Negotiated Rulemaking
Docket No. 58-0102-1801

Update to Human Health Criteria for Arsenic

May 23, 2018

Outline

I. Review of Identified Issues
II. Comments Received
III. Background Conditions
IV. Bioaccumulation
V. Monitoring
VI. Next Steps

I. Review of Issues

- No revision to IRIS or 304(a) recommendation
- Inorganic vs. Total As
- Elevated Background Concentrations in Surface Water
- CWA vs. SDWA
- Bioaccumulation

II. Comments Summary

- 6 Commenters:

Idaho Association of Commerce and Industry (IACI)	J.R. Simplot Company (Simplot)
Association of Idaho Cities (AIC)	Idaho Mining Association (IMA)
City of Meridian (Meridian)	Clearwater Paper (CP)

II. Comments

- Clean Water Act vs. Safe Drinking Water Act
- Options for HHC
- Toxicity/Cancer Slope Factor
- BAF Derivation
- Elevated Background
- Timing/Resources
- Implementation

CWA vs. SDWA

- Two different EPA standards to protect Human Health; MCL of 10 µg/L has been deemed safe under SDWA (IACI, Meridian, IMA)
  - SDWA sets MCLs based on feasibility considerations, CWA does not allow for considerations of economics, treatability, or detection when setting criteria
  - SDWA MCLG for As is 0
  - CWA allows for implementation tools (such as UAA, SSC, variances) to address feasibility

CWA vs. SDWA

- Question the technical basis for disapproval of 10 µg/L (IACI, CP)
  - Idaho is engaging in rulemaking, with the understanding that 10 µg/L is currently applicable
  - Others may consider appealing disapproval

Options

- Use of MCL (IACI, IMA)
  - This approach has already been disapproved

Options

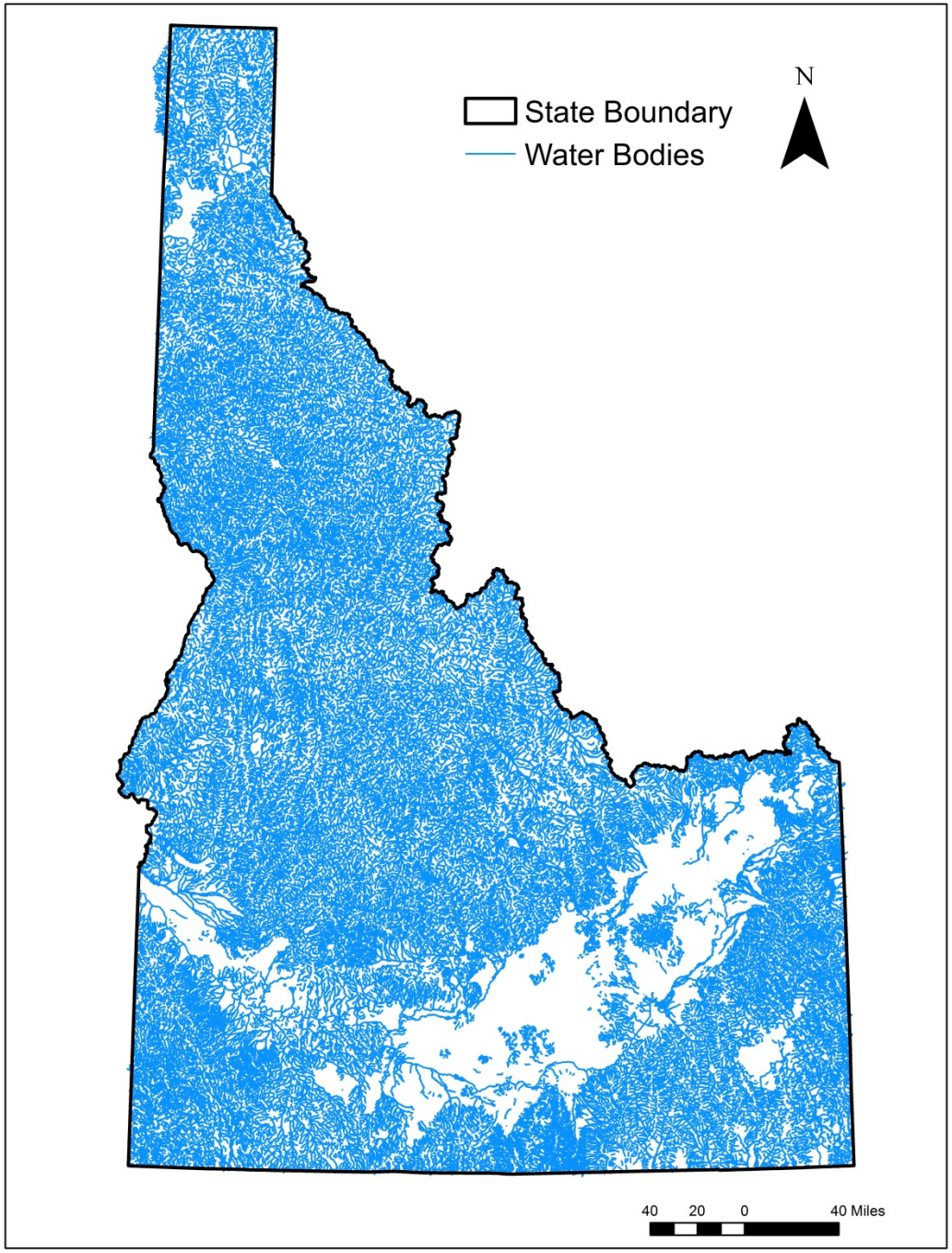
- Base criteria on natural background (IACI)
  - Either through development of SSC by watershed or implementation of Natural Background Provisions

Options

- Do not prefer EPA's Recommended Criteria (Meridian, Simplot)
  - Uses outdated CSF, results much lower than background
- Do not prefer Oregon Approach (Meridian)
  - May not be approvable

Options

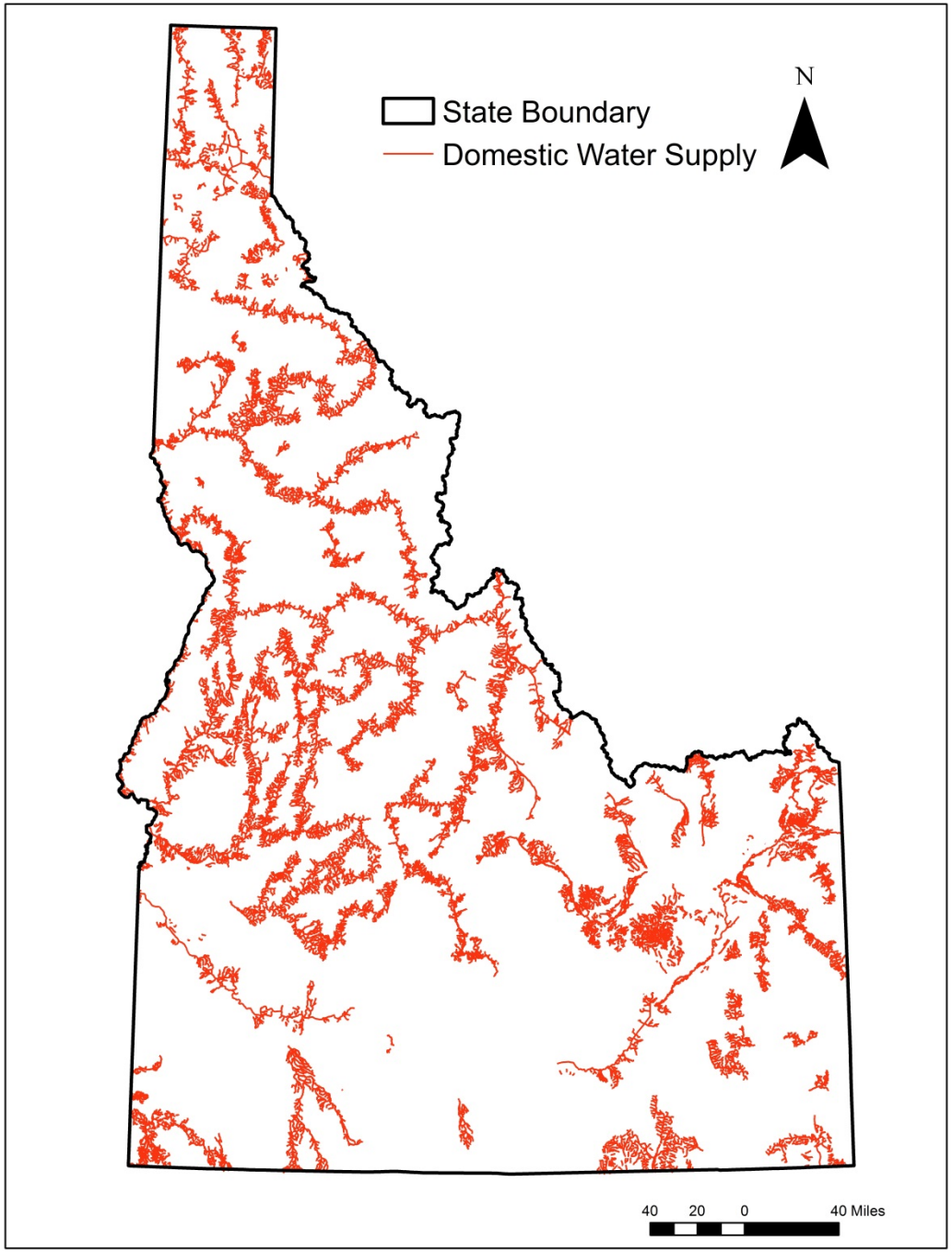
- Fish consumption component is negligible when compared to drinking water exposure (AIC, Simplot)
  - Fish consumption must be considered to provide criteria for waters *not* designated for Domestic Water Supply (DWS)
  - Idaho does not have Water Consumption Only use (all DWS also have Rec)



~96,490 stream miles designated (or presumed) for Recreation Uses (Fish Only criteria)

Recreation

Fish Only



~22,957 miles currently designated for DWS
(Fish + Water Criteria)

Domestic Water Supply

Fish + Water

+

Options

- Consider alternative risk factors in calculating criteria (Simplot, CP), review risk factors regularly (AIC) (Alternative cancer risk factor (10^{-4}) or other exposure factors)
  - DEQ's position is that the factors used in HHC derivation are the appropriate risk and exposure factors

Toxicity/Cancer Slope Factor

- Develop alternative Toxicity/Cancer Slope Factor independent of IRIS (Texas, National Academy of Sciences)(AIC)
  - Time and resource dependent
  - DEQ will follow EPA's lead

BAF Derivation

- Suggest regression approach to estimate BAF (Simplot)

Elevated Background

- Removal of high background As at treatment facilities is not feasible (AIC)
  - Feasibility cannot be considered in setting criteria; other implementation tools may be explored
- Criteria should consider background (AIC, Simplot)

Timing/Resources

- Provide adequate staffing and support of research (AIC)
  - Requires considerable increase in resources (people and money)
- More time to develop criteria and implementation tools (AIC, Meridian)

Implementation

- Use concentrations rather than loads when developing TMDLs, account for naturally occurring concentrations (AIC)
- Investigate Statewide Variance or Intake Credit
  - Variance approach has been done for other pollutants in other states, gives time for technology to make incremental improvements
  - Intake Credits are likely not appropriate for discharges of ground water -> surface water

Implementation

- DEQ and EPA should conduct a treatability analysis (Meridian)
  - May be part of statewide variance, time dependent

III. Background Conditions

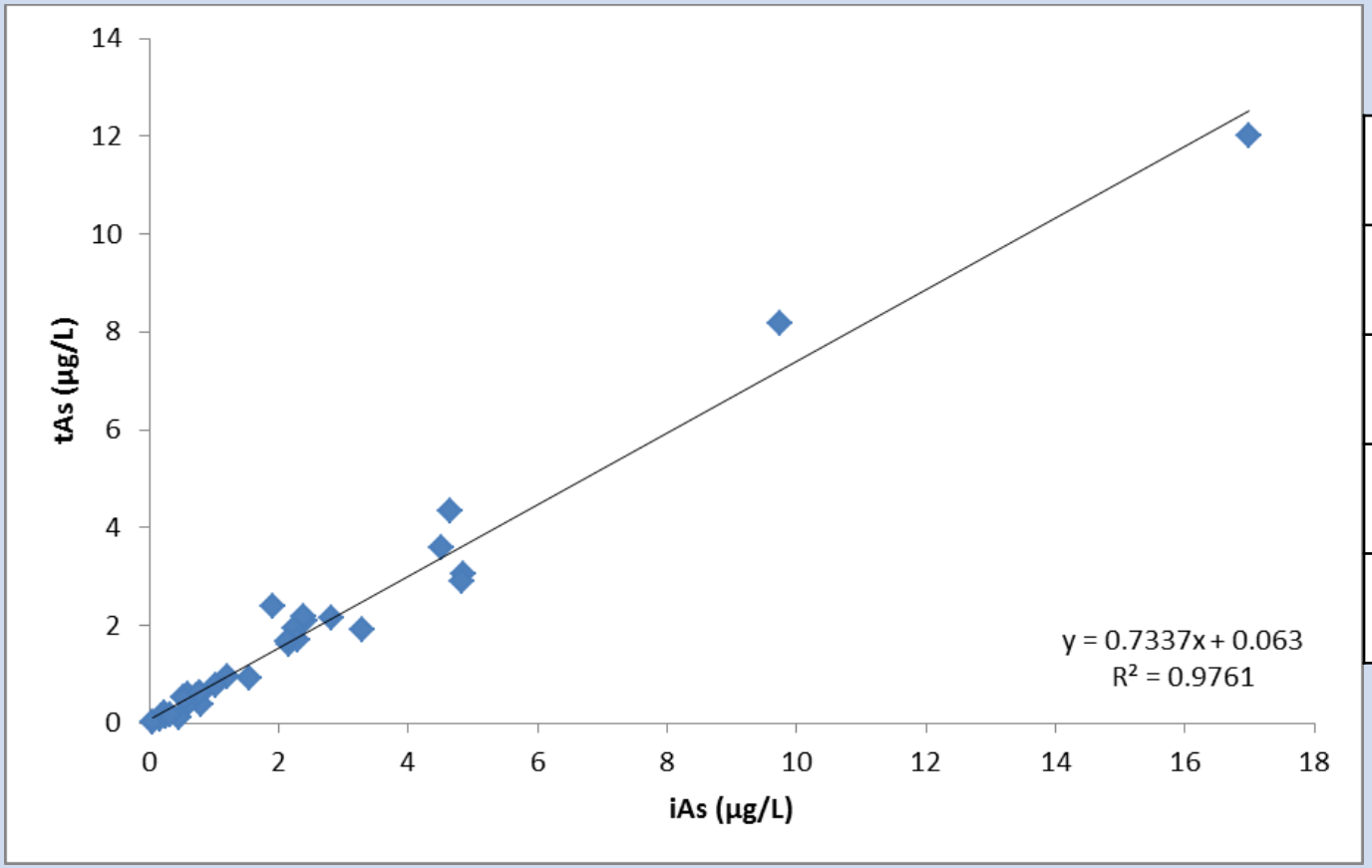
- Use Ambient Data to Identify Background Conditions
  - Filter based on percentile concentrations (e.g., remove values >75th %ile)
  - Existing NPDES permits with limits or monitoring requirements
  - Toxics Release Inventory
  - Reference-site approach- identify waters with limited human impacts

Ambient Data Available

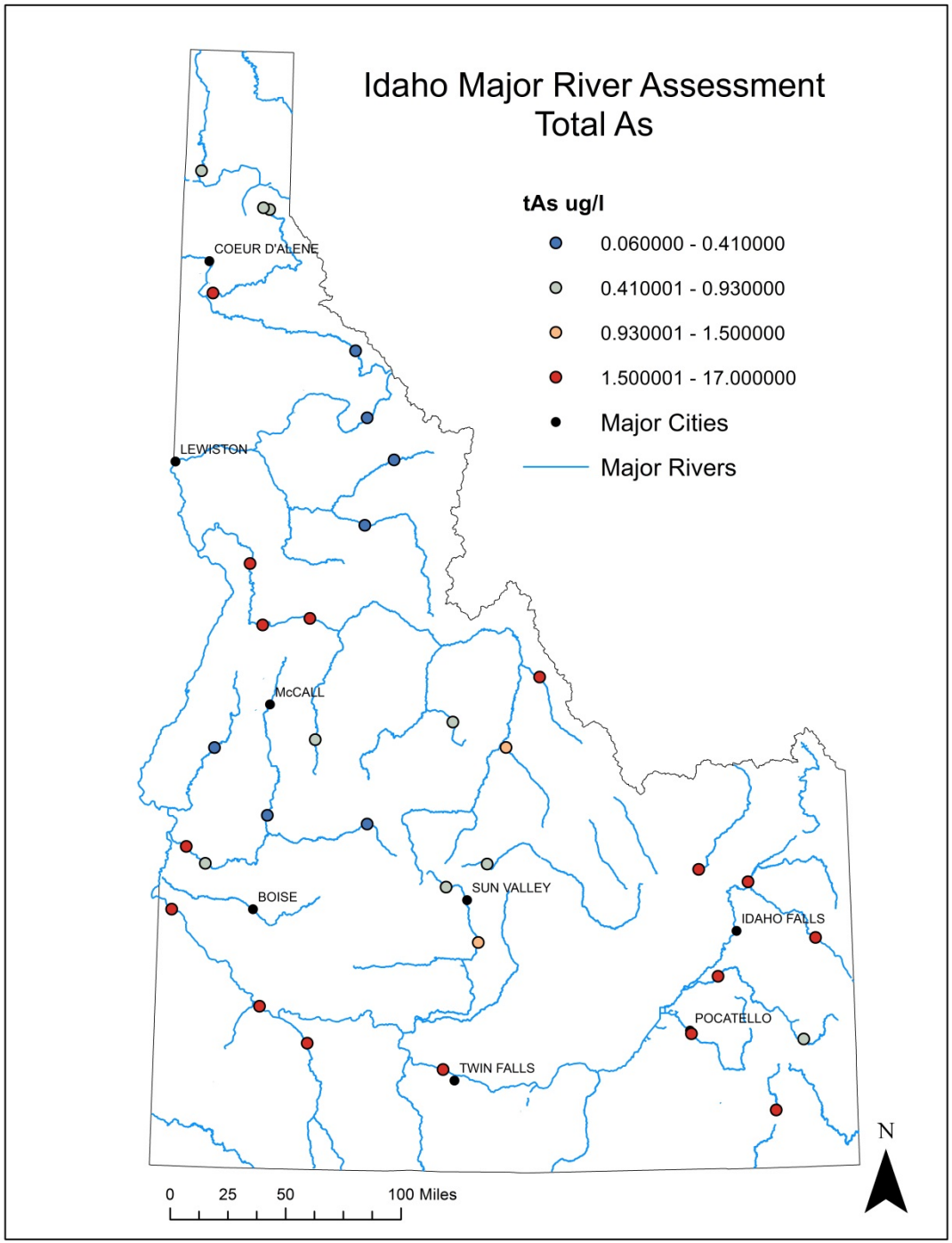
- 2010 Idaho Major River Assessment
  - Both Total and Inorganic Arsenic
- USGS NWIS data
  - Total only

Inorganic Fraction of Total As in Water

(2010 Idaho Major River Assessment)



Range	0.24 – 1.26
25th – 75th	0.61 – 0.85
Mean	**0.74**
Median	0.76
N	34



	As(T) (µg/L)	As(i) (µg/L)
Range	0.06 – 17.00	0.02 – 12.00
25th %ile	0.53	0.39
Mean	2.30	1.75
Median	1.12	0.84
75th %ile	2.40	2.13

USGS NWIS Data: 1998 - Present

	As(T) (µg/L)	
Min	0.1	
Mean	2.30	
Median	1.12	
75th %ile	6.4	
Max	1470	
N	870	

Use As(i):As(T) to estimate inorganic As concentrations

As(i)* = As(T)x 0.74

USGS NWIS Data: 1998 - Present

	As(T) (µg/L)	***As(i)* (µg/L)***
Min	0.1	*0.07*
Mean	2.30	*1.70*
Median	1.12	*0.83*
75th %ile	6.4	*4.7*
Max	1470	*1088*
N	870	*870*

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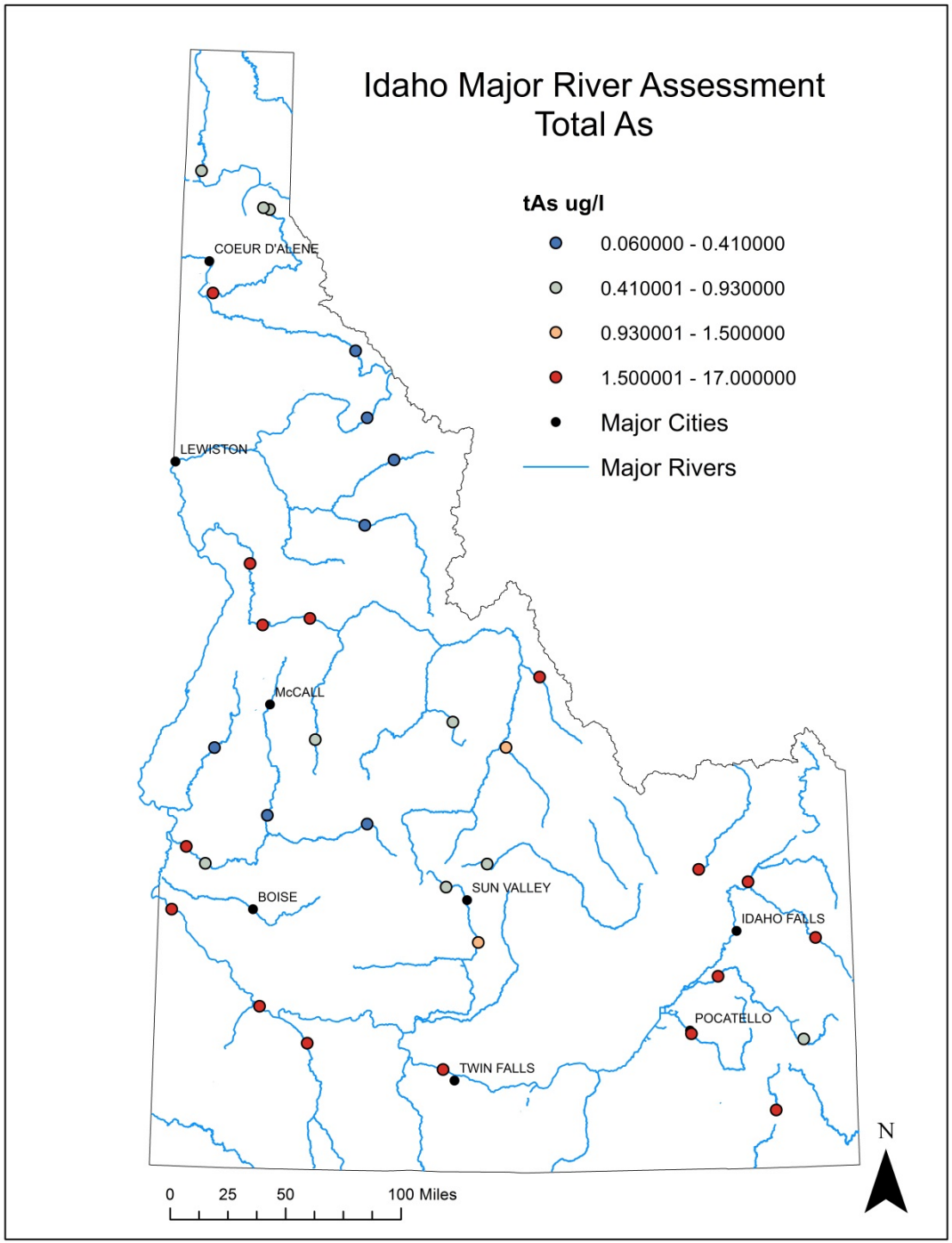
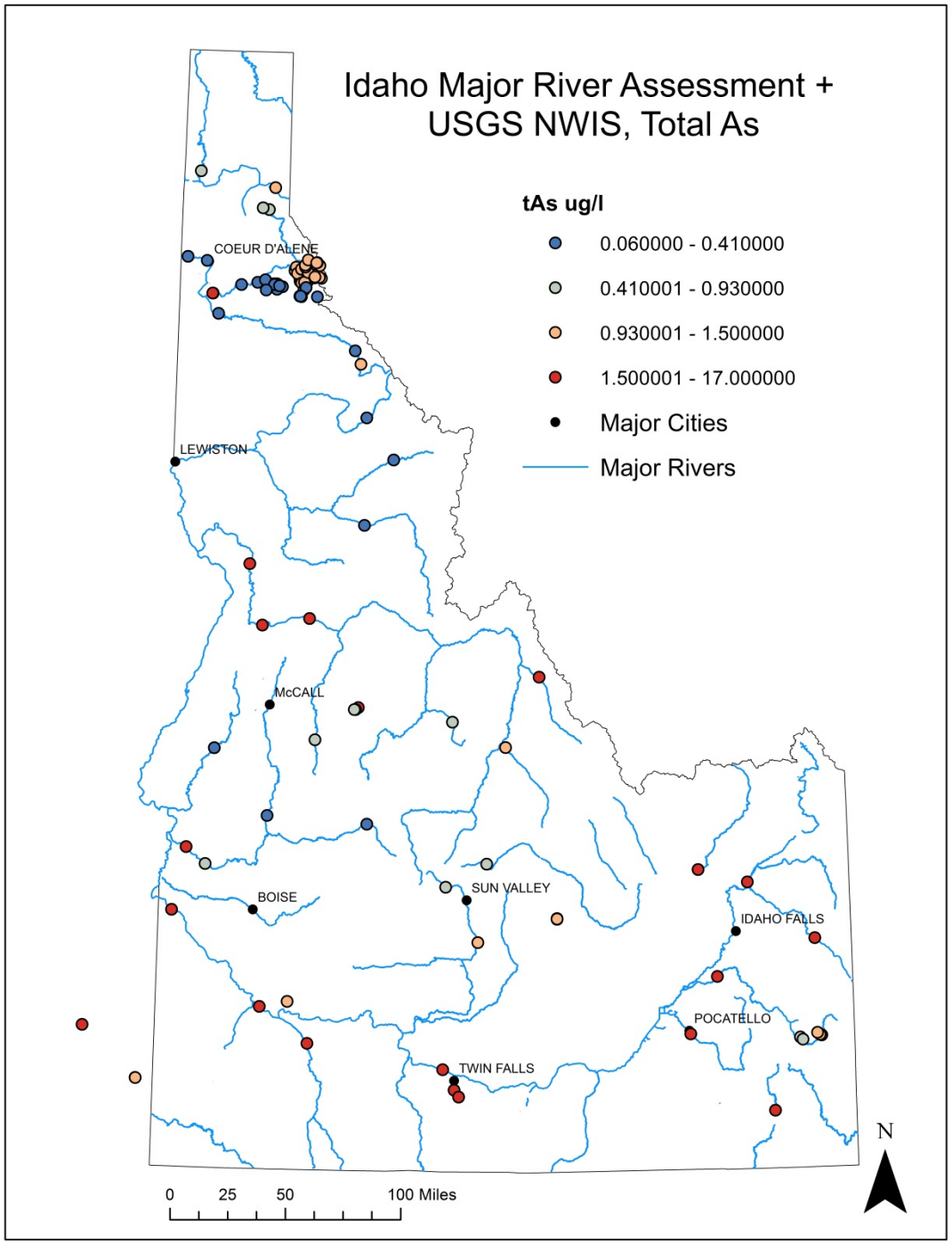
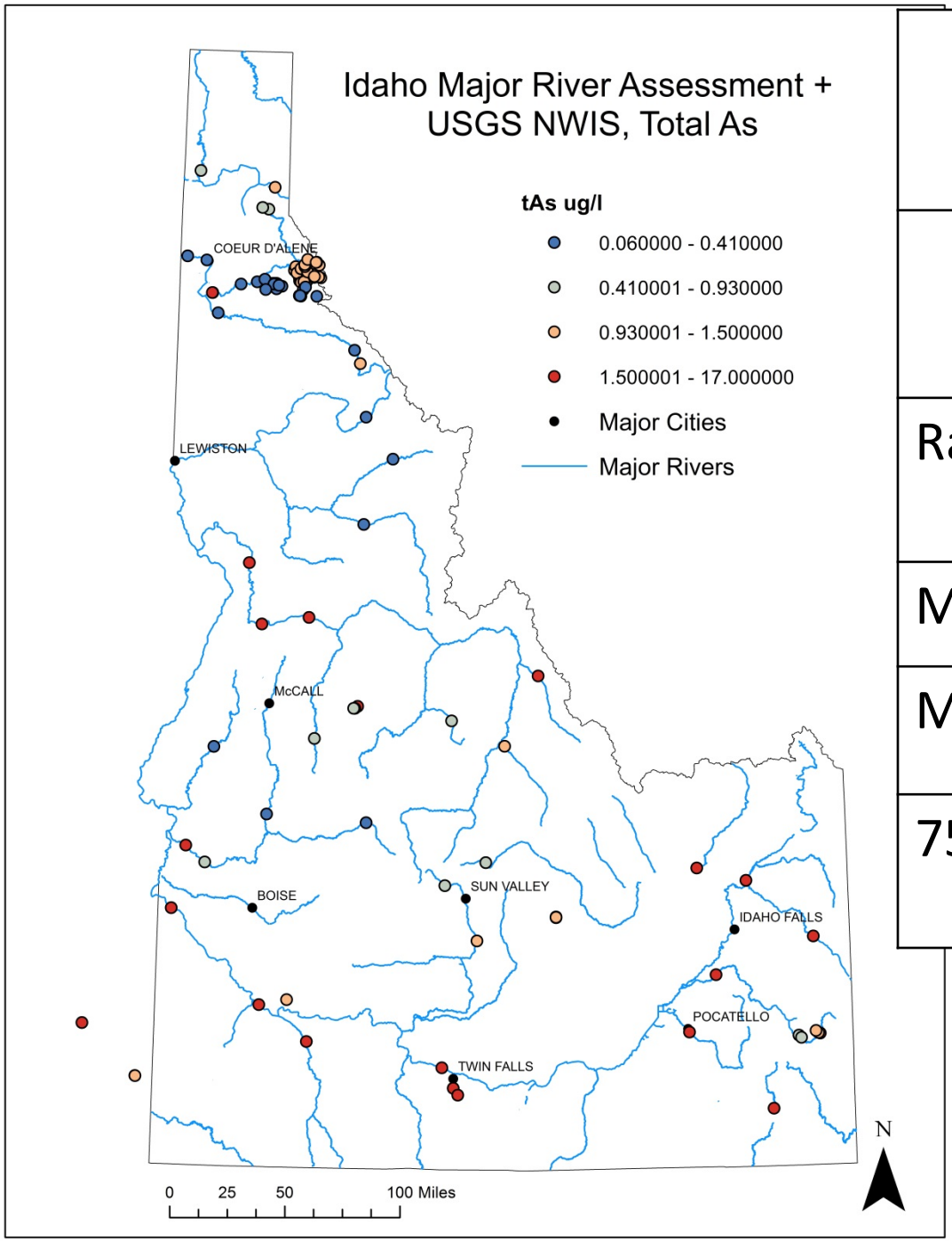
- Remove values >75th %ile
- Replace < results with ½ reported value


Idaho Major River Assessment
Total As
tAs ug/l
0.060000 - 0.410000
0.410001 - 0.930000
0.930001 - 1.500000
1.500001 - 17.000000
Major Cities
Major Rivers
COEUR D'ALENE
LEWISTON
McCALL
BOISE
SUN VALLEY
IDAHO FALLS
POCATELLO
TWIN FALLS
N
0
25
50
100 Miles

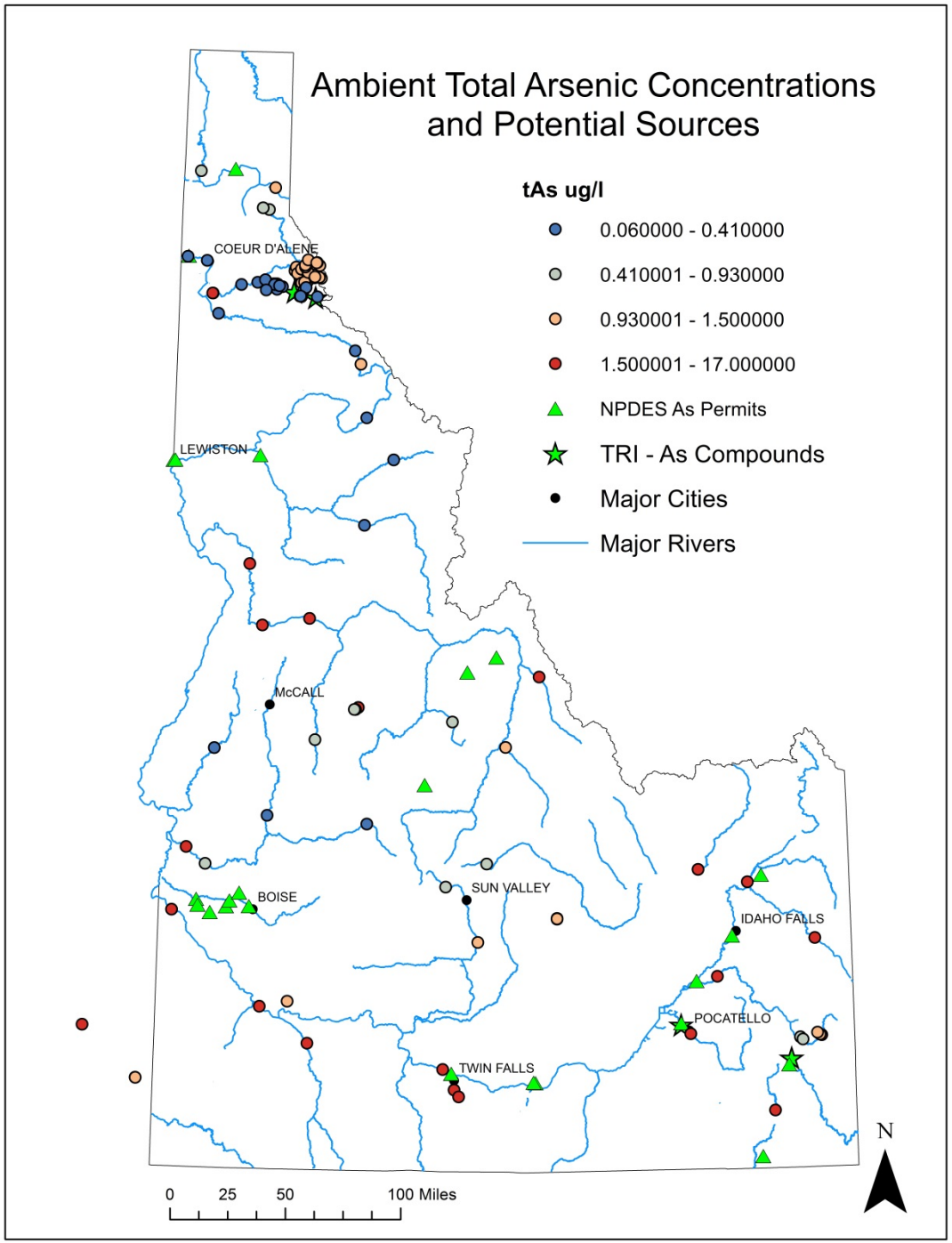


USGS

	As(T) (µg/L)	*As(i)* (µg/L)*
Range	0.1 – 6.1	*0.07 – 4.51*
Mean	1.10	*0.81*
Median	0.9	*0.67*



	Inorganic As (µg/L)	
	DEQ	**USGS Filtered & Estimated**
Range	0.02 – 12.00	*0.07 – 4.51*
Mean	1.75	*0.81*
Median	1.12	*0.67*
75th %ile	2.13	*1.11* (4.74)*



- 34 NPDES permits with either As limits or monitoring requirements
  - Most are municipal WWTP
- 4 Facilities on Toxic Release Inventory for As Compounds

Summary

- As(i):As(T) is ~0.74; can be used for estimates of inorganic As when only total is available
- Data are either sparse (DEQ) or non-representative (USGS) making generalizations difficult

Summary

- Relatively few anthropogenic sources of As
  - Much of the As(i) in surface water is likely natural

IV. Bioaccumulation

- Review of Arsenic Bioaccumulation
- Idaho BAFs
- Novel approaches to calculating BAF
- Monitoring Discussion

$$BAF(L/kg) = \frac{C_t}{C_w}$$

Where:

C_t = concentration in wet tissue (mg/kg)

C_w = concentration in water (mg/L)

Bioaccumulation of As

- As bioaccumulates, but does not biomagnify
  - Many studies suggest that lower trophic levels may have higher BAFs than higher trophic levels
  - Higher trophic levels have lower fraction of As(i) to As(T)

Bioaccumulation of Arsenic

- Generally, BAFs are different between freshwater and marine systems
  - Not between lentic and lotic
- BAFs are higher at lower ambient As concentrations

Bioaccumulation of Arsenic

- **Should Idaho limit consideration of As BAF to only Freshwater?**
- **Should Idaho only consider (relatively) low ambient concentrations of As when calculating BAFs?**

Approach to Calculate BAF

- Total vs. Inorganic
  - Calculate inorganic only
  - Calculate total then translate to inorganic based on As(i):As(T) in tissue
  - Use both water column and fish tissue translator to go from As(T) to As(i)

Inorganic Fraction in Fish

- 2010 IMRA found that ~ 4% of As(T) in fish is As(i)

  *Assuming all tissue is at the As(i) detection limit (0.002 mg/kg)

- Oregon used an IF of 10% based on literature values

Approach to Calculate BAF

- Standard approach: mean (arithmetic or geometric)
- Alternative Approach
  - Linear regression model
  - Power function

Standard Approach

Statewide BAF based on mean (or geomean) of paired sample BAFs

$$BAF(L/kg) = \frac{C_t}{C_w}$$

Statewide BAF from IMRA

	As(T)	As(i)*
Range	3 – 2,333	0.2 - 91
25th %ile	18	0.9
Mean	**143**	**11**
Geomean	**53**	**2.9**
75th %ile	181	9.6

*Assuming all tissue is at the As(i) detection limit (0.002 mg/kg)

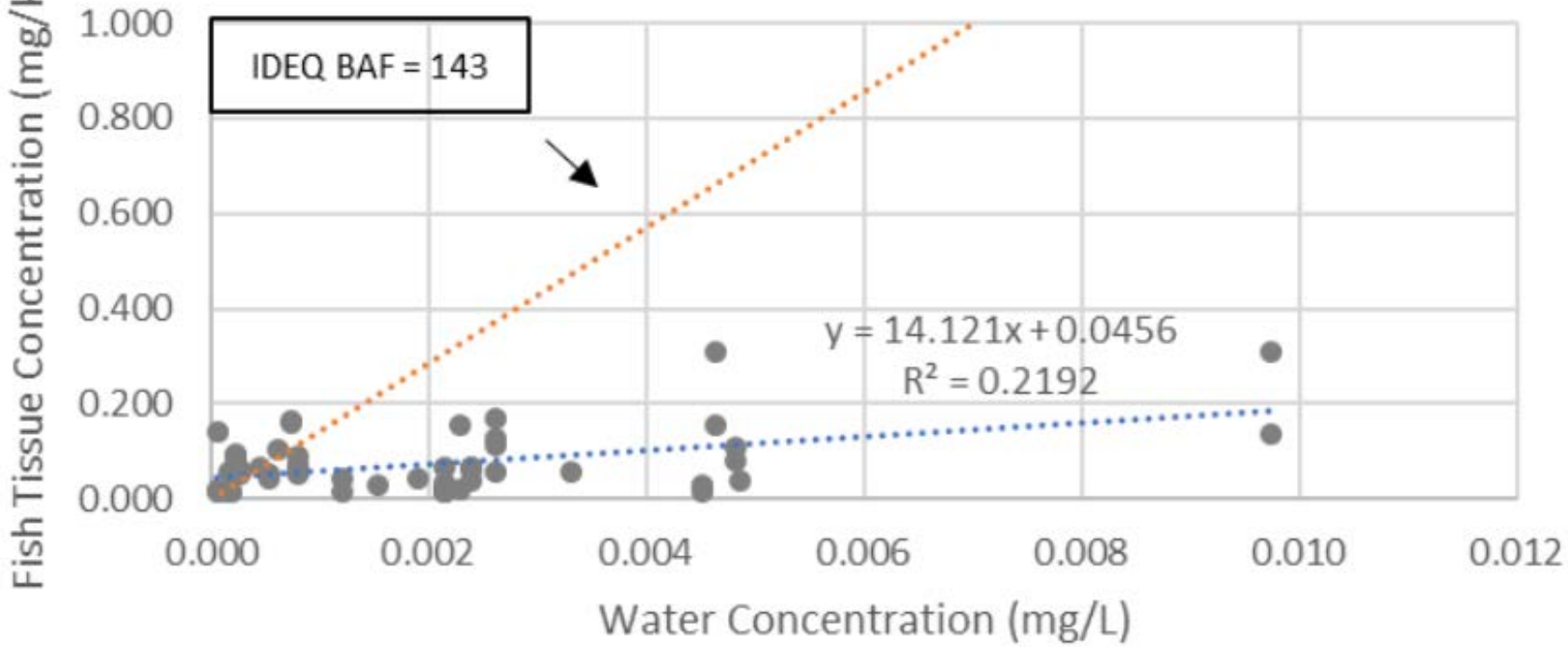
Alternative Approaches

- Linear regression (Arcadis report)
- Power Function

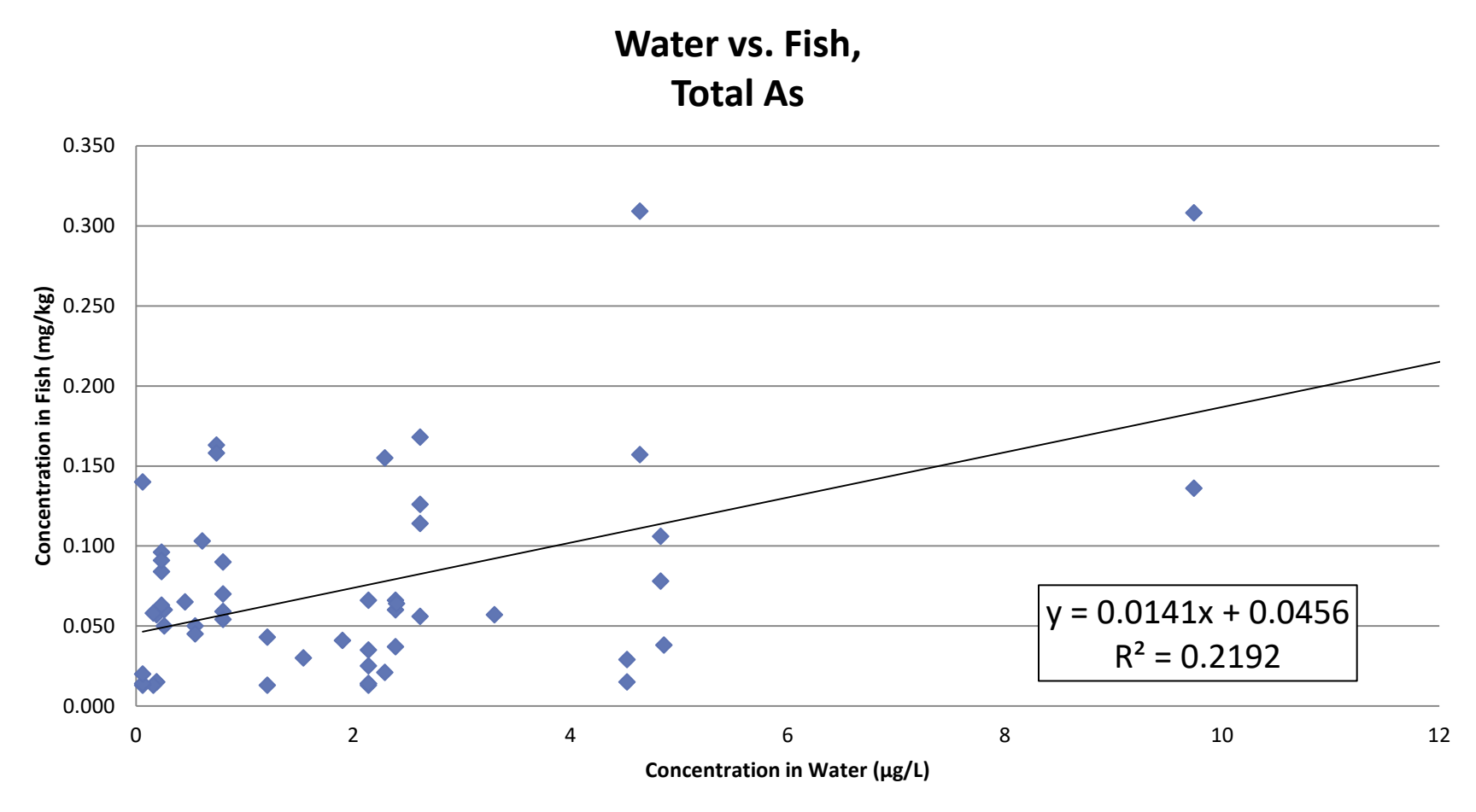
(Williams et al. 2006. Human and Ecological Risk Assessment 12: 904-923)

Figure 4

Plot of total arsenic in paired samples of Idaho surface water and fish tissue with regression equation with superimposed line showing concentrations predicted by IDEQ (2010) BAF of 143 L/kg

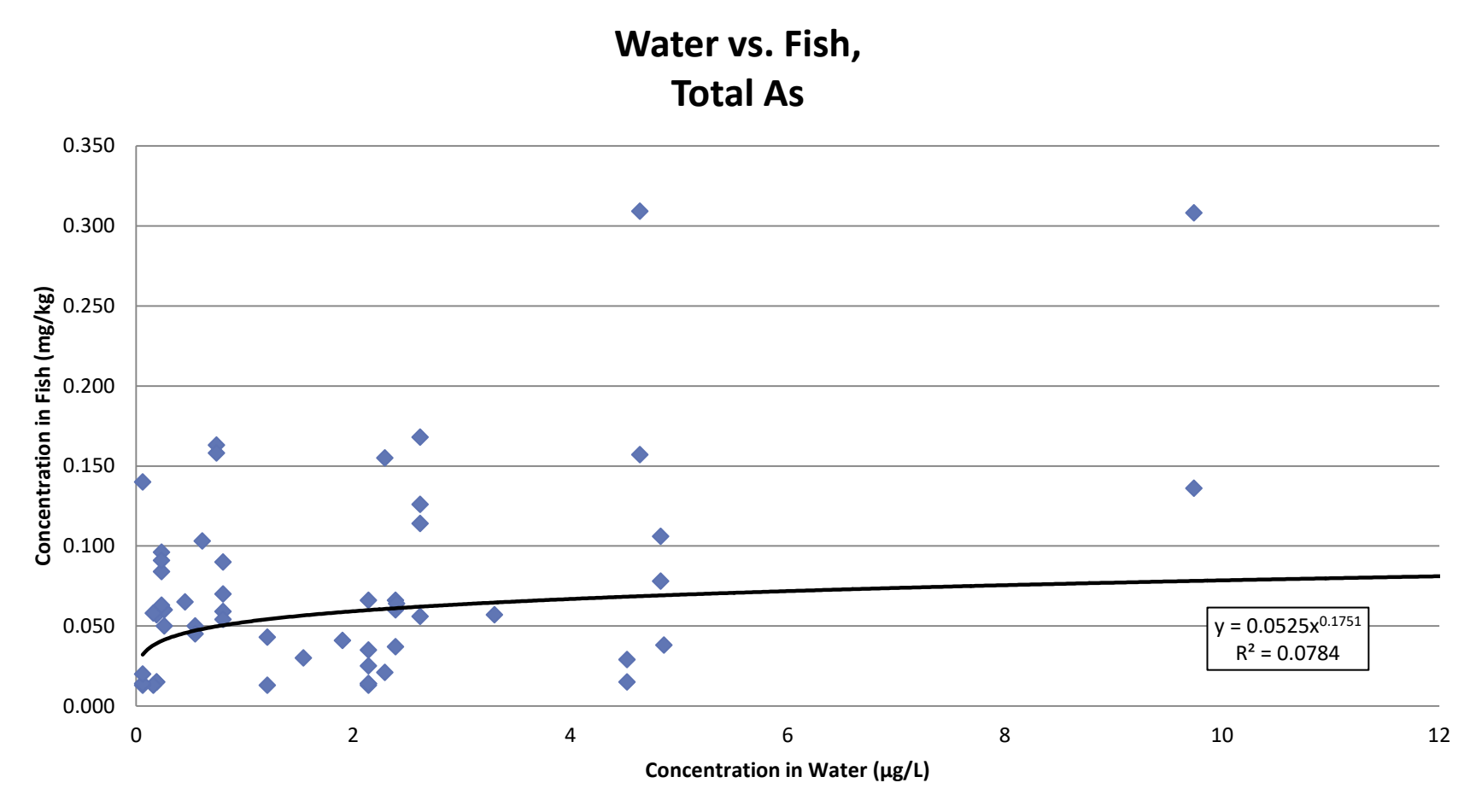


Linear Regression



Power Function

(Williams et al. 2006)



Approach to Calculate BAF

- **Should Idaho pursue alternative approach to calculate BAF?**

Bioaccumulation Data

- **Should Idaho limit derivation of BAF to Idaho-specific data, literature data, or use all available data?**
  - **Does it matter? How much effort is it worth?**

V. Monitoring

- Goals:
  - Identify background conditions
  - Refine Idaho-specific BAF
  - Refine understanding of As(i):As(T) in both water and fish

V. Monitoring

- Design
  - Probabilistic monitoring
  - Multiple water samples for As(T) and As(i) (June/July and October/November)
  - Fish Tissue (October/November):
    - Target game species, 2 species per site, 5 fish composite per species
      - Will take what we can get!

V. Monitoring

- Time dependent – Results will not be available in time to inform rulemaking unless timeline is extended
- Could be used to aid in implementation

VI. Next Steps

- Comments on:
  - Approaches to identify appropriate background
  - Approaches to calculating BAF
  - Any other issues presented
- Comments due: June 6, 2018
- Next Meeting: June 27, 2018
  - Implementation Tools and Natural Background Provisions