Tobacco River Sediment TMDLs

Advisory Group Meeting

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Document Outline

- Introduction (Section 1.0)
- Watershed Characterization (Section 2.0)
- Application of Montana's Water Quality Standards for TMDL Development (3.0)
- Description of TMDL Components (4.0)
- Sediment TMDL Components (5.0)
- Restoration Objectives & Implementation Plan (6.0)
- Monitoring Strategy & Adaptive Management(7.0)

Presentation Outline

- Introductory Information (Sections 1, 2, 3 & 4)
- Sediment TMDL Components (Section 5)
  - Target Development and Application
  - Source Assessment (Load & Reduction Estimates)
  - TMDLs & Allocations
- Monitoring & Implementation (Sections 6 & 7)
- Other Causes of Impairment
- Document Completion Steps
- How to Use the TMDL Wiki

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
- Expressed as a load per a given time & also as a percent reduction
  (16 pounds/day; 2.6 tons/year; 30% total load reduction)

What is a TMDL?

- A TMDL is developed for each pollutant causing impairment to a water body segment (i.e. each water body segment / pollutant combination)
  Example:
  - Fortine Creek is listed for both sediment and temperature
  - A sediment TMDL has been written for Fortine Creek
  - When a temperature TMDL is written in the future, Fortine Creek will have 2 separate TMDLs

What is a TMDL?

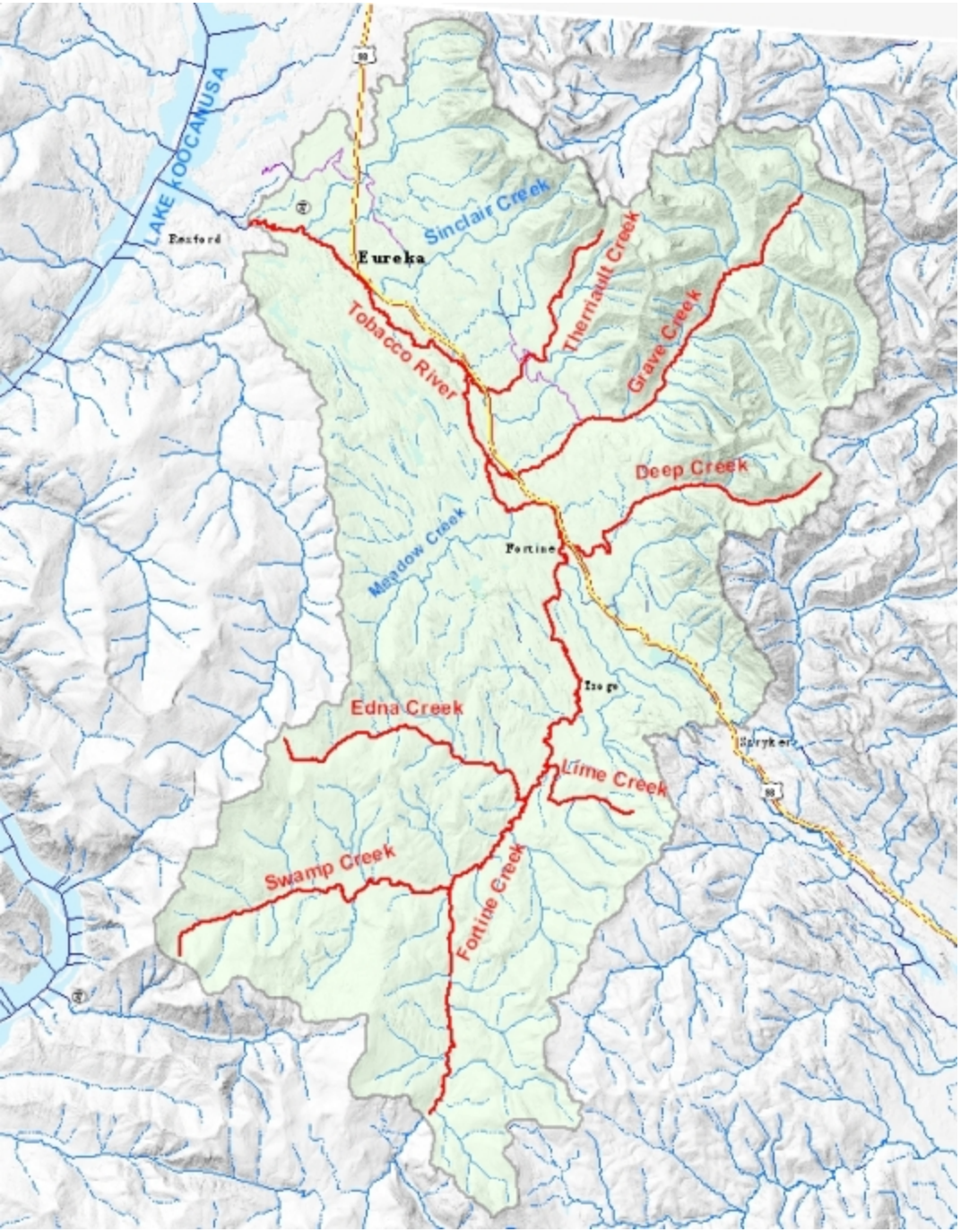
- Presented within the context of a scientifically based plan (not a mandate) that identifies a clean-up or restoration strategy for a specific water body and pollutant.

A TMDL is not….

- Not enforceable except for NPDES permitted point source loads must be consistent TMDL loads
- Does not create new regulations; implementation is voluntary unless already covered by existing Federal, State or Local regulations.
- A TMDL is not required for non-pollutant causes of impairment
  - Example: Alteration in stream-side or littoral vegetative covers

Why Develop TMDLs?

- Required by State and Federal Law (Clean Water Act)
- Required for each water body segment/pollutant combination identified on Montana's 303(d) list (currently about 1800 of these)
- Court Order: Must Substantially Increase the Pace of TMDL Development in Montana



Boundary of the Tobacco TMDL Planning Area (TPA) & Sediment 303(d) Listings

2006 303(d) List
Deep Creek
Edna Creek
Fortine Creek
Lime Creek
Swamp Creek
Therriault Creek
Tobacco River

303(d) Cycle First Listed (CFL) for Sediment Impairment Causes

- 1988: Therriault Creek, Tobacco River
- 1990: Fortine Creek
- 1992: Swamp Creek, Edna Creek
- 1996: Lime Creek
- 2006: Deep Creek

Sediment Standards (Section 3)

- Provide the basis for TMDL development

Sediment Standards (Section 3)

- **No increases are allowed above naturally occurring concentrations of sediment or suspended sediment** (except as permitted in 75-5-318, MCA), settleable solids, oils or floating solids, **which will or are likely to** create a nuisance **or render the waters harmful, detrimental, or injurious to** public health, recreation, safety, welfare, livestock, wild animals, birds, **fish or other wildlife**.

Sediment Standards (Section 3)

- **“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 ..
- **“Reasonable land, soil, and water conservation practices”** means methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution-producing activities.

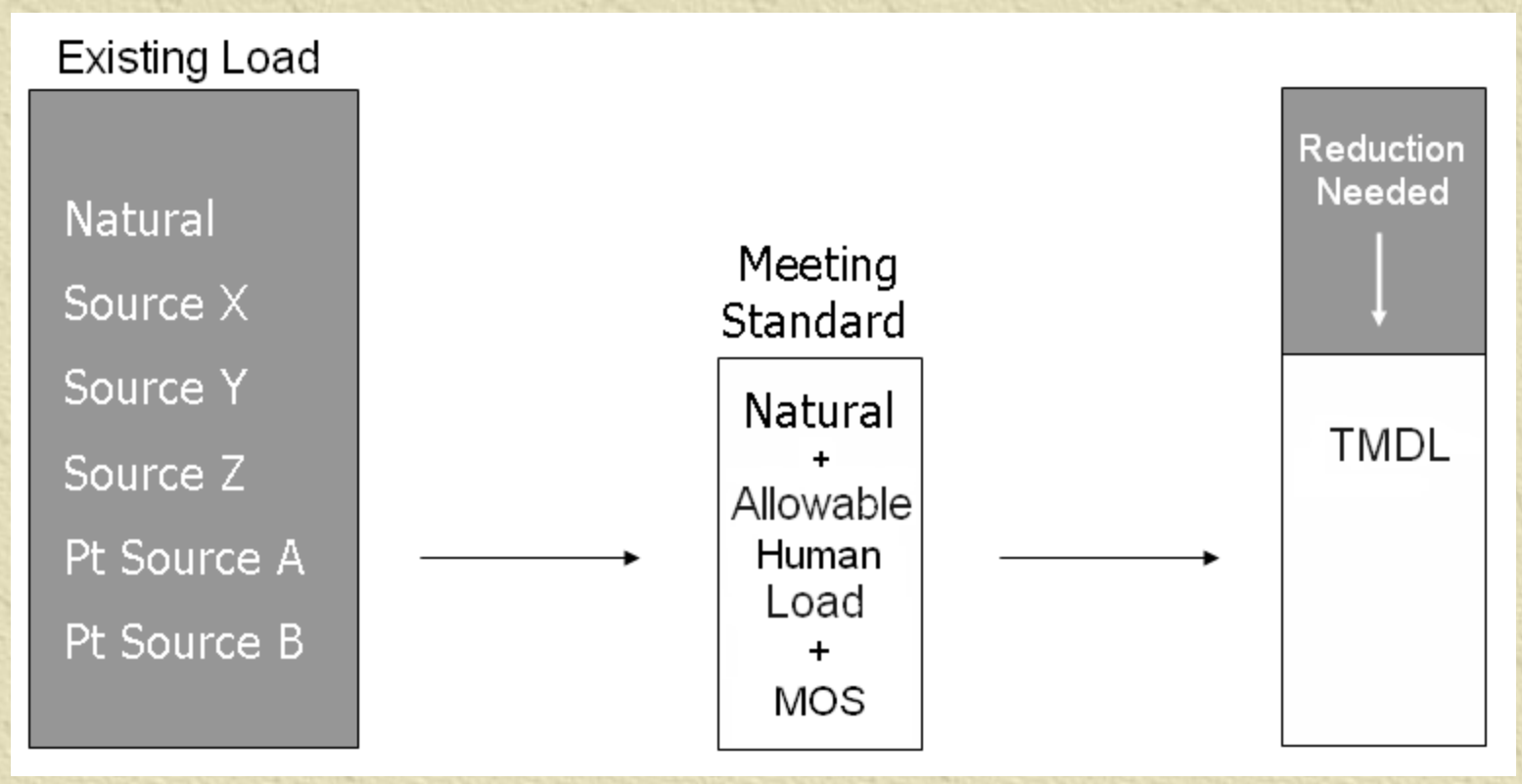
Sediment Standards (Section 3)

- **“Sediment”** means solid material settled from suspension in a liquid; mineral or organic solid material that is being transported or has been moved from its site of origin by air, water, or ice and has come to rest on the earth’s surface, either above or below sea level; or inorganic or organic particles originating from weathering, chemical precipitation, or biological activity.

Sediment Standards (Section 3)

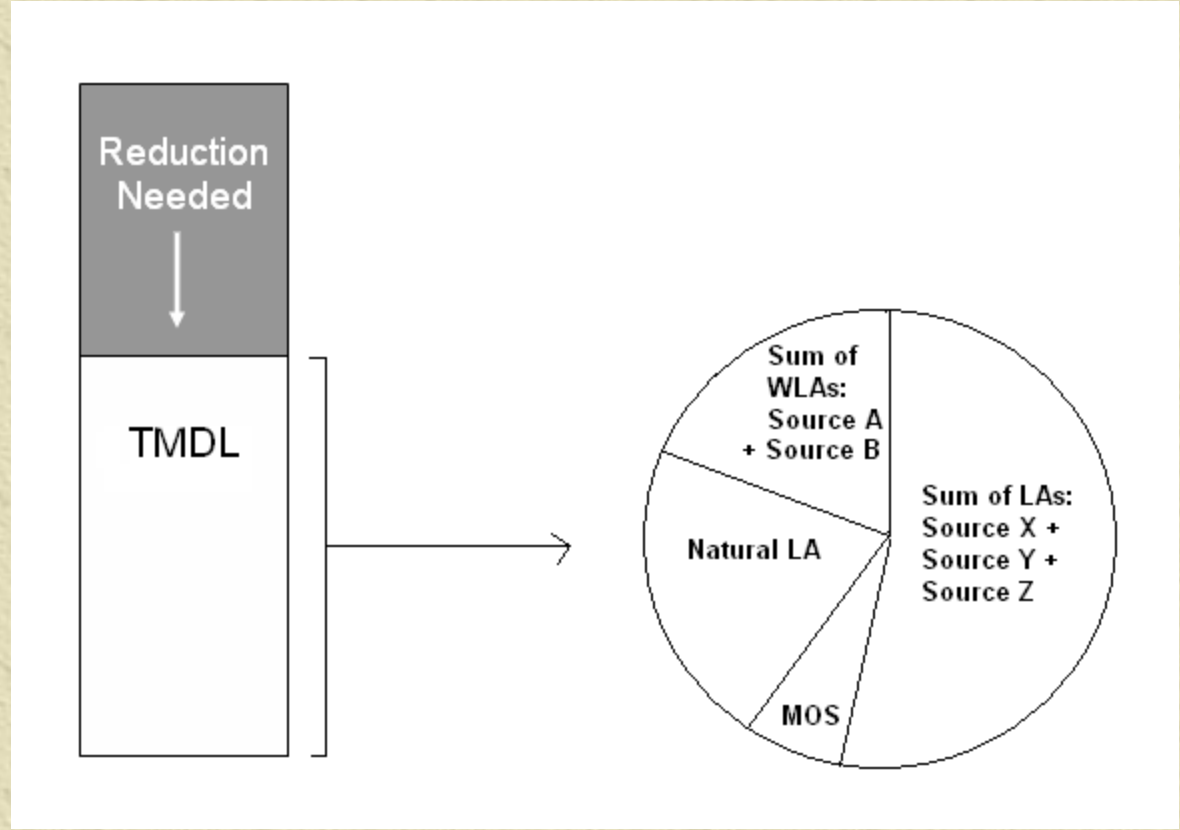
- **State surface waters must be free from substances attributable to** municipal, **industrial, agricultural practices or other discharges that will:**
  - **create concentrations or combinations of materials which are** toxic or **harmful to** human, animal, plant, or **aquatic life**

TMDL Basics (Section 4.0)



MOS = Margin of Safety

TMDLs Are Broken Into Allocations



WLA = Waste Load Allocation

LA = Load Allocation

MOS = Margin of Safety

TMDL = Sum of WLAs for point sources **+ Sum of LAs** for nonpoint sources **+ MOS** that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving stream

QUESTIONS?

NEXT: Target Development and Application

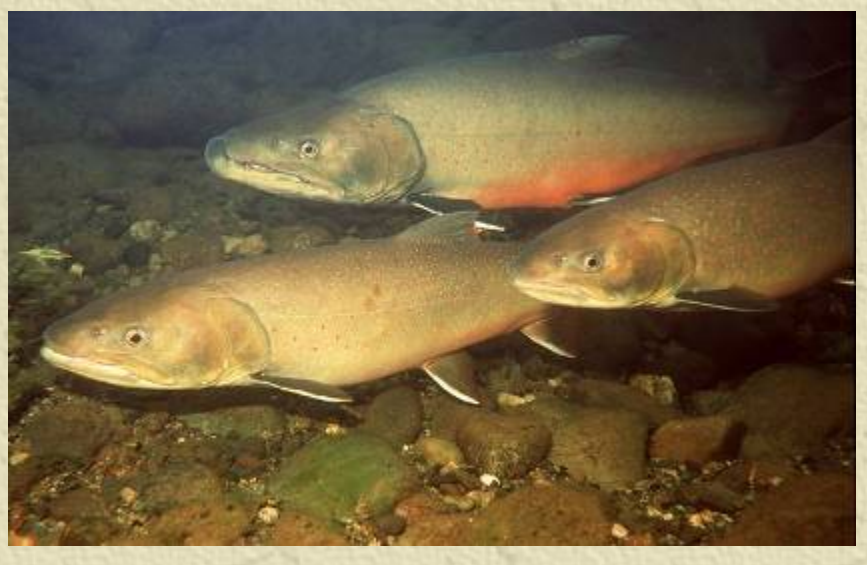
Section 5 -Sediment

- 5.0 Sediment
  - Effects of Sediment on Beneficial Uses (5.1)
  - Stream Segments of Concern (5.2)
  - Assessment Methods (5.3)
  - Water Quality Targets & Comparison of Existing Conditions to Targets (5.4)
  - Quantification of Sources (5.6)
  - TMDLs and Allocations (5.7)

Sediment Problems in the Tobacco River Watershed

- Impairments to Aquatic Life & Cold Water Fishery Beneficial Uses **(Section 5.1)**
  - Potential impacts to aquatic life from sediment discussed (fish, aquatic insects)

Kokanee



Bull Trout

Sediment Target Parameters (Section 5.4)

- Percentage of fine sediment in riffles and fish spawning areas (substrate measurements)
- Channel Form:
  - Width/Depth Ratio
  - Entrenchment Ratio

Sinclair Creek
Riffle Grid Toss

Pebble counting

Lime Creek
Cross-Section Measurement

Sediment Supplemental Indicators (Section 5.4)

- Amount of large woody debris per mile

Deep Creek

- Pool depths
- Number of pools per mile
- Macroinvertebrate assessments
- Amount of riparian vegetation (understory shrub cover)

Sediment Supplemental Indicators (Section 5.4)

- Percentage of actively eroding banks

- Identification of significant and controllable sediment sources

Sediment Target Parameter Assessment Method (Appendix C)

- An aerial assessment was performed using GIS to stratify the listed streams into segments of like characteristics, landscape, and land-use factors
- A subset of these reaches were sampled in 2008 using DEQ methods to evaluate target achievement:
  - Pebble counts and grid tosses to quantify % surface fine sediment in riffles and pools
  - Pool habitat information and large woody debris
  - Cross sections to evaluate width/depth and entrenchment ratios
  - Green line measurements to evaluate riparian health along stream banks
  - Bank Erosion Hazard Index (BEHI) measurements to quantify sediment loads from eroding banks

Development of Target Values (Section 5.4)

- Target values were developed using:
  - Regional reference data from the Kootenai National Forest and data sets from other similar national forests
  - Data collected from the 2008 Tobacco sediment and habitat assessment
  - Data from other recent Montana TMDL studies (Ruby River, Middle & Lower Big Hole, and St. Regis TMDLs)
  - Montana macroinvertebrate assessment method

Water Quality Targets: General Description

- A comparison of existing data to water quality targets (Section 5.4):
  - Helps define the level of impairment
  - Guides TMDL development determinations (TMDLs are developed for water bodies not meeting the targets)
  - Establishes a starting point from which to measure future water quality restoration success

TMDL Determinations (Section 5.4)


Lime Creek

- TMDLs have been developed for streams with elevated amounts of fine surface sediment; degraded habitat quality; and near-stream impacts from human sources, such as grazing and road erosion.
- TMDLs were not developed for streams failing to meet the water quality targets if it appeared that there were no significant controllable human causes.
  - Example: Fine sediment in Lime Creek and linkage to natural limestone geology

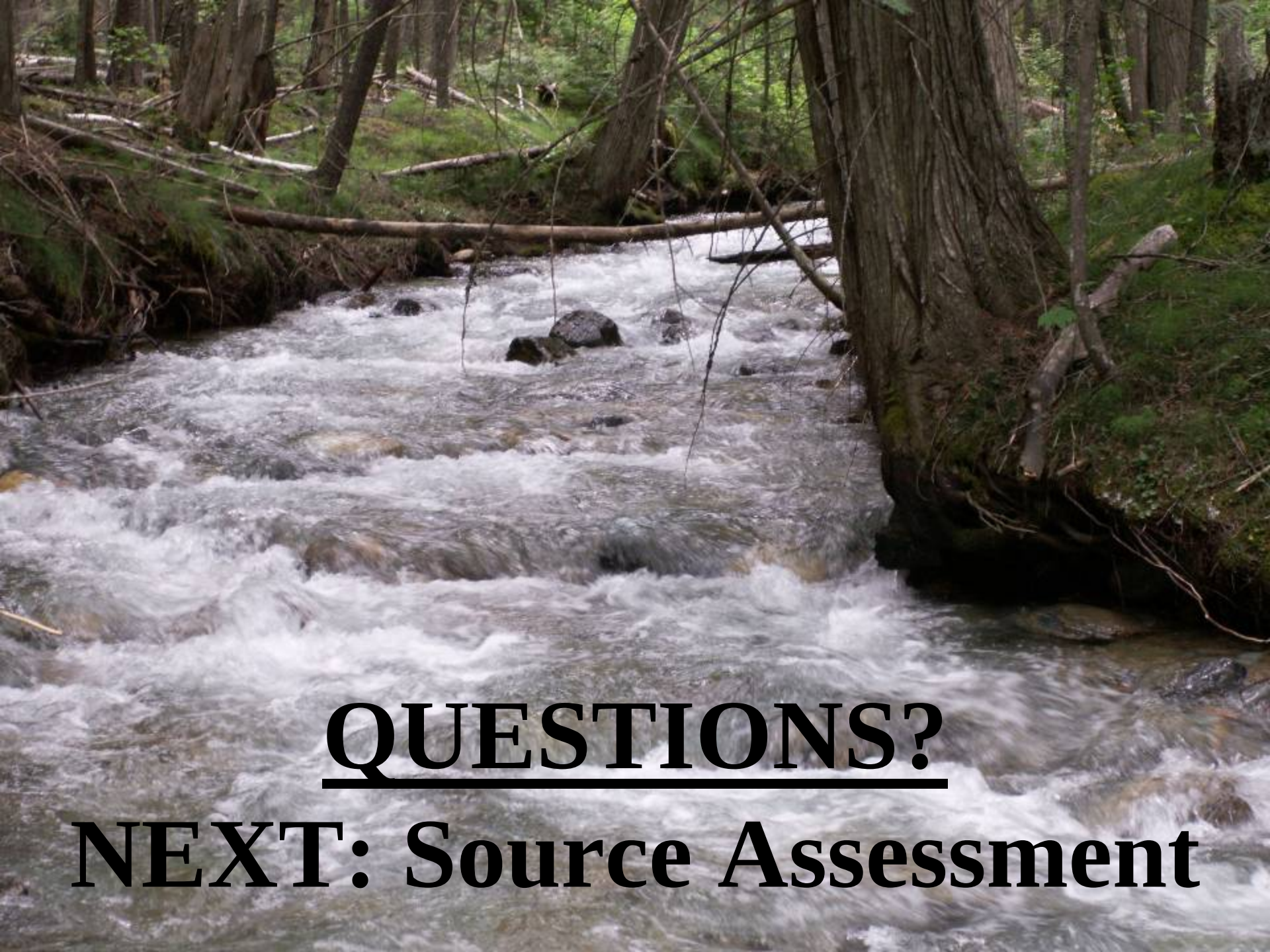
TMDL Determinations (Section 5.4)

- TMDLs were not developed for streams with uncertain impairment linkages to sediment or where data was not collected from areas with potential sediment impact
  - Examples: Tobacco River, Swamp Creek
- Additional monitoring & assessment is recommended for all streams, particularly Tobacco & Swamp (Section 7.0)

TMDL Determinations (Section 5.4)

- Based upon a comparison of the collected data to the developed targets and supplemental indicators, 5 TMDLs were written.
- Sinclair Creek was added to the 2008 assessment due to stakeholder input & concern.

2006 303(d) List	TMDL Developed?
Deep Creek	Yes
Edna Creek	Yes
Fortine Creek	Yes
Lime Creek	No
Swamp Creek	No
Therriault Creek	Yes
Tobacco River	No
Additional Assessed Water	
Sinclair Creek	Yes



QUESTIONS?

NEXT: Source Assessment

Sediment Sources by Land Use Types

- Agriculture
  - Grazing in Riparian Zone
  - Crop Production Encroachment
- Forestry
  - Road Erosion or Encroachment
  - Riparian Degradation
  - Historic Logging Methods
- Other Land Development
  - Road Erosion or Encroachment
  - Riparian Degradation
  - Railroad Encroachment

Fortine Creek

Therriault Creek

Fortine Creek

Sediment Source Assessment Categories

- Streambank Erosion (Appendix D)
- Upland Erosion (Appendix E)
- Unpaved Roads (Appendix F)

Source Assessment Methods

- Provide relative loading estimates within each source category
- Provide a basis for percent reductions
- Not calibrated for source category comparisons

Streambank Erosion Assessment (Section 5.3, Appendix D)

- Sediment loading was assessed from eroding banks in 2008 by performing bank erosion hazard index (BEHI) measurements & evaluating near bank stress along monitoring reaches based on these parameters:
  - Bank Height & Bankfull Height
  - Root Depth & Root Density
  - Bank Angle
  - Percent Surface Protection

Streambank Erosion Assessment

- Sources of streambank erosion were evaluated based on human-caused disturbances and surrounding land-use practices using the following categories:
  - Transportation
  - Riparian grazing
  - Cropland
  - Mining
  - Silviculture
  - Irrigation-shifts in stream energy
  - Natural sources
  - Other

Streambank Erosion Reduction Method (Appendix D)

- Data was extrapolated to the stratified stream reach and stream segment, and then to the watershed scale.
- Potential sediment load reduction was estimated as a percent reduction that could be achieved if all eroding streambanks could be reduced to a moderate BEHI score (a medium level of active bank erosion)

Upland Erosion Assessment (Section 5.3, Appendix E)

- Upland erosion due to hillslope erosion was modeled using the Universal Soil Loss Equation (USLE).
- Sediment delivery to the stream was predicted using a sediment delivery ratio, taking into account riparian buffering (the ability of the near stream vegetation to filter out sediment).
- The model provided an estimate of existing sediment loading from upland sources and an estimate of potential sediment loading reductions by applying best management practices (BMPs) in the uplands and in the near-stream riparian area

Upland Erosion & Riparian Buffering Capacity (Appendix E)

- Potential load reductions are calculated by adjusting factors within the model associated with land management and cropping practices.
- Riparian buffering can influence erosion and therefore, additional potential load reductions were estimated by adjusting (improving) the sediment trapping efficiency of the riparian buffer.
- Sediment loads can be reduced by applying BMPs to upland land management practices, as well as practices affecting the health and buffering capacity of the vegetated riparian buffer.

Unpaved Roads Assessment (Section 5.3, Appendix F)

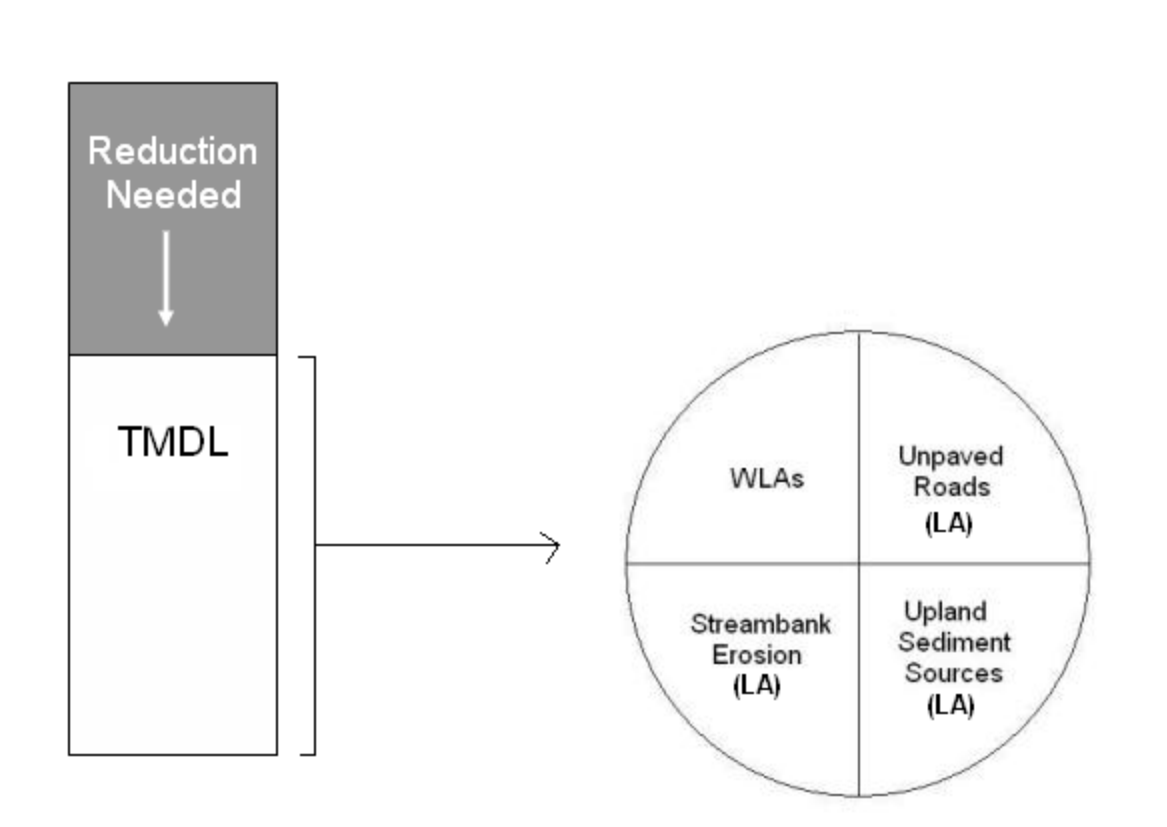
- GIS: Identification of road crossings and parallel segments
  - 1345 total road crossings in Tobacco TPA
    1231 of those are unpaved
  - 19.2 miles of unpaved parallel road segments within 50 feet of stream channels
- 2008 field data collection
  - 50 unpaved road x-ings & 10 parallel segments evaluated
  - Sites captured various land ownership & landscape types (mtn, foothill, valley), and also road design and soil type
- Sediment modeling: Water Erosion Prediction Project Methodology (WEPP:Road)

Unpaved Roads Reduction Method (Appendix F)

- WEPP:Road predicts sediment yield based on specific soil, climate, ground cover, and topographic conditions
- BMP sediment reduction for road crossings was evaluated based on a reduction in contributing road length


QUESTIONS?
NEXT: TMDLs & Allocations

Tobacco TMDL Allocations (Section 5.6)



Natural Loads and Margins of Safety are implicitly incorporated into the Tobacco sediment allocations

Presentation of Tobacco TMDL Allocations (Section 5.7)

- **Streambank Erosion:**

  Although sediment load associated with bank erosion is presented in separate sources categories (e.g. transportation, grazing, cropland), the allocation is presented as a collective percent reduction expected from human sources

Presentation of Tobacco TMDL Allocations (Section 5.7)

Upland Sediment Sources:

- Derived by modeling the reduction in sediment loads that will occur by increasing ground cover through upland BMP implementation and also increasing the trapping efficiency (health) of the vegetated riparian buffer through riparian BMPs
- Reductions are given for each subwatershed's major source categories (e.g. Forest, Range, Agriculture)

Presentation of Tobacco TMDL Allocations (Section 5.7)

Unpaved Roads

- Road crossings: allocations assumed a reduction in contributing road length to a maximum of 100 feet from each side of the crossing or 200 feet if contributing from one side

Deep Creek Allocations (Section 5.7.1)

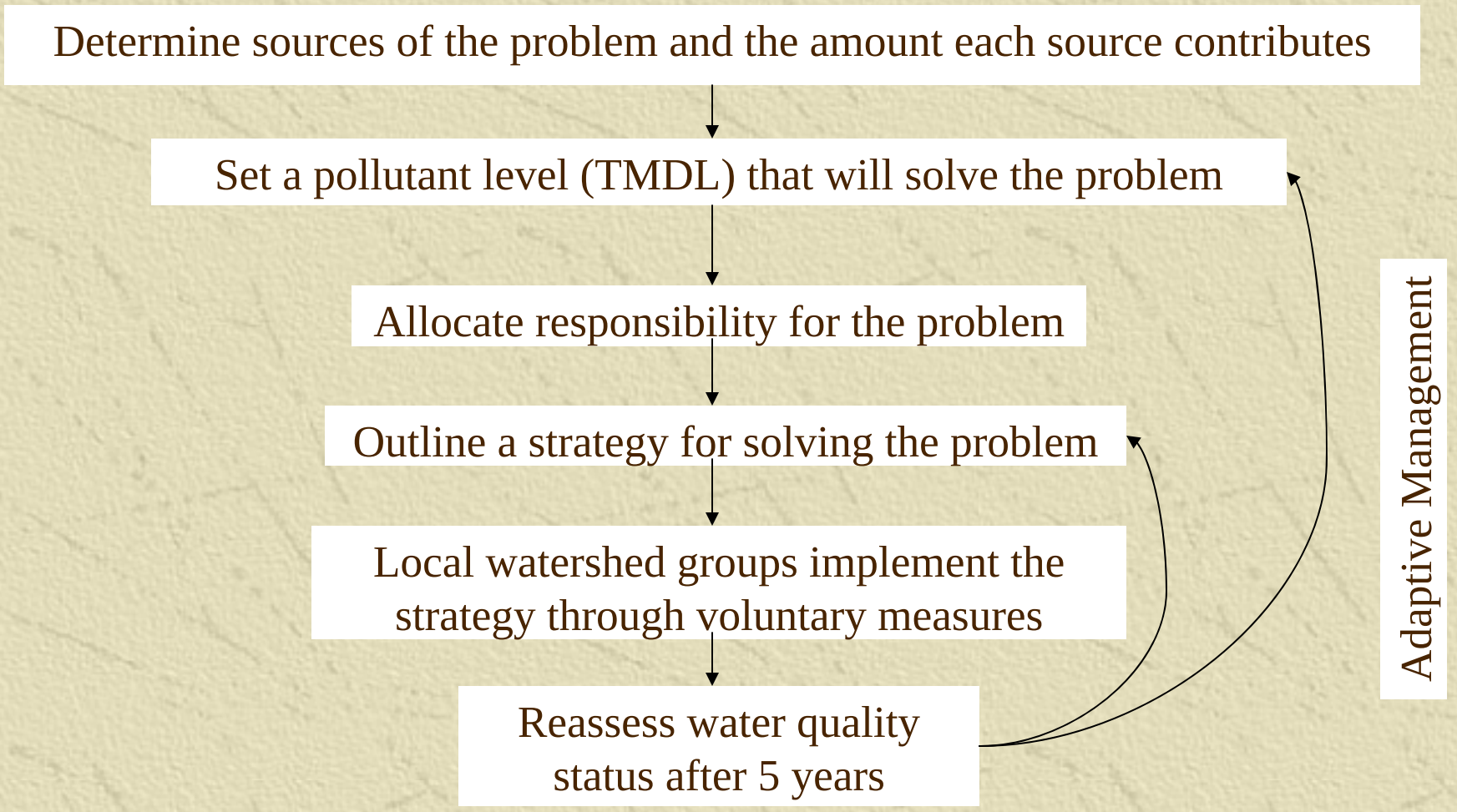
- Human Sources Include:
  - Roads/transportation
  - Grazing
  - Cropping
  - Forest Management
  - Historic Mining
- 15% of total sediment load from human sources
- 85% from naturally occurring sources

Source Category	Total Percent Reduction
Streambank Erosion	15%
Unpaved Roads	50%
Upland Sediment Forest Range Agriculture	15% Total 14 % 13 % 43 %
Total Sediment Load Reduction:	13%

QUESTIONS?

NEXT: Implementation, Other Impairments, Next Document Steps

TMDL Development & Adaptive Management



Implementation & Monitoring Strategy (Sections 6.0 and 7.0)

- Section 6.0 provides restoration approaches and BMP recommendations by source category
- Section 7.0 discusses development of a monitoring strategy to provide feedback on effectiveness of restoration strategies and an adaptive management approach to implementation.
- 5 – Year Reviews by DEQ

Watershed Management Recommendations & Restoration Approaches (Section 6.0)

- Eroding Banks are the primary controllable sediment source for most of the TMDLs
- Road BMPs and Riparian Improvements to Mitigate Erosion Delivery Also Important

Water gap limits cattle access to the stream and will allow the streambank to recover

Planted willows will subsequently stabilize the streambank

Water bar above Fortine Creek diverts storm water into the grass buffer above the stream

Therriault Creek

Watershed Management Recommendations & Restoration Approaches (Section 6.0)

The most important restoration approach for reducing sediment loading in the Tobacco River watershed is streamside riparian restoration and long-term riparian zone management.

What About Other Causes of Impairment??

- Habitat Alterations (riparian degradation)
- Nutrient Related Impacts
- Arsenic
- Temperature
- Flow Alterations
- Others?

Sediment Related Pollution Listings (Section 1.2 & Table 1-1)

Stream Name	Pollution Listings
Deep Creek	Alteration in stream-side or littoral vegetative covers
Fortine Creek	Alteration in stream-side or littoral vegetative covers
Lime Creek	Alteration in stream-side or littoral vegetative covers
Swamp Creek	Alteration in stream-side or littoral vegetative covers
Tobacco River	Physical substrate habitat alterations

Recommended restoration activities and goals for these will probably be discussed in a new document section (to be developed)

Additional Listed Causes of Impairment (Table 1-1)

Stream Name	Impairment Causes
Deep Creek	Excess Algal Growth
Fortine Creek	Excess Algal Growth Temperature Low flow alterations
Lime Creek	Arsenic Total Phosphorus (TP) Total Kjehldahl Nitrogen (TKN) Chlorophyll *a*
Swamp Creek	Low flow alterations

Nutrient Related Impairment Causes (Chlor-a, Excess Algal Growth, TP, TKN)

- Watershed scale nutrient sampling was conducted in 2007 & 2008
- Results suggest that there may not be nutrient related causes of impairment
- This information is not part of the sediment TMDL document

Arsenic

- Data collected for Lime Creek in 2008
- Possible linkage to natural background conditions
- This information is not part of the sediment TMDL document

Temperature & Flow

- Temperature work limited to multiple data loggers throughout the watershed between 2003 and 2005
- Temperature TMDL not pursued
- Temperature TMDL development will be a future requirement
- Flow alteration not evaluated; may be incorporated into future temperature TMDL work

What's Next (Sediment TMDL Document)

- **Advisory Group comments due by 5:00 pm Monday, November 30, 2009**
  - **Submit to CStaten@mt.gov**

- Final draft document will be completed
- Public Comment Period (Typically 30 days)
- Response to comments and completion of Final Document
- Submit to EPA for approval
- Approved plan ready for stakeholder implementation

FINAL QUESTIONS?