Kootenai-Fisher Project Area Sediment, Nutrients, Metals, and Temperature TMDLs

Advisory Group Teleconference
January 23, 2014

Presented by Lisa Kusnierz (EPA) and Lou Volpe (DEQ)

Background

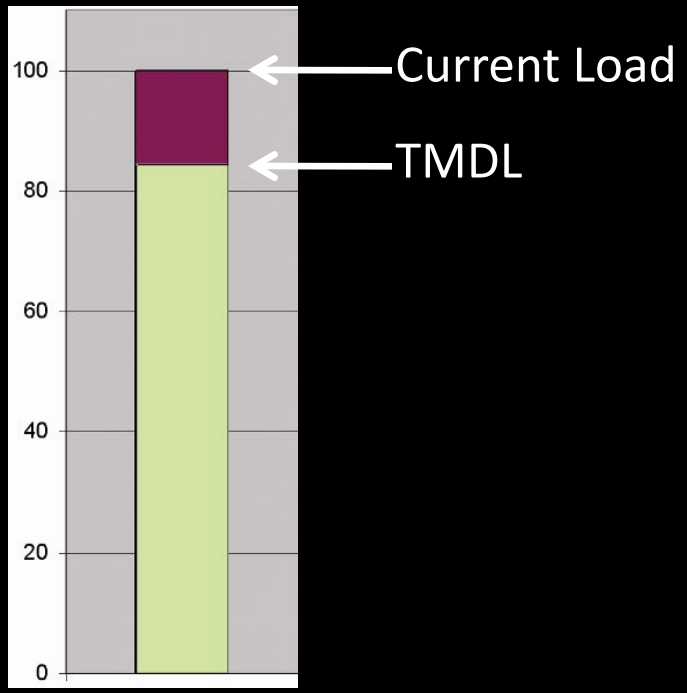
- Waterbodies are classified by beneficial use
  - Drinking water, Agriculture, Recreation, Aquatic Life
- We use criteria to assess waterbodies
  - Numeric Criteria
  - Narrative Criteria
- Streams and lakes not supporting their beneficial use(s) are impaired and require a TMDL
  - Montana State Law and Federal Clean Water Act

What is a TMDL?

- Total Maximum Daily Load is the amount of pollutant a waterbody can receive from all sources and still meet water quality standards.
- It may be expressed as a load per unit time (e.g. lbs/day)

  or

  as a percent load reduction (e.g. 36% reduction)



What is a TMDL?

- TMDLs are specific to a waterbody and a pollutant, so a single waterbody may have multiple TMDLs
  - Snowshoe Creek has 4: As, Cd, Pb, Zn

- The document itself is sometimes referred to as a TMDL
  - Kootenai-Fisher Project Area TMDL

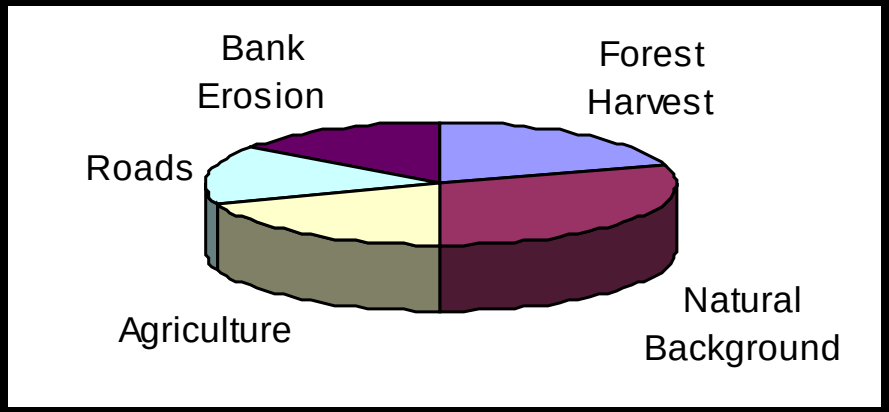
Pollutant Groups

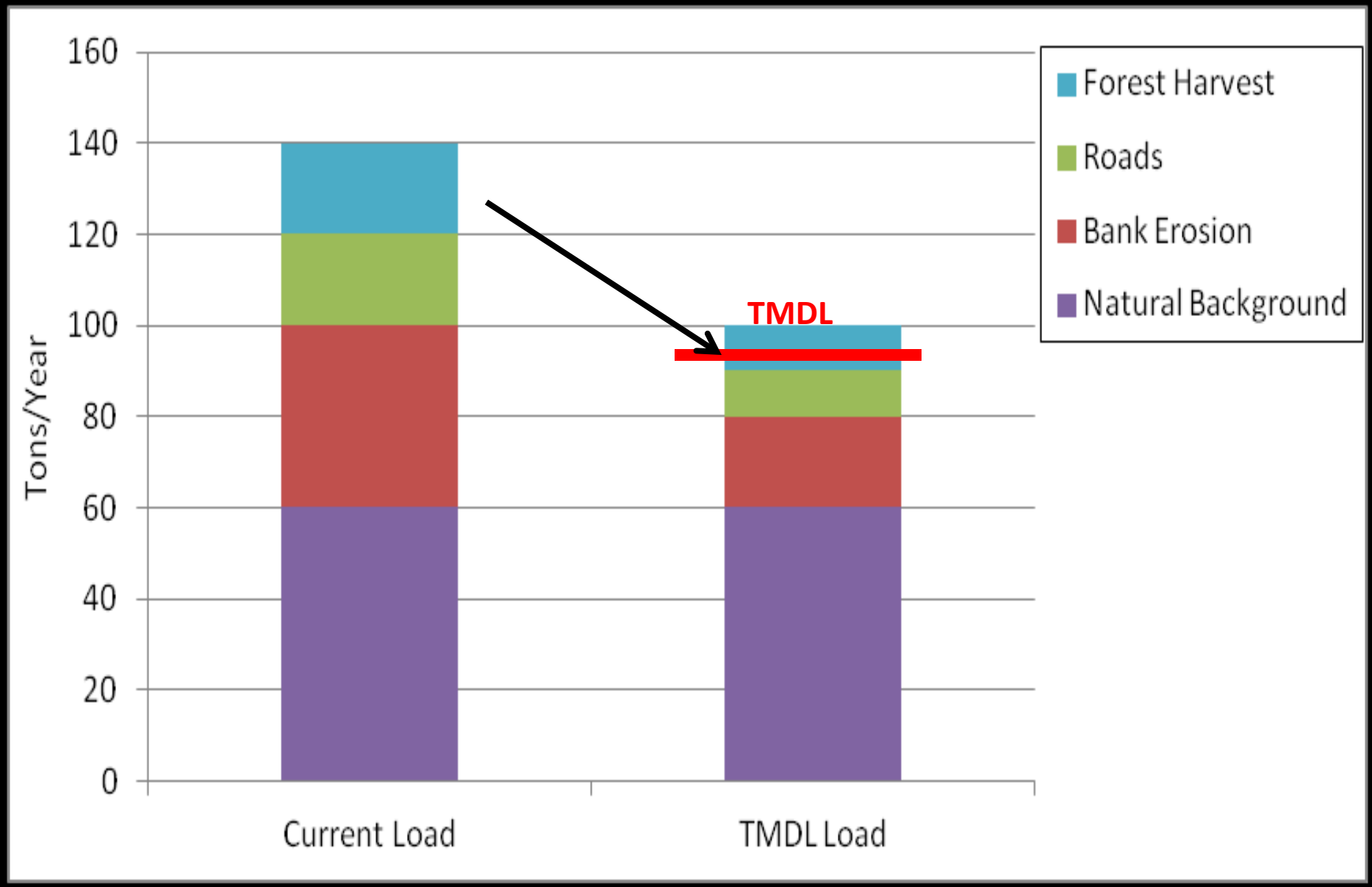
TMDL Development Steps

- Identify Water Quality Targets
- Determine Water Quality Impairment Status
- Characterize and Quantify Sources of the Problem (Source Assessment)
- Establish the TMDL & Associated Allocations

What makes up a TMDL or the Allowable Load?

- TMDL = Load Allocation (LA) + Wasteload Allocation (WLA) + Margin of Safety
- The TMDL must be allocated to sources
- Allocations usually based on existing loading and opportunity for reductions via BMPs



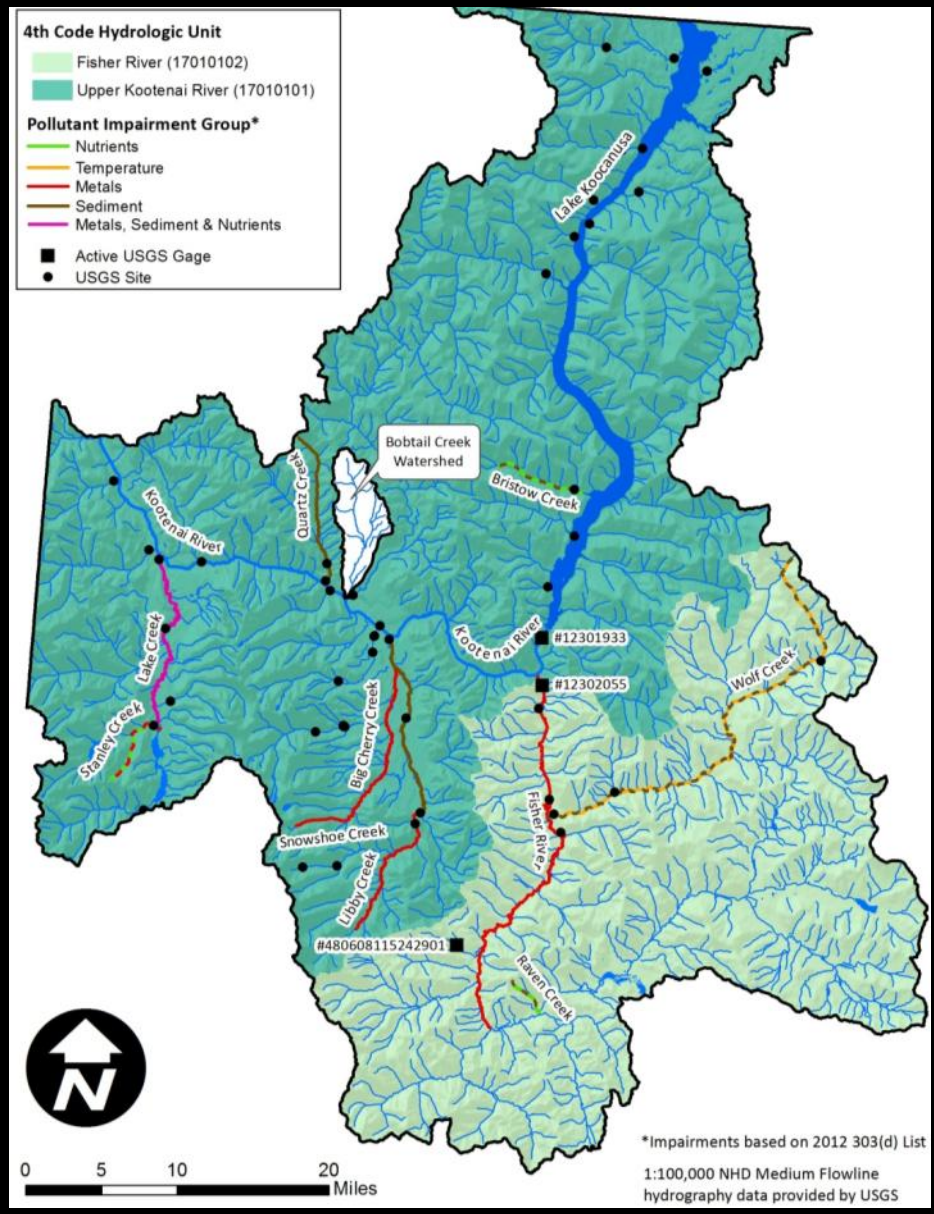

160
140
120
100
80
60
40
20
0
Tons/Year
Forest Harvest
Roads
Bank Erosion
Natural Background
TMDL
Current Load
TMDL Load

Document Layout

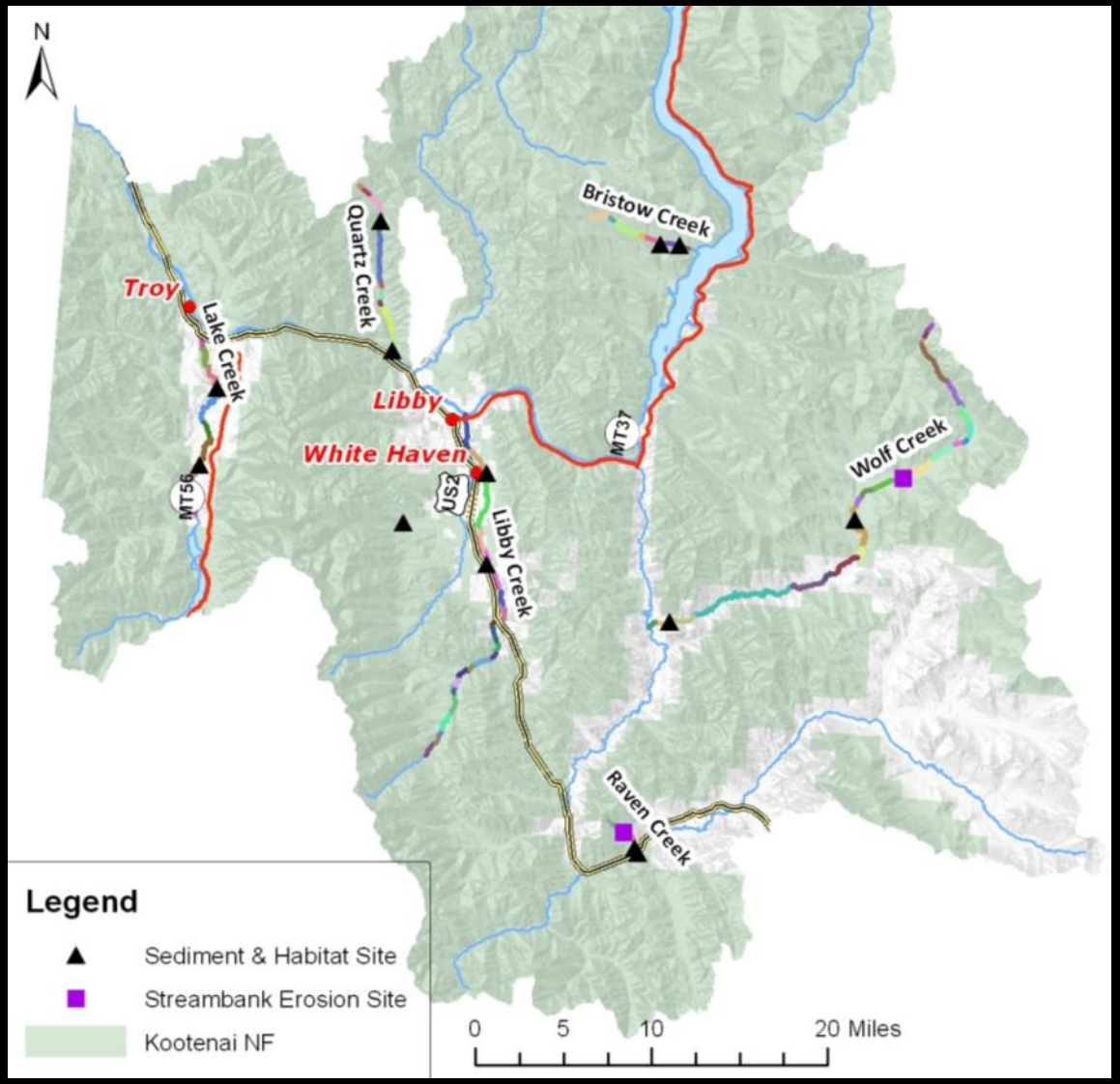
- Project Area Description
- Water Quality Standards Overview
- TMDL Process Overview
- Separate Sections for Sediment, Nutrients, Metals, & Temperature
  - Impaired waters, targets, source assessment, TMDLs / allocations
- Implementation Strategy
- Monitoring Strategy

Streams with TMDLs

- **Sediment (4)** – lower Libby, Lake, Raven and Wolf Creeks
- **Nutrients (3)** – Stanley, Lake, and Raven Creeks
- **Temperature (1)** – Wolf Creek
- **Metals (12)** – Big Cherry, Lake, Snowshoe, and Stanley Creeks



Sediment



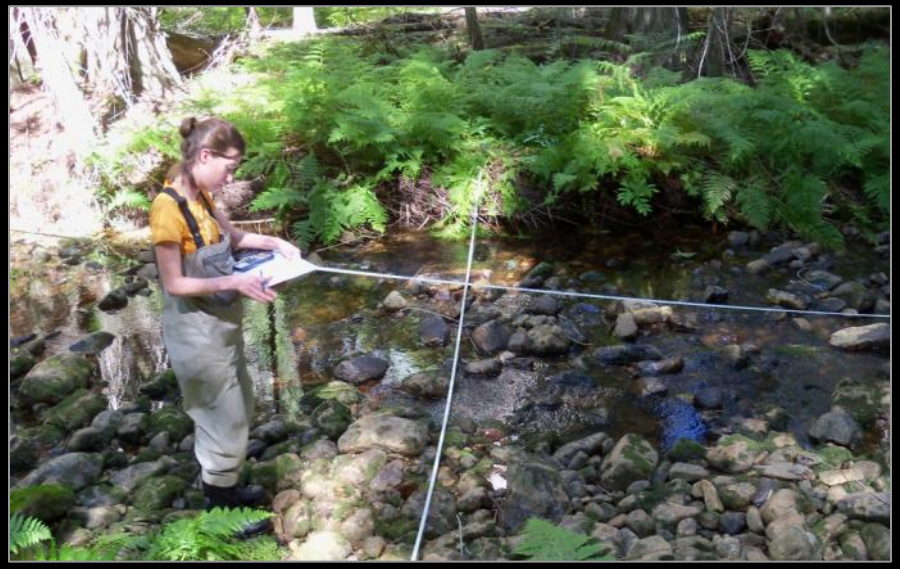
2012 303(d)

- 6 waterbodies listed as impaired due to Sedimentation & other sediment related habitat alterations
  - ~~Bristow Creek~~ **Delisted**
  - Lake Creek
  - Libby Creek
  - ~~Quartz Creek~~ **Delisted**
  - Raven Creek
  - Wolf Creek

- Monitoring was conducted on 15 reaches in 2011

Monitoring Data

- Collected in-stream data in 2011 at 15 reaches
  - Channel form, percent fine sediment, riparian shrub cover, bank erosion, frequency of pools and large woody debris



Data Evaluation and TMDLs

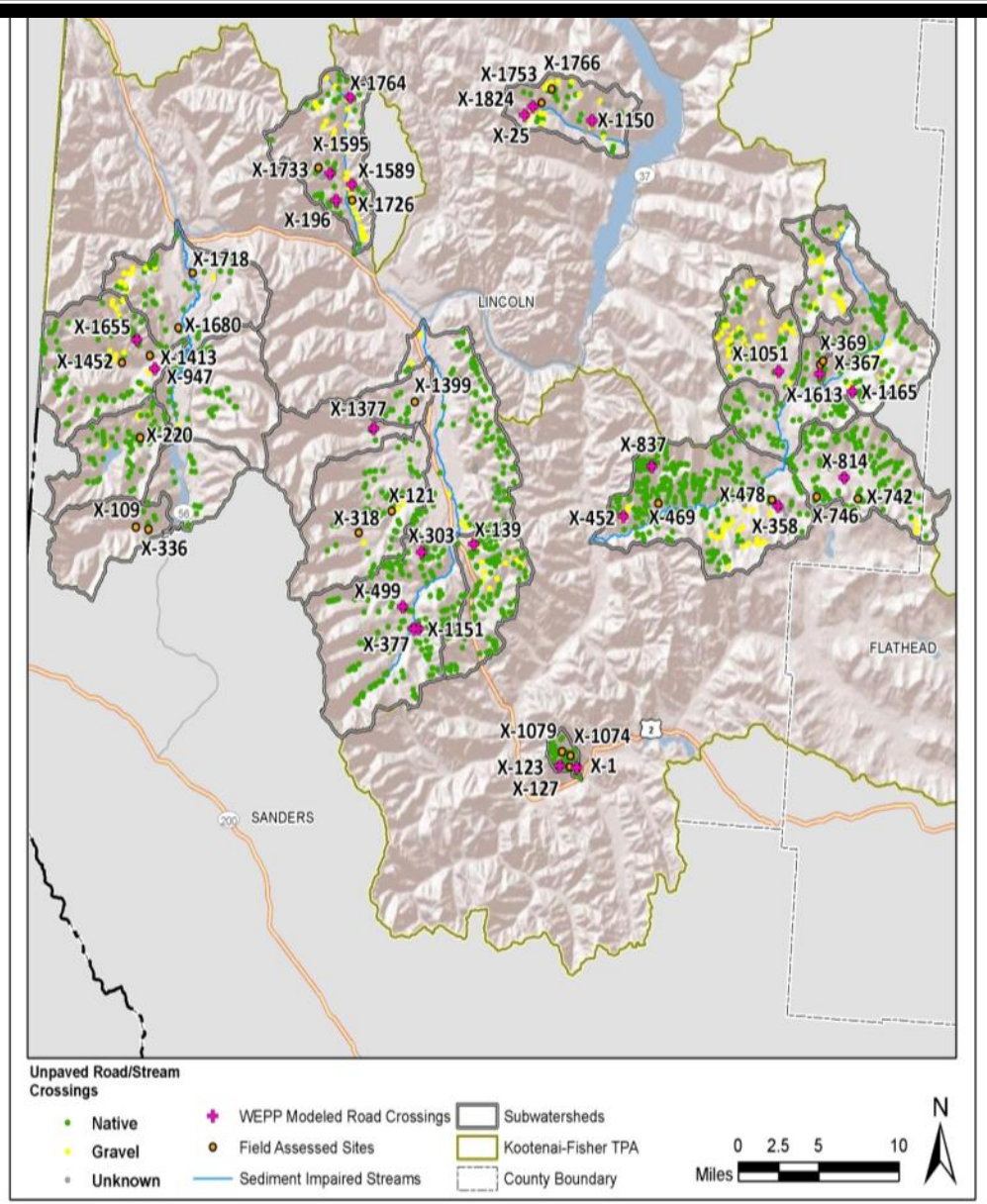
- Targets were developed to translate the narrative standard and evaluate condition of each stream
  - Targets based on reference data
- Sediment TMDLs are based on following all reasonable land, soil, and water conservation practices
  - TMDL is based on a percent reduction approach for all significant sediment sources (point sources, unpaved roads, eroding streambanks, and upland erosion)

Permitted Point Sources

- 11 permitted point sources (MPDES)
- All within the Libby Creek watershed
- Mine operations, suction dredge, and construction stormwater
- Evaluated permit files and conditions to estimate current load and assign WLA

Unpaved Roads Assessment

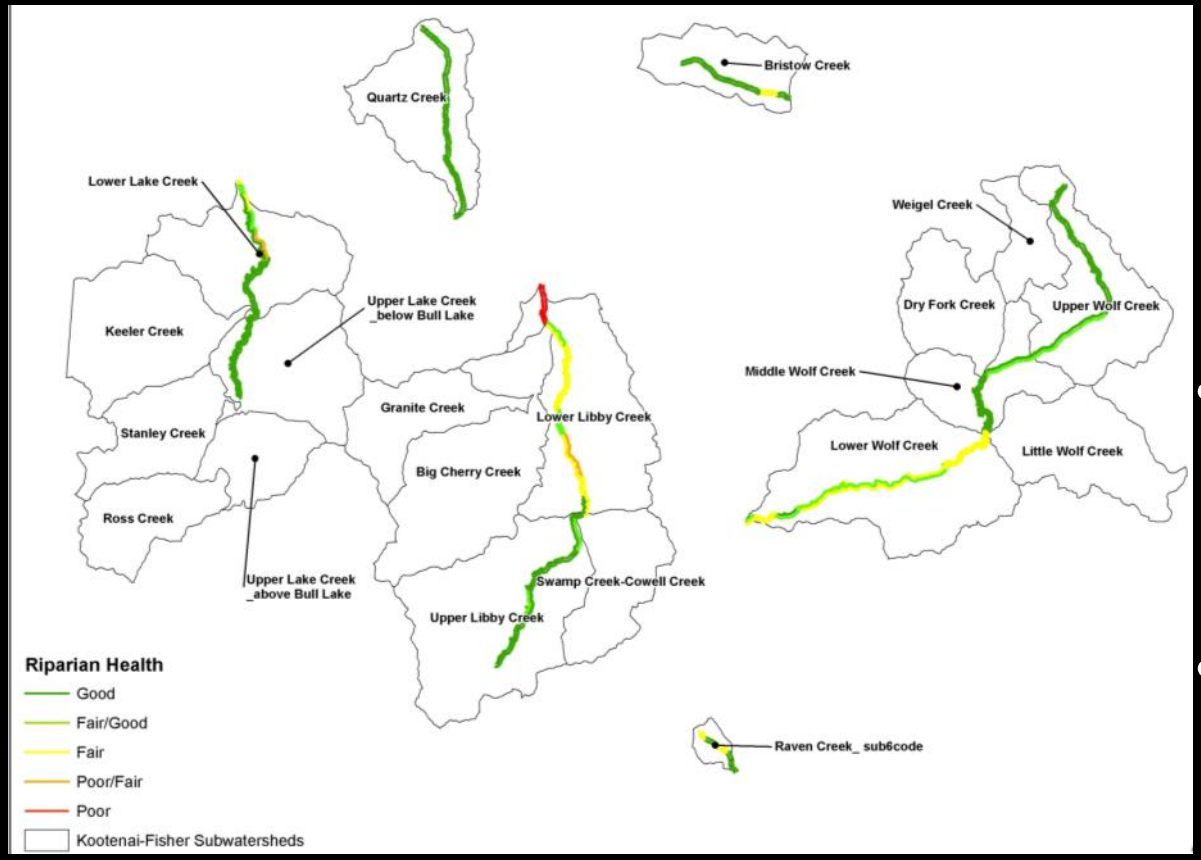
- Completed a full evaluation at 24 sites & recorded condition at additional 23 in 2011
- Used WEPP model to estimate load/crossing
- Culvert failure potential and fish passage also evaluated



Streambank Erosion Assessment

- Used data collected at the monitoring reaches in 2011
- Load from eroding streambanks and the source category was identified
- Loads extrapolated to the watershed scale based on the average load for reaches where erosion dominated by natural sources

Upland Erosion Assessment



- USLE model incorporates precipitation, soil erodibility, slope and flow length, and vegetative cover
- Ground cover and riparian condition are modified to reflect management changes
- Riparian health improvements comprise more than 98% of the estimated reduction

Example TMDL: lower Libby Creek

Sediment Sources		Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Load Allocations (% reduction)
Roads		6.9	3.4	51%
Streambank Erosion		4,938	3,498	29%
Upland Sediment Sources		876	709	19%
Point Source	Montanore Mine (MT0030279)	0	24	0%
	Suction Dredge (MTG370000)	0	0	0%
	Construction Stormwater (MTR100000)	0	0	0%
Total Sediment Load		**5,821**	**4,234**	**27%**

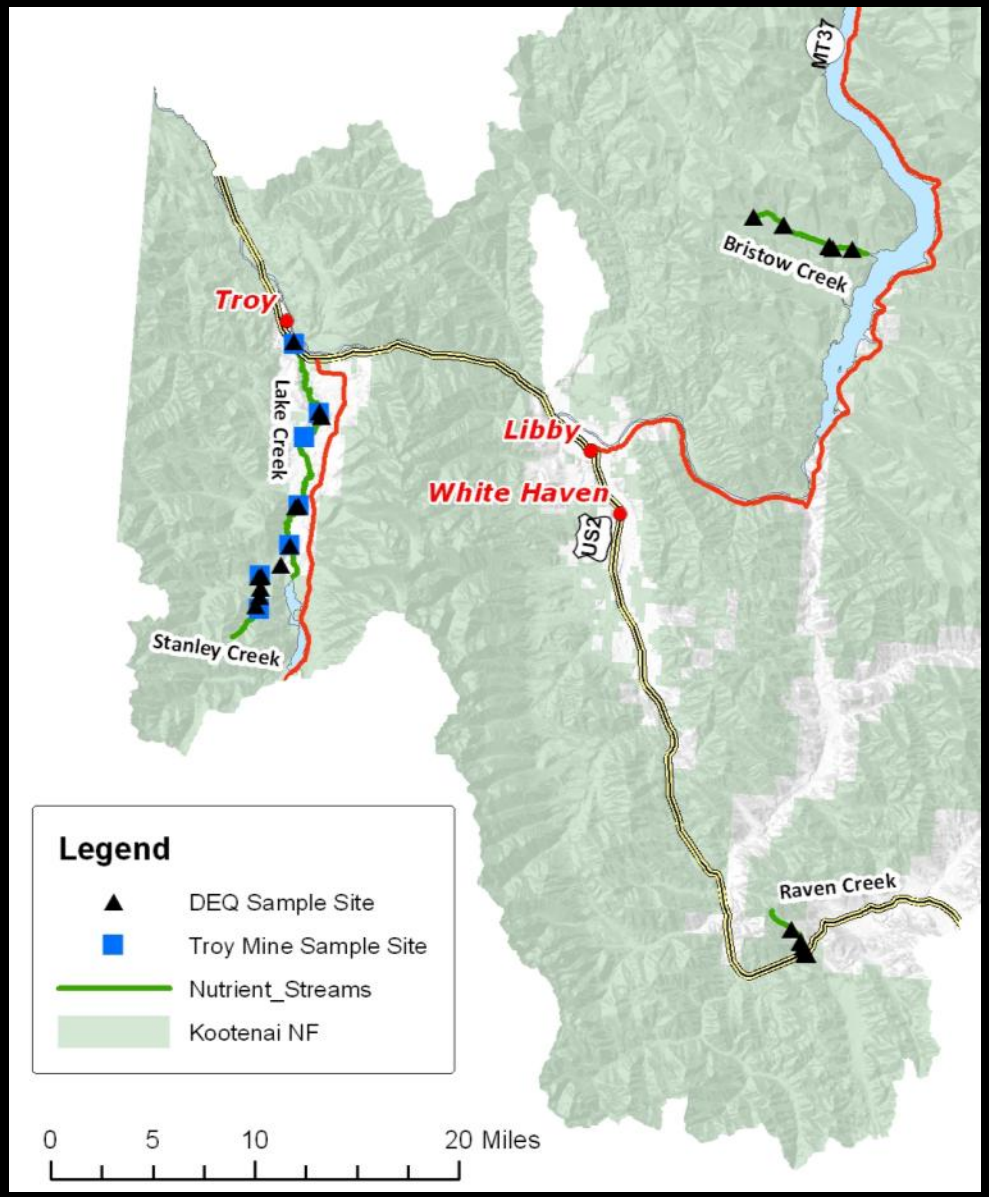
Nutrients

2012 303(d)

- Four listed waterbodies
  - ~~-Bristow Creek (TN)~~ Delisted
  - -Lake Creek (NO_3)
  - -Raven Creek (TP, ~~TN, NO_3~~) N Delisted
  - -Stanley Creek (bio-integrity) NO_3

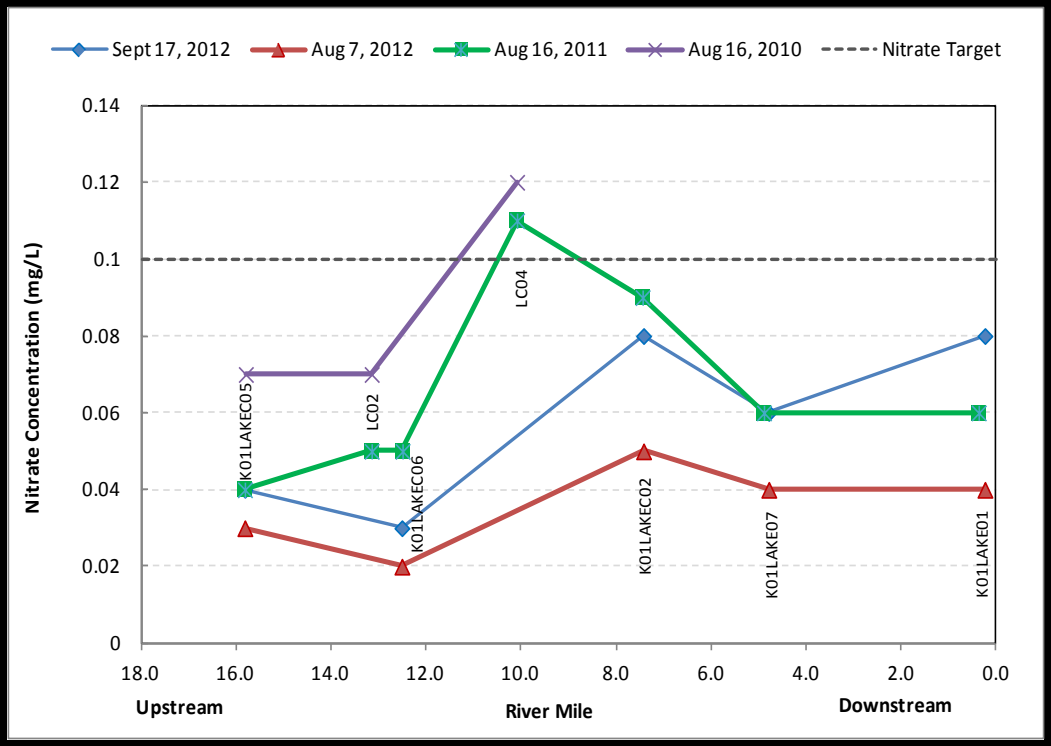
Monitoring

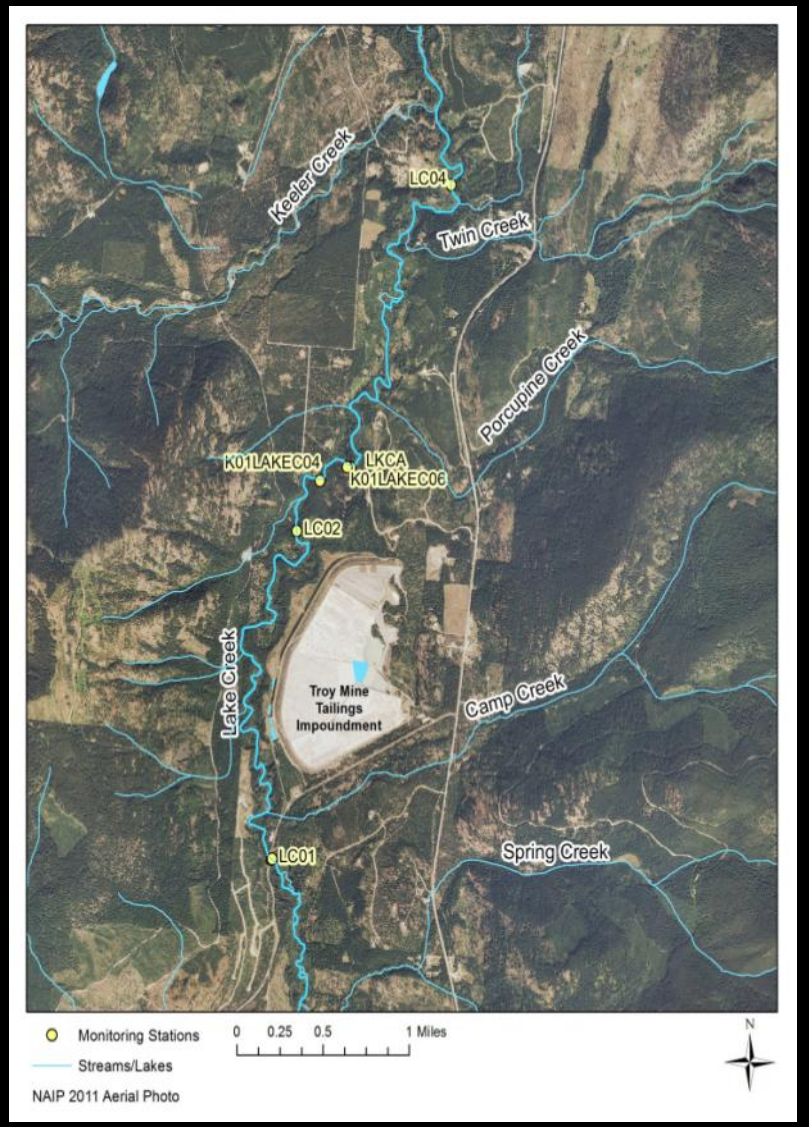
- Growing season sampling once in 2011 and 3 times in 2012
- Data also obtained from Troy Mine for Lake and Stanley creeks
- Biological data collected in 2011



Source Assessment

- Water quality data, land use distribution, and literature used for source assessment
- There are no nutrient point sources





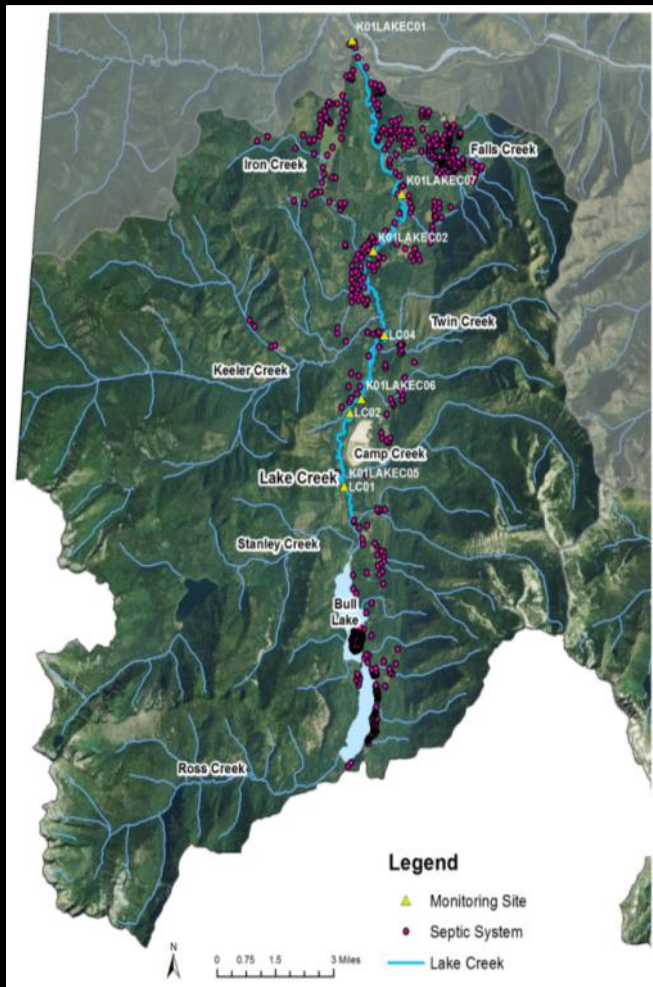
Potential Sources & Allocations

Stanley: Timber harvest & mining

Lake: Timber harvest, mining, septic

Raven: Sources of sediment

- Allocations to natural background and a composite of human sources



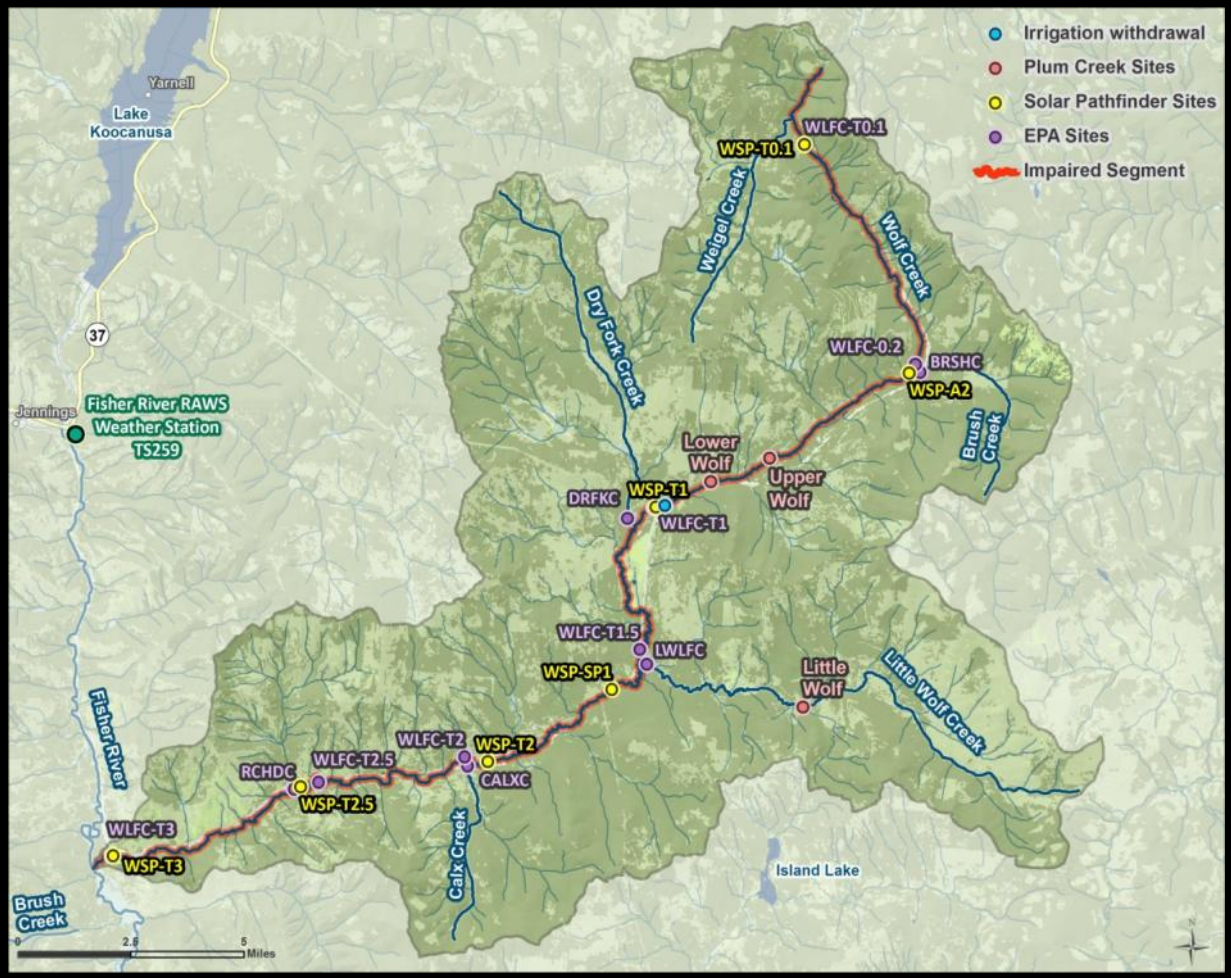
Example TMDL: Lake Creek

Allocation	Source Category	Current Load (lbs/day)	% Reduction	Allocation (lbs/day)
Load Allocation	Natural Background	4.0	0%	4.0
	Other sources including septics, timber harvest, and mining	16.7	0%	16.7
	Troy Mine Tailings Impoundment	40.8	43%	23.3
TMDL	**All Sources**	**61.5**	**28%**	**44.0**

Temperature

2012 303(d) List:
Wolf Creek

- 7 loggers on Wolf Creek and at 5 tributary sites
- 3 loggers deployed by Plum Creek in 2012
- Flow collected at all sites and shade measurements on Wolf Creek

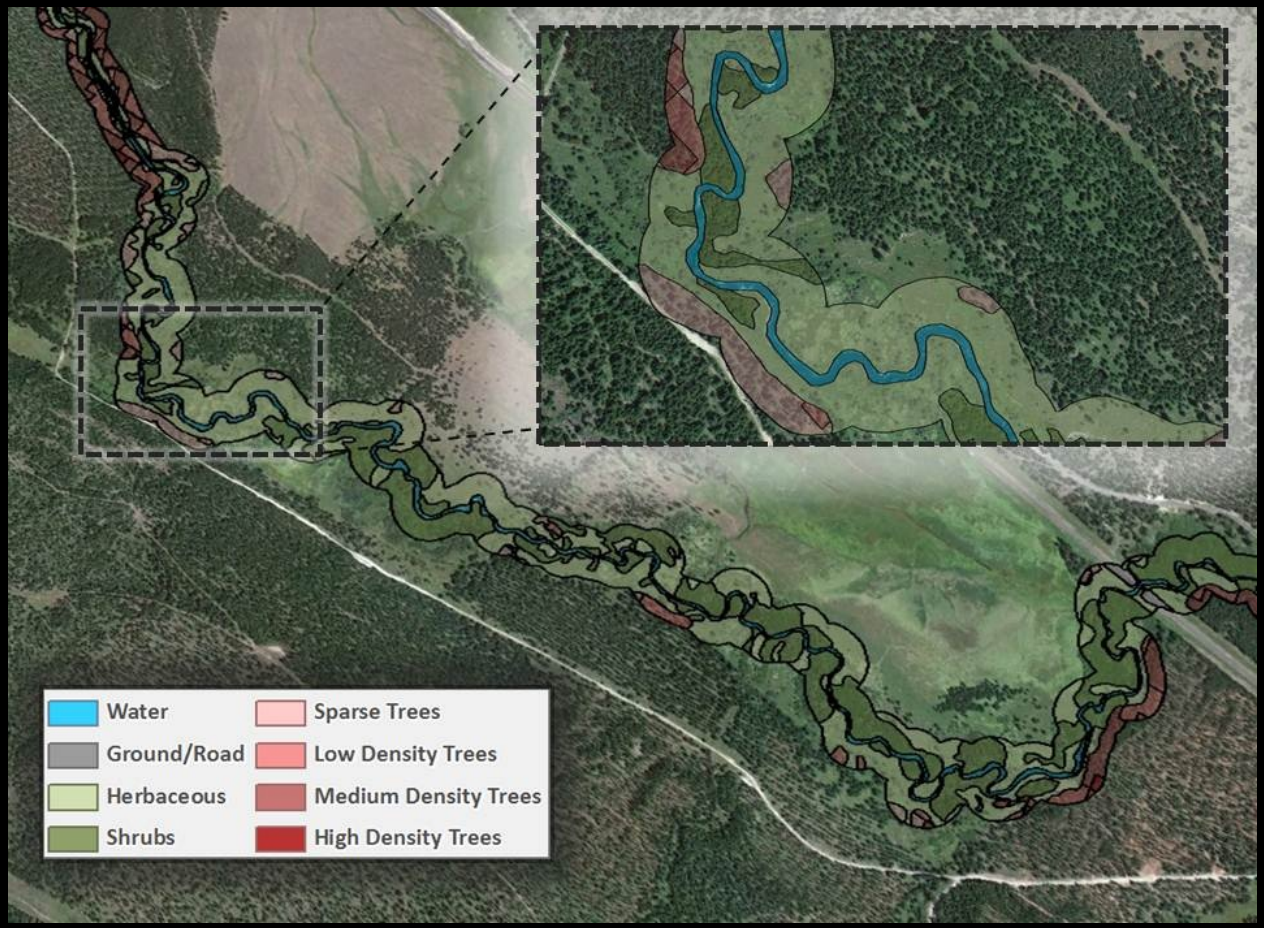


Temperature Standard & Model Framework

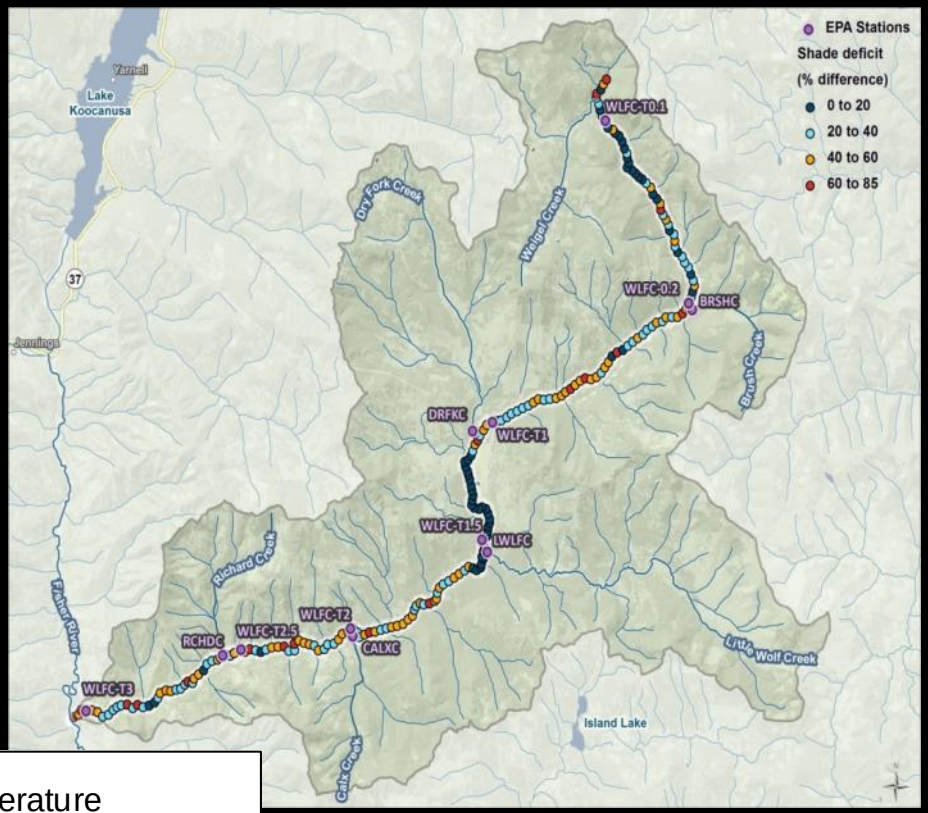
- The standard allows a human caused 0.5 or 1°F change from the naturally occurring temperature
- Targets for shade, width/depth ratio
- QUAL2K used to model the existing temperature and 3 scenarios: 1) improved shade; 2) improved water conservation; and 3) improved shade & water conservation [naturally occurring]
  - Comparison between scenarios shows level of impairment and improvement needed

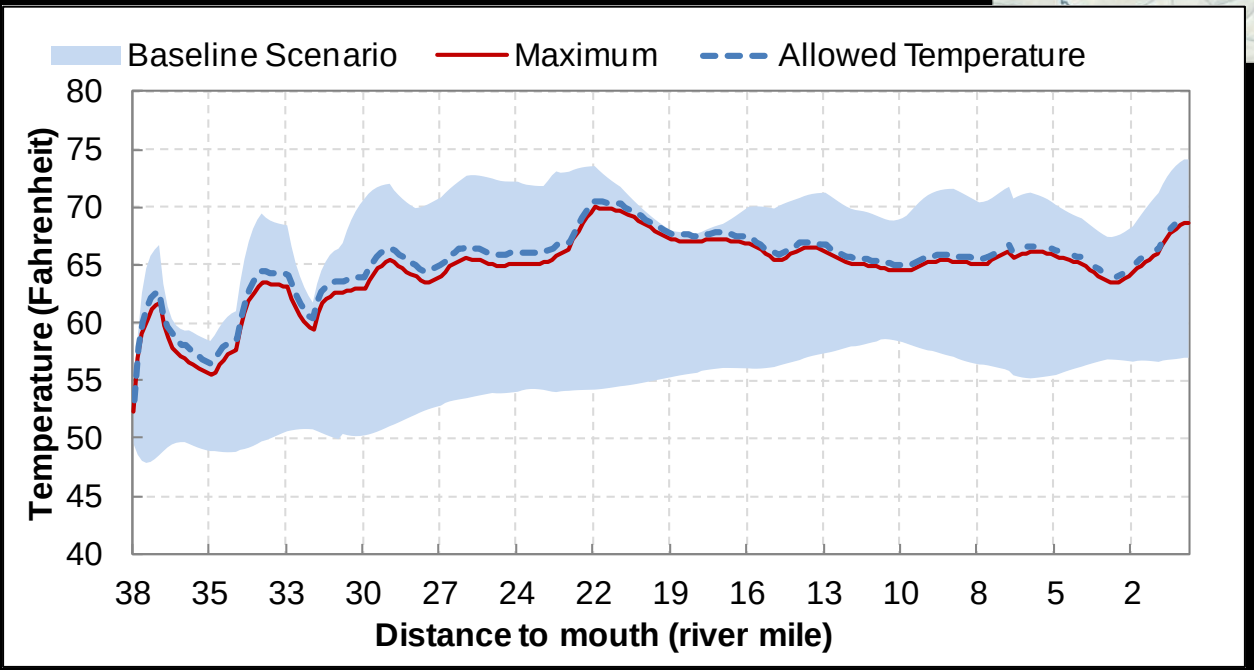
Vegetation Mapping

- Aerial photo classification within a 150 buffer of the stream into trees, shrubs, herbaceous
- Tree density categorized based on canopy from 2001 NLCD
- Vegetation info used in combination with GIS data to estimate effective shade



Scenario Results





-Potential decrease between naturally occurring and existing 0.72°F – 7.82°F, with an average decrease of 4.6°F

Numeric and Surrogate TMDL

Source Type	Modeled Existing Load (kcal/sec)	TMDL/Load Allocation (kcal/sec)	Percent Reduction Needed
Natural and human sources that influence temperature	6,229	5,483	12%

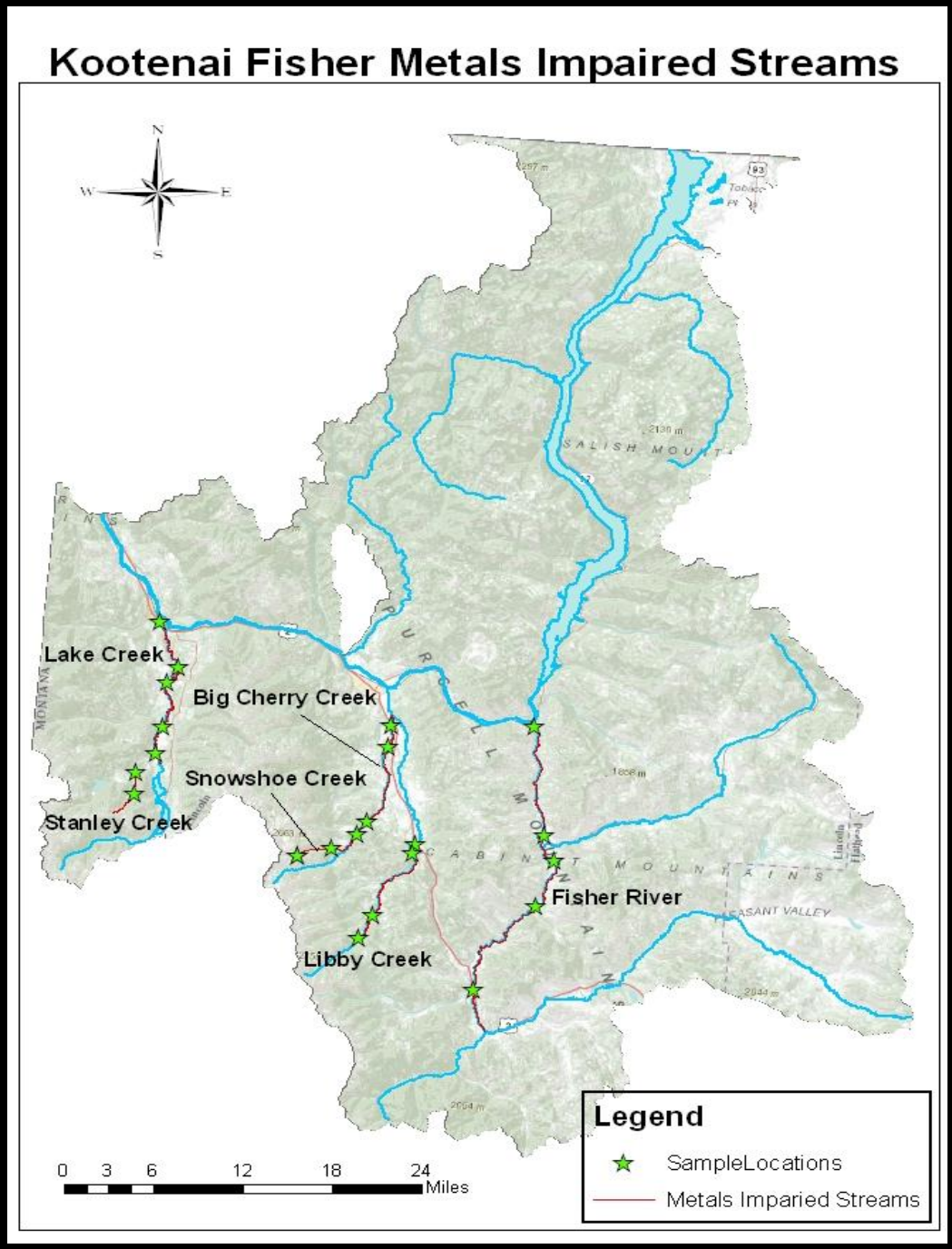
Source Type	Surrogate Allocation
Land uses and practices that reduce riparian health and shade provided by near-stream vegetation along Wolf Creek.	• Improve to and maintain a 50 foot buffer with medium density trees or any vegetation providing equivalent effective shade
Land uses and practices that result in the over-widening of the stream channel such that widths are increased, depths are decreased, and thermal loading is accelerated	No increase in average width or width/depth ratios due to human-caused sources • Where bankfull width < 30ft, a width/depth ratio $\leq$ 21 • Where bankfull width > 30ft: a width/depth ratio $\leq$ 32
Inefficient consumptive water use	• Application of all reasonable water conservation practices
Surrogate TMDL	• **Application of all reasonable land, soil, and water conservation practices for human sources that could influence stream temperatures. This primarily includes those affecting riparian shade, channel width, and in-stream flow.**

Metals TMDLs for the Kootenai-Fisher Project Area

Metal TMDLs

Metals Impaired Streams

- Stanley Creek
  - Copper
  - Lead
  - Zinc
- Lake Creek
  - Copper
  - Lead
- Snowshoe Creek
  - Arsenic
  - Cadmium
  - Lead
  - Zinc
- Big Cherry Creek
  - Cadmium
  - Lead
  - Zinc



Data Collection & Impairment Determination

- Sampling conducted in 2009- 2012
- Sampled and assessed for: Aluminum (Al) Arsenic(As), Cadmium (Cd), Copper (Cu), Iron (Fe), Lead (Pb), Selenium (Se), Silver (Ag) and Zinc (Zn)
- High and low flow conditions
- Updated DEQ assessment:
  - Even with limited data:
    - Some stream showing no metals impairment conditions (Fisher River and Libby Creek)
    - Streams still indicating impairment for metals (not necessarily for original listings)
    - Addition of metals/waterbody combinations to impairment list
      - Big Cherry (Cd, Pb)
      - Snowshoe (As, Pb)
      - Stanley Creek (Pb, Zn)
    - Elimination of other combinations
      - Lake Creek (Cd, Hg, Zn)
  - Beneficial uses found to be impaired include:
    - Aquatic Life Support
    - Drinking Water
    - Agriculture
    - Recreation

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

Numeric Water Quality Standards

Metal of Concern	Aquatic Life Criteria (µg/L) at 25 mg/L Hardness		Aquatic Life Criteria (µg/L) at 400 mg/L Hardness		Human Health Criteria (ug/L)
	Acute	Chronic	Acute	Chronic	
Arsenic, TR*	340	150	340	150	10
Cadmium, TR	0.52	0.10	8.73	0.76	5
Copper, TR	3.79	2.85	51.68	30.5	1,300
Lead, TR	13.98	0.54	476.82	18.51	15
Mercury, TR	1.70	0.91	1.70	0.91	0.05
Zinc, TR	37.02	37.02	387.83	387.83	2,000

*TR = total recoverable

Metals TMDL Development Triggers

- Greater than 10 % of recent analytical results exceed Chronic Aquatic Life (CAL) targets.
- At least one analytical result is greater than twice the Acute Aquatic Life (AAL) target.
- At least one analytical result exceeds the Human Health (HH) target.
- Water column metals concentrations are elevated under both high and low flows regimes and sediment metals concentrations greatly exceed (more than 2X) Probable Effects Level (PELs).

AU ID:	MT76D002_010		AU Name	Stanley Creek		
			Aquatic Life/ Fishes BU			
2012 Aquatic Life/Fishes Metals Listings:	Copper					
Metals:	Dissolved Al	As	Cd	Cu	Fe	Pb
Sample Date Range	2011-2012	2005-2012	2005-2012	2005-2012	2005-2012	2005-2012
Number of Samples	9	37	14	38	37	19
Number of High Flow Samples	5	14	6	14	14	7
Percent of High Flow Samples	55.56	37.84	42.86	36.84	37.84	36.84
Number of samples that are ≥2x the Acute Standard	0	0	0	6		0
Number of Acute Exceedances	0	0	1	10		0
Number of Chronic Exceedances	0	0	1	11	0	3
Acute Exceedance Rate (%)	0.00	0.00	7.14	26.32		0.00
Chronic Exceedance Rate (%)	0.00	0.00	7.14	28.95	0.00	15.79
Listing Decision (List/Keep Listed, Delist/ Do not List)	Do not list	Do not list	Do not list	Keep Listed	Do not list	LIST
Listing Decision Rational	No excedances	No excedances	Exccedance rate below 10%	Multiple exceedances	No excedances	Chronic exceedance rate
Metals:	Se	Ag	Zn			
Sample Date Range	2005-2012	2009-2012	2005-2012			
Number of Samples	13	11	34			
Number of High Flow Samples	5	3	10			
Percent of High Flow Samples	38.46	27.27	29.41	#DIV/0!	#DIV/0!	#DIV/0!
Number of samples that are ≥2x the Acute Standard	0	0	1			
Number of Acute Exceedances	0	0	1			
Number of Chronic Exceedances	0		1			
Acute Exceedance Rate (%)	0.00	0.00	2.94	#DIV/0!	#DIV/0!	#DIV/0!
Chronic Exceedance Rate (%)	0.00	#DIV/0!	2.94	#DIV/0!	#DIV/0!	#DIV/0!
Listing Decision (List/Keep Listed, Delist/ Do not List)	Do not list	Do not list	LIST			
Listing Decision Rational	No excedances	No excedances	2x the Acute standard was exceeded.			

2013 Metals TMDLs

Updated Metals TMDL Assessment Results and TMDLs Developed Determination for the Kootenai - Fisher TMDL Project Area					
Waterbody & Location Description	**Waterbody ID**	**Metal Pollutant**	**Listed as Impaired on 2012 303(d) List**	**Updated Impairment Determination**	**TMDL Developed**
Fisher River, (Silver Butte/Pleasant Valley Junction to Kootenai River)	MT76C001_010	Lead	Yes	Not Impaired	No
Lake Creek, (Bull Lake outlet to Kootenai River)	MT76D002_070	Cadmium	Yes	Not Impaired	No
		Copper	Yes	Impaired	Yes
		Lead	Yes	Impaired	Yes
		Mercury	Yes	Not Impaired	No
		Zinc	Yes	Not Impaired	No
Big Cherry Creek, (Snowshoe Creek to Libby Creek)	MT76D002_050	Cadmium	No	Impaired	Yes
		Lead	No	Impaired	Yes
		Zinc	Yes	Impaired	Yes
Libby Creek,(1 mile above Howard Creek to HWY 2 bridge)	MT76D002_061	Mercury	Yes	Not Impaired	No
Snowshoe Creek, (Cabinet Wilderness Boundary to Big Cherry Creek)	MT76D002_040	Arsenic	No	Impaired	Yes
		Cadmium	Yes	Impaired	Yes
		Lead	No	Impaired	Yes
		Zinc	Yes	Impaired	Yes
Stanley Creek, (Headwaters to mouth, (Lake Creek))	MT76D002_010	Copper	Yes	Impaired	Yes
		Lead	No	Impaired	Yes
		Zinc	No	Impaired	Yes

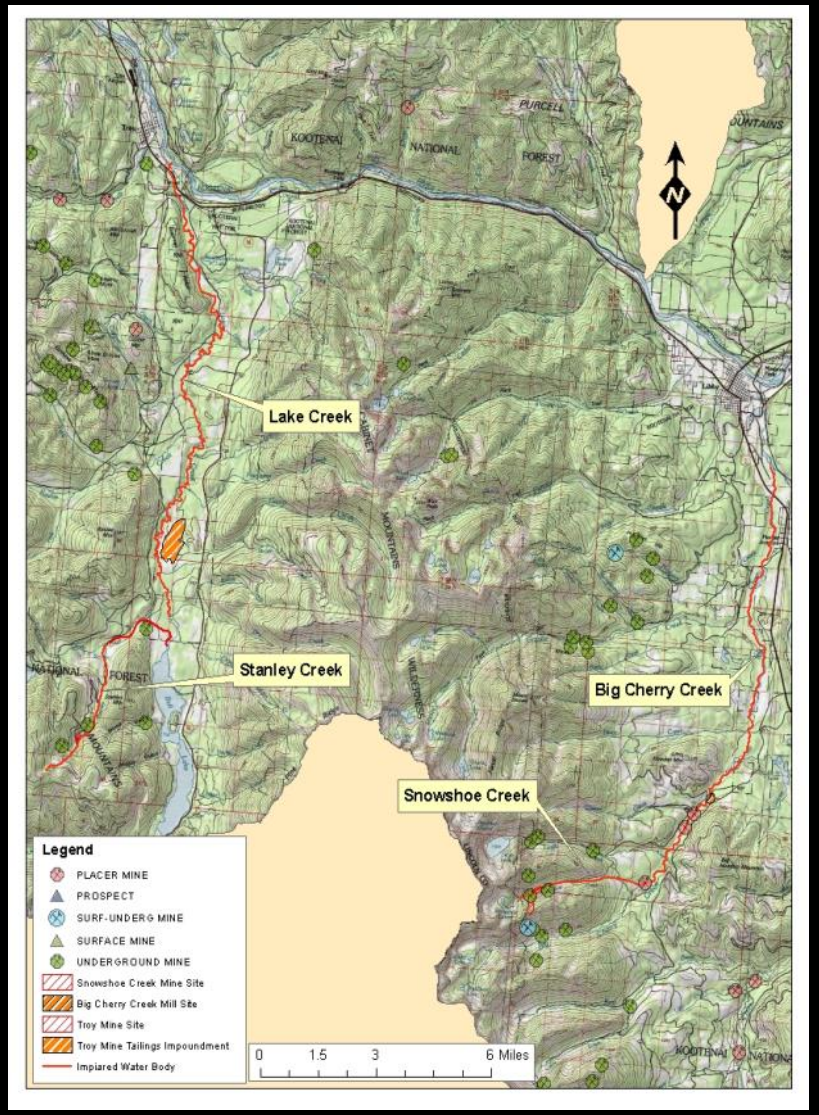
Metals Sources

Snowshoe Creek

- Reclaimed Snowshoe mine site
- Stream side tailings downstream of mine site
- Several inactive/abandoned mines
  - St. Paul,
  - Texas Ranger

Big Cherry Creek

- Big Cherry Creek mill site
- Copper Reward, Seattle, Silver Tip and Fairbault Mines (Headwaters of Big Cherry Creek)
- Big Sky and Missouri (Leigh Creek)
- Various placer operations



Metals Sources

Stanley Creek

- Land disturbances associated with the Troy Mine, and other historical mining operations
  - metals loading associated sediment production, i.e. high flows, and land disturbance contributing sediment
- Several small inactive load mines: Daniel Lee and Blue Bird

Lake Creek

- Numerous abandoned underground lode mines
  - Copper Creek watershed
  - North Fork watershed
- Troy Mine tailing impoundment
- Effects of metals loading from Stanley Creek

Watershed-Wide Metals Reductions

- Arsenic 0% - 23%
- Cadmium 86%-97%
- Copper 20%-80%
- Lead 0% - 94%
- Zinc 0% - 91%

Implementation Strategy

- Sediment , Nutrient, and Temperature Goals
  - Improve and restore riparian corridors
  - Improve land use management practices to reduce pollutant loading while still providing viable and sustainable economic growth
- Metals Goals
  - Prevent contaminated sediment and waste rock/ tailings from migrating into adjacent surface waters
  - Reduce or eliminate concentrated runoff and discharges that generate sediment and/or heavy metals contamination to adjacent surface waters and groundwater
  - Minimize erosion of mineralized soils
- Adaptive Management
  - Conduct monitoring to assess water quality conditions and success of applied recommended land management practices
  - Adapt your water quality improvement strategy as necessary

Now That It's Done, What Does This Mean?

- A TMDL does not create or impose new regulations
- Voluntary for the majority of nonpoint sources activities
- Application of water quality improvement practices is a landowner's decision
- Existing regulations related to 310 permits and streamside management zones still apply

Next Steps

- Development of the Watershed Restoration Plan
  - Identify priorities
  - Refine source assessment
- Seek Funding to Implement Projects
  - Potential funding sources: 319, Future Fisheries Improvement Program, Watershed Planning and Assistance, EQIP, RIT/RDG

DEQ Nonpoint Source Program Contact:
Elena Evans
eevans2@mt.gov
(406) 444-0531

Tentative Schedule

- Stakeholder Comments: Due Friday, Jan 24

  Send to Christina at: cstaten@mt.gov

- Public Comment Period:

  Tentative Dates: February 3 – March 4

- Public Meeting

  Tentative Date: February 13 in Libby

Draft document will be available on DEQ's website and at the Troy and Libby public libraries

Lou Volpe
LVolpe@mt.gov
406-444-6742

Lisa Kusnierz
Kusnierz.Lisa@epa.gov
406-457-5001