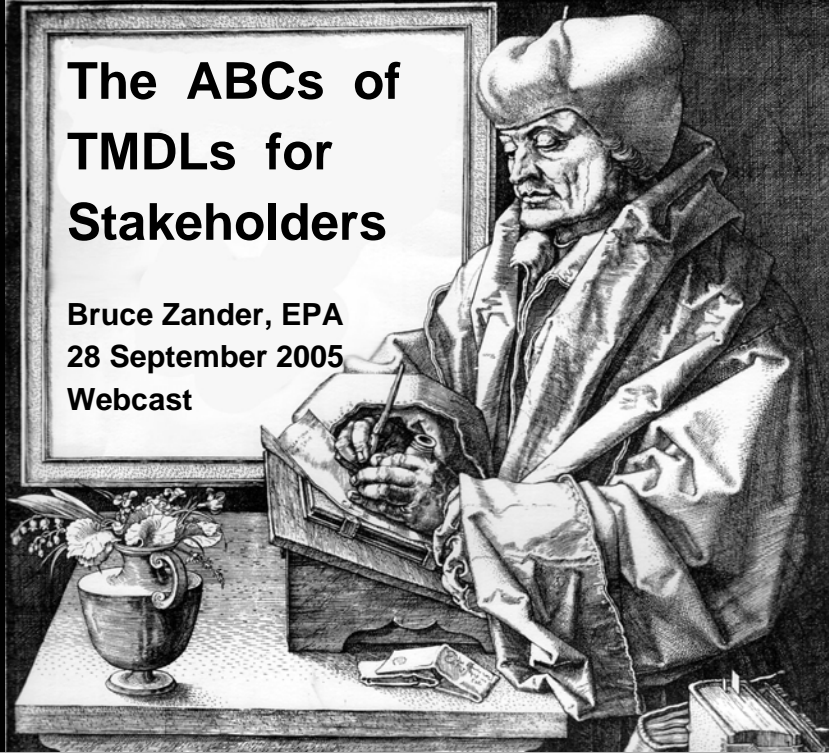


The ABCs of TMDLs for Stakeholders

**Bruce Zander, EPA
28 September 2005
Webcast**



Agenda

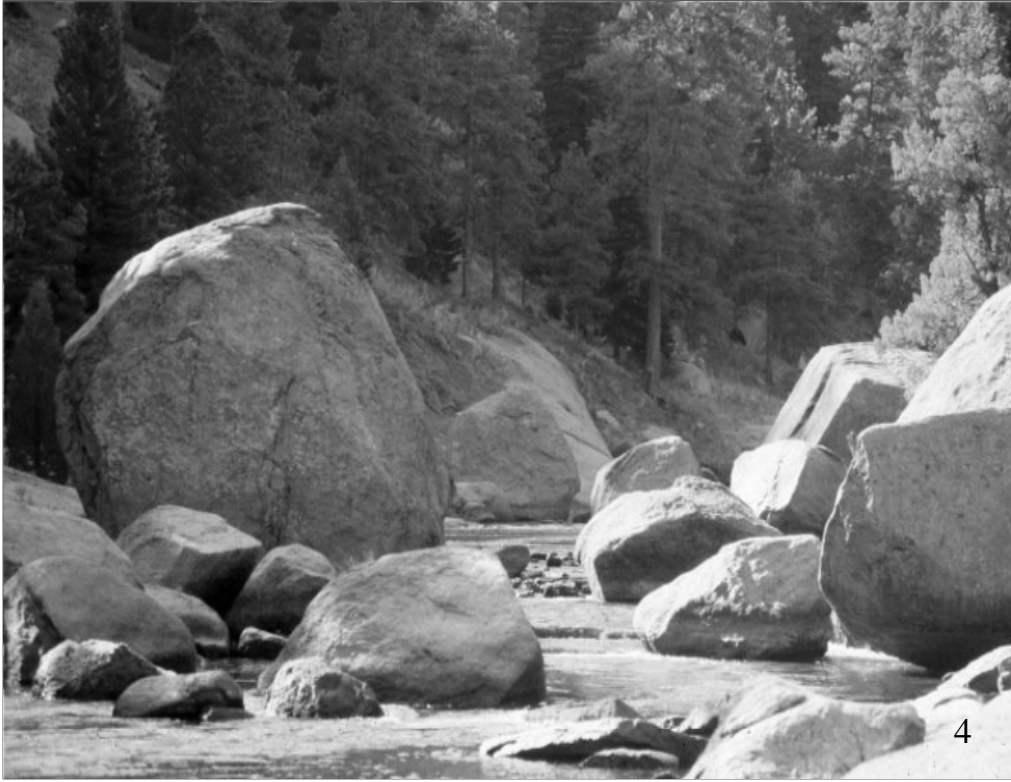
- Review the parts and pieces of the TMDL* program
- Understand terminology
- View some case examples
- Understand how TMDLs can be
you friend in the water quality
business.

* TMDL = total maximum daily load

Agenda

- Review the parts and pieces of the TMDL program
- Understand terminology
- View some case examples
- Understand how TMDLs can be your friend in the water quality business.











































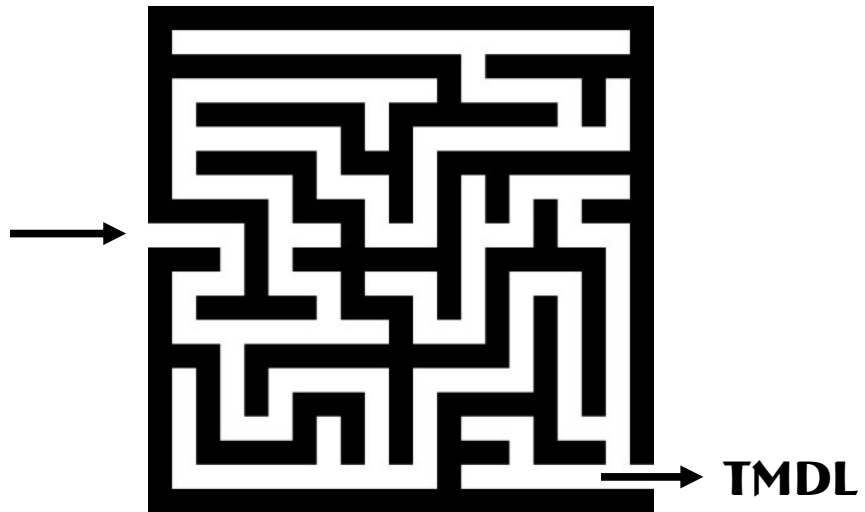








Clean Water Act Maze





Water Quality Controls in the Clean Water Act

- Technology-based controls
- Water quality-based controls

Water Quality Controls in the Clean Water Act

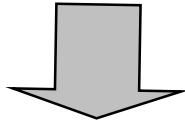
- Technology-based controls (*point sources*)
- Water quality-based controls

Water Quality Controls in the Clean Water Act

- Technology-based controls (*point sources*)
- Water quality-based controls (*point sources*
& *nonpoint sources*)

Water Quality Controls in the Clean Water Act

- Technology-based controls (*point sources*)
- Water quality-based controls (*point sources & nonpoint sources*)



TMDL agenda

Questions?



TMDL Definition

- The amount of a specific pollutant that a waterbody can receive and still meet water quality standards.
- A TMDL is made up of the sum of all the point source loads ("wasteload allocation") and load associated with nonpoint sources and background sources ("load allocation"). TMDLs must include a margin of safety (explicit or implicit) and consider seasonal variations.

TMDL Definition

$$\Sigma WLA + \Sigma LA + \{MOS\} = TMDL$$

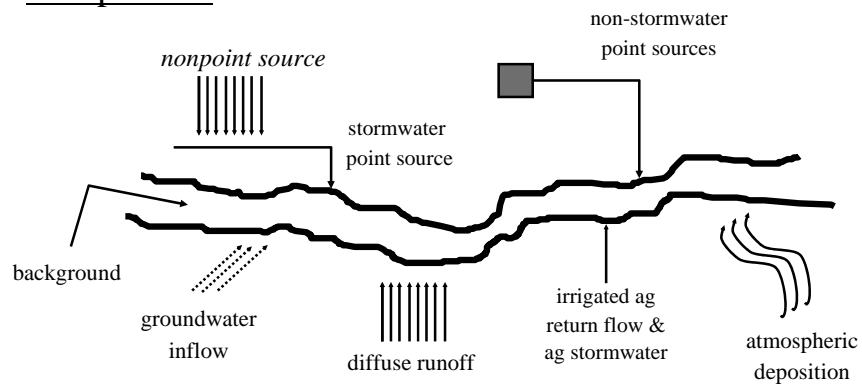
WLA = wasteload allocation
(point source loads)

LA = load allocation
(nonpoint source and background loads)

MOS = margin of safety (explicit or implicit)

TMDL = total maximum daily load

Wasteload Allocation Components



Load Allocation Components

Water Quality Standards

[Ref: 40 C.F.R. 130.7(b)(3)]

- **use classifications**
(e.g., aquatic life, irrigation, drinking water, recreation)
- **numeric standards**
(e.g., 5.0 mg/l dissolved oxygen with corresponding
averaging period and exceedence frequency)
- **narrative standards**
(e.g., "free from toxics")
- **antidegradation provisions**

Clean Water Act

TMDL Requirements in Section 303(d)

- identify impaired/threatened waterbodies
- develop TMDLs for those waters

Clean Water Act
TMDL Requirements



*303(d) Waterbody
List*

- identify impaired/threatened waterbodies
- develop TMDLs for those waters

Colorado 303(d) Waterbody List

Excerpt: Upper Colorado Basin

<u>Waterbody</u>	<u>Pollutants</u>	<u>Priority</u>
Blue River (French Gul. to Swan R.)	Cadmium, Zinc	medium
Snake River (below Peru Creek)	Cadmium, Zinc, Lead, Manganese,	medium
Peru Creek	Copper	medium
French Gulch (1.5 mile below Lincoln to mouth)	Cadmium, Copper, Manganese pH, Cadmium, Zinc	high
Straight Creek	Sediment	medium
Eagle River (Belden to Gore Creek)	Cadmium, Manganese, Zinc	low
Cross Creek (lower portion near mouth)	Cadmium, Manganese, Zinc	low
Eagle River (Gore Cr. to Colorado R.)		low
Coal Creek	Manganese	medium
Unnamed Trib in Willow Cr. watershed	Iron	low
Williams Fork River	Ammonia, Manganese	medium

Colorado 303(d) Waterbody List

Excerpt: Upper Colorado Basin

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Clean Water Act

TMDL Requirements in Section 303(d)

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- develop TMDLs for those waters

303(c)

Water Quality
Standards

- States/Tribes*
establish
- EPA reviews
& approves
- EPA has authority
to promulgate

** Authorized Tribes*

303(c)

303(d)

Water Quality
Standards → TMDLs

▪States/Tribes*
establish

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** Authorized Tribes*

303(c)

303(d)

303(e)

Water Quality
Standards



TMDLs



Water Quality
Controls*

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& approves

▪EPA has authority
to establish

▪Point Source
NPDES permits

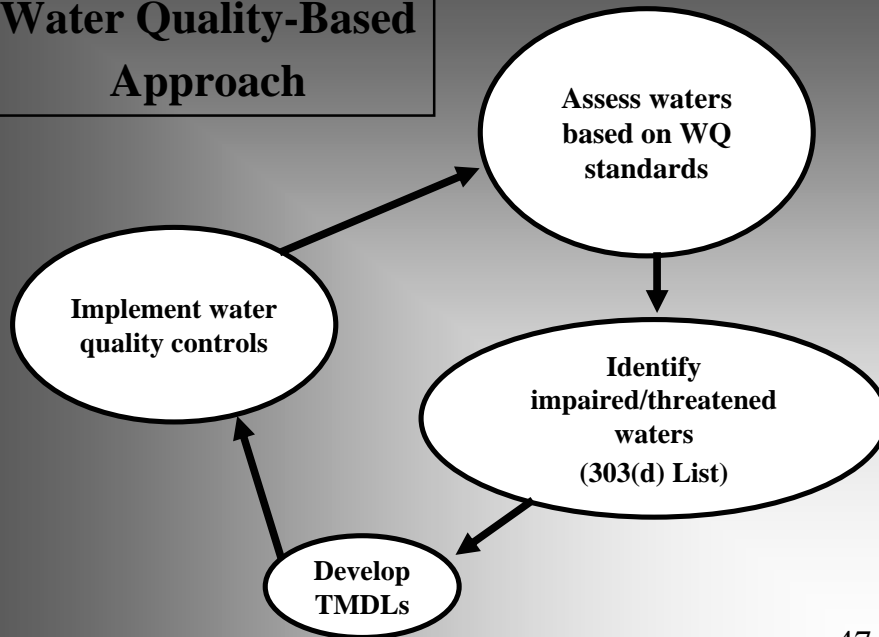
▪Nonpoint
management
practices

▪ - - -

▪ - - -

* Water quality controls include regulatory as well
as voluntary controls

Water Quality-Based Approach



Questions?







"Integrated Report"

State & Tribal Reporting of Water Quality Assessment Results

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

◆303(d) list - *list of impaired/threatened waters*

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

- ◆303(d) list - *list of impaired/threatened waters*
- ◆305(b) report - *report on overall health of waterbodies*

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

- ◆303(d) list - *list of impaired/threatened waters*
- ◆305(b) report - *report on overall health of waterbodies*
- ◆314 report - *report on the health of lakes/reservoirs*

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

- ◆303(d) list - *list of impaired/threatened waters*
- ◆305(b) report - *report on overall health of waterbodies*
- + ◆314 report - *report on the health of lakes/reservoirs*

Integrated Report

Due April 1 every even-numbered year.

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

- Category 1 - All uses are being attained
- Category 2 - Some uses are being attained
- Category 3 - Insufficient data to determine if any use is attained.
- Category 4 - Impaired/threatened, but no TMDL is needed.
- Category 5 - Impaired/threatened; TMDL needed.

Integrated Report

State & Tribal Reporting of Water Quality Assessment Results

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- Category 2 - Some uses are being attained
- Category 3 - Insufficient data to determine if any use is attained.
- Category 4 - Impaired/threatened, but no TMDL is needed.
- Category 5 - Impaired/threatened; TMDL needed.





Basic Provisions for TMDLs

- **TMDLs are designed to attain and maintain applicable water quality standards**
- **TMDLs apply to both point and nonpoint sources**
- **TMDLs apply to all pollutants**
- **TMDLs are pollutant-specific**
- **A waterbody will often have several TMDLs (one for each pollutant of concern)**

TMDLs can be described as:

- mass per time (e.g., pounds per day)
- toxicity (e.g., toxic units)
- other measure (e.g., % reduction)

Ref: 40 C.F.R. Part 130.2(i)

TMDL Implementation

- TMDLs are not self-implementing
 - Section 303(d) does not create any implementing authorities, TMDLs are implemented only through other programs and statutory mechanisms

- TMDLs do set the stage for implementation

- Implementation tools vary:
 - NPDES permits
 - other Federal, state, local laws & requirements
 - State and local laws and ordinances (enforceable & voluntary)
 - individual, voluntary-based actions

Dealing with Uncertainty in TMDLs

- Use margin of safety (explicit or implicit) to address uncertainties. The larger the uncertainty, the larger the margin of safety (MOS).
- Use phased TMDL* approach

* A phased TMDL is designed to achieve applicable water quality standards and is based on the best data and information that is available at the time the TMDL is established, but is subject to change as new data and information is collected. Using the phased TMDL approach triggers the need to include a monitoring plan in the TMDL.

Questions?



TMDL Review Criteria

Is the TMDL approvable?

- Identification of waterbody/pollutant of concern
- Applicable water quality standards and numeric targets
- Technical analysis/supporting documentation
- Margin of safety & seasonality
- TMDL/loading capacity
- Wasteload & load allocations
- Reasonable assurances nonpoint source controls will be implemented if point source WLAs rely on those controls
- Public participation
- Monitoring plan (*for phased approach*)

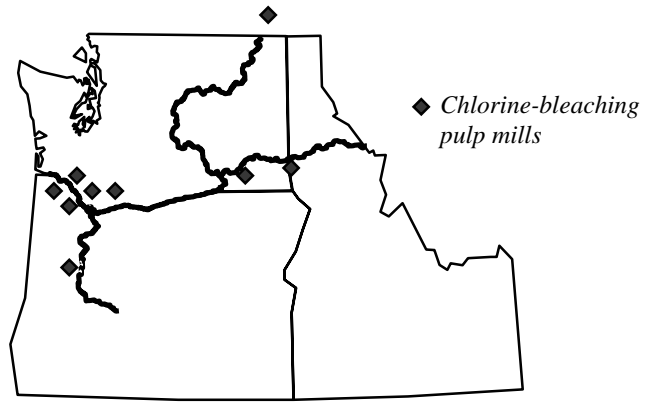
-
- Implementation plan (*not required*)





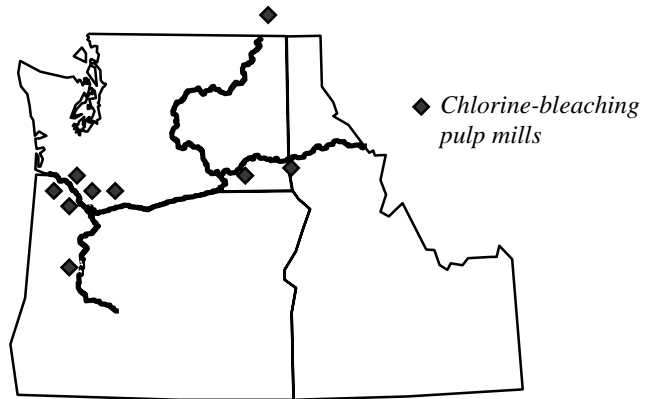
Columbia River Basin

Dioxin TMDL



Columbia River Basin

Dioxin TMDL



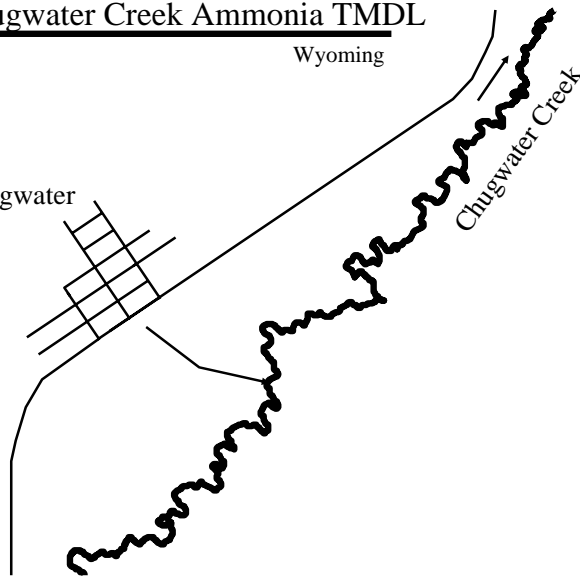
"complex TMDL"

Chugwater Creek Ammonia TMDL

Wyoming

Chugwater

Chugwater Creek



Chugwater Creek Ammonia TMDL

Wyoming

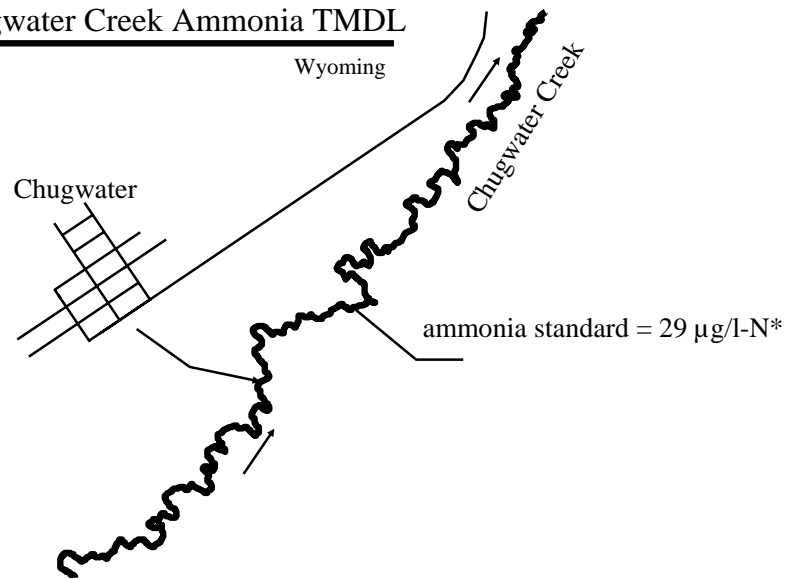
Chugwater

Chugwater Creek

"simple TMDL"

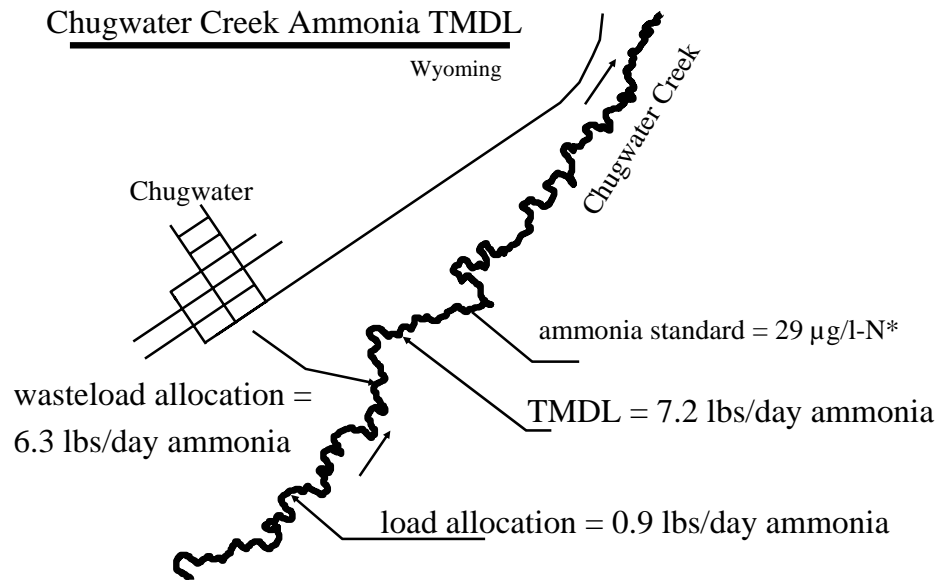
Chugwater Creek Ammonia TMDL

Wyoming



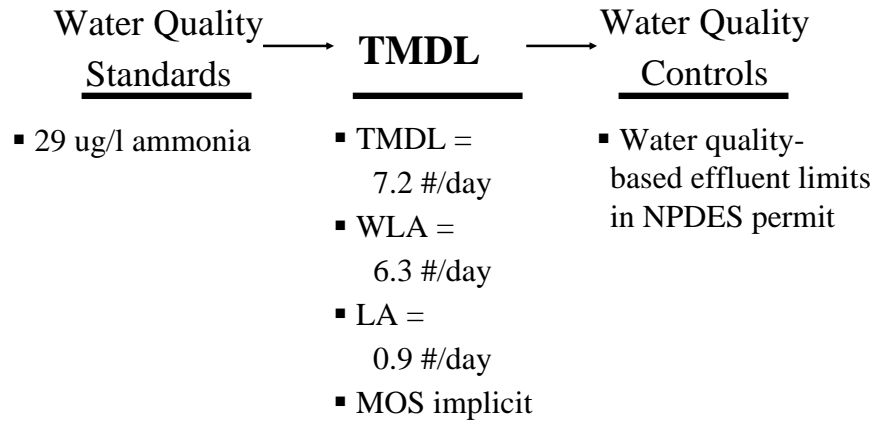
** 4 day average standard not to be exceeded once in 3 years*

Chugwater Creek Ammonia TMDL



** 4 day average standard not to be exceeded once in 3 years*

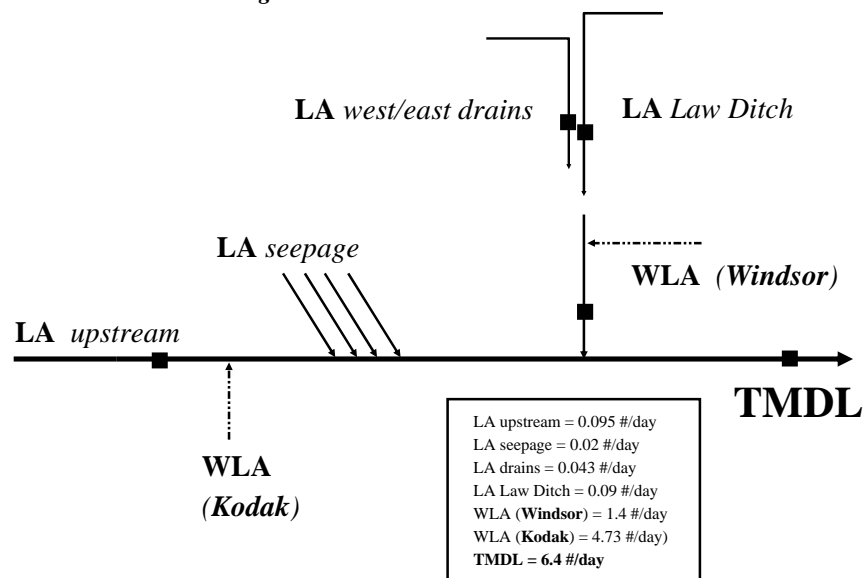
Chugwater Creek Ammonia TMDL



$$\Sigma WLA + \Sigma LA + \{MOS\} = TMDL$$

Cache la Poudre River Copper TMDL

Kodak & Windsor Dischargers - Colorado





Questions?

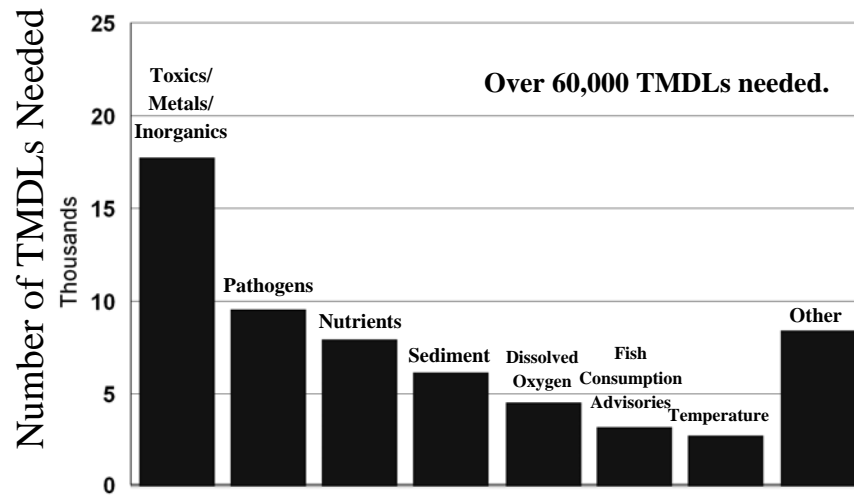






TMDLs Needed by Stressor Type

Numbers are for entire country.





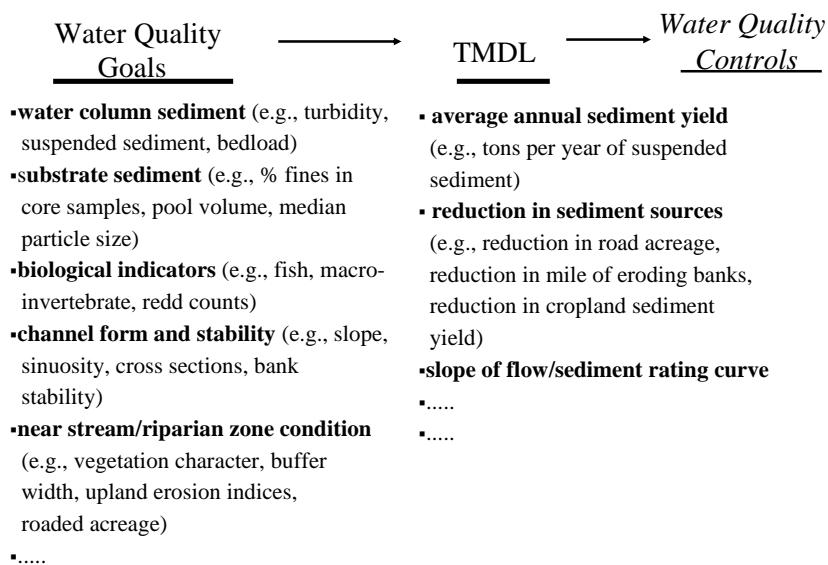


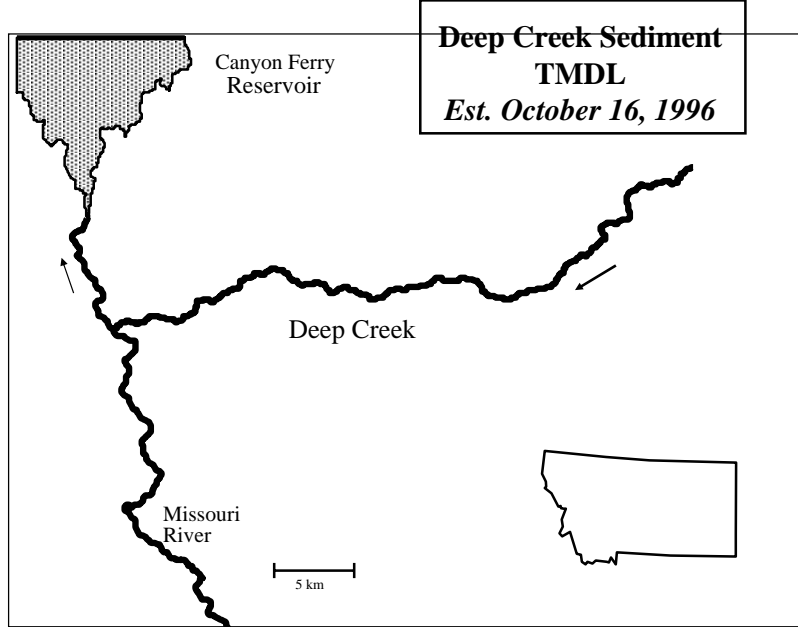
Sediment Water Quality Criteria Types

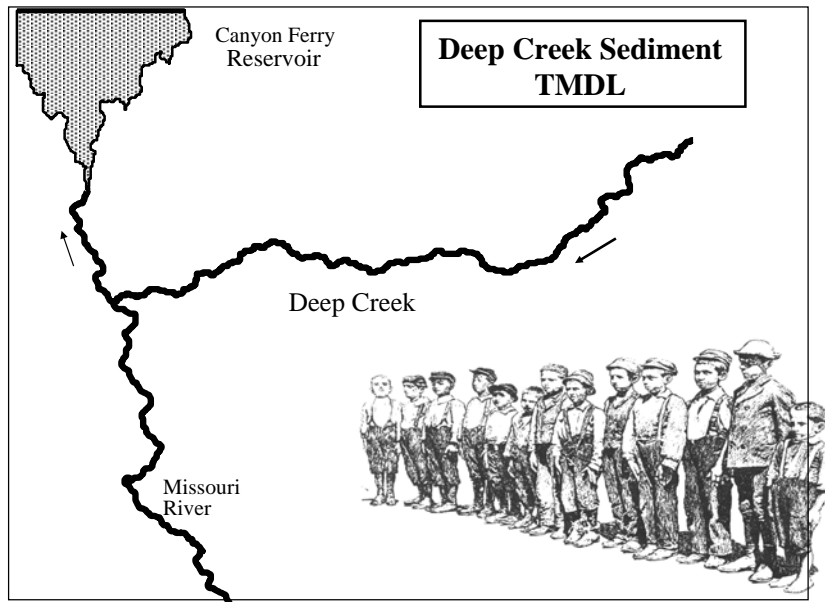
- water column sediment
- substrate sediment
- biological integrity
- channel form & stability
- near stream/riparian zone condition

Sediment TMDLs

Examples of how wq goals and TMDLs could be expressed







Deep Creek TMDL (MT)

Sediment



- Substrate sediment

30% substrate fines (<6.35 mm)

- Water temperature

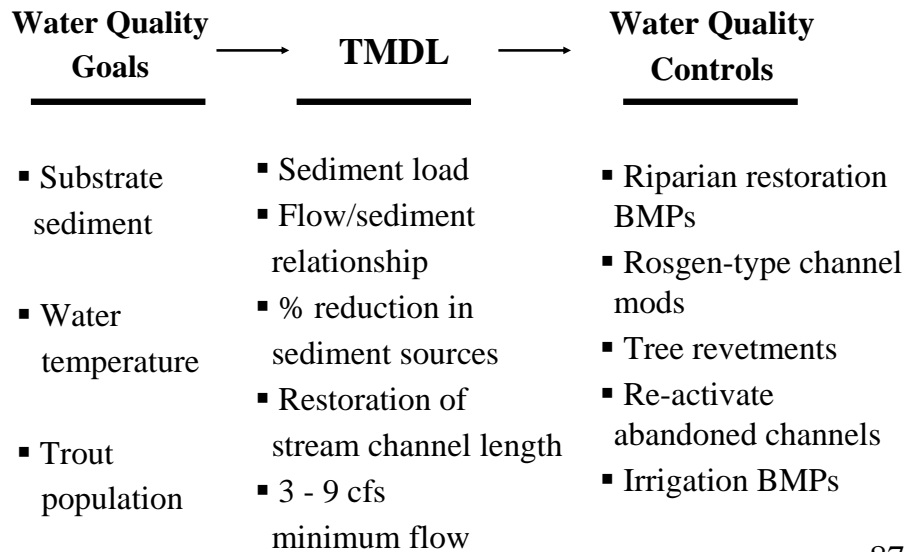
> 73°F in only 10 days annually

- Trout population

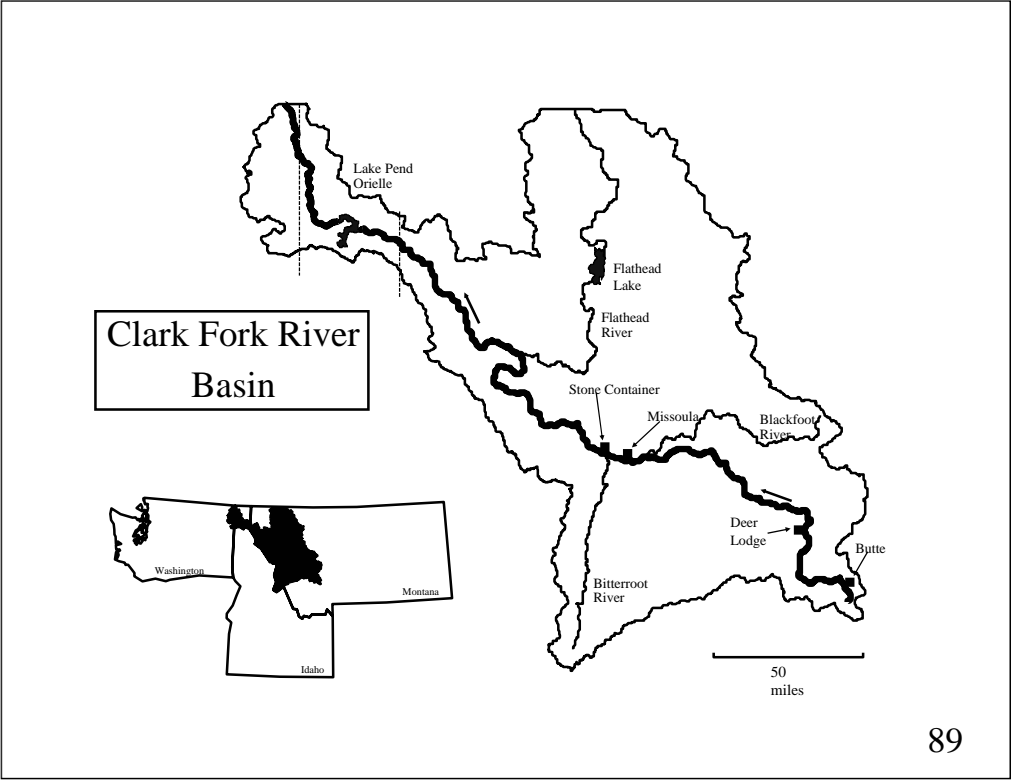
3,000 returning female trout captured/year

Deep Creek TMDL (MT)

Sediment









Clark Fork Nutrient Goals

benthic algal chlorophyll

Methods Used to Develop Goals

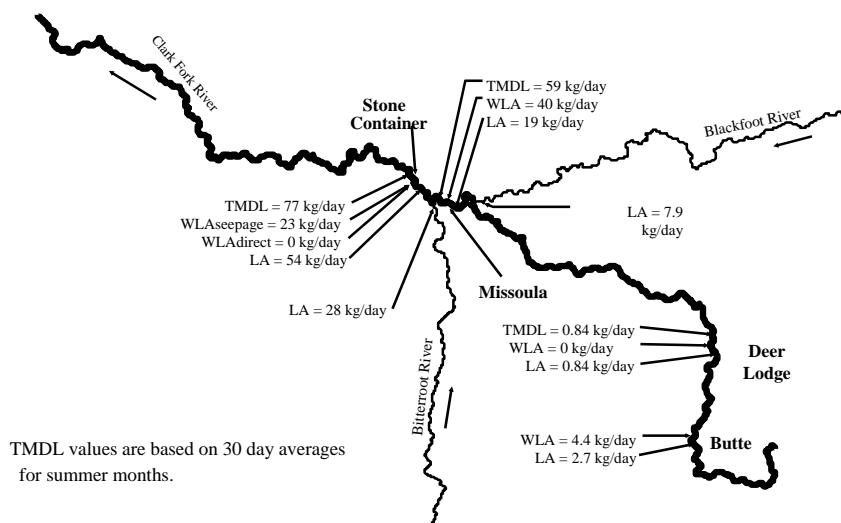
Based on State's Narrative Standards

artificial stream tests
nutrient uptake tests with Cladophora
cellular N/P analysis of Cladophora
reference reach approach
global regression of TN & chlorophyll *a*

Goals

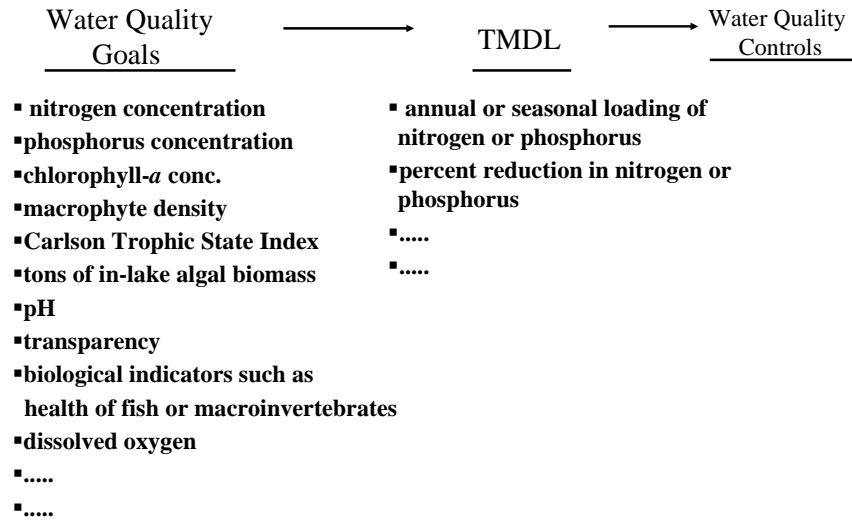
- 300 ug/l total nitrogen (30 day avg)
- 30 ug/l total phosphorus (30 day avg)
- 100 mg/m² chlorophyll *a* (30 day avg)
- 150 mg/m chlorophyll *a* (inst. max.)

Components of Phosphorus TMDL for the Clark Fork River



Nutrient TMDLs

Examples of how wq goals and TMDLs could be expressed

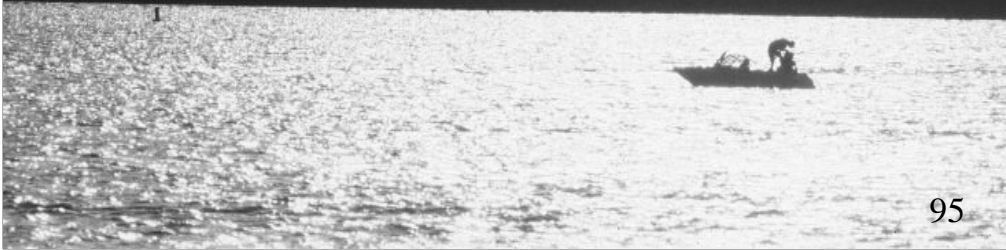


Questions?



Swan Lake TMDLs (MT)

Threatened Waterbody



Swan Lake TMDLs (MT)

Siltation & Dissolved Oxygen

Water Quality Goals	TMDL	Water Quality Controls
<ul style="list-style-type: none">▪ <u>Siltation targets</u><ul style="list-style-type: none">• secchi depth• TSS▪ <u>DO targets</u><ul style="list-style-type: none">• epilimnion DO• nutrient conc.• chlorophyll <i>a</i> conc.• organic carbon	<ul style="list-style-type: none">▪ <u>Siltation</u><ul style="list-style-type: none">• 40% reduction in sediment from certain road systems▪ <u>DO</u><ul style="list-style-type: none">• N & P allocations to septic tanks• POC & nutrient allocations to:<ul style="list-style-type: none">♦ riparian areas♦ timber harvesting	<ul style="list-style-type: none">▪ timber harvest BMPs▪ forest road BMPs▪ riparian protection BMPs to address future development▪ septic tank controls▪ restoration of fish passage



97

Shane Green, NRCS; Chalk Creek Project
Officer

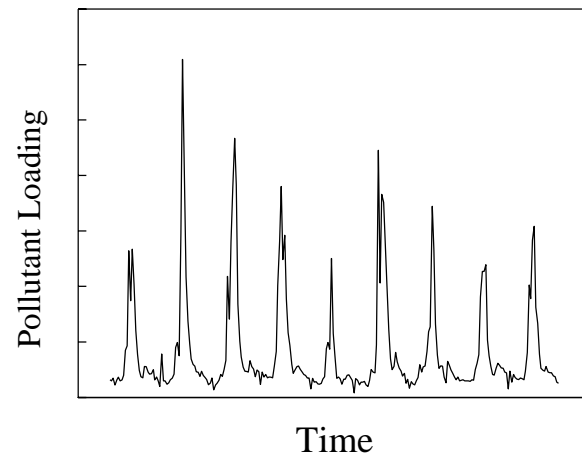
Public Participation

TMDLs involve some level of public involvement or review.

- The public should be involved from the very beginning of the process.
- It is recommended that a notification of the proposed TMDL be widely disseminated (e.g., newspapers, Internet).
- Notifications or solicitations for comments regarding the TMDL should clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review.
- When the TMDL is submitted to EPA for review, a copy of the comments received should be also submitted to EPA

Dealing with Temporal
Variability in Nonpoint Source TMDLs

Variable Pollutant Loading



Dealing with Temporal Variability in Nonpoint Source TMDLs

Examples

- Long Averaging Period

Chalk Creek, UT Sediment TMDL

93,000 tons/year sediment reduction (255 tons/day)

Dealing with Temporal Variability in Nonpoint Source TMDLs

Examples

- Long Averaging Period

Chalk Creek, UT Sediment TMDL

93,000 tons/year sediment reduction (255 tons/day)

- Reference Condition or Year

Lake Dillon, CO Phosphorus TMDL

10,165 lbs/year based on 1982 hydrologic conditions

Dealing with Temporal Variability in Nonpoint Source TMDLs

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93,000 tons/year sediment reduction (255 tons/day)

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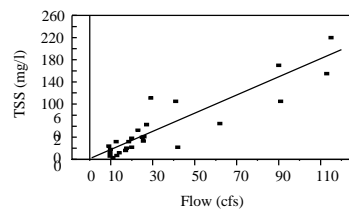
10,165 lbs/year based on 1982 hydrologic conditions

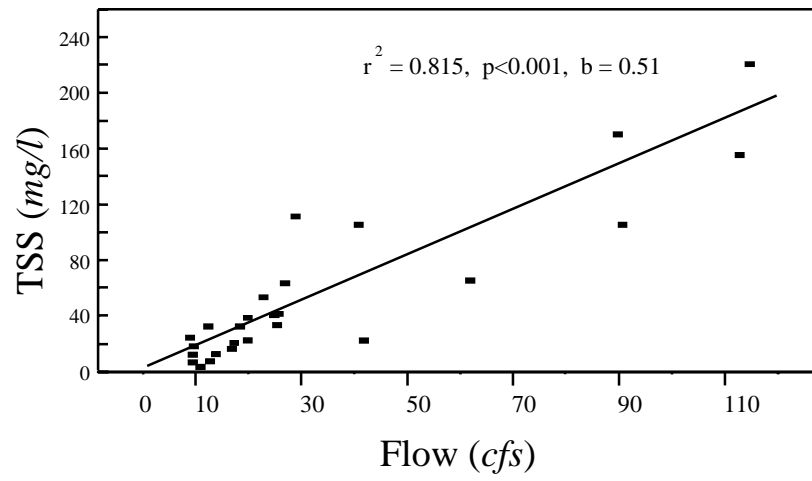
- Variable TMDL

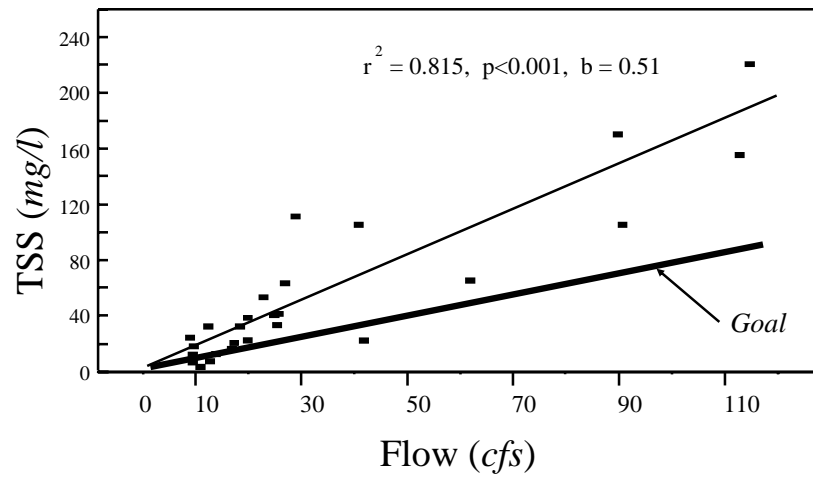
Deep Creek, Mt

Sediment TMDL

TMDL based on TSS/Flow







**Deep Creek: Relationship between TSS concentrations
and flow (Deep Creek, MT) (Endicott, et al., 1996)**

Dealing with Temporal Variability in Nonpoint Source TMDLs

Examples

- Long Averaging Period

Chalk Creek, UT Sediment TMDL

93,000 tons/year sediment reduction (255 tons/day)

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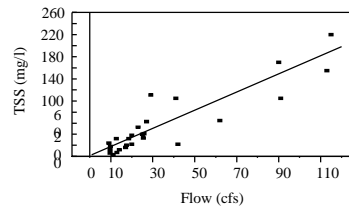
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- Variable TMDL

Deep Creek, Mt

Sediment TMDL

TMDL based on TSS/Flow



Allocation Options for TMDLs

Chap. 7; EPA's Sediment TMDL Protocol

- **Maximum allowable loads**

- . allocation to source categories, tributaries, channel types, specific parcels, erosion process categories

- **Percentage reduction targets**

- . reduction from estimated baseline load

- **Performance-based actions or practices**

- . for example, allocation of responsibilities of BMPs distributed throughout watershed

All allocation methods must demonstrate that water quality standards will be met.

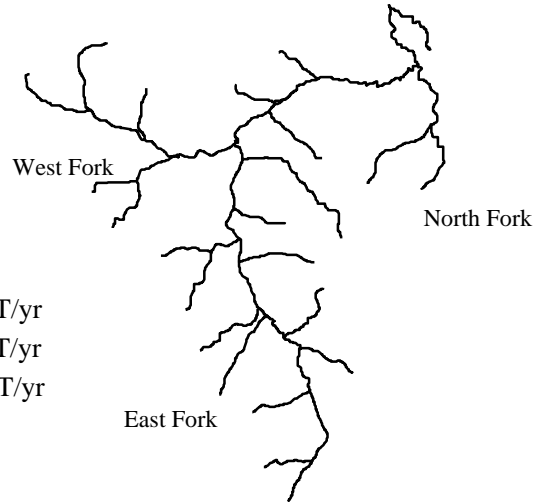
Allocation Methods

Example: **Maximum allowable loads**

<u>Tributary</u>	<u>Load</u>
East Fork	10,000 T/yr
West Fork	20,000 T/yr
North Fork	5,000 T/yr

or

<u>Land Use</u>	<u>Load</u>
Channel/Riparian	10,000 T/yr
Rangeland	20,000 T/yr
Forested Area	1,000 T/yr



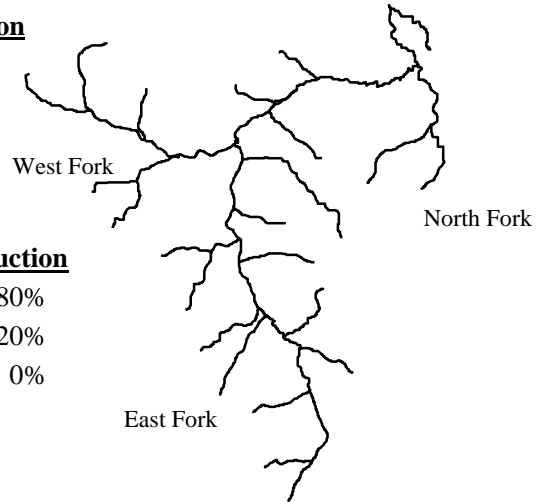
Allocation Methods

Example: **Percent Reduction**

<u>Tributary</u>	<u>Load Reduction</u>
East Fork	40%
West Fork	20%
North Fork	0%

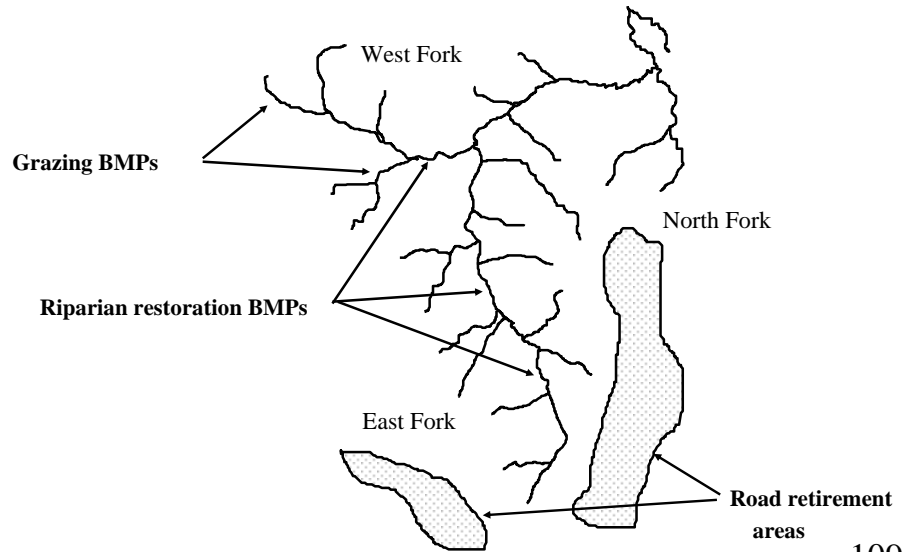
or

<u>Land Use</u>	<u>Load Reduction</u>
Channel/Riparian	80%
Rangeland	20%
Forested Area	0%



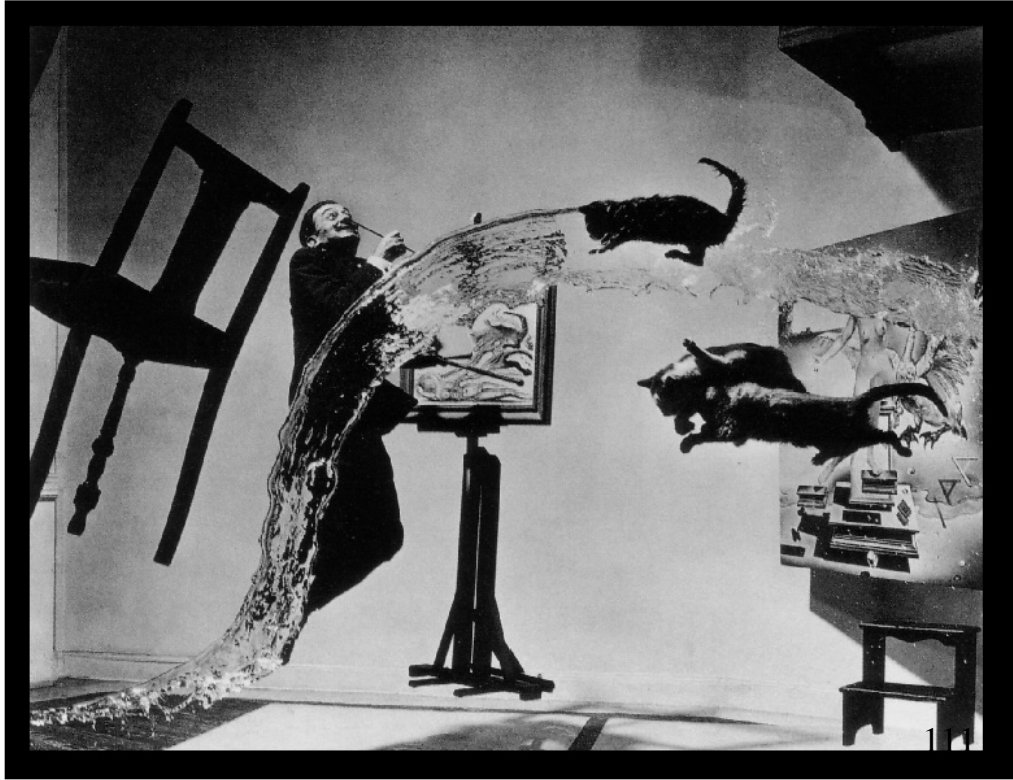
Allocation Methods

Example: **Performance Based Actions**



Questions?









Monitoring in the TMDL Process



- document extent of impairment
- define numeric endpoints/targets

- identify sources/ causes of pollutant loads
- support modeling in TMDL development

- document effectiveness of controls


Relationship to other Clean Water Programs

- Water quality standards
- Monitoring and Assessment
- Section 319 nonpoint source program
 - consistency between 303(d) list and 319 project priorities
 - TMDL development precursor to or part of 319 project
- NPDES permitting
- Wetlands
- Watershed initiatives
- Water Quality Trading
- Tribal Programs
- CERCLA/Superfund
- Forest Planning/BLM Range Management

TMDL Development: *An Ongoing Process*

Why?

- water quality standards changed
- environmental conditions changed
- shifting priorities
- new water quality problems uncovered
- previous assumptions changed
- - - - -



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