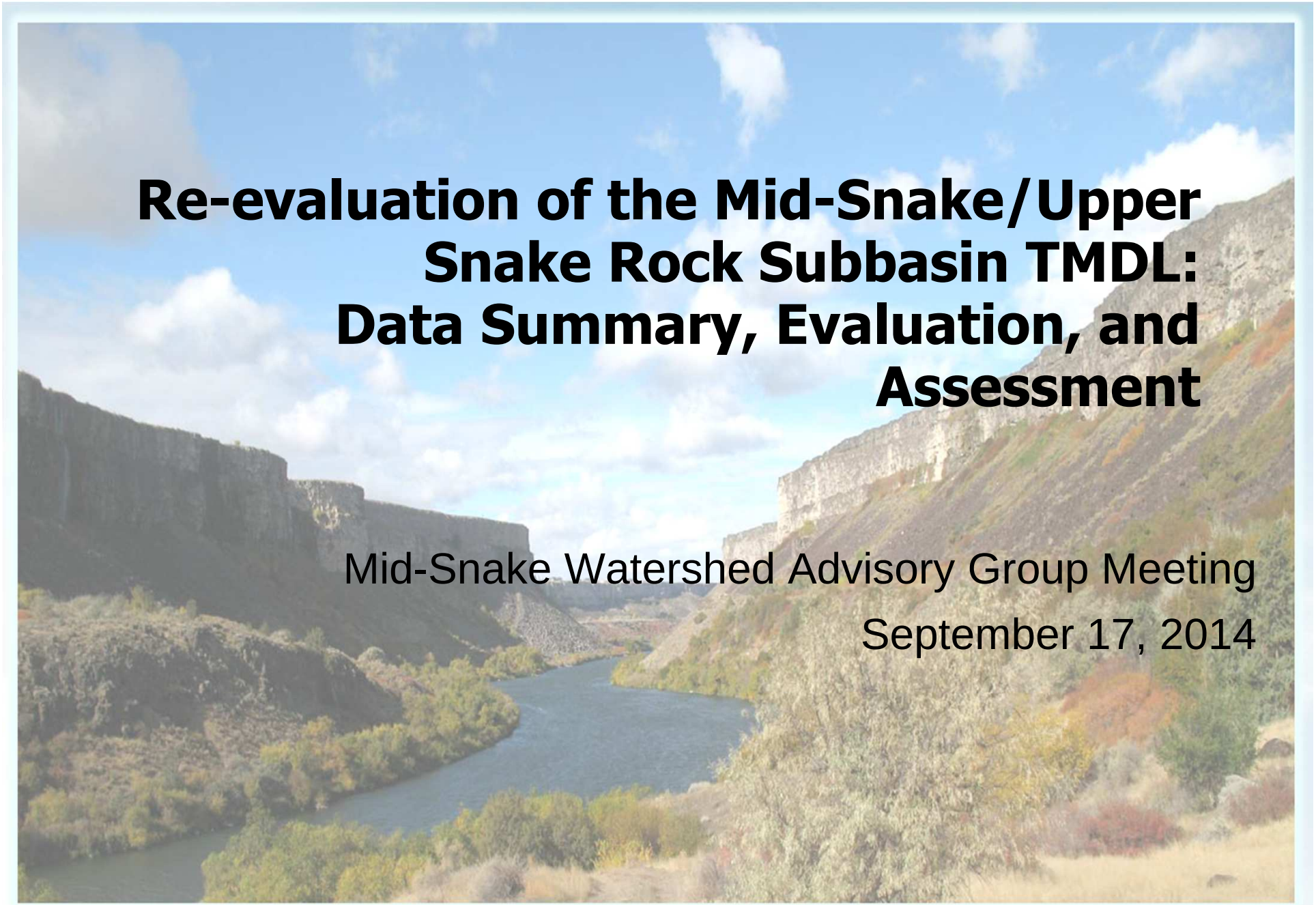


Re-evaluation of the Mid-Snake/Upper Snake Rock Subbasin TMDL: Data Summary, Evaluation, and Assessment

Mid-Snake Watershed Advisory Group Meeting

September 17, 2014

TMDL Data Assessment

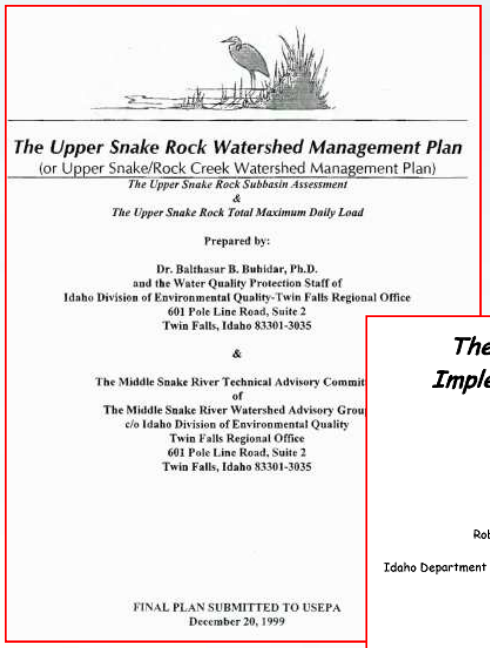
Discussion Overview

- **Background**
- **2013 Report -- Comments Received**
- **Modifications and Material Added**
- **Results Summary**
- **Key Findings**
- **Next Steps**

Mid-Snake TMDL

Activity to Date

Initial TMDL in 1997, *followed by …*



The Upper Snake Rock Watershed Management Plan
(or Upper Snake/Rock Creek Watershed Management Plan)
The Upper Snake Rock Subbasin Assessment
&
The Upper Snake Rock Total Maximum Daily Load

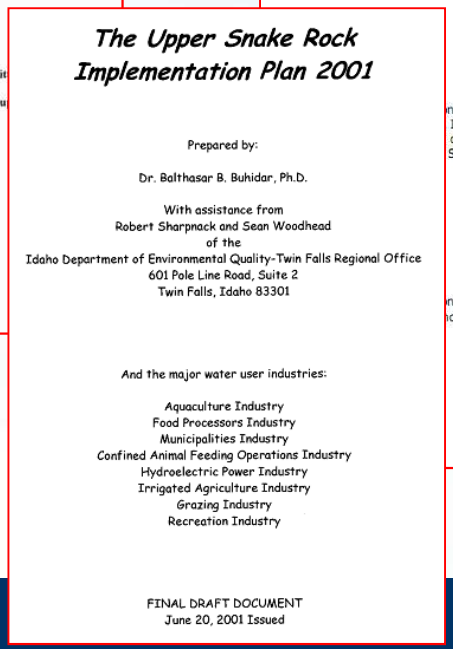
Prepared by:

Dr. Balthasar B. Buhidar, Ph.D.
and the Water Quality Protection Staff of
Idaho Division of Environmental Quality-Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

&

The Middle Snake River Technical Advisory Commit
of
The Middle Snake River Watershed Advisory Grou
c/o Idaho Division of Environmental Quality
Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

FINAL PLAN SUBMITTED TO USEPA
December 20, 1999



The Upper Snake Rock Implementation Plan 2001

Prepared by:

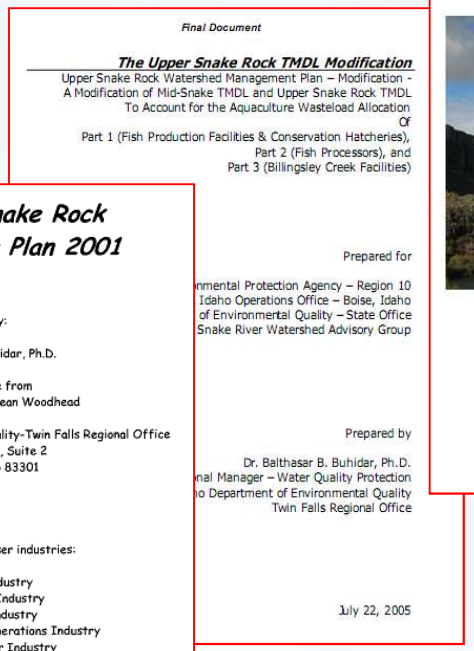
Dr. Balthasar B. Buhidar, Ph.D.

With assistance from
Robert Sharpnack and Sean Woodhead
of the
Idaho Department of Environmental Quality-Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301

And the major water user industries:

Aquaculture Industry
Food Processors Industry
Municipalities Industry
Confined Animal Feeding Operations Industry
Hydroelectric Power Industry
Irrigated Agriculture Industry
Grazing Industry
Recreation Industry

FINAL DRAFT DOCUMENT
June 20, 2001 Issued



Final Document

The Upper Snake Rock TMDL Modification
Upper Snake Rock Watershed Management Plan – Modification -
A Modification of Mid-Snake TMDL and Upper Snake Rock TMDL
To Account for the Aquaculture Wasteload Allocation
Of
Part 1 (Fish Production Facilities & Conservation Hatcheries),
Part 2 (Fish Processors), and
Part 3 (Billingsley Creek Facilities)

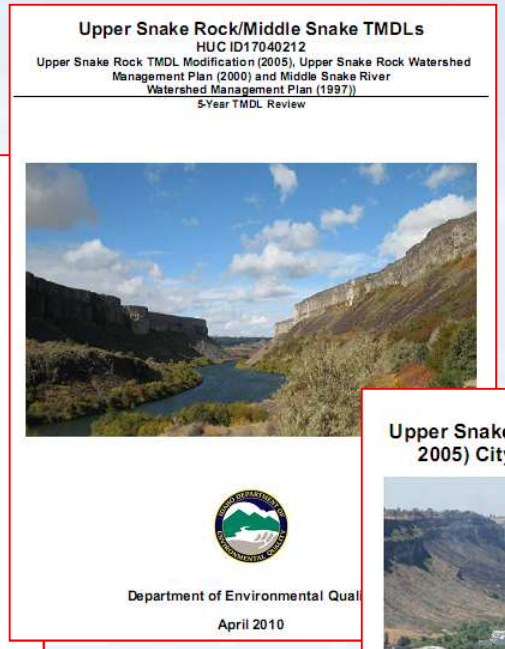
Prepared for

nmental Protection Agency – Region 10
Idaho Operations Office – Boise, Idaho
of Environmental Quality – State Office
Snake River Watershed Advisory Group

Prepared by

Dr. Balthasar B. Buhidar, Ph.D.
nal Manager – Water Quality Protection
o Department of Environmental Quality
Twin Falls Regional Office

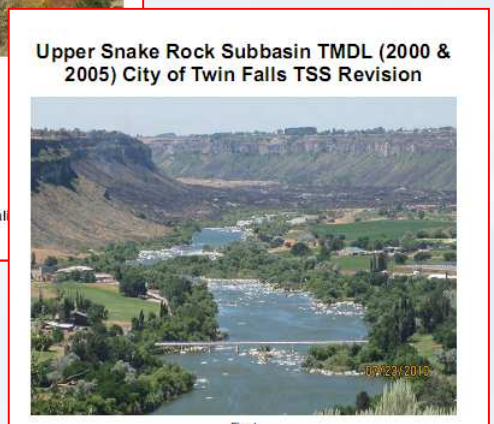
July 22, 2005



Upper Snake Rock/Middle Snake TMDLs
HUC ID17040212
Upper Snake Rock TMDL Modification (2005), Upper Snake Rock Watershed Management Plan (2000) and Middle Snake River Watershed Management Plan (1997))
5-Year TMDL Review

Department of Environmental Quali

April 2010



Upper Snake Rock Subbasin TMDL (2000 & 2005) City of Twin Falls TSS Revision

Final

Department of Environmental Quality
January 2011

Mid-Snake TMDL

Activity to Date

1997 ► Initial Phosphorus TMDL

- ***Established TP & nuisance algal growth targets***
- ***Assessed low flow, high flow, & baseline years***
- ***Industry-wide WLA established for aquaculture (970.2 pounds /day)***
- ***WLAs established for municipalities***

2000 ► Phosphorus and Total Suspended Solids (TSS) TMDL

- ***Defined six TMDL study segments***
- ***WLAs set for municipalities***
- ***Placeholder for aquaculture facilities***

Mid-Snake TMDL

Activity to Date

2005 ► Phosphorus and TSS TMDL Modification

- ***WLAs established for aquaculture facilities***
- ***WLAs set for municipalities***

2010 ► DEQ Five-year Data Review

- ***TSS & E. coli targets achieved. TP targets <u>not</u> met.***
- ***TMDL did not employ a low flow assumption***
- ***Past decade flows substantially <u>lower</u> than TMDL assumptions***

2014 ► Current Issues

- ***Aquaculture general permit expired in 2012***
- ***Population & economic growth in the area***
- ***Discussion of water quality trading***
- ***WLA revision for Jerome Cheese, City of Jerome***

Data Assessment

Scope of Current Task

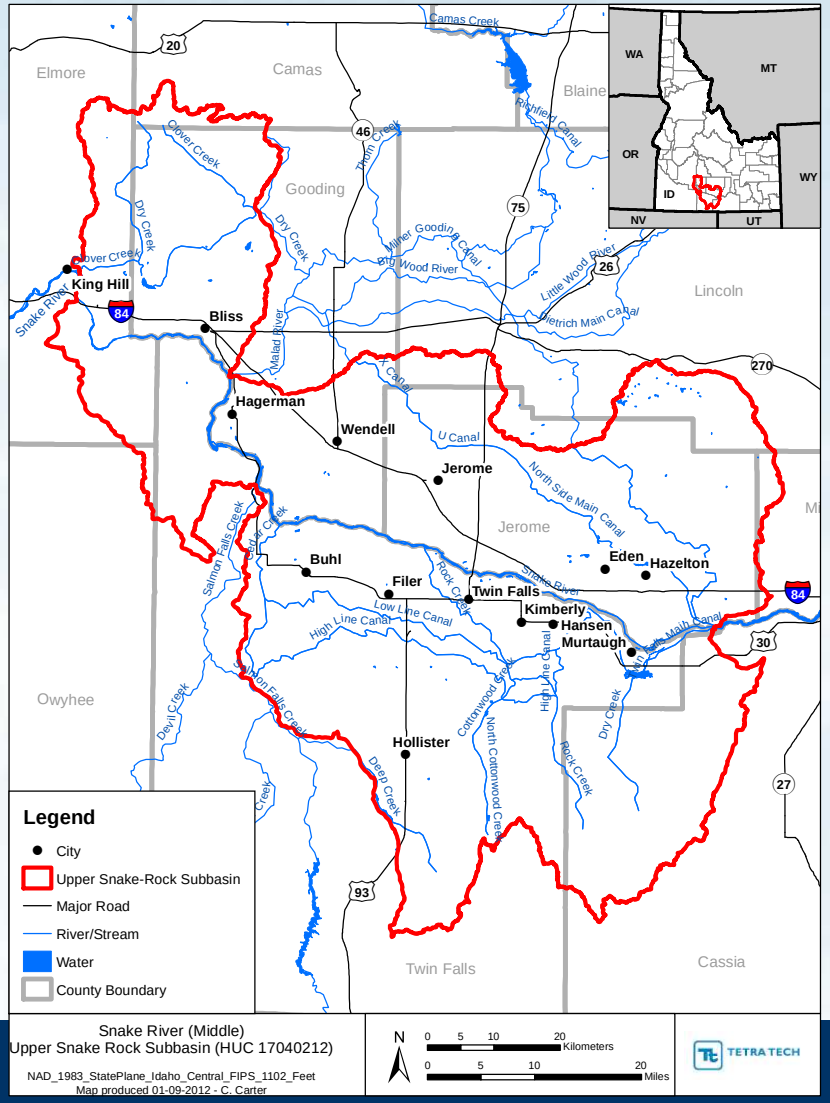
Integrated analysis of available data

- ***Total phosphorus conditions***
  - *Concentrations relative to 0.075 mg/L target*
  - *Loading patterns (sources, in-stream response)*
  - *Attenuation & uncertainty*
- ***Role of hydrology***
  - *Flow conditions over past decade*
  - *Comparison to TMDL assumptions*

Mid-Snake TMDL

WHY the Concern

- **Excessive Algal Growth**

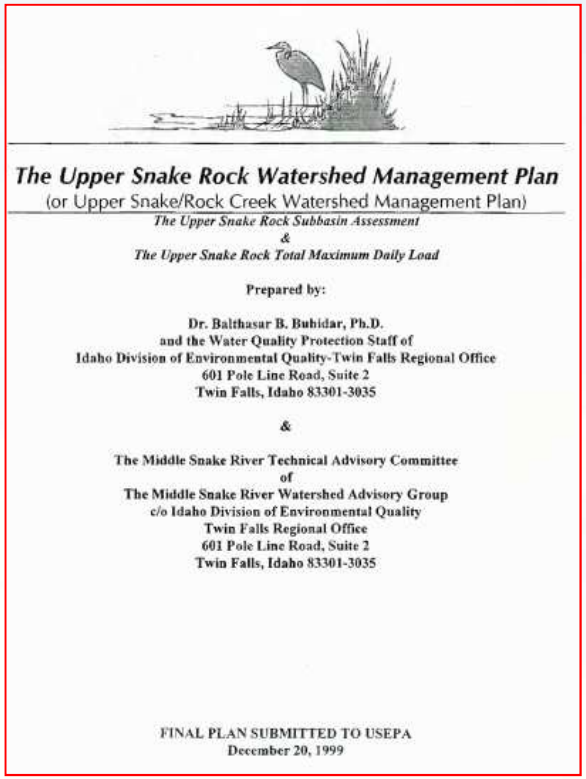


Mid-Snake TMDL

WHAT are the Targets

First TMDL established: March 1997

(EPA approval: April 1997)



The Upper Snake Rock Watershed Management Plan
(or Upper Snake/Rock Creek Watershed Management Plan)
The Upper Snake Rock Subbasin Assessment
&
The Upper Snake Rock Total Maximum Daily Load

Prepared by:

Dr. Balthasar B. Buhidar, Ph.D.
and the Water Quality Protection Staff of
Idaho Division of Environmental Quality-Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

&

The Middle Snake River Technical Advisory Committee
of
The Middle Snake River Watershed Advisory Group
c/o Idaho Division of Environmental Quality
Twin Falls Regional Office
601 Pole Line Road, Suite 2
Twin Falls, Idaho 83301-3035

FINAL PLAN SUBMITTED TO USEPA
December 20, 1999

Parameter	Target	2001-2010 Average
Total Suspended Solids *(mg/L)*	52 [1]	22.6 [3,4]
Total Phosphorus *(mg/L)*	0.075 [2]	0.091 [3]

Notes:

[1] Monthly average *(Daily maximum: 80 mg/L)*

[2] 0.1 mg/L for tributaries

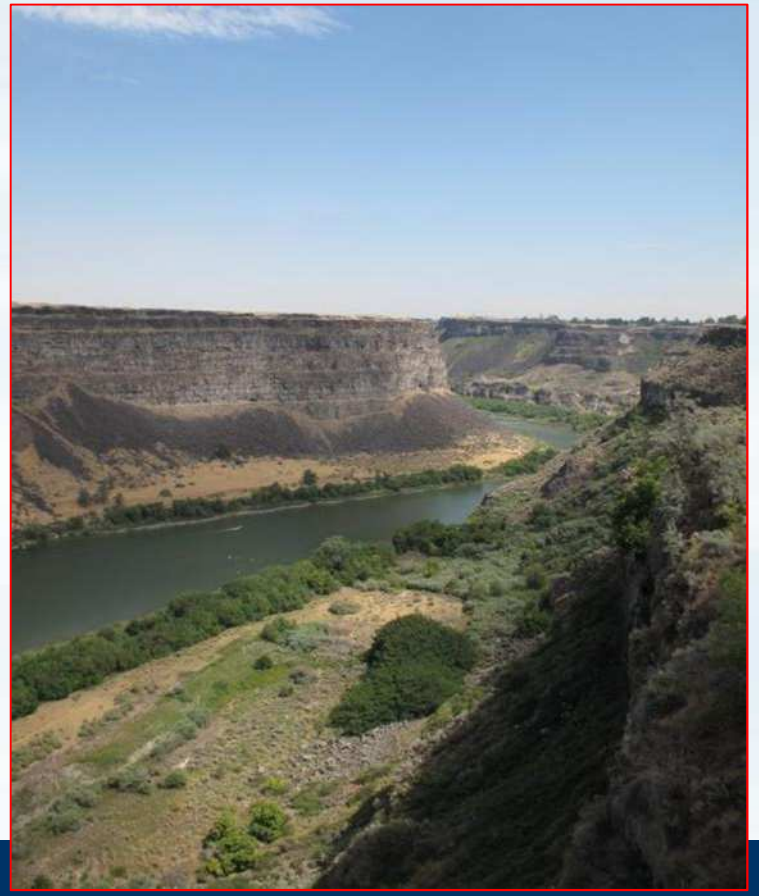
[3] Gridley Bridge monitoring site

[4] Maximum monthly average *(June)*

2013 Report

Comments and Additional Data

- **Watershed Advisory Group**
- **Clear Springs Food**
- **Idaho Power**
- **University of Idaho**
- **Twin Falls Canal**
- **Northside Canal**

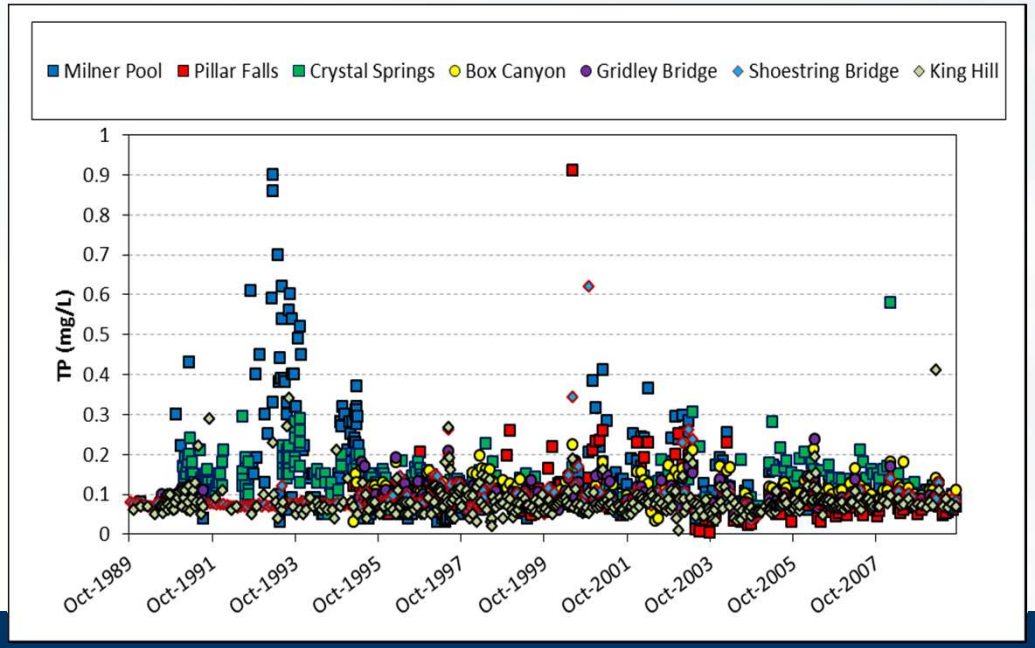


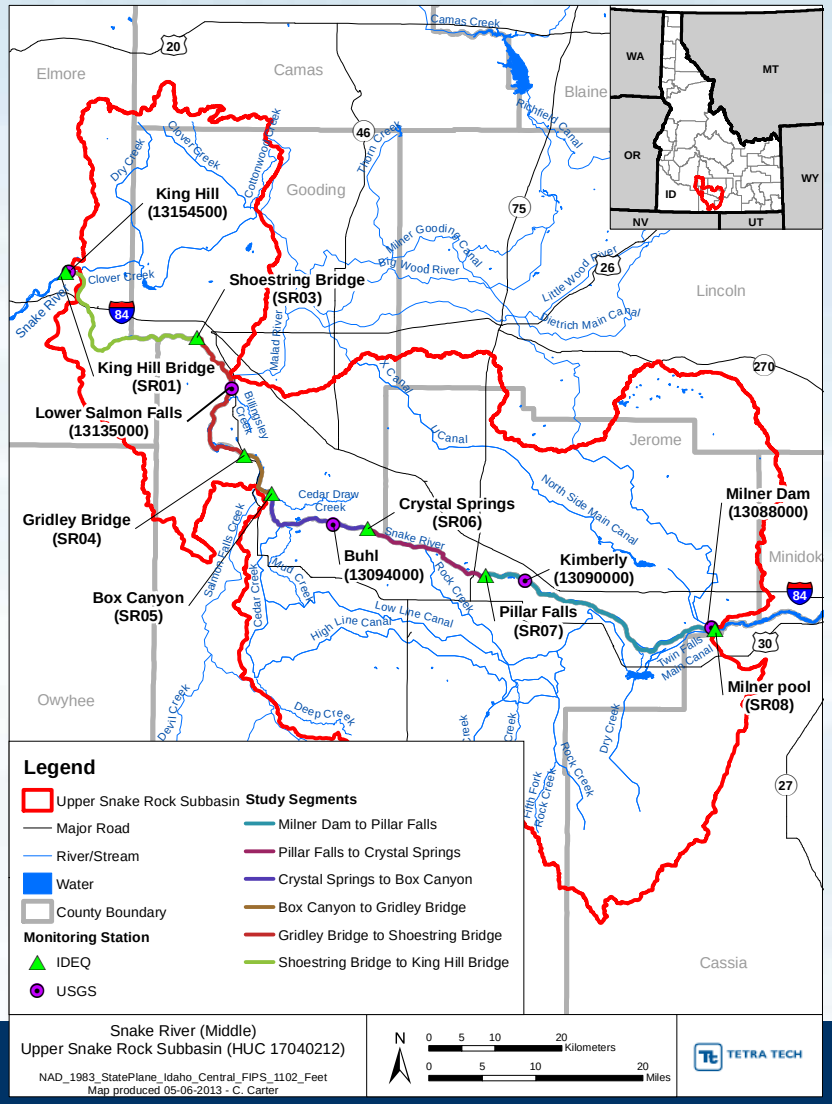
Mid-Snake TMDL

Adaptive Management

Data Driven Approach

- ***DEQ & USGS monitoring***
- ***Stakeholder sampling***

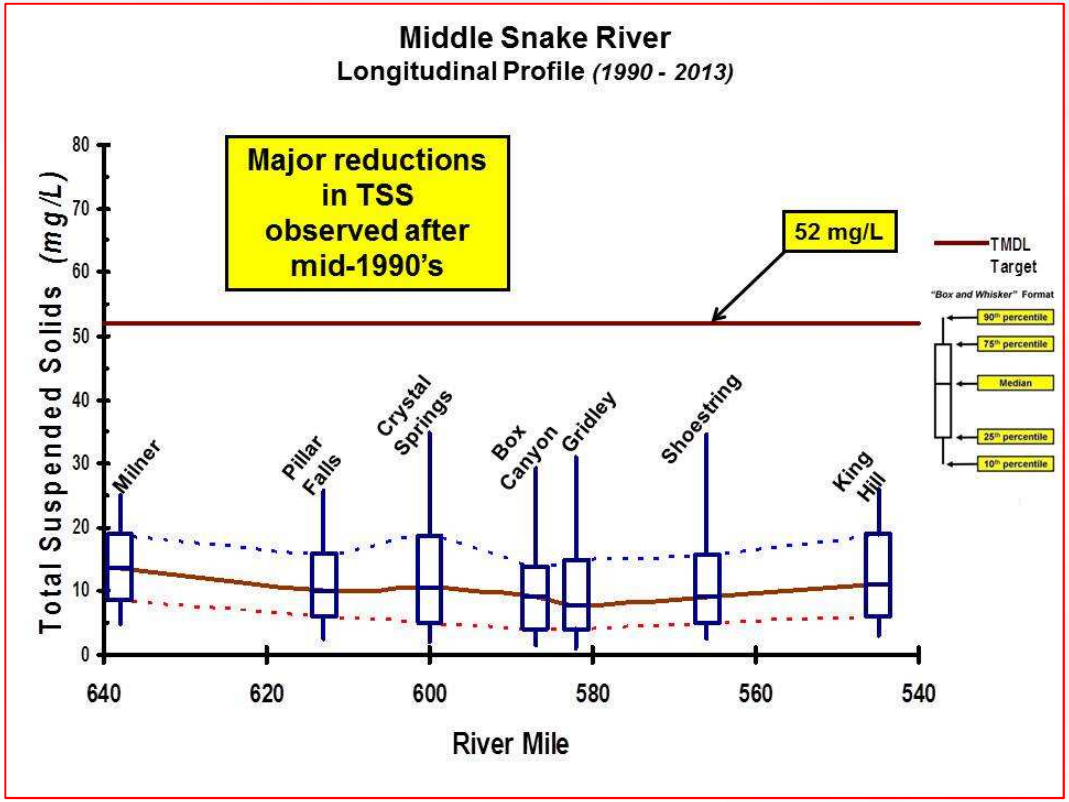


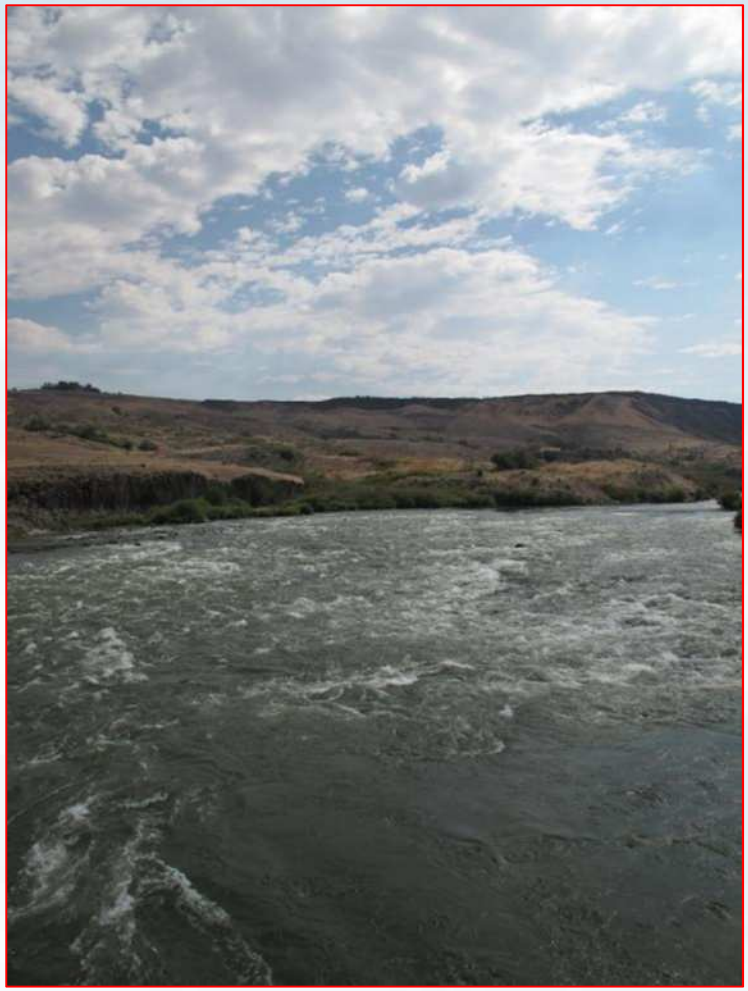


Data Driven Approach

Declining Trends

Total Suspended Solids

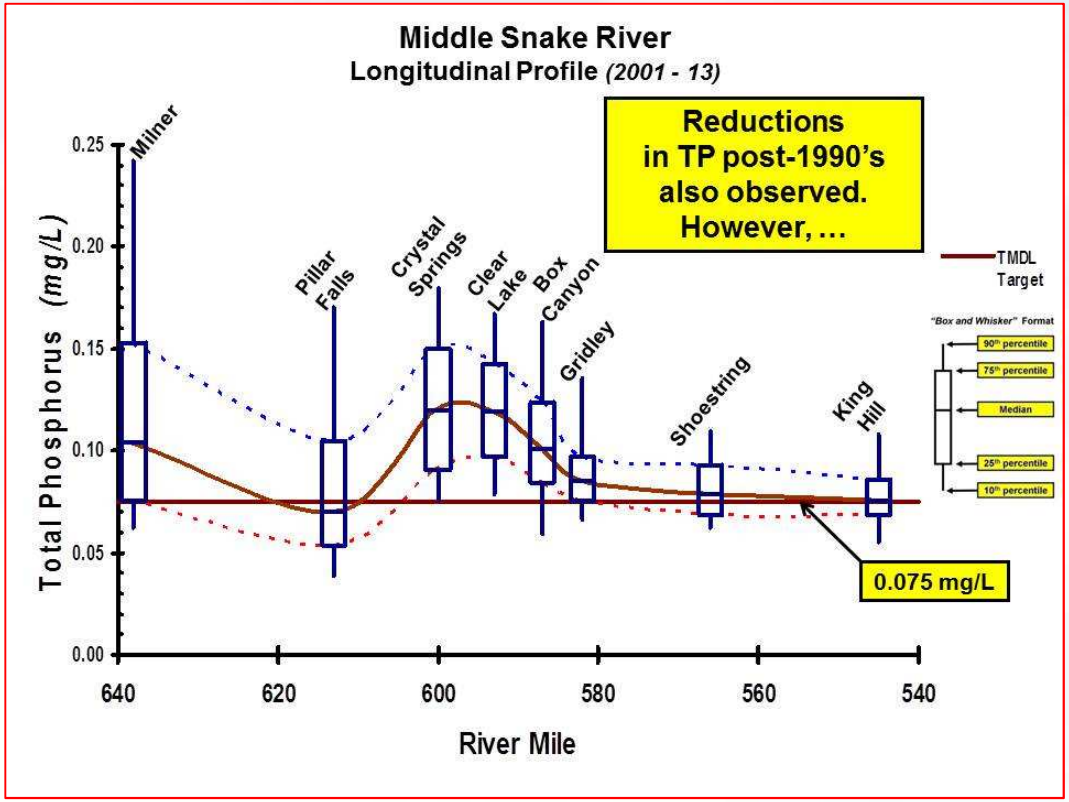


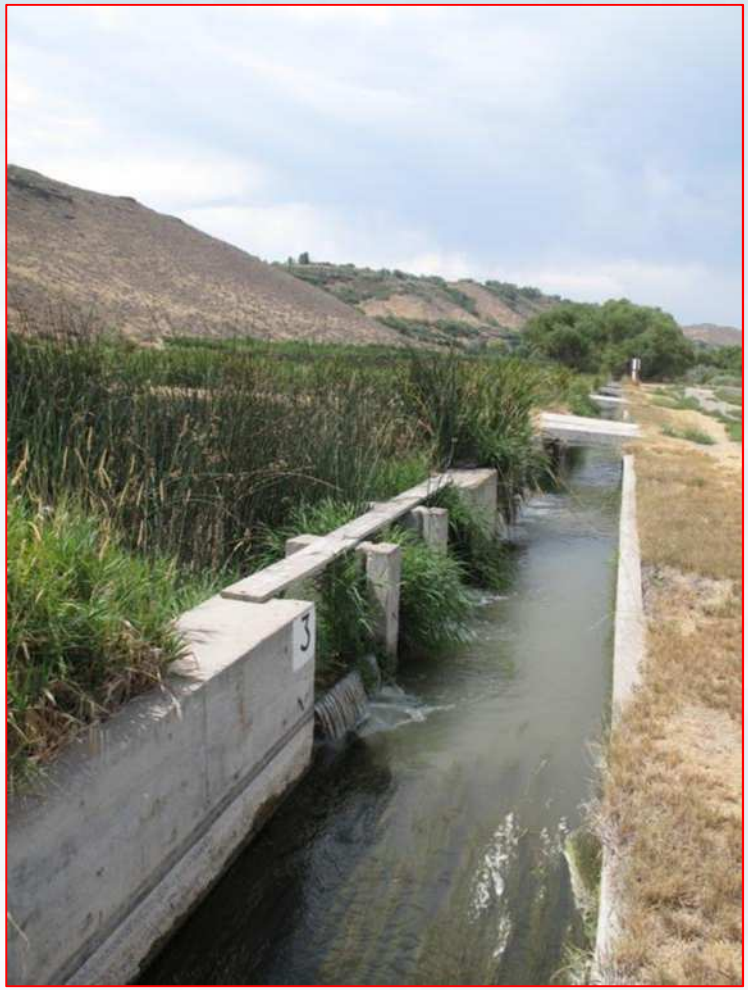


Data Driven Approach

Declining Trends

Total Phosphorus

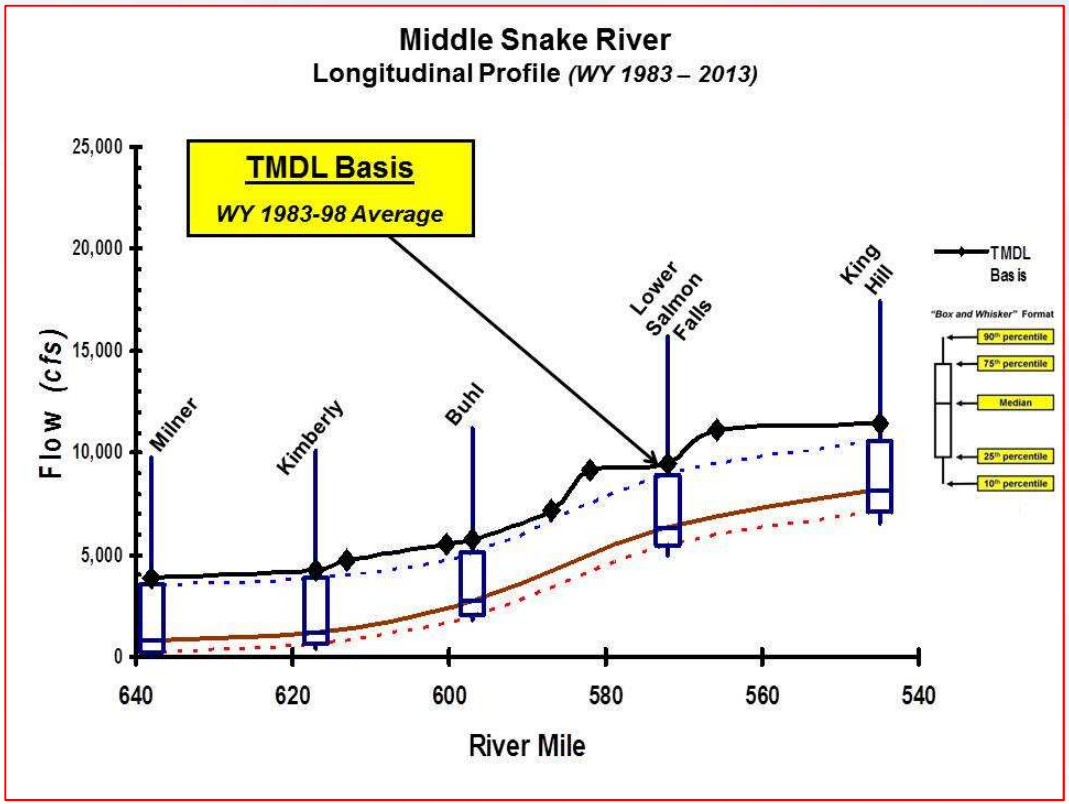




Data Driven Approach

Role of Hydrology

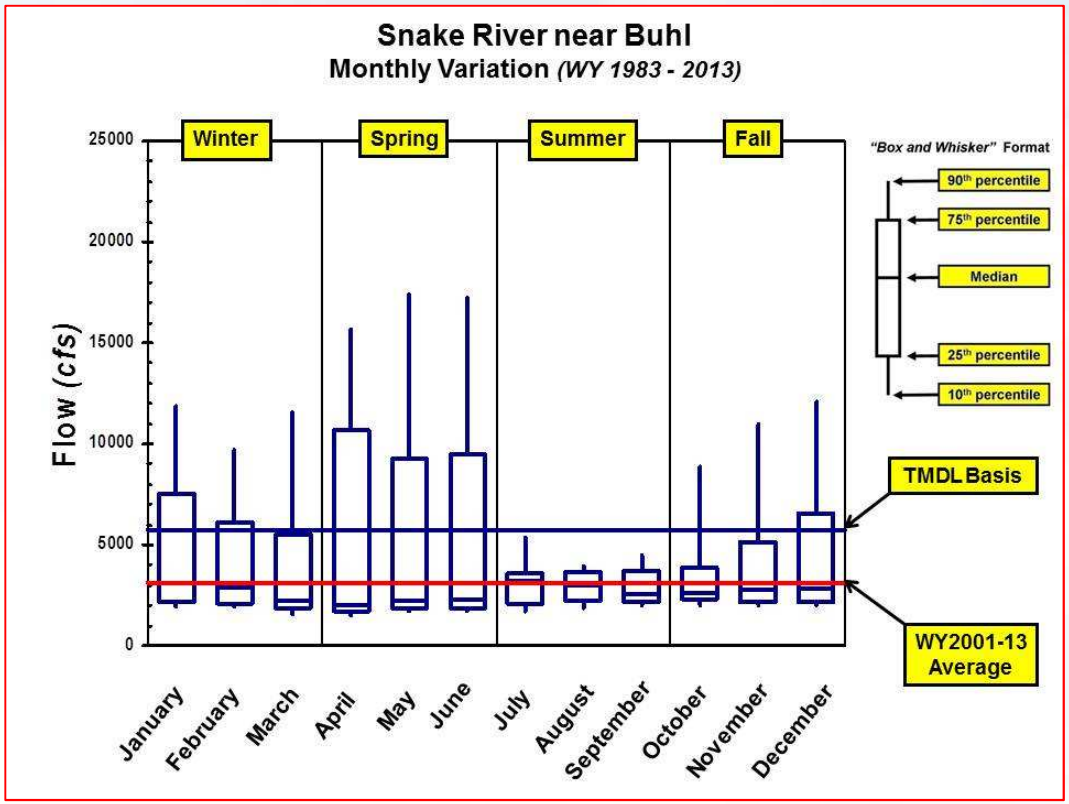
Flow Patterns



Role of Hydrology

Seasonal Patterns

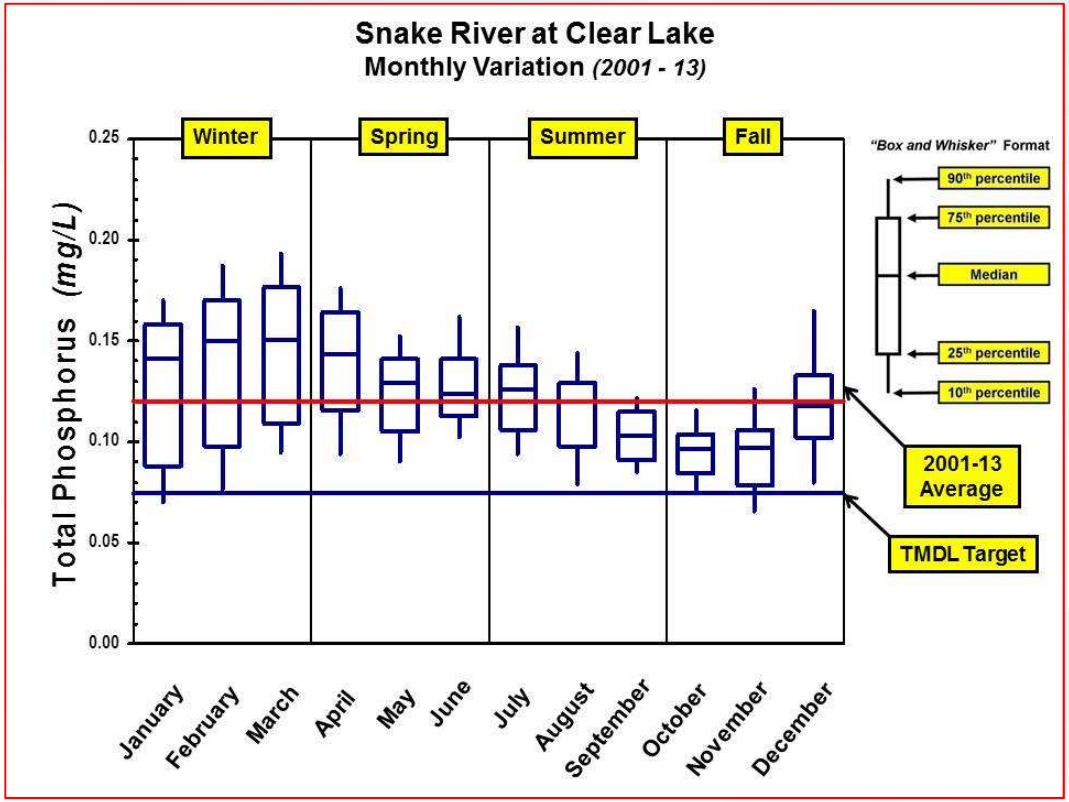
Critical Conditions

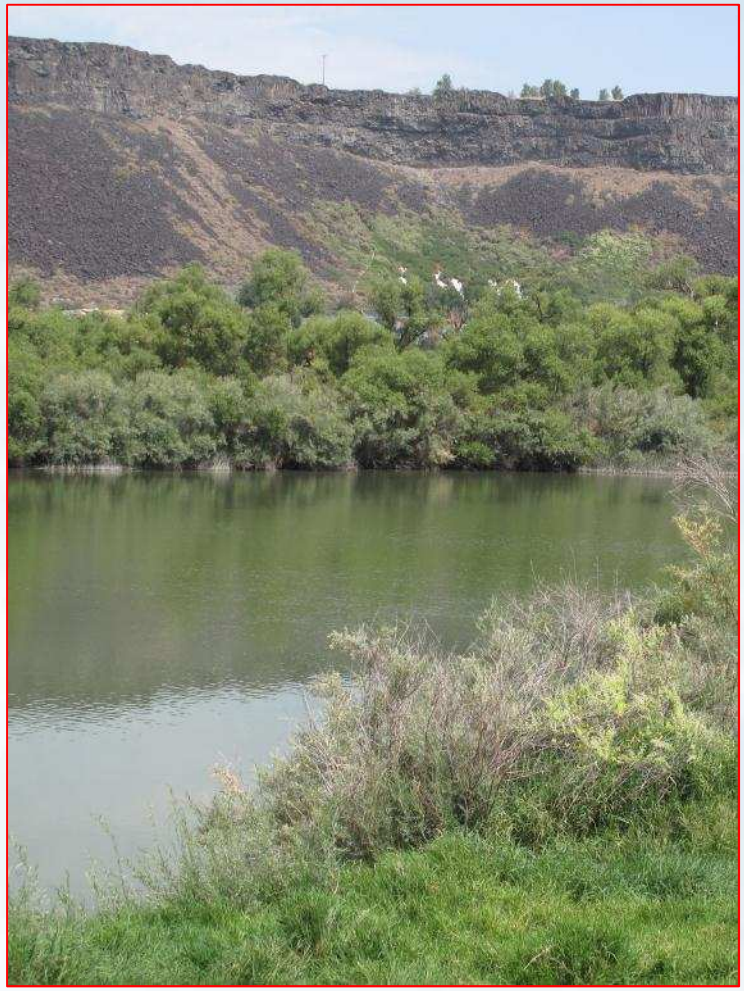


Role of Hydrology

Effect on Water Quality

Seasonal Patterns

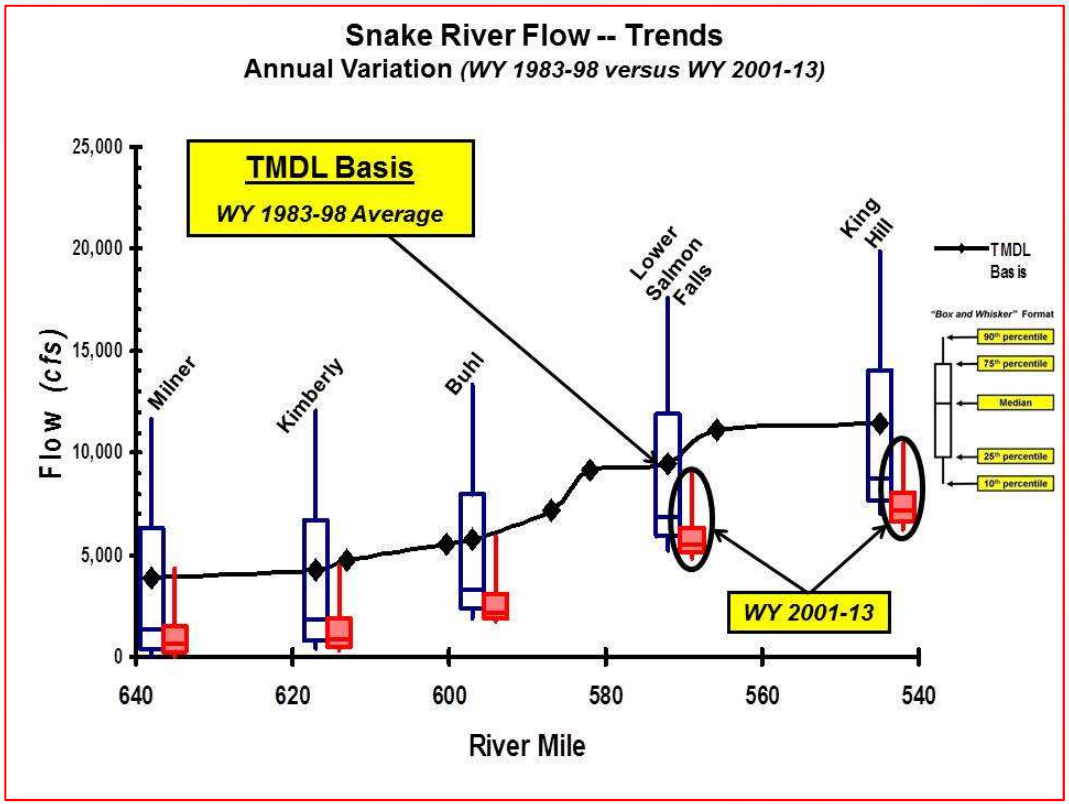




Role of Hydrology

Year-to-Year Variation

Shift over Past Decade



Data Assessment

Attenuation

- **Defining what we mean by "Attenuation"**
  - ***Dilution***
  - ***Temporary Retention – e.g., plant uptake***
  - ***Permanent Removal – e.g., deep burial or chemical change***
- **TMDL assumptions can directly affect loading capacity and allocations**

Data Assessment

Attenuation

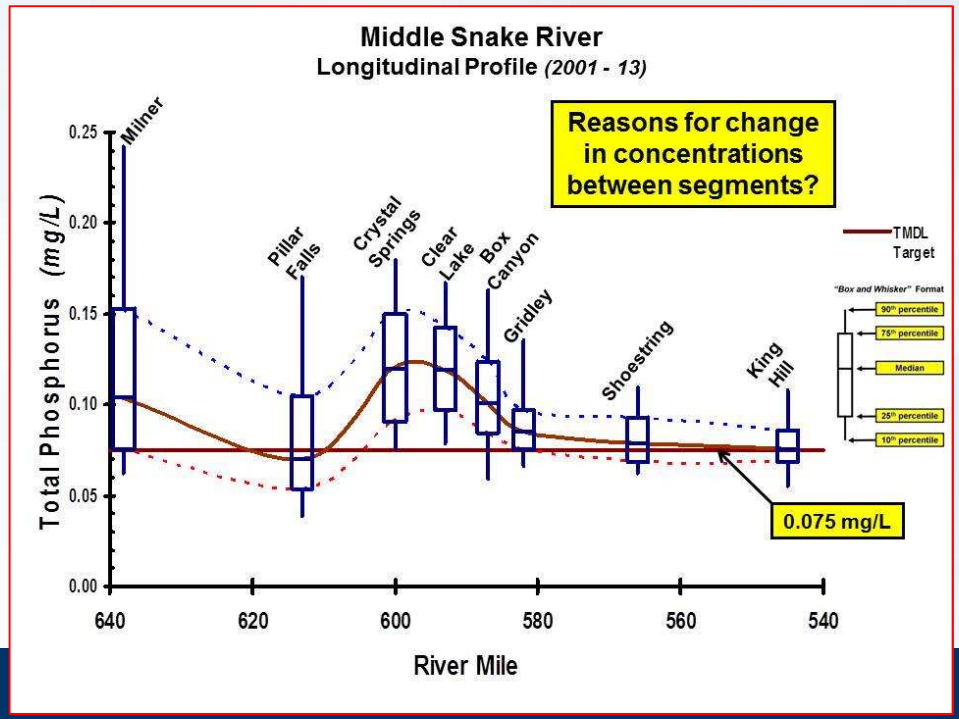
- **2005 TMDL assumed removal occurs**
- **2014 Assessment**
  - ***Plant uptake and die-off is likely resulting in temporary retention of phosphorus in aquatic plant bed sediments***
  - ***Retained nutrient load is likely re-suspended and transported downstream during high flow events***

Mass Balance

Key Questions

Examine loading changes between segments

- ***What is the relative magnitude of source inputs?***
- ***What are areas of uncertainty?***
- ***What are the data gaps?***



Mass Balance

Draft Report Approach (2013)

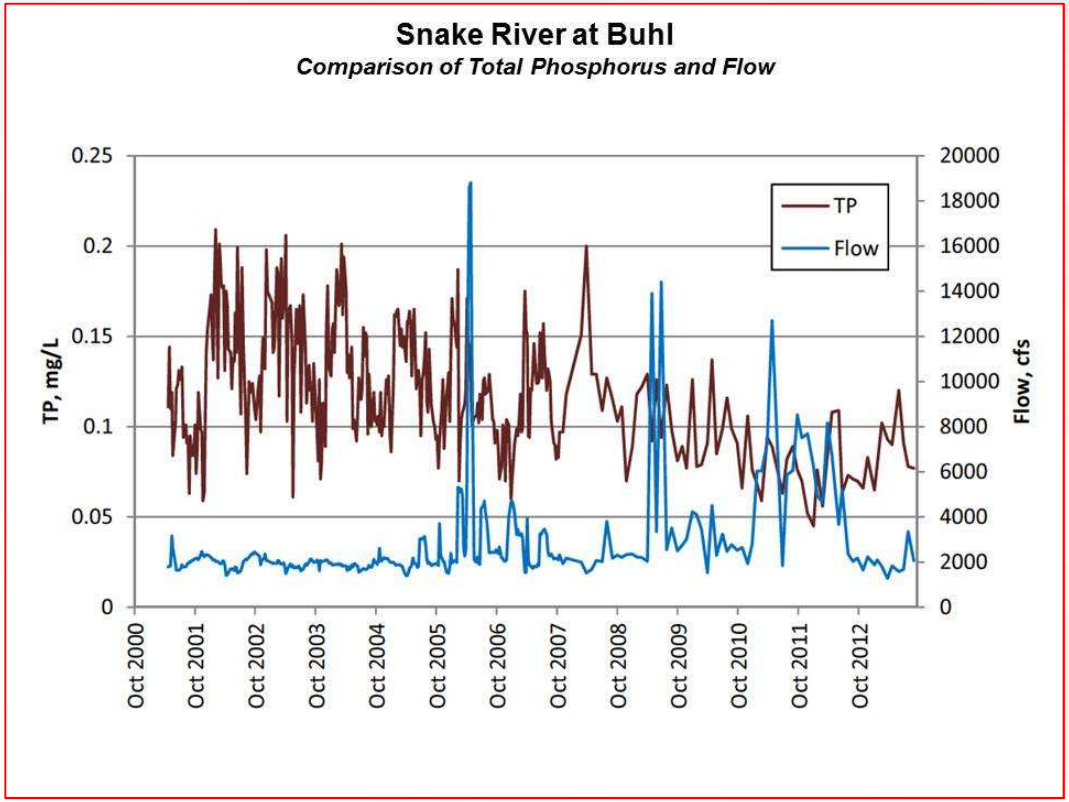
- **Source Load Estimates**
  - ***Point sources (direct & indirect)***
  - ***Gaged tributaries***
  - ***Irrigation return drains***
  - ***Gaged springs (discrete GW)***
  - ***Baseflow (diffuse GW)***

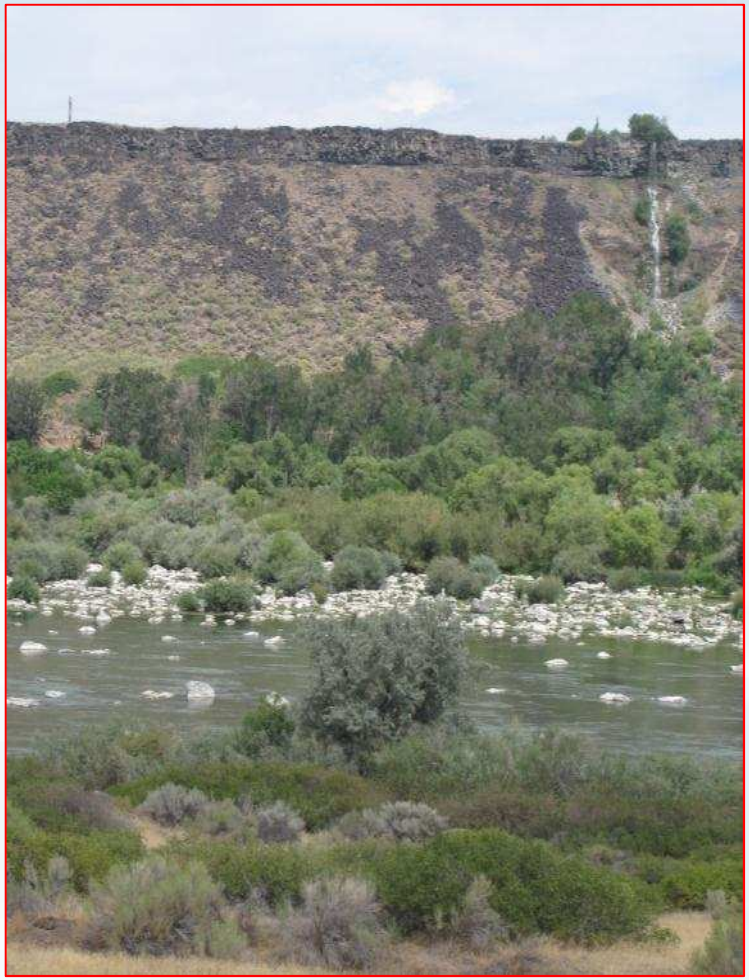
- **Assumed no attenuation**
- **Baseflow contributions did not account for potential year-to-year variability**

Trend Analysis

Total Phosphorus

Revised Approach





Trend Analysis

Total Phosphorus

LOWESS Analysis

- ***Data smoothing to account for seasonal and flow variability***
- ***Compared to critical probability value to determine significance***

Trend Test Results
All Locations

Location	Test	p-value[1]	Trend (mg/L/yr)
Milner	Seasonal Kendall with LOWESS	0.0174	-0.0028
Pillar Falls	Seasonal Kendall with LOWESS	0.0082	-0.0055
Buhl	Seasonal Kendall with LOWESS	0.0195	-0.0031
King Hill (IPC data)	Mann-Kendall with LOWESS	0.0001	-0.0010
King Hill (USGS data)	Seasonal Kendall with LOWESS	0.1640	-0.0008

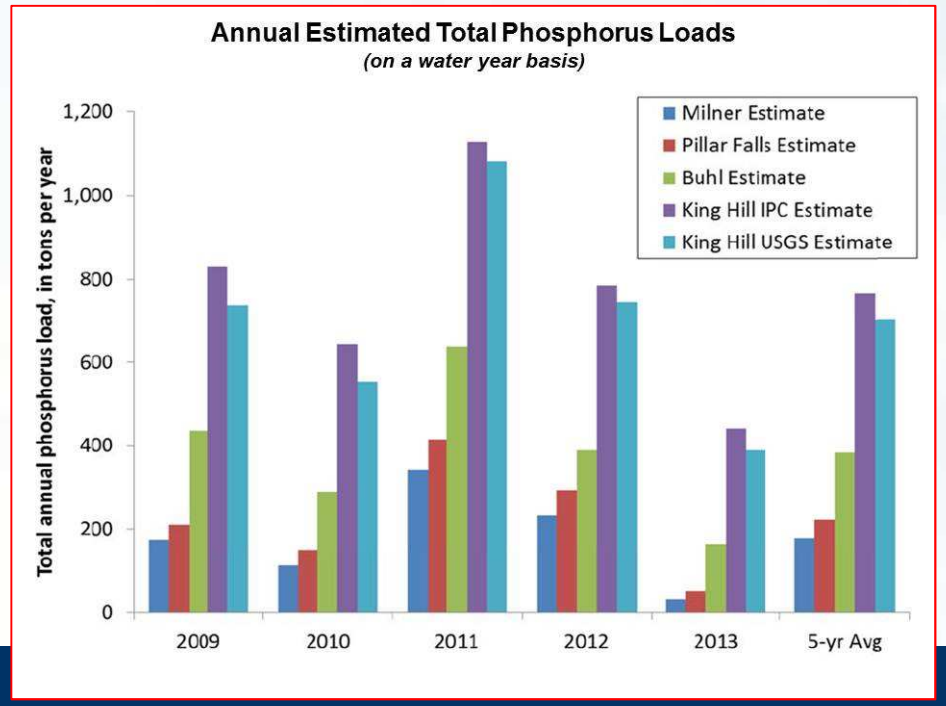
[1]Seasonal Kendall tests show p-value adjusted for autocorrelation

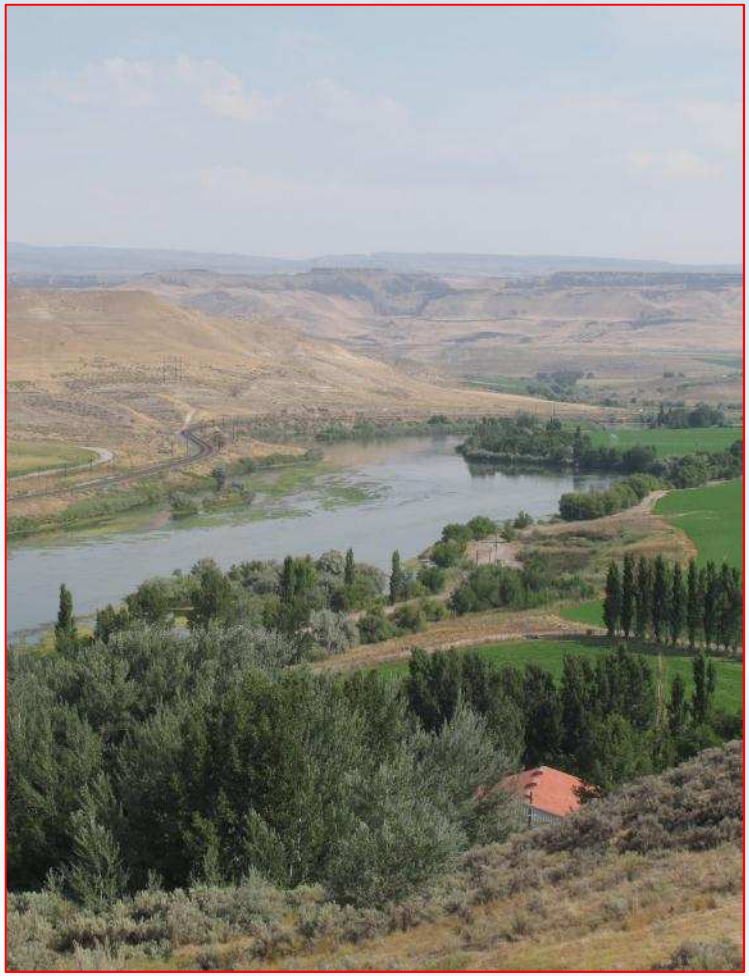
Mass Balance and Loads

LOADEST Analysis

LOADEST Analysis

LOAD estimation based on statistical analysis of flow and concentration data



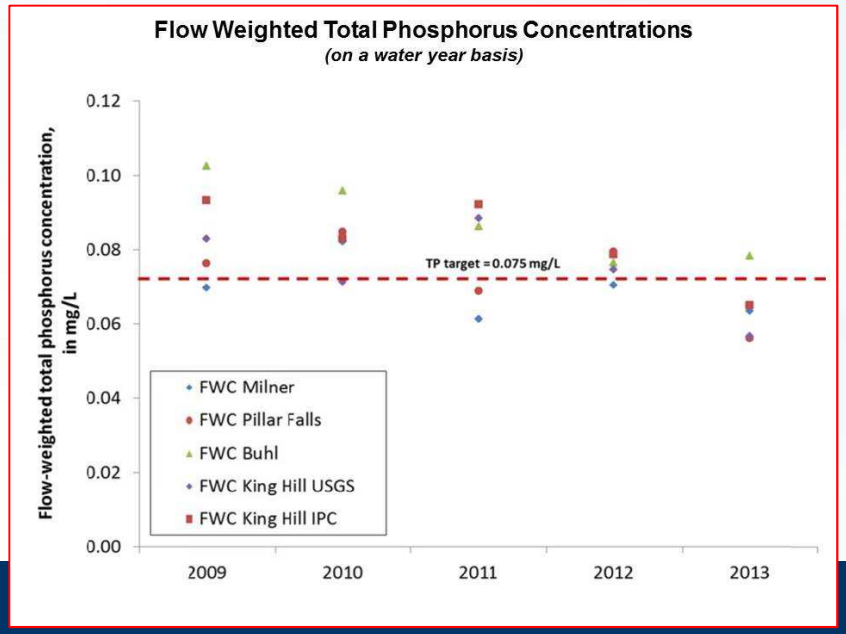


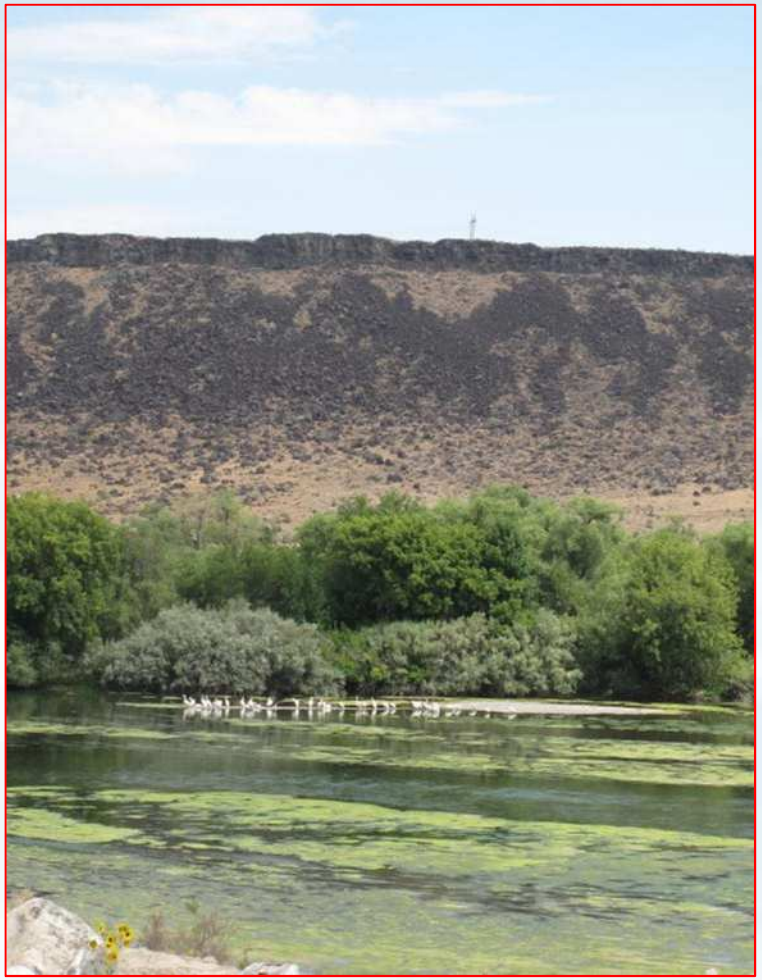
Flow-weighted Concentrations

LOADEST Analysis

Declining TP trends

- ***Daily concentrations calculated from load estimates***
- ***Monthly and annual average values based on flow weighting***



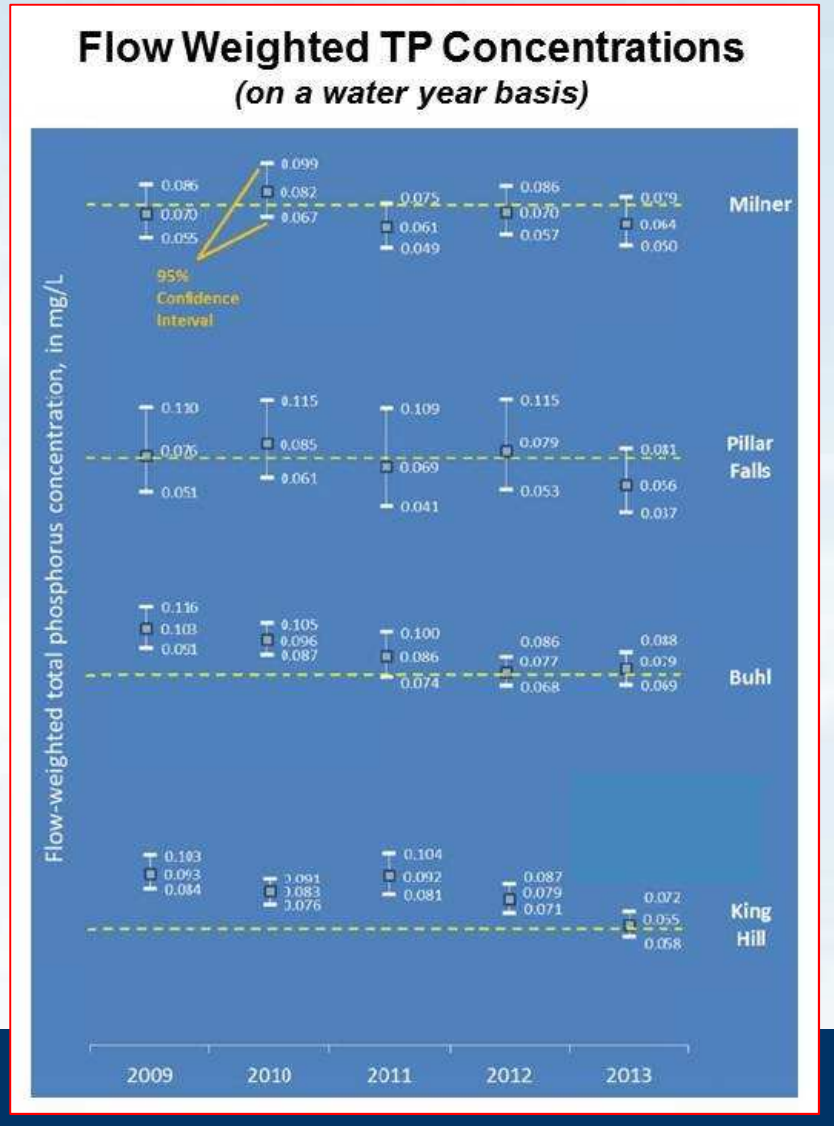


Flow-weighted Concentrations

LOADEST Analysis

LOADEST Analysis

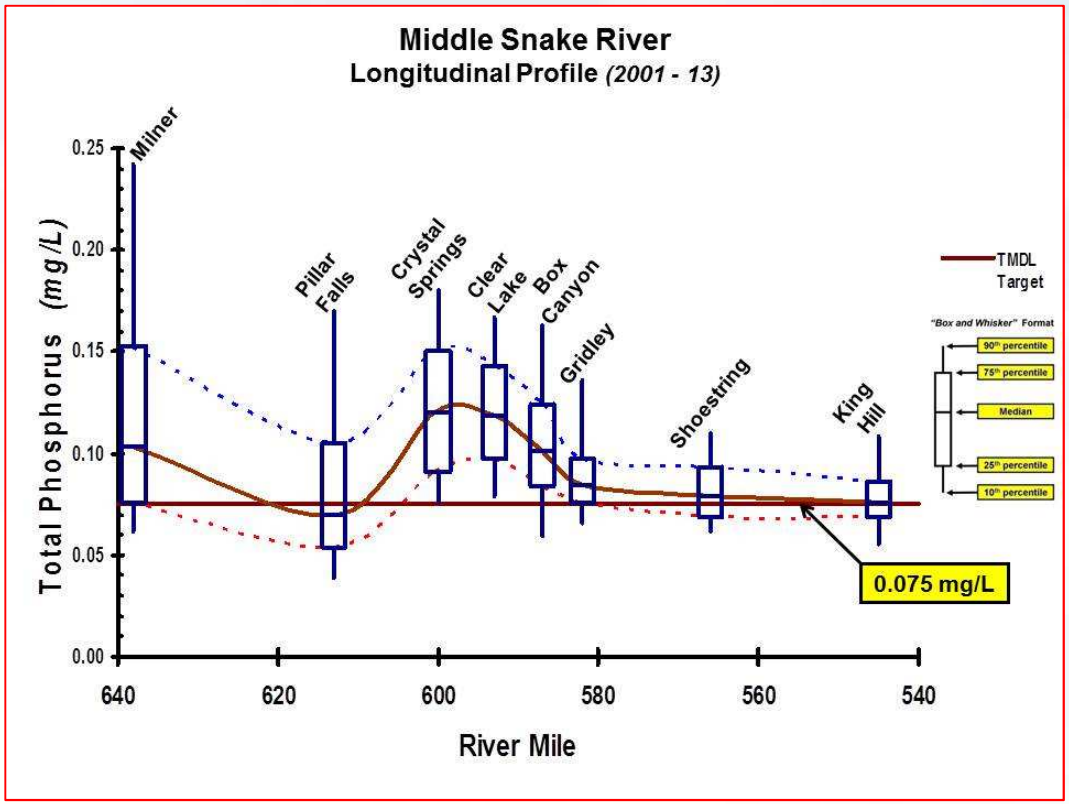
- ***Declining trend in TP at all stations***
- ***Buhl concentrations remain highest***



Buhl Trends

General Observations

Largest allocations above Buhl

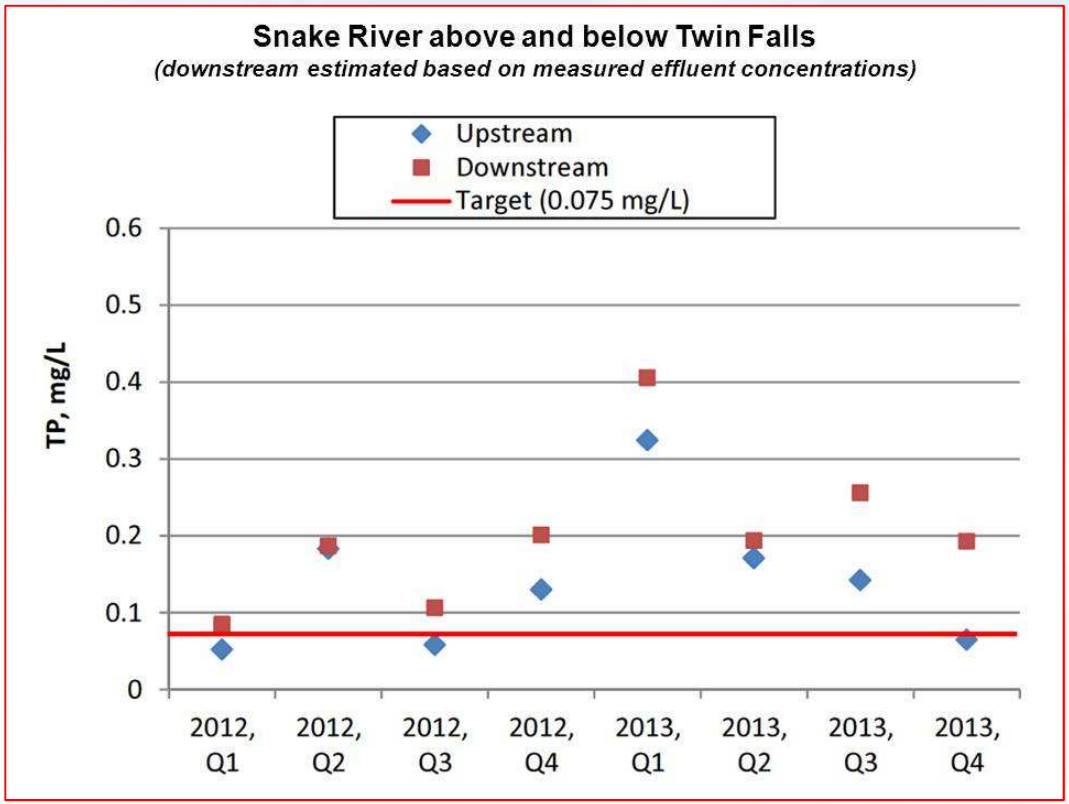


Source	WLA *(pounds/day)*
Twin Falls POTW	710
Jerome POTW	205
Box Canyon FH	141

Buhl Trends

Twin Falls POTW

Effect of existing discharge

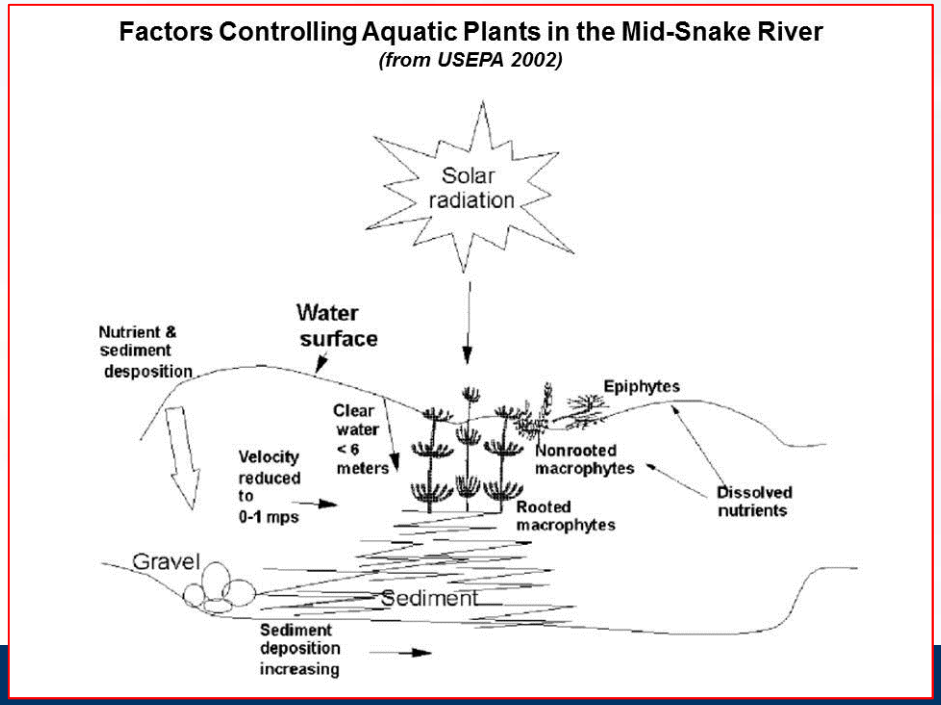


Macrophytes

Nutrient Cycling

Plays an important role

- ***Relationship between bed sediments, macrophytes, and non-rooted algae critical***



Data Assessment

Key Findings

- **Declining trends in river flow**
  - ***Flow basis of current TMDL exceeds average and current flow conditions***
  - ***Reduced assimilative capacity***
- **Declining TP concentration trends *(all stations)***
  - ***Concentrations remain highest at Buhl***
  - ***Twin Falls POTW***

Data Assessment

Key Findings

- **Point sources generally in compliance with WLAs**

however

- **Significant macrophyte growth continues**
  - ***Numerous factors likely affect their growth***
    - *Nutrients (phosphorus and nitrogen)*
    - *Substrate (sediment)*
    - *Flow*
  - ***Quantitative data on macrophyte levels is lacking***
  - ***Both water column and sediment are nutrient sources***
  - ***Intense local nutrient cycling***
  - ***Likely minimal long-term nutrient attenuation***

Mid-Snake TMDL

Next Steps

Implementation Discussion

- ***Address data gaps for tributaries / drains***
- ***Further evaluation of NPS controls where data indicate tributaries / drains not meeting 0.100 mg/L target***

Mid-Snake TMDL

Next Steps

Implementation Discussion

- ***Investigation of other factors controlling macrophytes (flow shaping, nitrogen, etc)***
- ***Quantitative analysis of macrophyte levels***
- ***Data collection of periphyton / chlorophyll-a may aid in determining what is happening in the system***

Mid-Snake TMDL

Next Steps

- **Implementation Discussion**
  - ***Future data collection and evaluation of Lake Walcott HUC upstream***