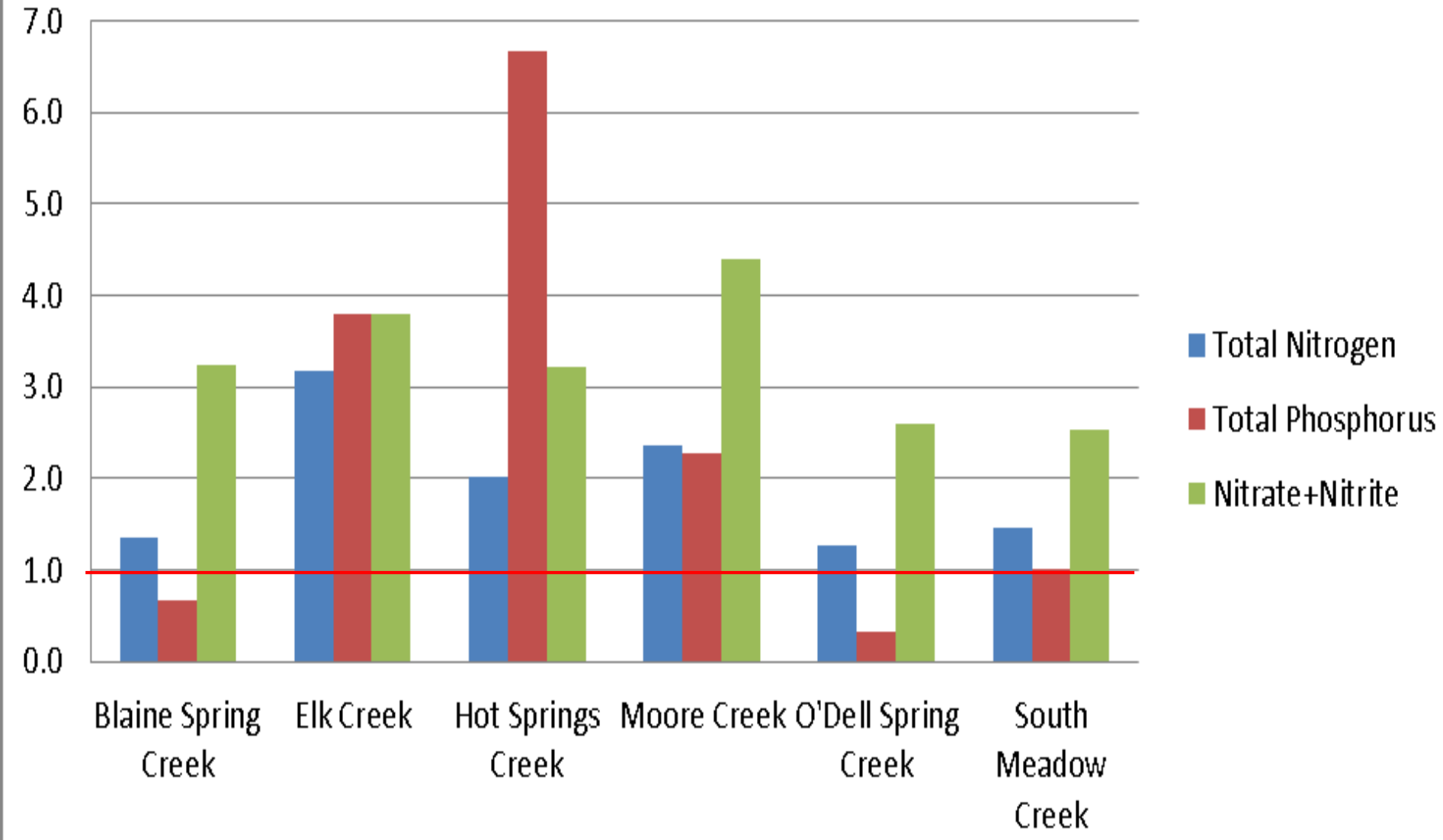
- Nutrient targets are determined by ecoregion
- Nutrient targets are seasonal (July 1 to September 30)

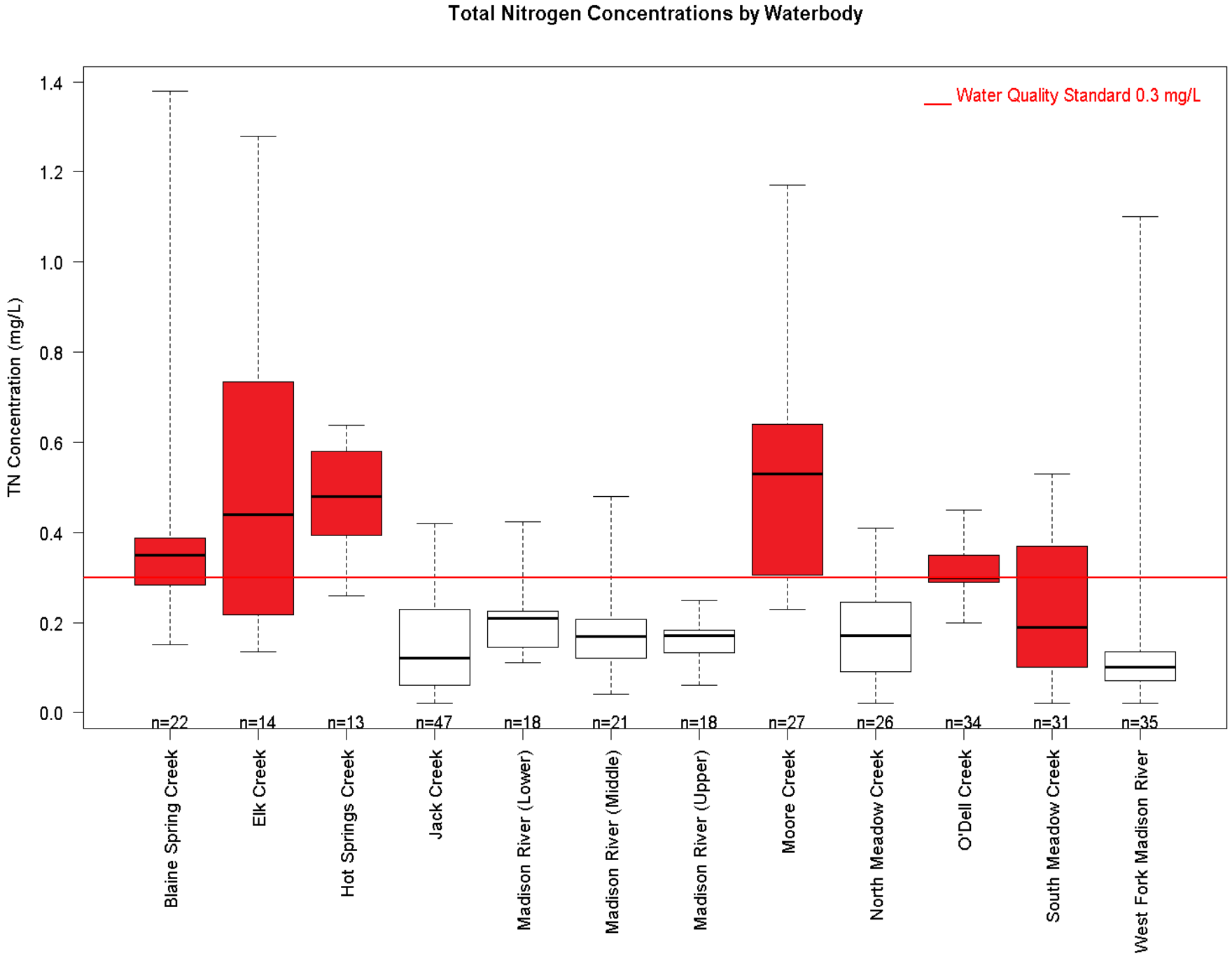
| Parameter | Middle Rockies Level III Ecoregion Target Value |
|---|---|
| Nitrate+Nitrite ($NO_3$+$NO_2$) | ≤ 0.100 mg/L |
| Total Nitrogen (TN) | ≤ 0.300 mg/L |
| Total Phosphorus (TP) | ≤ 0.030 mg/L |
| Chlorophyll-a | ≤ 125 mg/$m^2$ |
| Ash Free Dry Mass (AFDM) | ≤ 35 g/$m^2$ |
| Hilsenhoff's Biotic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

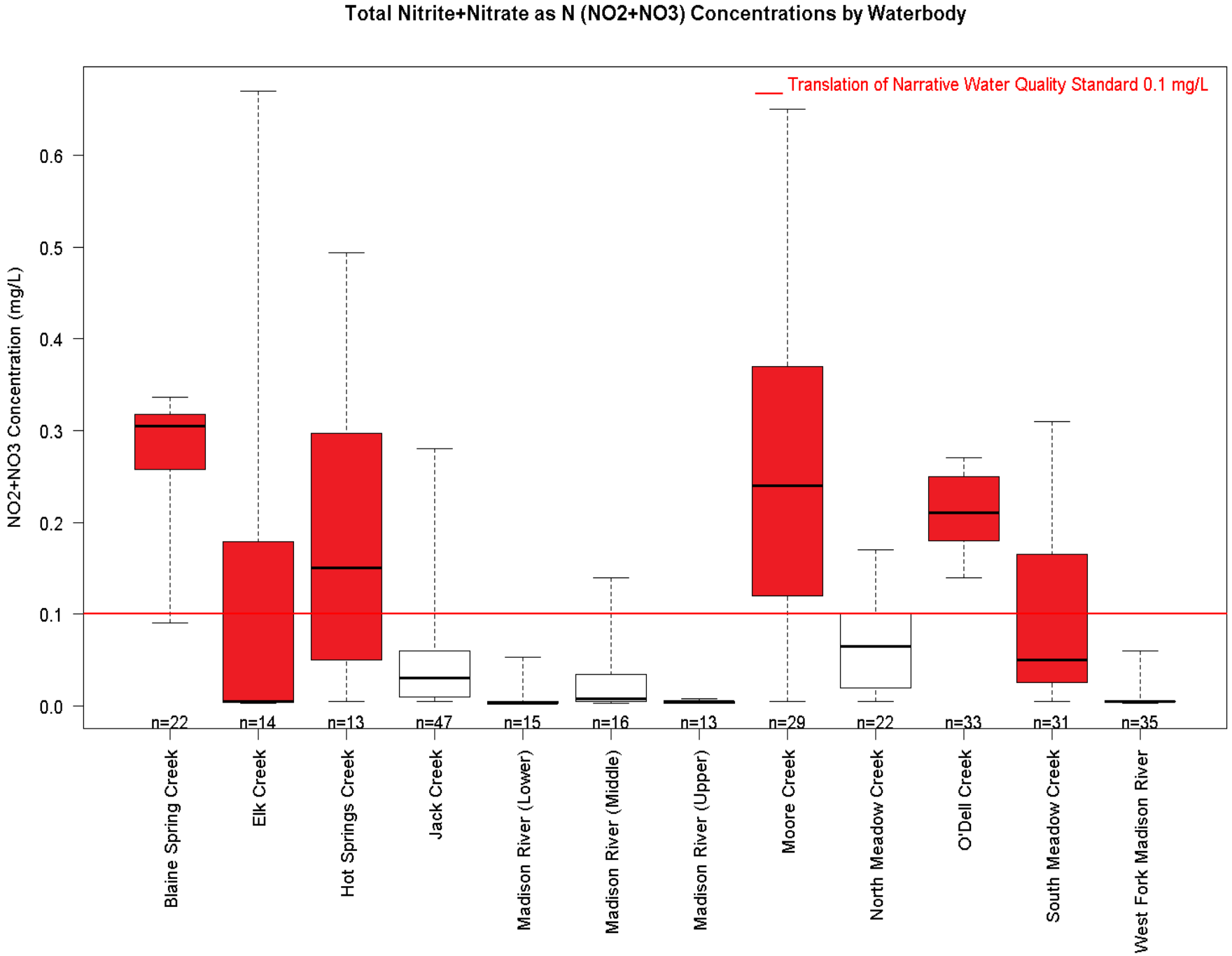
# Nutrient Target Exceedance Ratio by Waterbody and Pollutant

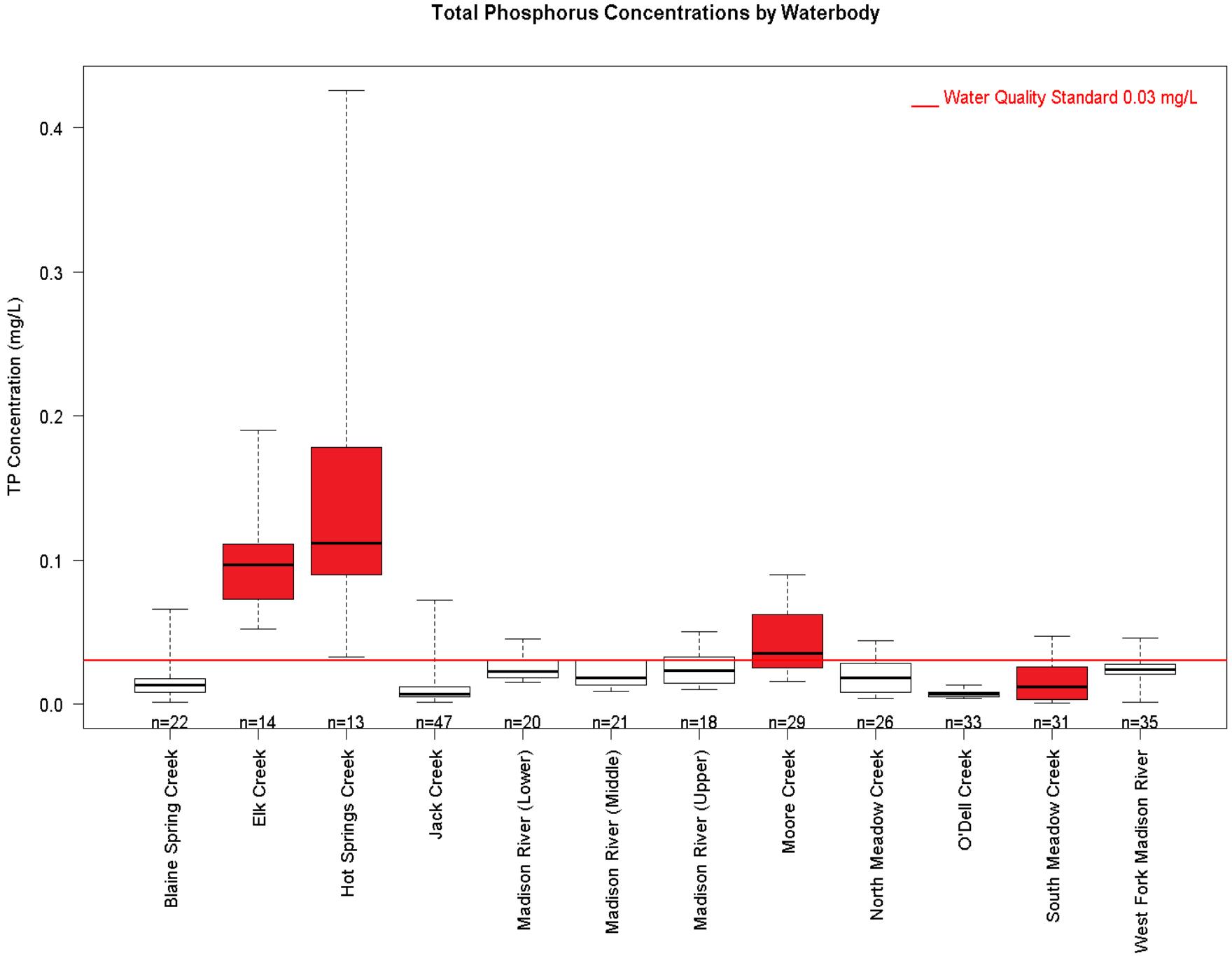
<1 = Meeting Target

>1 = Exceeding Target




Total Nitrogen Concentrations by Waterbody
Water Quality Standard 0.3 mg/L
TN Concentration (mg/L)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
n=22
n=14
n=13
n=47
n=18
n=21
n=18
n=27
n=26
n=34
n=31
n=35
Blaine Spring Creek
Elk Creek
Hot Springs Creek
Jack Creek
Madison River (Lower)
Madison River (Middle)
Madison River (Upper)
Moore Creek
North Meadow Creek
O'Dell Creek
South Meadow Creek
West Fork Madison River


Total Nitrite+Nitrate as N (NO2+NO3) Concentrations by Waterbody
Translation of Narrative Water Quality Standard 0.1 mg/L
NO2+NO3 Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
n=22
n=14
n=13
n=47
n=15
n=16
n=13
n=29
n=22
n=33
n=31
n=35
Blaine Spring Creek
Elk Creek
Hot Springs Creek
Jack Creek
Madison River (Lower)
Madison River (Middle)
Madison River (Upper)
Moore Creek
North Meadow Creek
O'Dell Creek
South Meadow Creek
West Fork Madison River

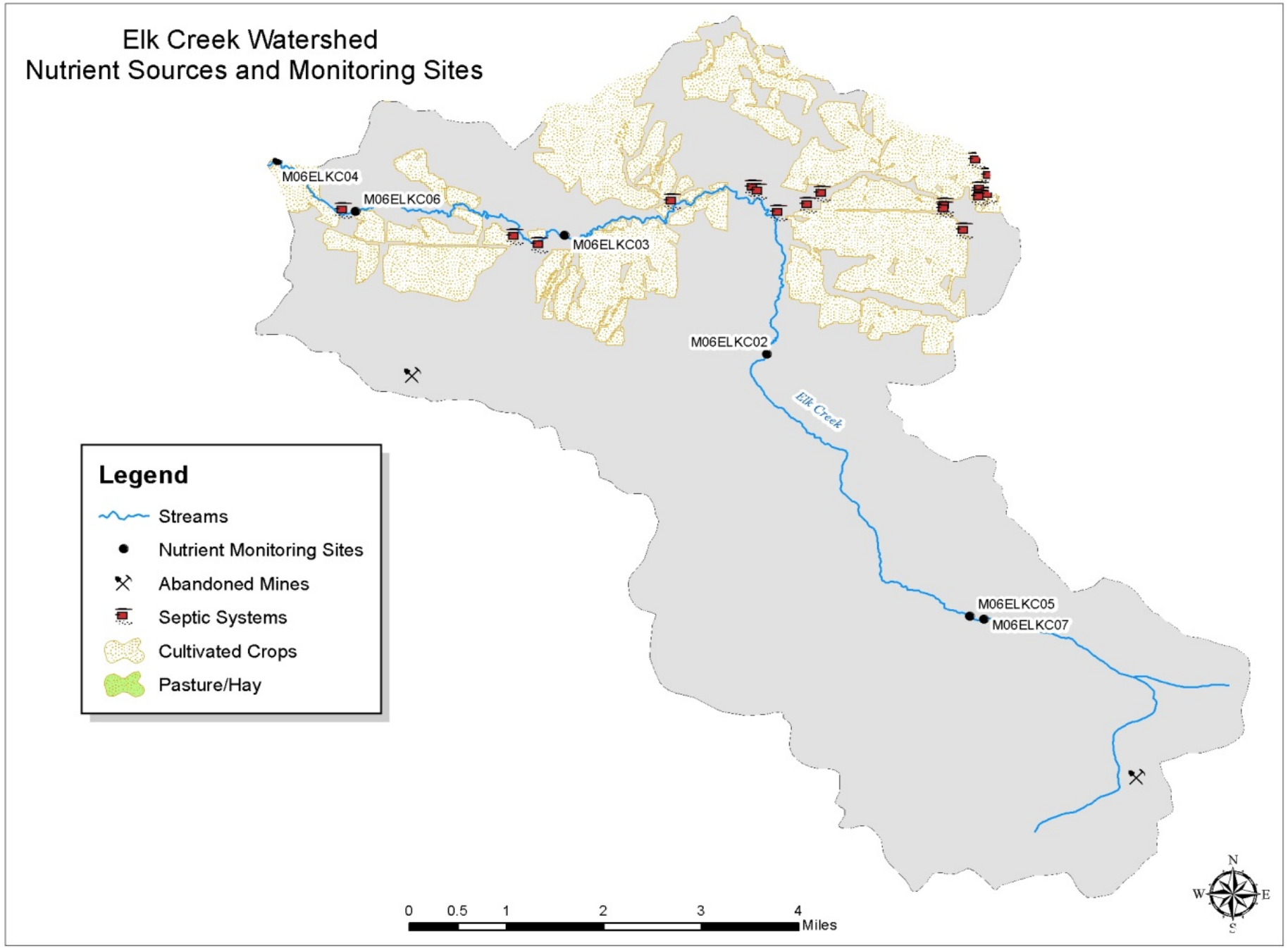

Total Phosphorus Concentrations by Waterbody
Water Quality Standard 0.03 mg/L
TP Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
n=22
n=14
n=13
n=47
n=20
n=21
n=18
n=29
n=26
n=33
n=31
n=35
Blaine Spring Creek
Elk Creek
Hot Springs Creek
Jack Creek
Madison River (Lower)
Madison River (Middle)
Madison River (Upper)
Moore Creek
North Meadow Creek
O'Dell Creek
South Meadow Creek
West Fork Madison River

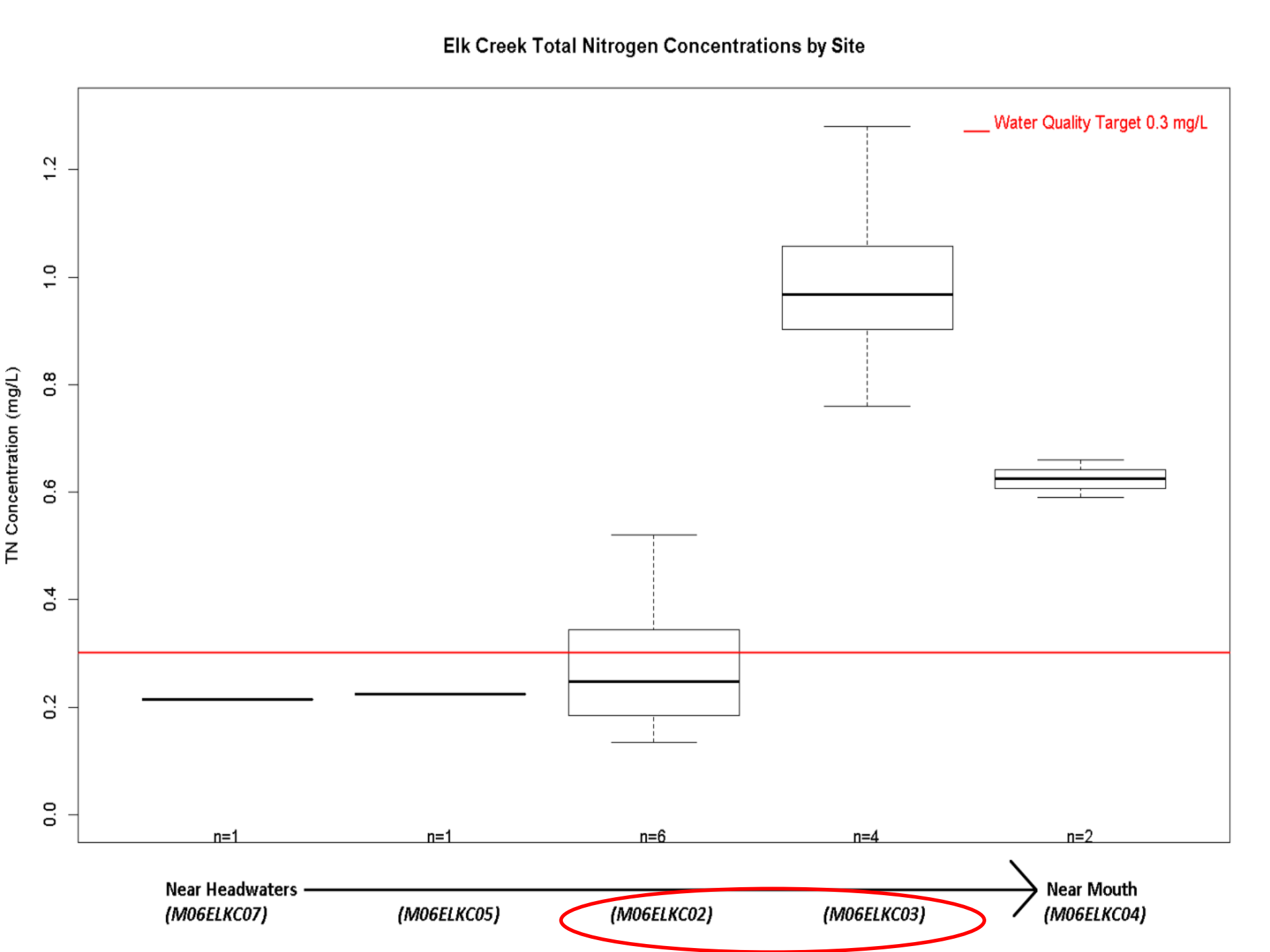
# Source Assessment

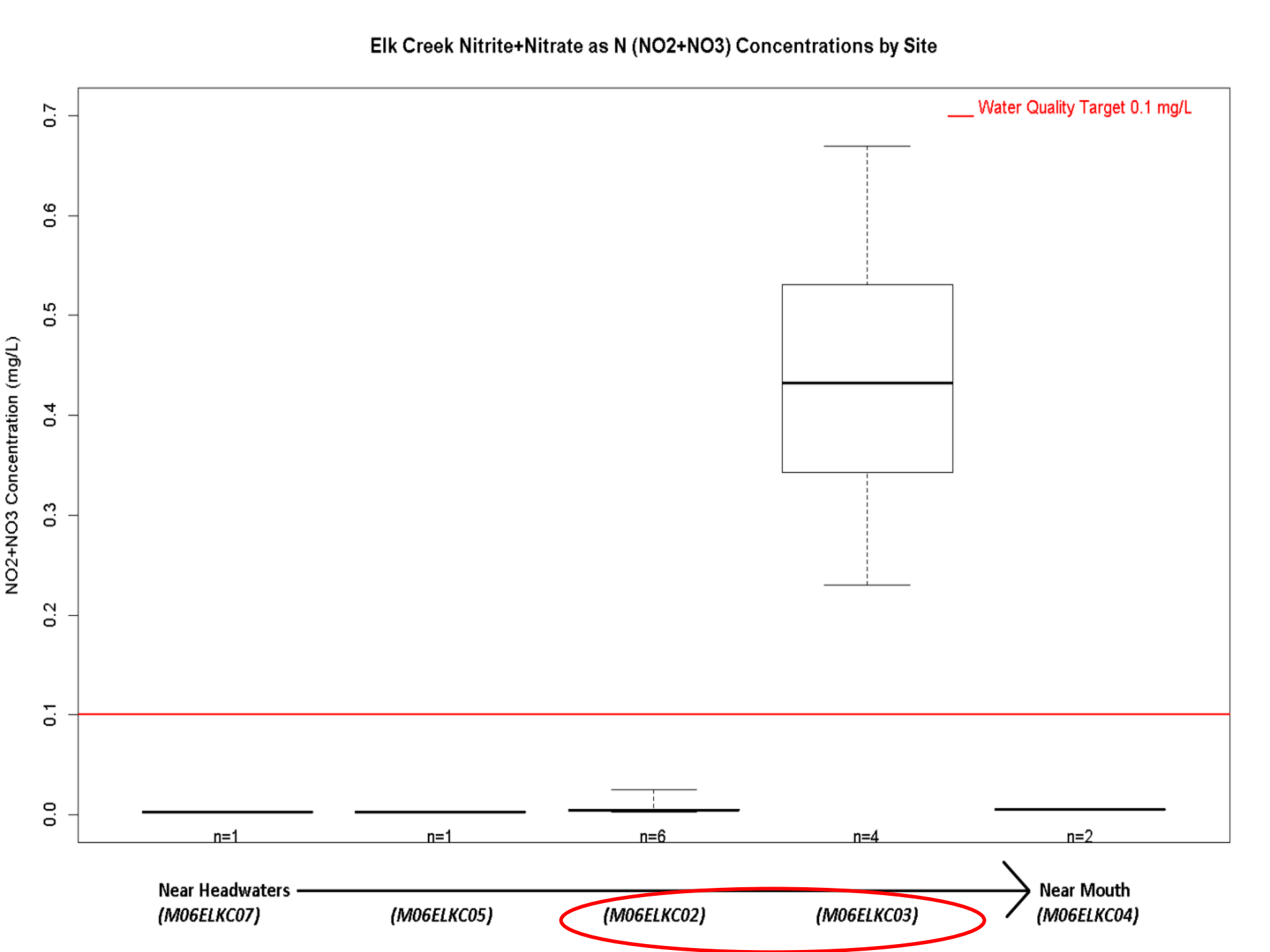
- Source assessment characterizes the type, magnitude, and distribution of sources contributing to nutrient loading
- Source assessment includes:
  - Water quality data (2007-2016)
  - Aerial photos
  - GIS analysis
  - On the ground observations
  - Literature reviews

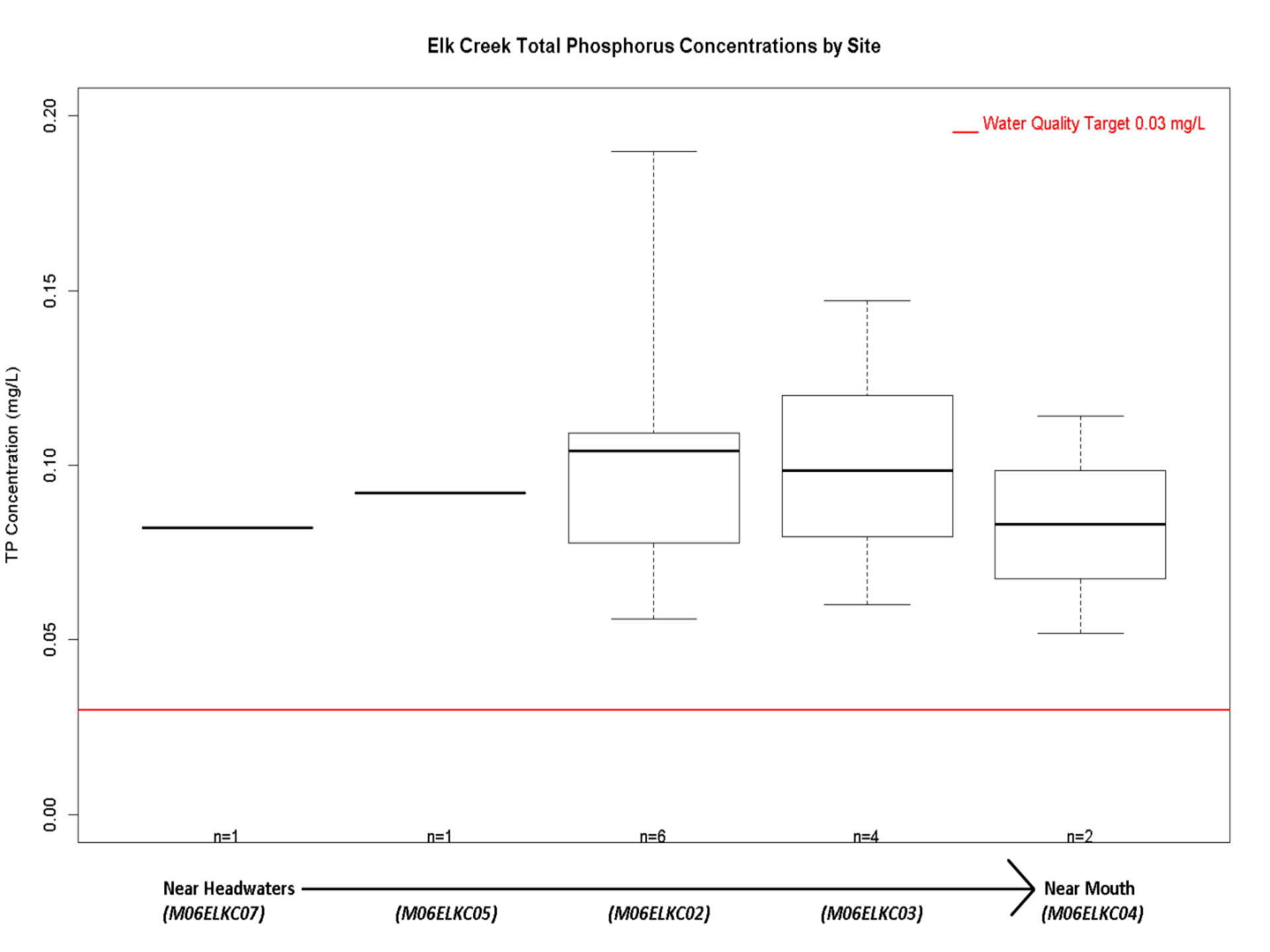
# Potential Nutrient Sources

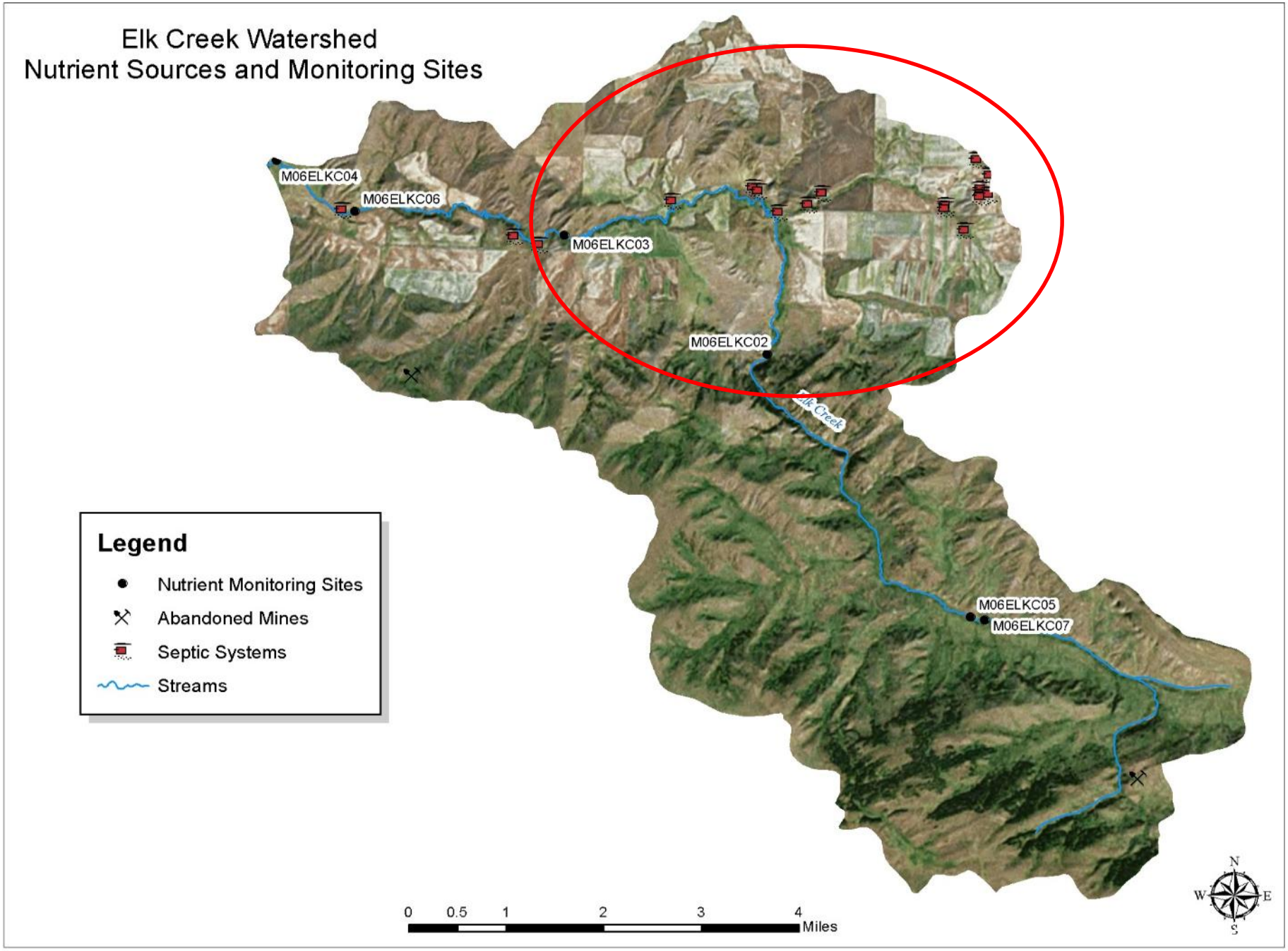
- Agriculture (cropland and pasture/rangeland/forest grazing)
- Residential development and subsurface wastewater disposal and treatment (individual and community septic systems)
- Mining
- Natural background


Elk Creek Watershed
Nutrient Sources and Monitoring Sites
M06ELKC04
M06ELKC06
M06ELKC03
M06ELKC02
Elk Creek
M06ELKC05
M06ELKC07
Legend
Streams
Nutrient Monitoring Sites
Abandoned Mines
Septic Systems
Cultivated Crops
Pasture/Hay
0
0.5
1
2
3
4
Miles
N
W
E
S


Elk Creek Total Nitrogen Concentrations by Site
Water Quality Target 0.3 mg/L
TN Concentration (mg/L)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
n=1
n=1
n=6
n=4
n=2
Near Headwaters
(M06ELKC07)
(M06ELKC05)
(M06ELKC02)
(M06ELKC03)
Near Mouth
(M06ELKC04)

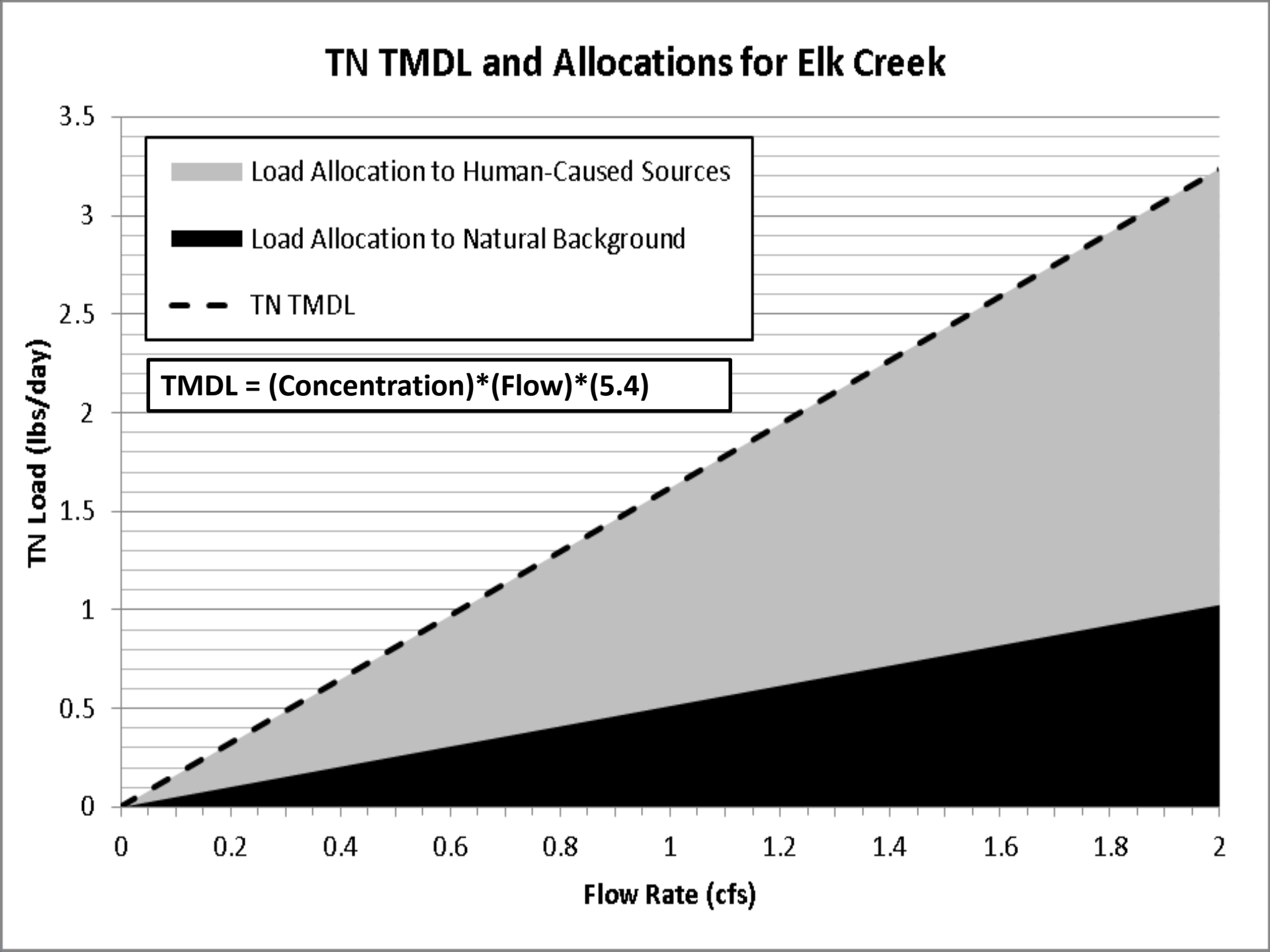

Elk Creek Nitrite+Nitrate as N (NO2+NO3) Concentrations by Site
Water Quality Target 0.1 mg/L
NO2+NO3 Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
n=1
n=1
n=6
n=4
n=2
Near Headwaters
(M06ELKC07)
(M06ELKC05)
(M06ELKC02)
(M06ELKC03)
Near Mouth
(M06ELKC04)


Elk Creek Total Phosphorus Concentrations by Site
Water Quality Target 0.03 mg/L
TP Concentration (mg/L)
0.00
0.05
0.10
0.15
0.20
n=1
n=1
n=6
n=4
n=2
Near Headwaters
(M06ELKC07)
(M06ELKC05)
(M06ELKC02)
(M06ELKC03)
Near Mouth
(M06ELKC04)


Elk Creek Watershed
Nutrient Sources and Monitoring Sites
M06ELKC04
M06ELKC06
M06ELKC03
M06ELKC02
Elk Creek
M06ELKC05
M06ELKC07
Legend
Nutrient Monitoring Sites
Abandoned Mines
Septic Systems
Streams
0 0.5 1 2 3 4
Miles
N
W
E
S

# Nutrient Sources

- Agriculture
- Septic systems (17 total)
- Mining – not a significant source
- Natural background


TN TMDL and Allocations for Elk Creek
Load Allocation to Human-Caused Sources
Load Allocation to Natural Background
TN TMDL
TMDL = (Concentration)*(Flow)*(5.4)
TN Load (lbs/day)
3.5
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Flow Rate (cfs)


Questions?
Moore Creek

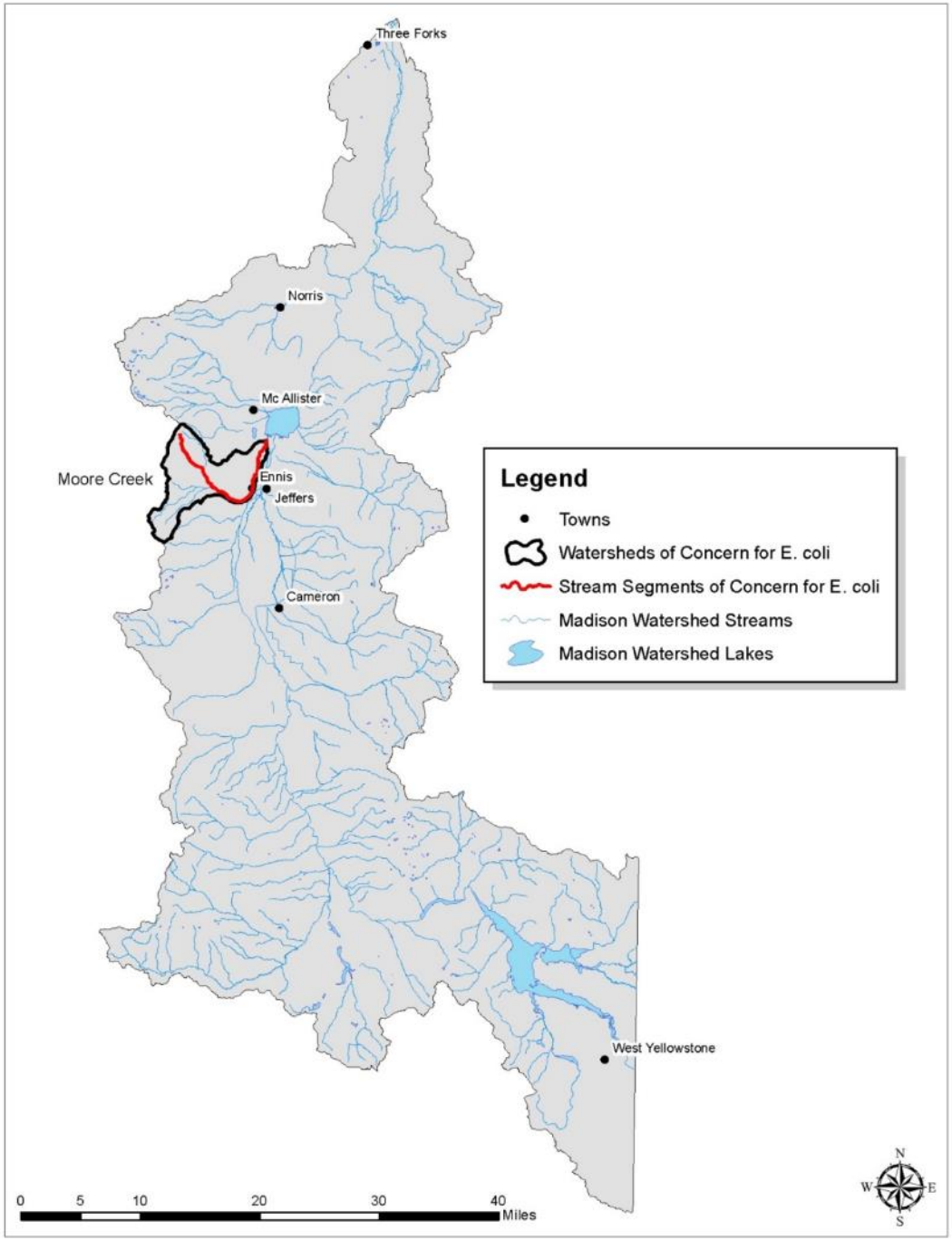
# Madison Watershed
# *E. coli* TMDLs

# Problems with Excess *E. coli*

- *E. coli* is a nonpathogenic indicator bacterium that is usually associated with pathogens (bacteria, viruses, and protozoans) transmitted by fecal contamination.
- Excess *E. coli* in a waterbody is associated with waterborne illnesses

# *E. coli* Waterbody of Concern

| Stream Segment | Pathogen Related Impairments |
|---|---|
| **Moore Creek** | *E. coli* |


Three Forks
Norris
Mc Allister
Moore Creek
Ennis
Jeffers
Cameron
West Yellowstone
Legend
Towns
Watersheds of Concern for E. coli
Stream Segments of Concern for E. coli
Madison Watershed Streams
Madison Watershed Lakes
0
5
10
20
30
40
Miles
N
W
E
S

# 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 |

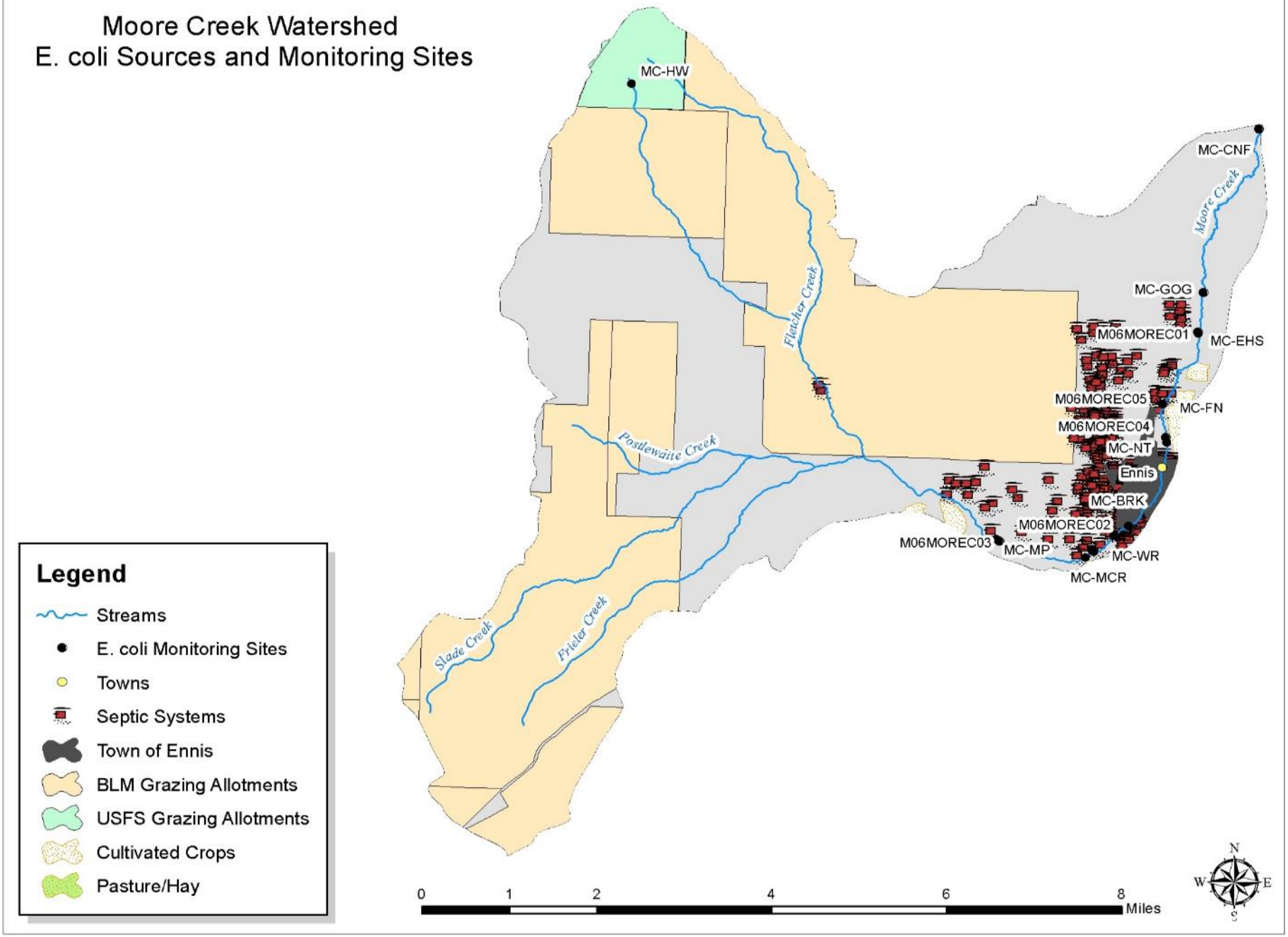
# Source Assessment

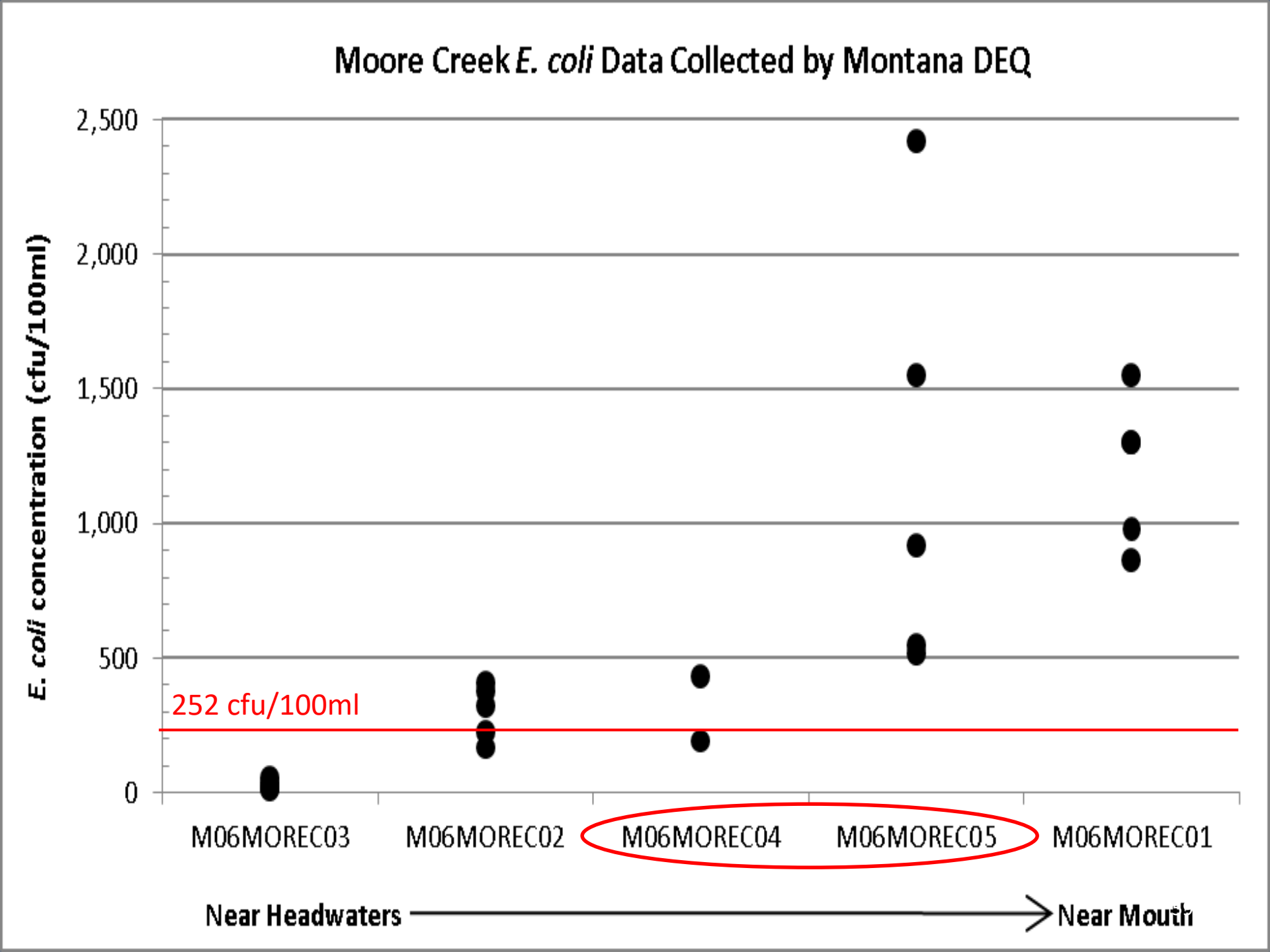
- Source assessment characterizes the type, magnitude, and distribution of sources contributing to *E. coli* loading
- Source assessment includes:
  - Water quality data (2012-2013)
  - Aerial photos
  - GIS analysis
  - On the ground observations
  - Literature reviews

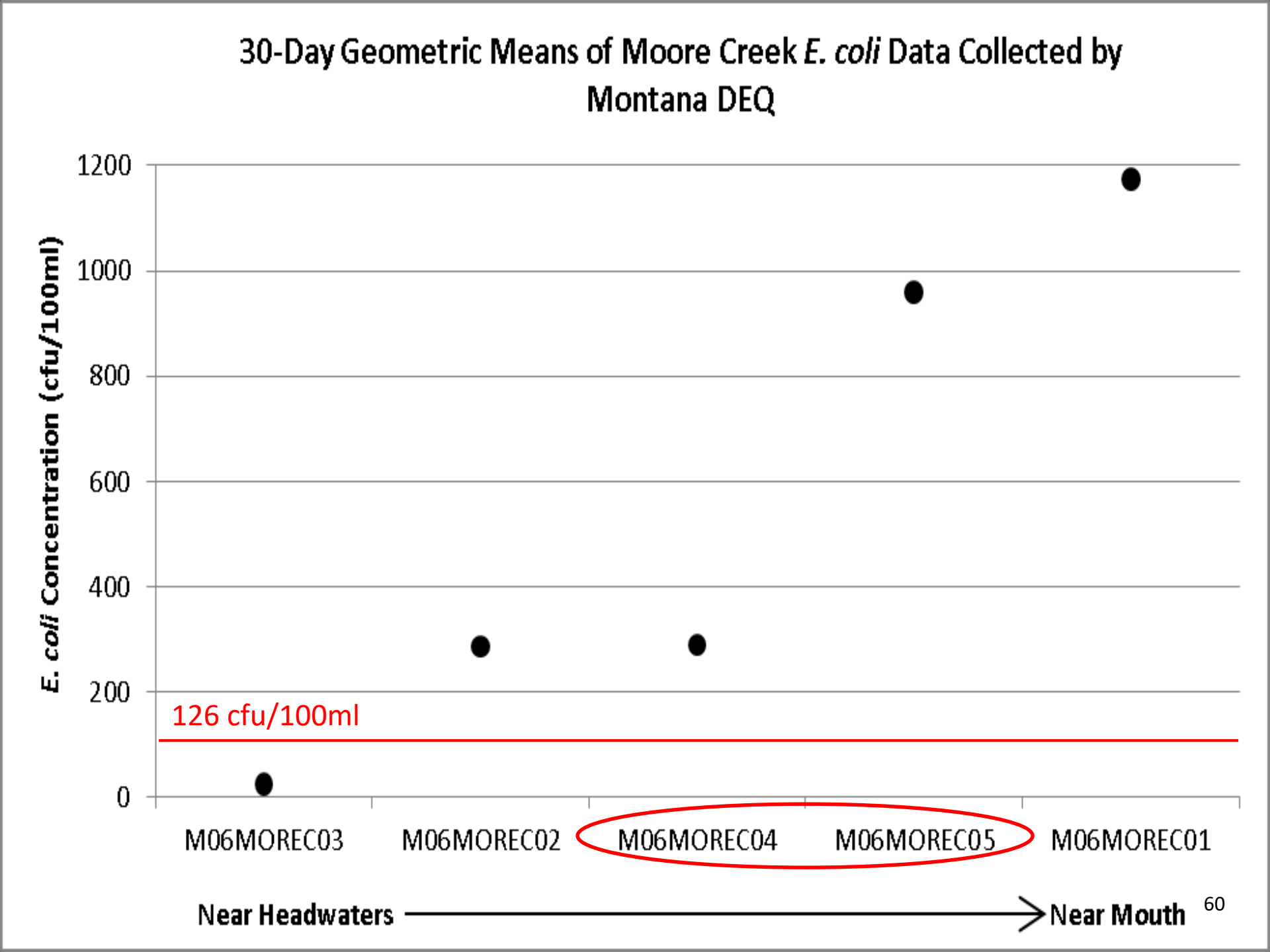
# Potential *E. coli* Sources

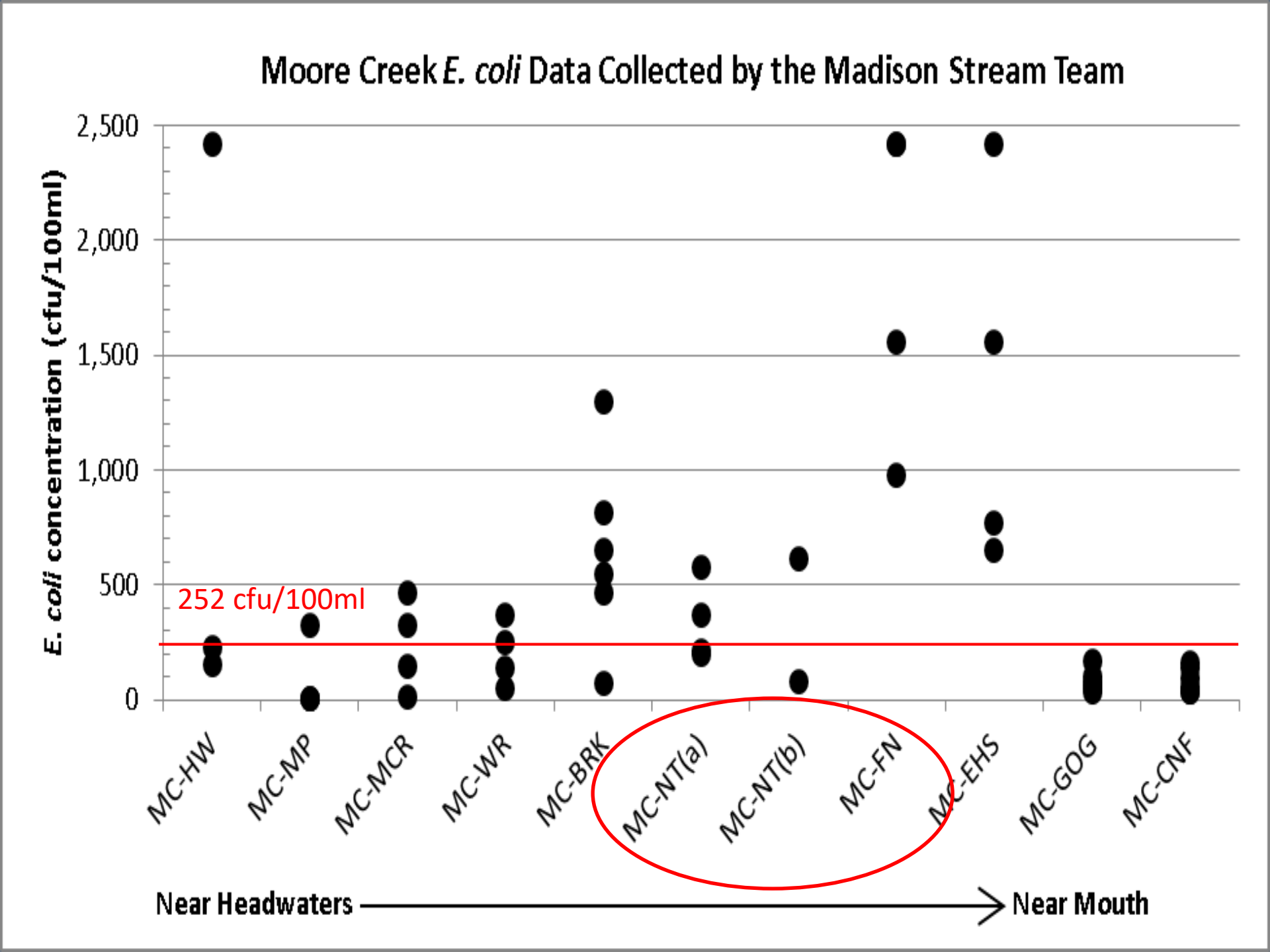
- Agriculture (manure application on cropland, animal feeding operations, pasture/rangeland/forest grazing)
- Residential development and subsurface wastewater disposal and treatment (individual and community septic systems)
- Leaky municipal sewer pipes
- Natural background

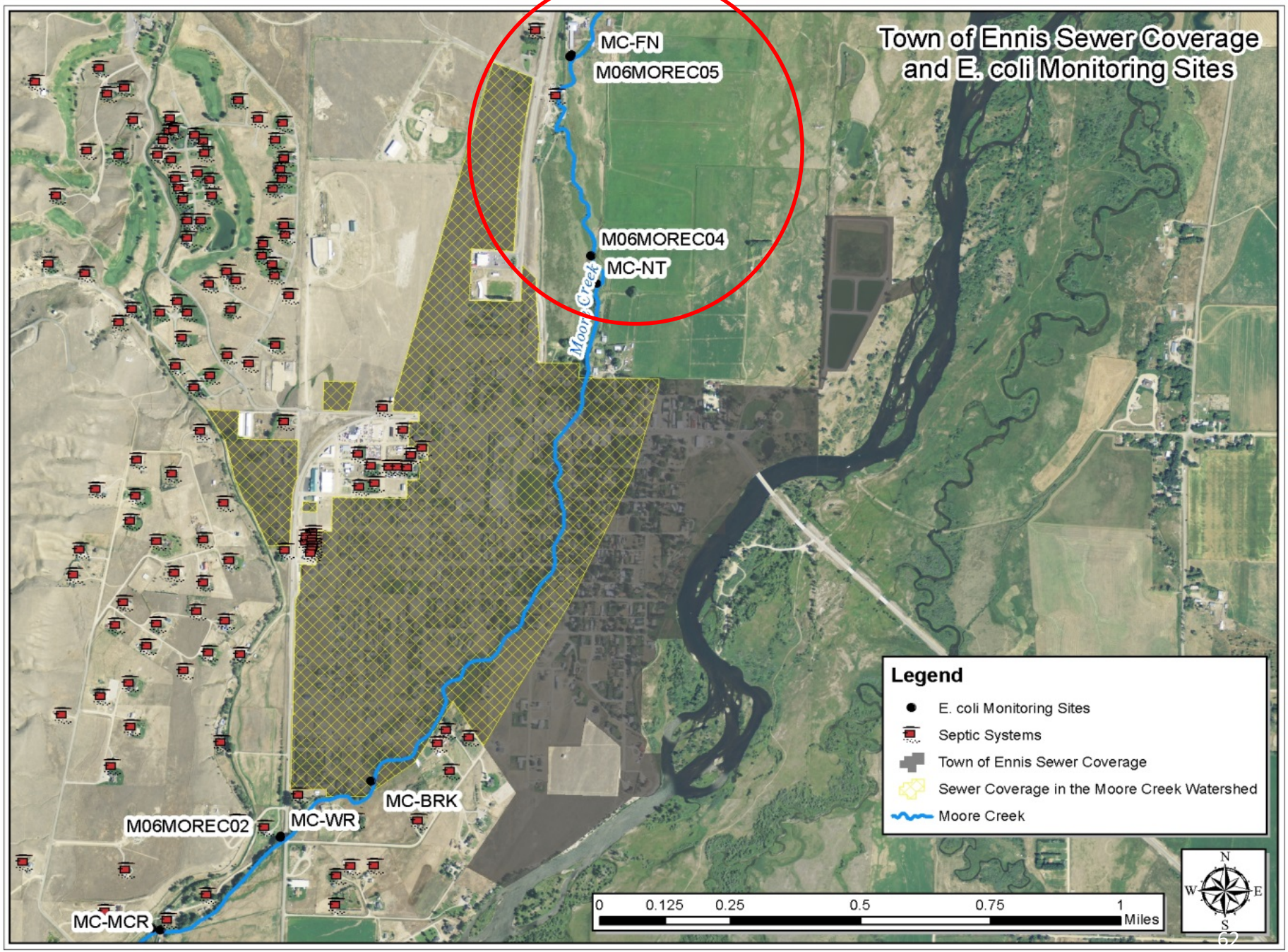
# Moore Creek Watershed
# E. coli Sources and Monitoring Sites




Moore Creek E. coli Data Collected by Montana DEQ
E. coli concentration (cfu/100ml)
2,500
2,000
1,500
1,000
500
0
252 cfu/100ml
M06MOREC03
M06MOREC02
M06MOREC04
M06MOREC05
M06MOREC01
Near Headwaters
Near Mouth

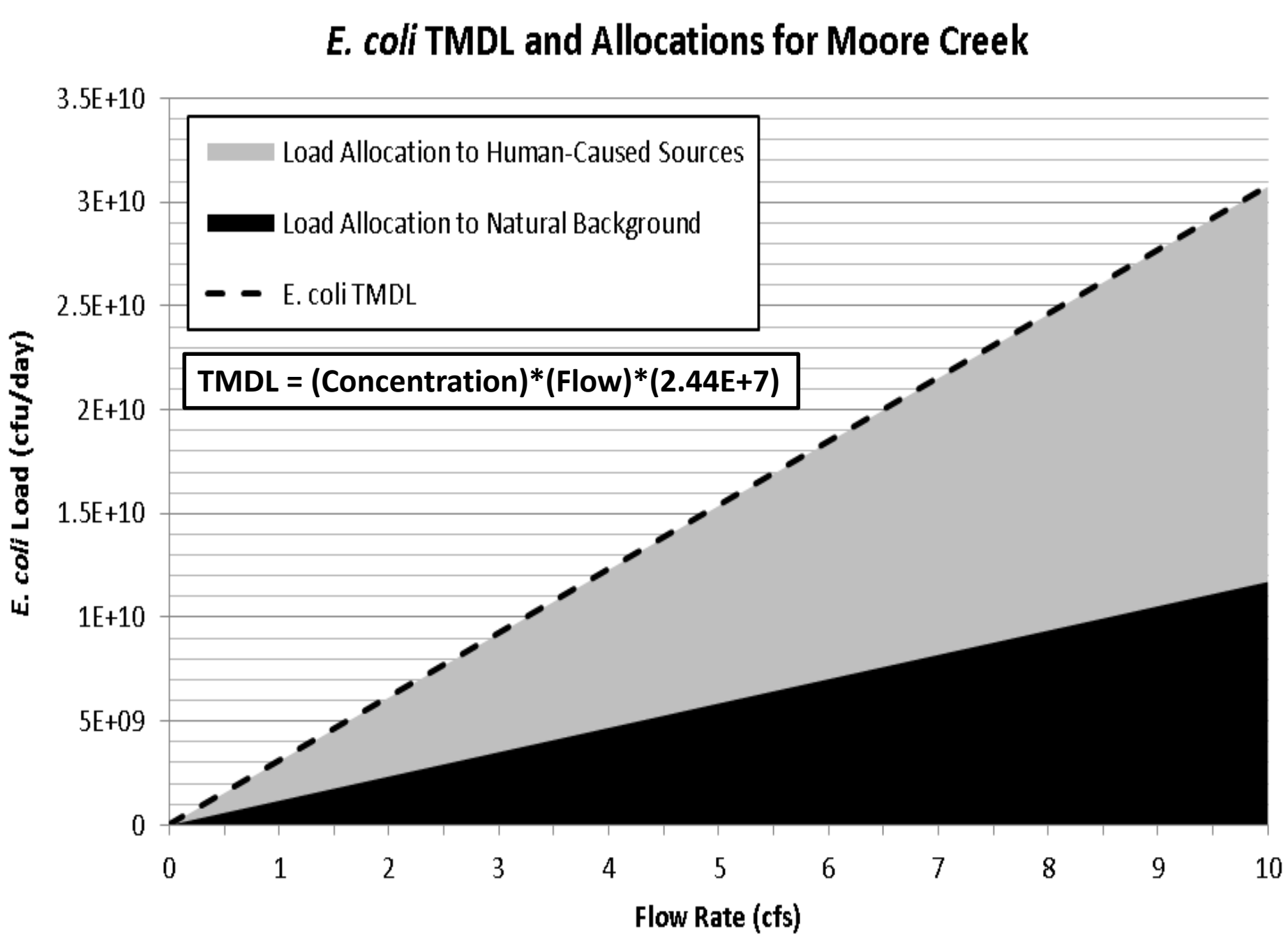

30-Day Geometric Means of Moore Creek E. coli Data Collected by Montana DEQ
E. coli Concentration (cfu/100ml)
1200
1000
800
600
400
200
0
126 cfu/100ml
M06MOREC03
M06MOREC02
M06MOREC04
M06MOREC05
M06MOREC01
Near Headwaters
Near Mouth


Moore Creek E. coli Data Collected by the Madison Stream Team
E. coli concentration (cfu/100ml)
2,500
2,000
1,500
1,000
500
0
252 cfu/100ml
MC-HW
MC-MP
MC-MCR
MC-WR
MC-BRK
MC-NT(a)
MC-NT(b)
MC-FN
MC-EHS
MC-GOG
MC-CNF
Near Headwaters
Near Mouth


Town of Ennis Sewer Coverage
and E. coli Monitoring Sites
MC-FN
M06MOREC05
M06MOREC04
MC-NT
Moore Creek
MC-BRK
MC-WR
M06MOREC02
MC-MCR
Legend
E. coli Monitoring Sites
Septic Systems
Town of Ennis Sewer Coverage
Sewer Coverage in the Moore Creek Watershed
Moore Creek
0
0.125
0.25
0.5
0.75
1
Miles
N
W
E
S

# *E. coli* Sources

- Agriculture (manure application on cropland, animal feeding operations, pasture/rangeland/forest grazing)
- Residential development and subsurface wastewater disposal and treatment (individual and community septic systems)
- Natural background


E. coli TMDL and Allocations for Moore Creek
3.5E+10
3E+10
2.5E+10
2E+10
1.5E+10
1E+10
5E+09
0
E. coli Load (cfu/day)
Load Allocation to Human-Caused Sources
Load Allocation to Natural Background
E. coli TMDL
TMDL = (Concentration)*(Flow)*(2.44E+7)
0
1
2
3
4
5
6
7
8
9
10
Flow Rate (cfs)

# Questions?

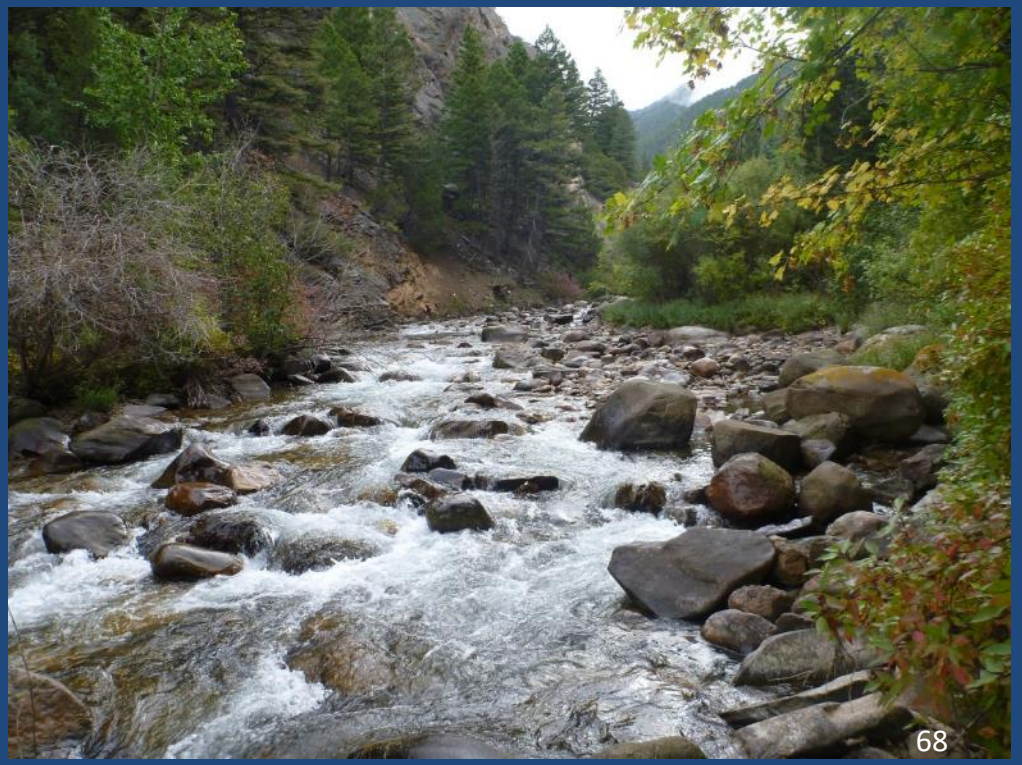
# Metals



Metals can affect both human health and aquatic life

# Metals Data Collection

- DEQ sampling conducted from 2011- 2013
- Sampled and assessed select water bodies for a full suite of metals including:
  - Aluminum
  - Arsenic,
  - Cadmium,
  - Chromium,
  - Copper,
  - Iron,
  - Lead,
  - Selenium,
  - Silver,
  - Zinc,
  - Mercury



# Metals Assessments

- Assessments completed on:
  - Madison River (Hebgen Lake to the Mouth), South and West Forks Madison River
  - Blaine Spring Creek, Buford Creek, Elk Creek, Elk River, Hot Springs Creek, Moore Creek, North Meadow Creek, South Meadow Creek, O'Dell Spring Creek
  - Ennis Lake

# Numeric Water Quality Standards

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

Aquatic Life: (varies with hardness)

At 25 mg/L hardness-

- Acute: 3.79 µg/l (do not exceed)
- Chronic: 2.85 µg/l (96 hour mean)

At 100 mg/L hardness-

- Acute: 14.0 µg/l (do not exceed)
- Chronic: 9.33 µg/l (96 hour mean)

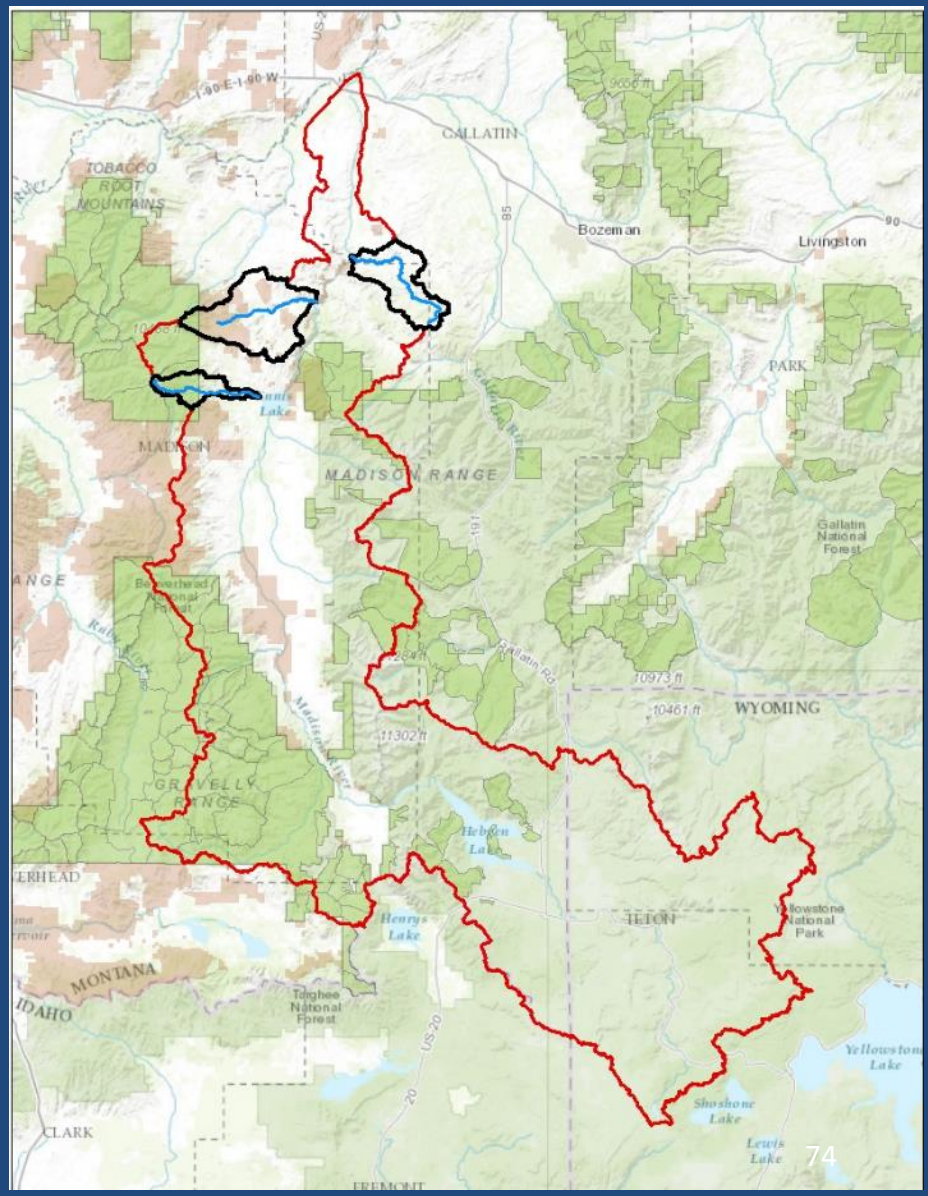
# Arsenic

- 2011-2013 field monitoring revealed arsenic concentrations in the Madison watershed are above the Human Health criterion of 10 ug/L.
- USGS has concluded that the likely source of arsenic is from non-human sources originating in Yellowstone National Park and local geology (USGS 2013)
- DEQ not perusing Arsenic TMDLs due to lack of human sources

# Madison Watershed TMDL Development

- TMDLs to be completed:
  - Elk Creek:
    - Iron
    - Selenium
  - Hot Springs Creek
    - Iron
    - Lead
  - South Meadow Creek
    - Copper

Not pursuing arsenic TMDLs in any waterbodies in the Madison watershed.



# Metals Sources

- Natural Background
  - Sediment bound metals
- Mining
  - Significant historical mining
    - Priority Mines: Boaz, Grubstake, Missouri, SE SE Section 25
    - Abandoned Mines:
      - Total of about 50 in all the impaired wastersheds
      - Elk Creek Corundum, Galatian Corundum
      - Red Bluff Mining district
  - Active mining
    - Majesty Mine, cyanide heap leach (not currently active)
    - Various small miner exclusions (less than 5 acres of disturbance)
  - Various adits, cuts, pits, drilling waste linked to historical mining

# Data Discussion

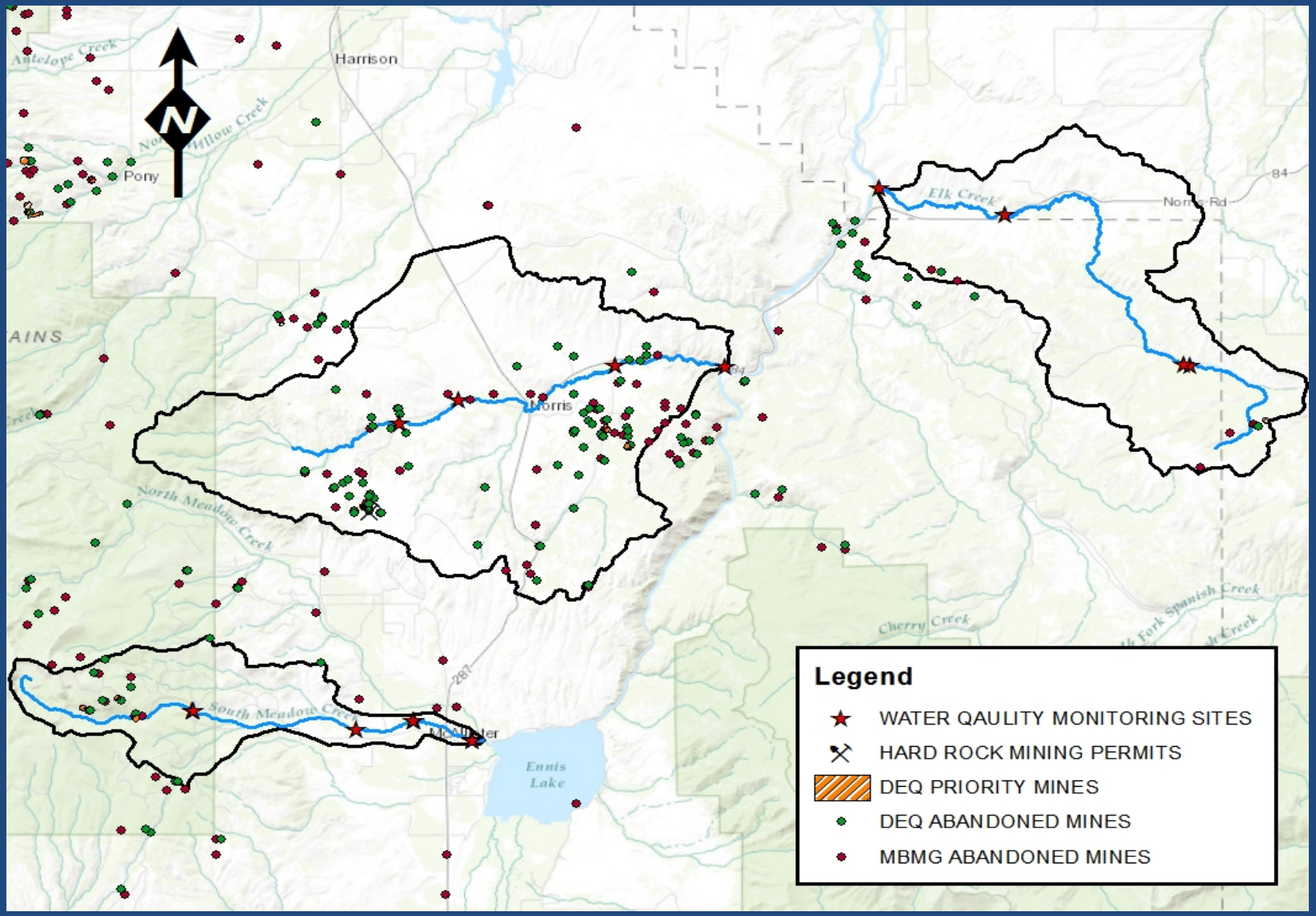
- Elk Creek:
  - Iron concentrations tend to be linked to high flow, high TSS events. Exceedances concentrated in lower portion of watershed
  - Highest Selenium concentration were observed close to the mouth, during low flow scenarios, when hardness values were highest (potential ground water source).

- Hot Springs Creek:
  - Iron  concentrations tend to be linked to high flow, high TSS events. Concentrations highest downstream of the Red bluff Mining District
  - Lead not correlated to flow, hardness, TSS concentration. High concentrations dispersed throughout watershed

South Meadow Creek:

- Copper exceeded  one time, as such special and temporal trends difficult to establish.  Exceedance occurred in upper third of watershed, down stream of priority mine site.

# Metals Sources



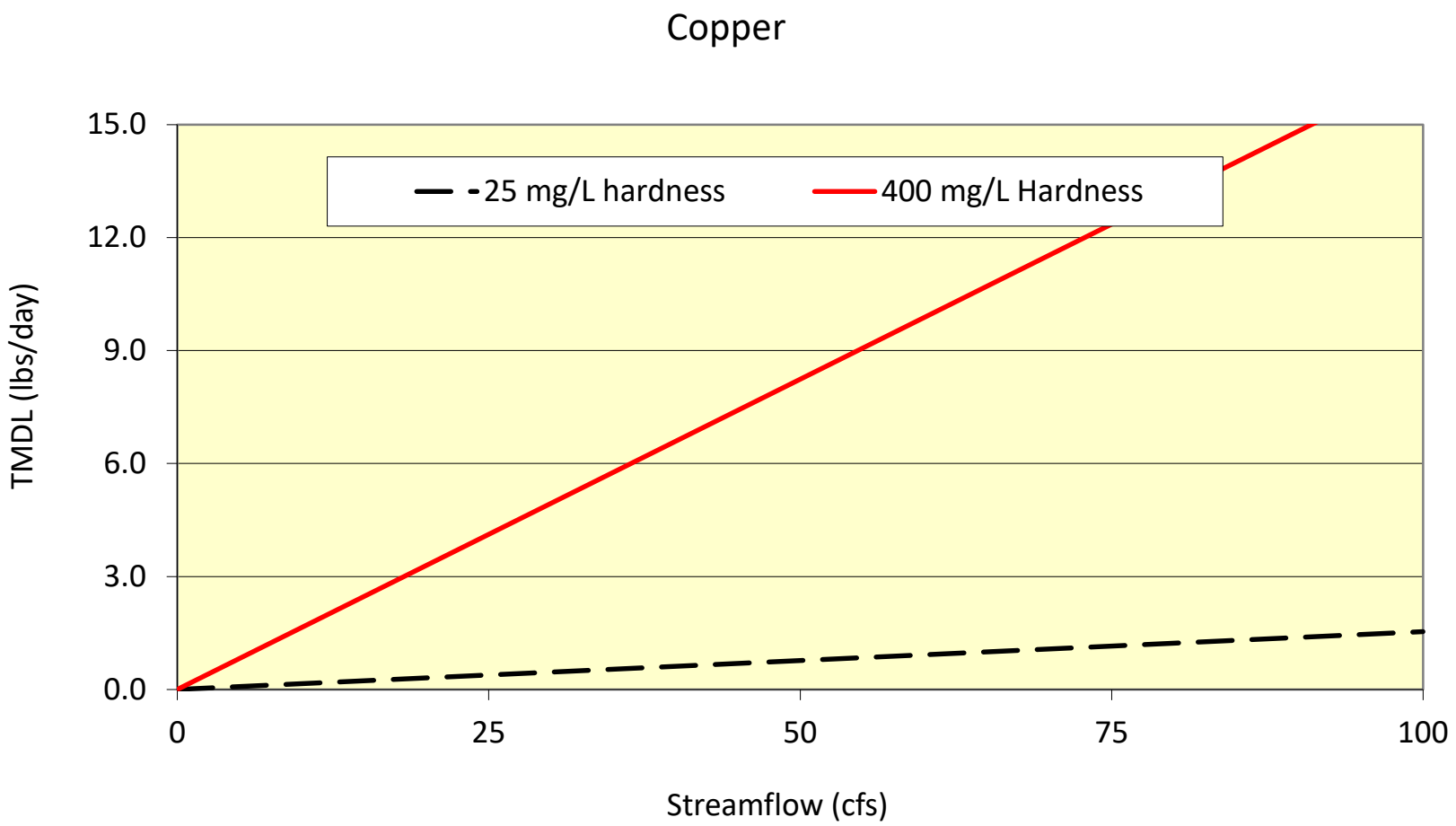
# Defining the TMDL

- The maximum allowable daily load (TMDL) can be determined using the target concentration and stream flow

- Example: Copper TMDL at 25 mg/L hardness and 10 cfs flow in Elk Creek Creek:

Copper TMDL (lb/day) = (10 cfs) X (2.85 ug/L) X (0.0054 conversion factor)

# Copper TMDL Curve




* Loads below the line are meeting the TMDL

# TMDL Allocations

# Questions?

# Sediment TMDLs

**Sediment:** naturally occurring component of healthy and stable stream ecosystems

## Too much sediment :

- High concentrations of suspended sediment
- Changes composition of stream bottom
- Alters channel form and function

# Sediment Standard

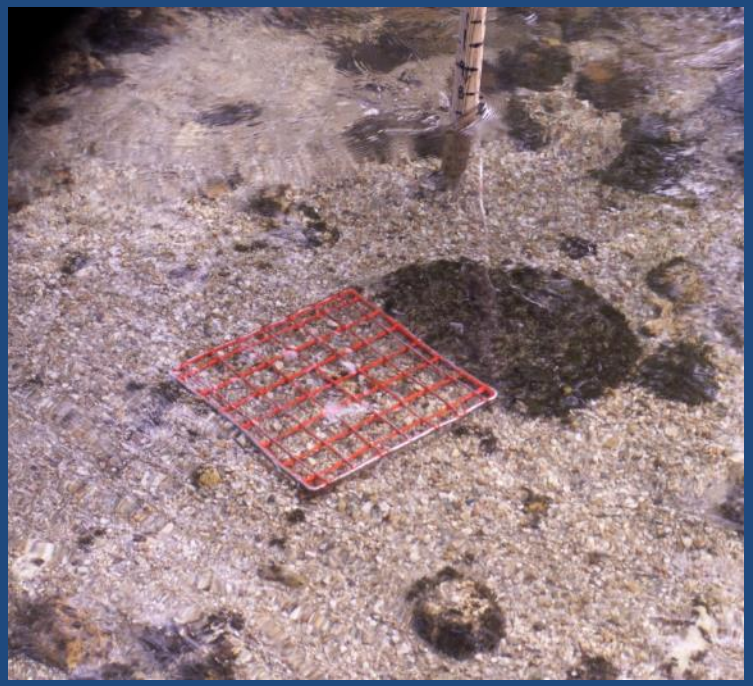
No increases in sediment above naturally occurring concentrations which will or are likely to create a nuisance or harm to beneficial uses.

# Sediment TMDL Components

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

# Water Quality Targets: Sediment and Habitat

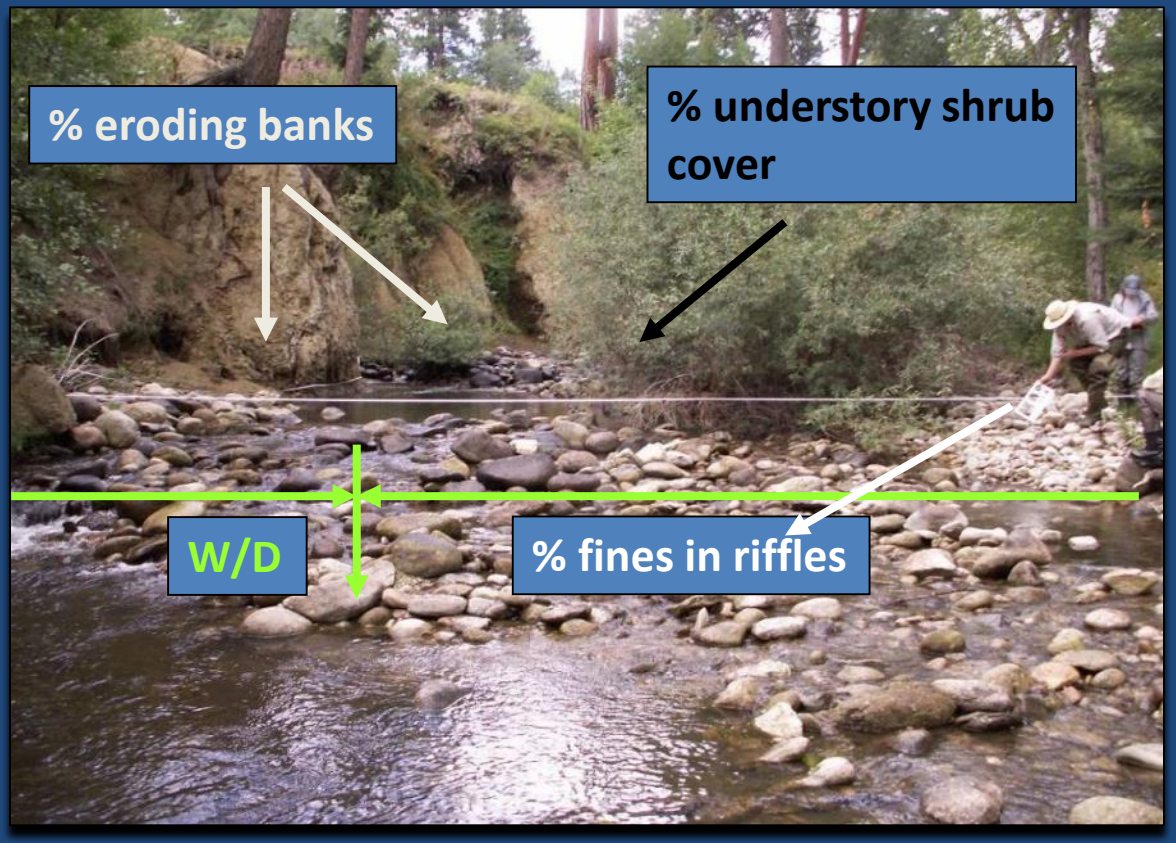
Targets are values that translate the narrative standard into something measurable. For sediment, we look at habitat and take measurements of certain stream features.



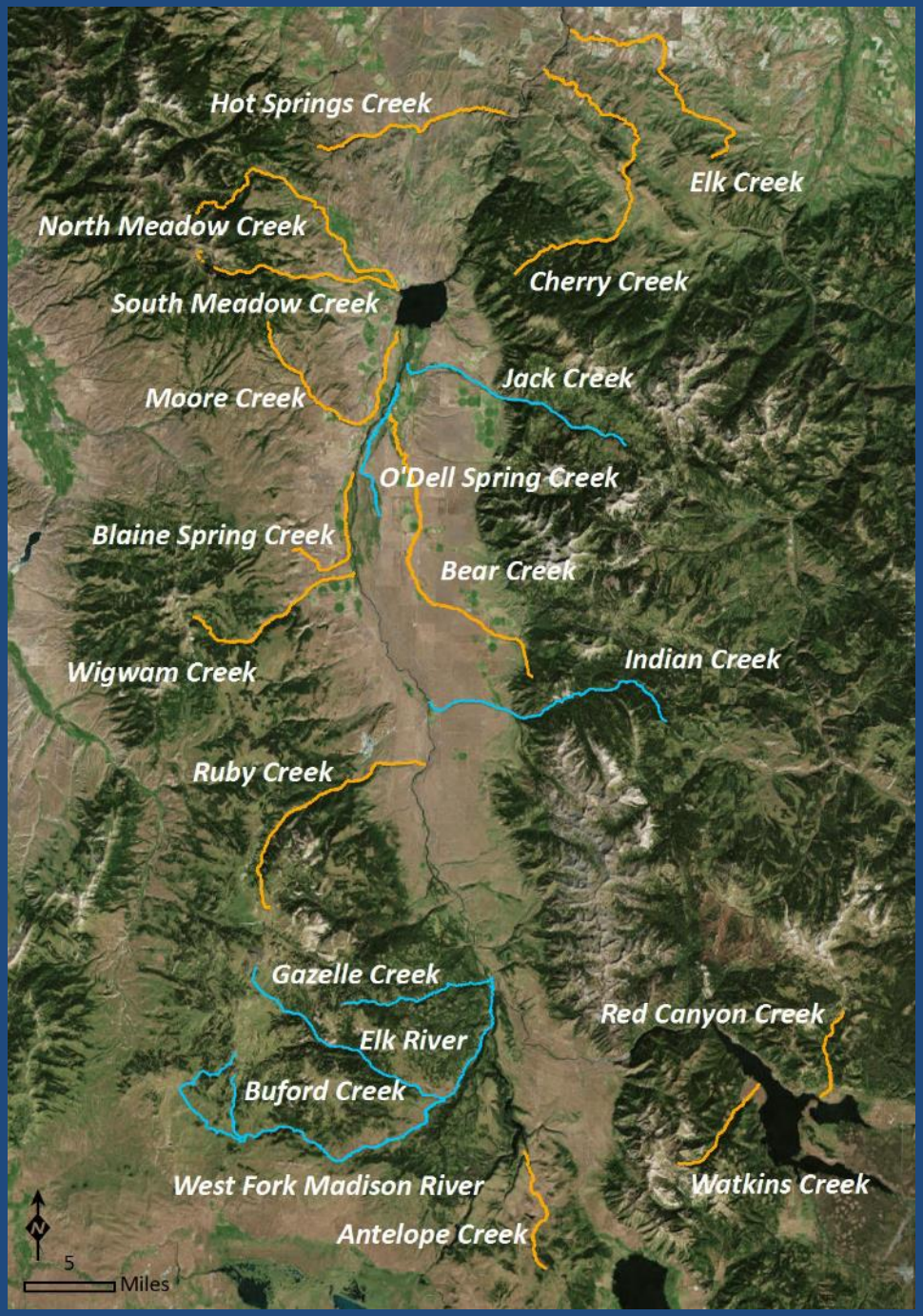
# Field Investigations

## 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, % bare ground)*
- 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 TMDLs

- Antelope Creek
- Bear Creek
- Blaine Spring Creek
- Cherry Creek
- Elk Creek
- Hot Springs Creek
- Moore Creek
- North Meadow Creek
- South Meadow Creek
- Red Canyon Creek
- Ruby Creek
- Watkins Creek
- Wigwam Creek

# Sediment Source Assessments: Categories

## Natural erosion

## Human influenced sediment/erosion

- Sediment from roads and road crossings
  - Non-"BMP'ed" roads and crossings
  - Culvert failure
- Upland sediment
  - Grazing practices
  - Timber harvest
  - Streamside vegetation removal
  - Crop production
  - Development/construction
- Streambank erosion
  - Streamside vegetation removal
  - Unnatural flow fluctuations
  - Livestock trampling

# Load allocations
# Expressed as percent reduction

Desired condition

÷

Existing condition

= X

1-X*100 =
% reduction needed

# TMDLs and Allocations

- The TMDL is expressed as reduction in annual load
- Allocation (TMDL budget among sources)

Example Sediment TMDL:

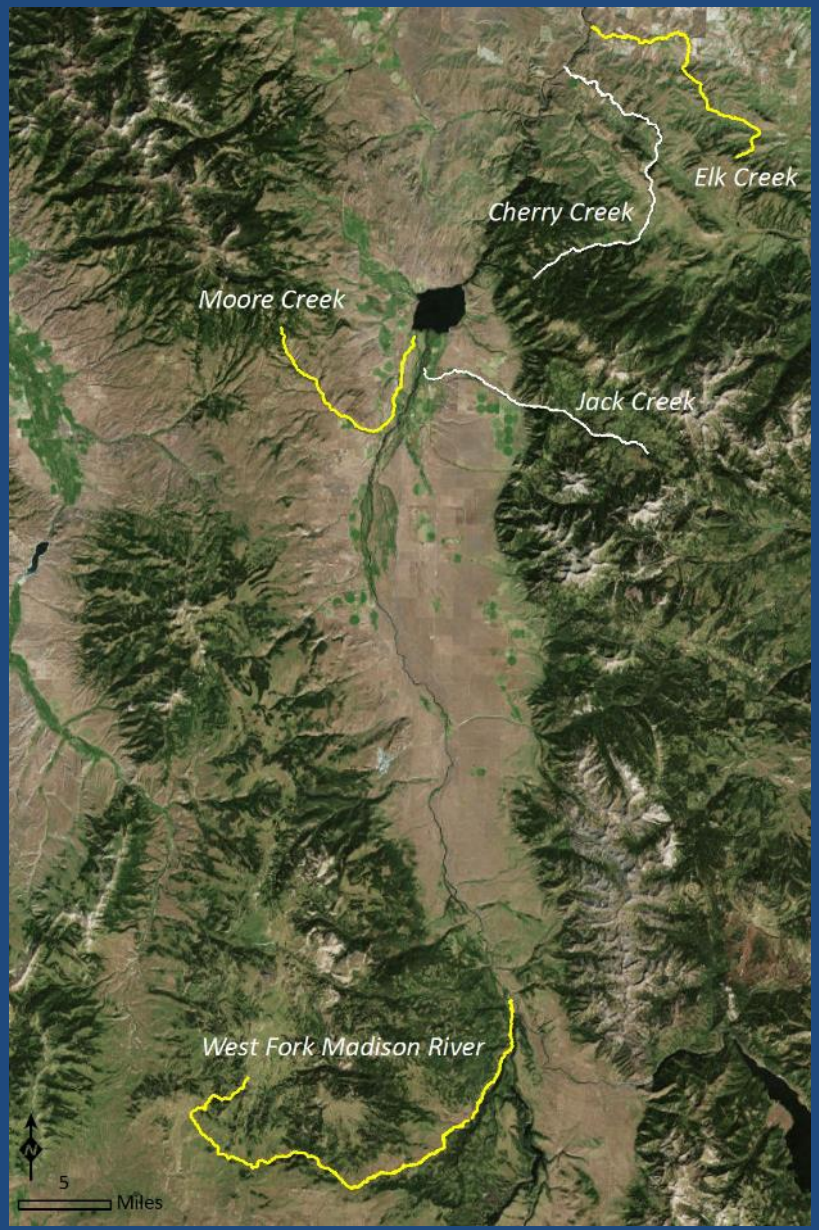
| **Sediment Source Assessment, Allocations and TMDL for Some Creek** | | | |
|---|---|---|---|
| **Sediment Sources** | **Current Estimated Load (Tons/Year)** | **Total Allowable Load (Tons/Year)** | **Load Allocations (% Reduction)** |
| Roads | 0.199 | 0.066 | 67% |
| Eroding Banks | 473 | 439 | 7% |
| Upland Erosion | 65 | 53 | 18% |
| **Total Sediment Load** | **538** | **492** | **9%** |

# Temperature TMDLs

High thermal loading may increase water temperatures to levels that harm fish and other aquatic life.

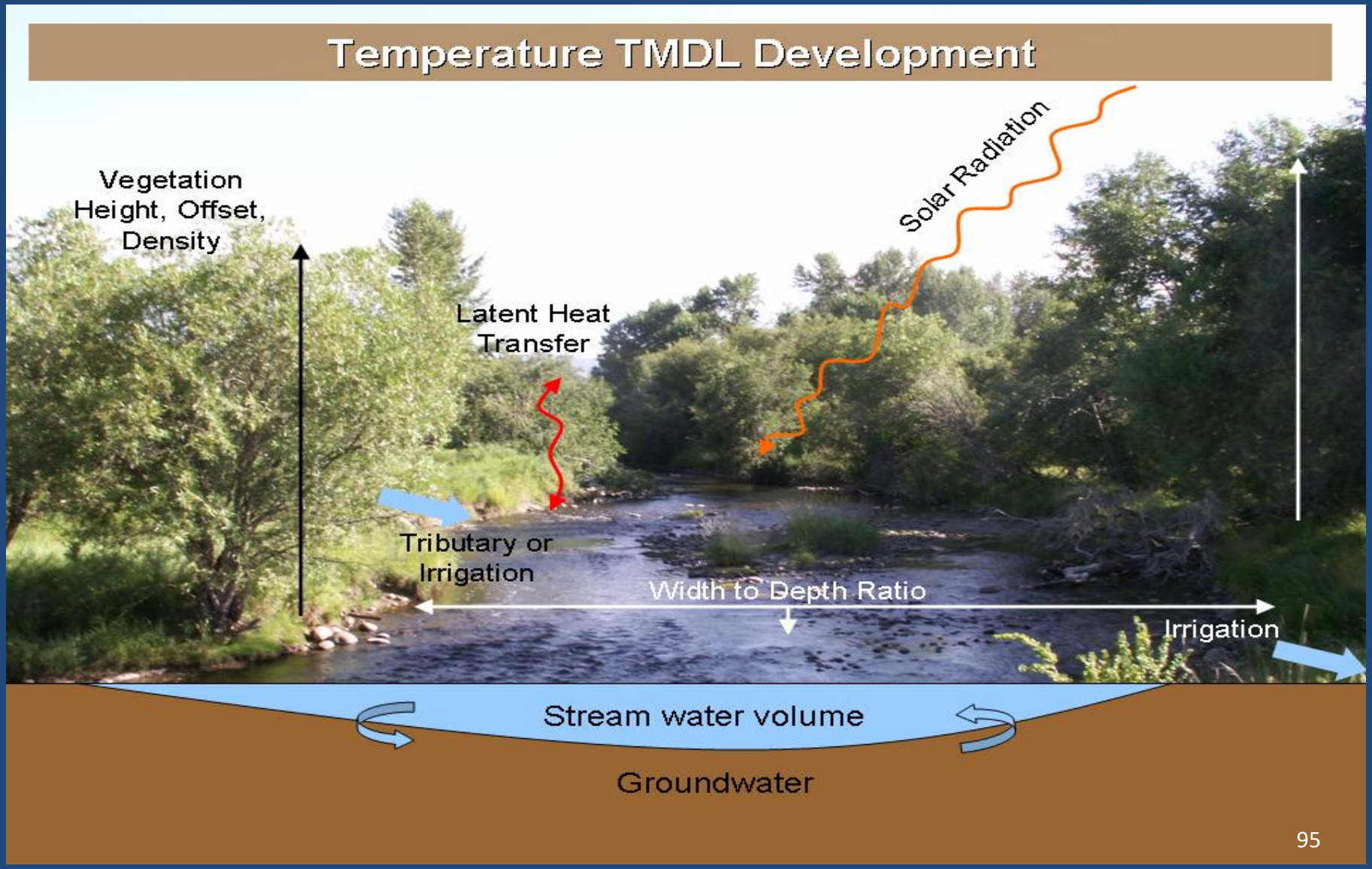
In western Montana, temperature impairment listings are associated with fish and aquatic life beneficial uses.

# Madison Temperature Streams




- Cherry Creek
- **Elk Creek**
- Jack Creek
- **Moore Creek**
- **West Fork Madison River**

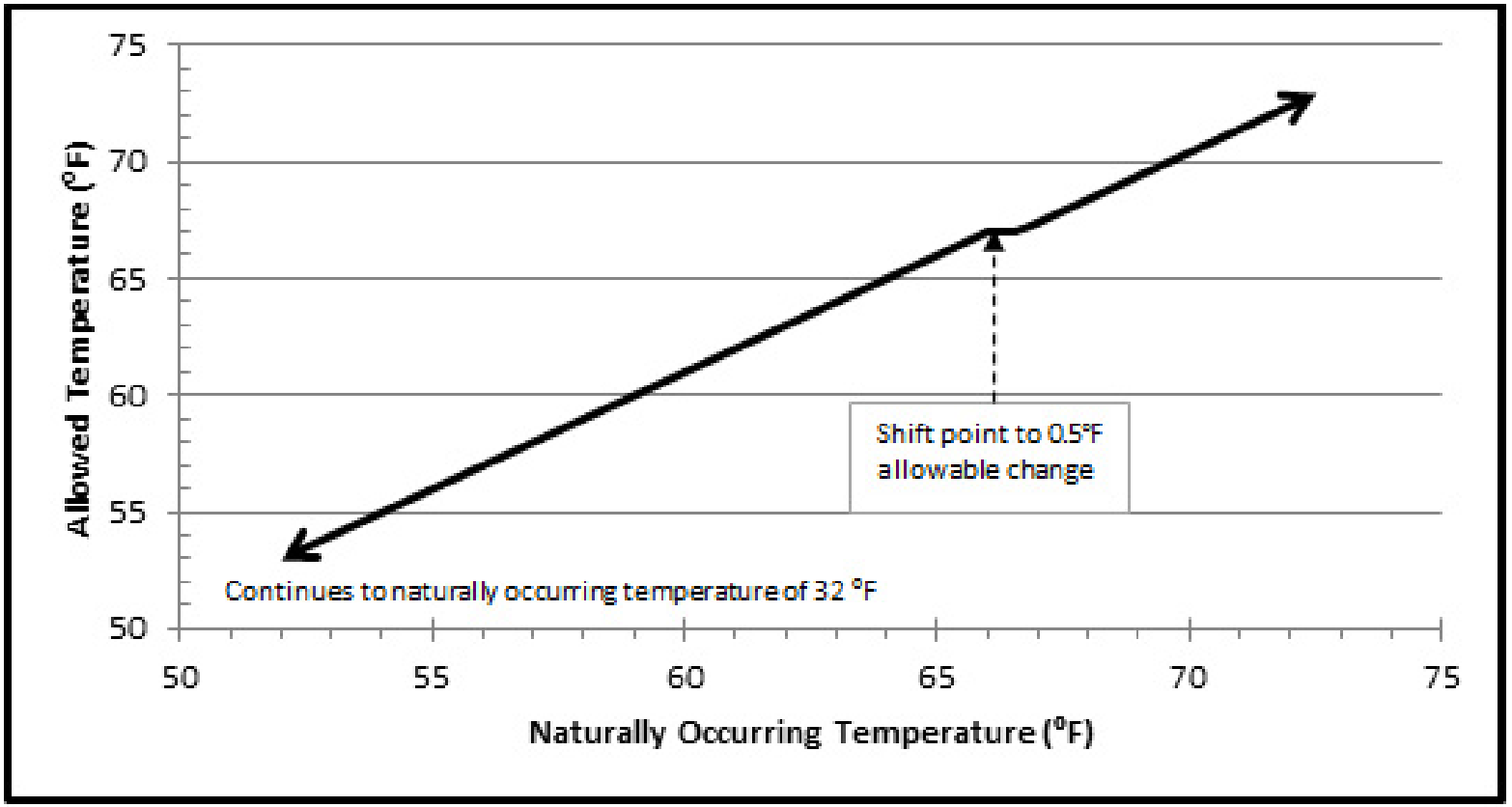
# Temperature TMDL considerations



# Standard for Temperature

- 17.30.623(2)(e) A 1 $^{O}$F maximum increase above naturally occurring water temperature is allowed within the range of 32 $^{O}$F to 66 $^{O}$F; within the naturally occurring range of 66 to 66.5 $^{O}$F, no discharge is allowed which will cause the water temperature to exceed 67 $^{O}$F; and where the naturally occurring water temperature is 66.5 $^{O}$F or greater, the maximum allowable increase in water temperature is 0.5 $^{O}$F.

1°F increase over naturally occurring temperatures is allowed



# Field Data

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

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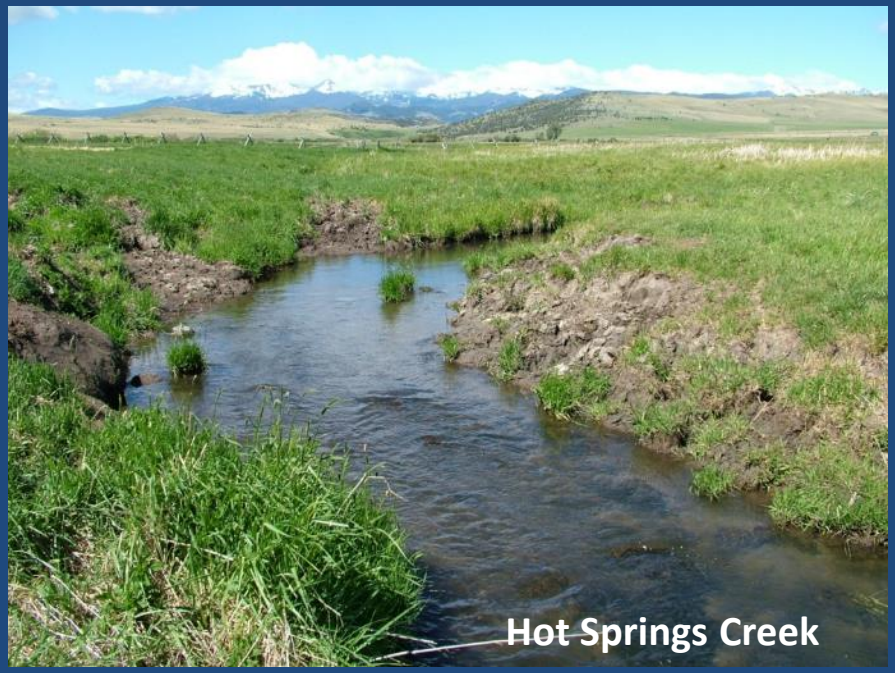
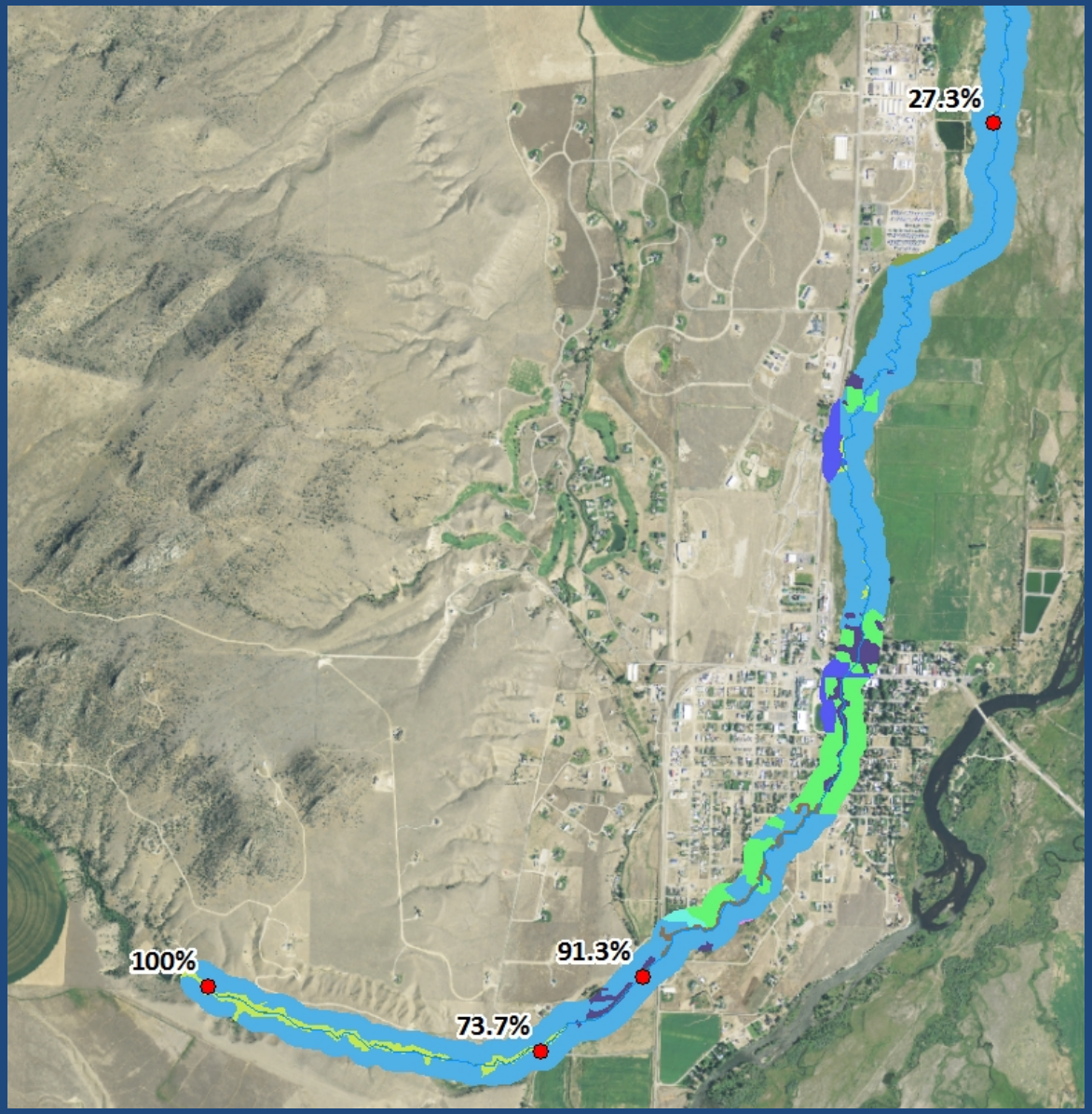



# Vegetation Mapping




- Basic vegetation categories
- Field sites

# Riparian Vegetation Proxy

- Experience with QUAL2K models shows shade and flow are the primary variables
- Shade is easily observed and measured
- Increased riparian shade is the most attainable improvement

# Temperature TMDLs 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: % increased shade
- Improve width-depth relationships where stream is overwidened (sediment/habitat connection)

# Sediment, Habitat, Temperature

- These impairments are commonly related
- Common factors include:
  - Stream form & function
  - Riparian health


Hot Springs Creek


Bear Creek

# Lower Madison River

- Sediment and temperature impairments
- Dam-controlled river
- No TMDL development in this project


Questions?

# TMDL Implementation:

Tool that can be used to determine which areas to prioritize for restoration efforts

- Identified pollutant causes
- Identified pollutant sources
- Load reductions needed
- Potential conservation practices and BMPs

# Watershed Restoration Planning

A WRP is a tool developed and designed by a watershed group as a guide in planning for and implementing restoration activities.

## EPA Guidance: 9 Minimum elements

1. Identify causes and sources of pollution
2. Estimate pollutant loading and expected load reductions
3. Describe management measures to achieve load reductions
4. Estimate amounts of technical and financial assistance needed
5. Develop an information/education component
6. Create a schedule for implementing management measures
7. Describe interim, measurable milestones
8. Identify indicators to measure progress over time
9. Create a monitoring component

# 319 Funding Program

$900,000 available annually
$300,000 maximum award
40% match

- Eligibility
  - Be a governmental entity or a nonprofit organization
  - Have liability insurance
- Project Requirements
  - Address nonpoint source pollution
  - Address impairments on Montana's list of Impaired Waters
  - Implement projects or activities in a WRP

# Projects:

Missouri River


Riparian fencing with grazing management plan

# Bioengineered Streambank Restoration

Rye Creek

# Stream restoration with channel re-meandering

Ruby River


Questions?

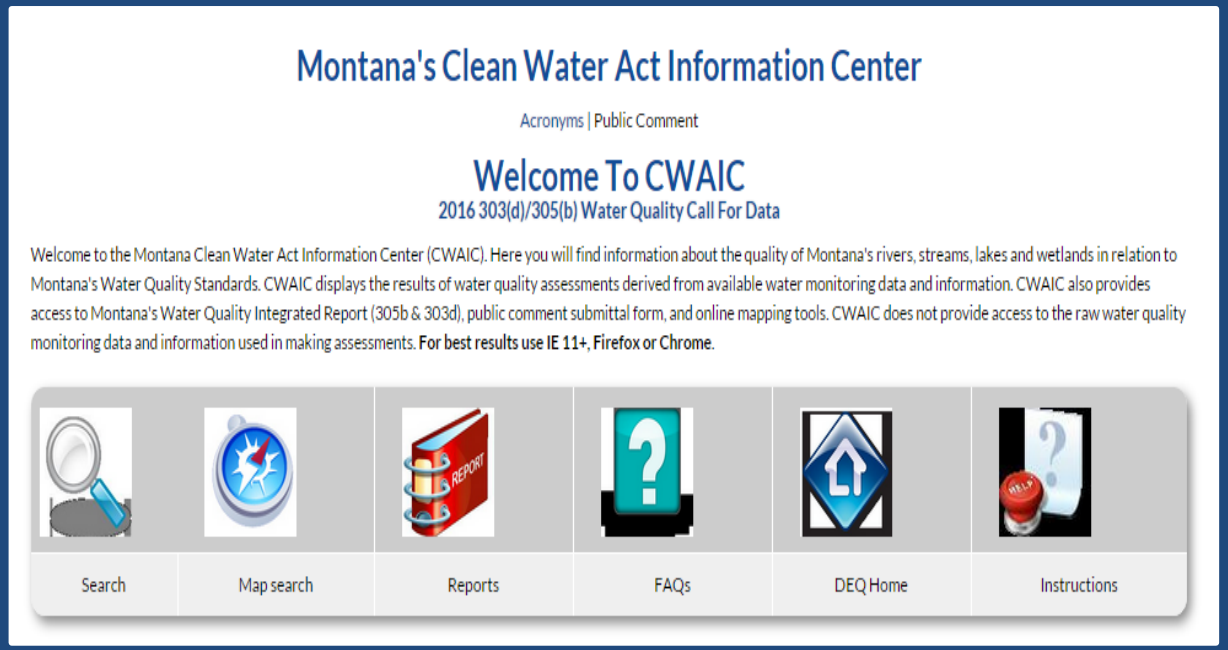
# Next Steps

- Complete source assessments and draft the TMDL document
- Stakeholder review and comment on draft document
- Advisory group meeting in Ennis during the review period
- DEQ will review comments and make document edits

# Advisory Group Feedback

- Did we capture all of the potential pollutant sources?
- Is information on current and historical land management practices accurate?
- Available data we missed?
- Provide information and experience on improving land management practices in the area

# DEQ's Data & Assessment Records




cwaic.mt.gov

www.epa.gov/storet

# Public Comment Process

- Typically a 30-day public comment period
- Public meeting will be held in Ennis during the public comment period
- DEQ will prepare responses to public comments
- Final document submittal to EPA expected by early next year
- EPA approval and final document publication by DEQ

# Questions & Additional Discussion