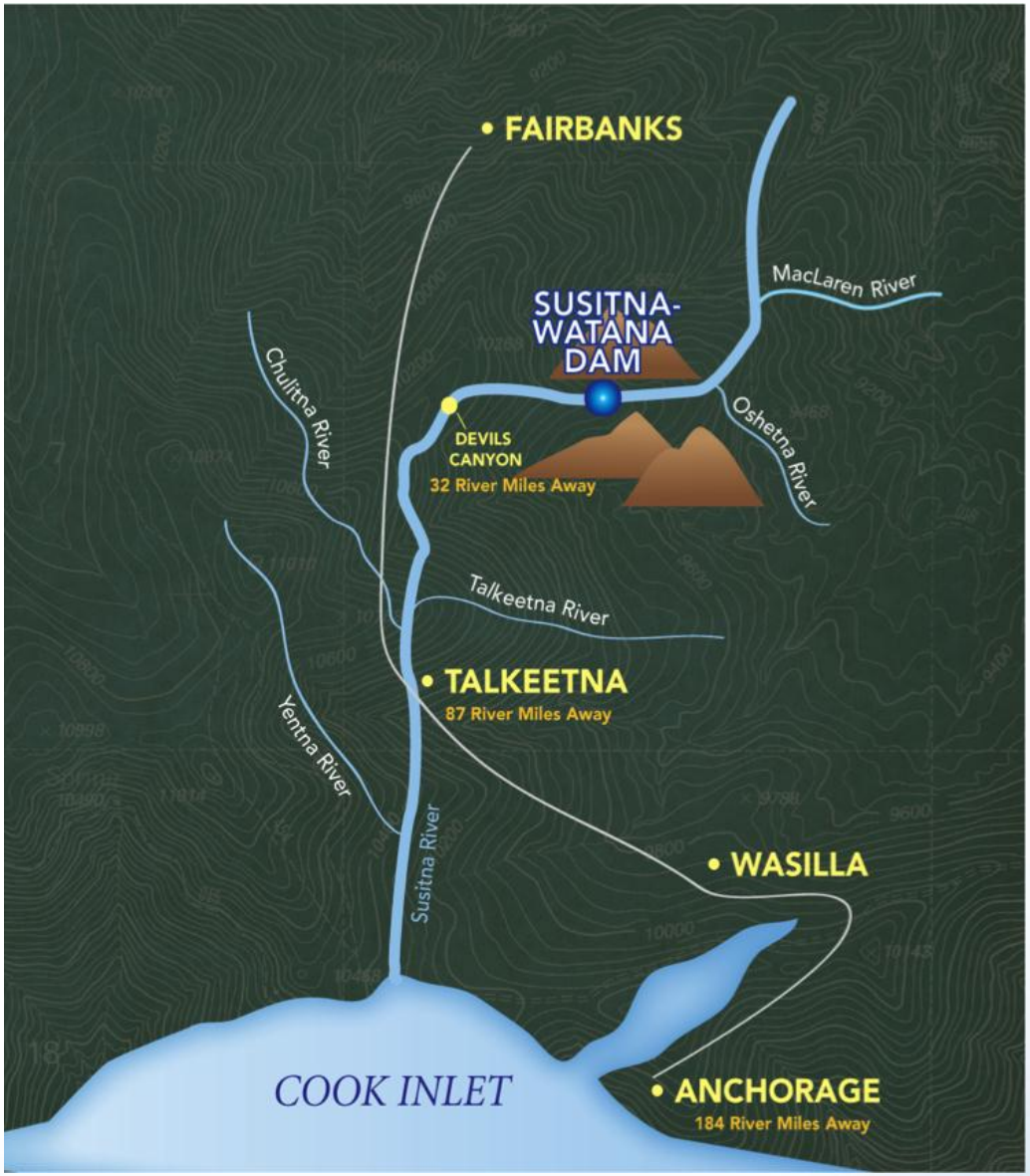
Water Quality Modeling

October 23, 2012 TWG meeting

Study Purpose: How to characterize and conduct operational assessments of water quality of the Susitna-River



Water Quality Modeling

Overview

- Goals and Objectives
- Issues
- Resolutions
- Additional Work
- Interdependency Chart

Water Quality Modeling

RSP's Goals and Objectives are consistent with PSP

Goals and Objectives

- Identify an appropriate reservoir and riverine water temperature model;
- Model water quality conditions in the proposed reservoir including: field parameters, general chemistry, and metals (including mercury); and
- Model water quality conditions in the proposed river downstream including: field parameters, general chemistry, and metals (including mercury).

Water Quality Modeling

Comment: Study should predict potential toxic impacts.

Toxics Modeling

- Mercury Inputs to the Reservoir
- Toxicity Effects to Aquatic Organisms

RSP Provides Additional Detail

- Reservoir Water Quality Model
  a. Surface water predictions
  b. Mechanisms for transfer

- Riverine Water Quality Model
  a. Surface water predictions
  b. Influence of Operational scenarios
  c. Hourly time-step (able to model shorter intervals)

- Potential for Bioaccumulation: Pathways Analysis
  a. Predict water quality conditions that mobilize toxics
  b. Determine if metals present are bioavailable

Water Quality Modeling

Comment: Study should address Mercury Ecosystem Response

Mercury Modeling

Surface Water Issues

- Mercury Inputs, Methylation, Uptake, and Biomagnification

RSP includes additional modeling

- Mercury toxicity model within the EFDC Model for the reservoir

  a. Predict Total Hg and Methylated Hg in the reservoir
  b. Hourly time-step predictions to accommodate for operational scenarios

- Metals toxicity model for the reservoir and riverine portions of the Project area

Baseline Water Quality Modeling

Comment:

Study should address other potential toxic metals

Determining Toxicities

RSP include Modeling and Provides Additional Detail regarding Standards and Thresholds

- Alaska State Water Quality Standards
  - Surface Water (acute/chronic criteria)
- NOAA SQuiRT Tables
  - sediment, surface water, tissues
  - acute/chronic toxicity benchmarks

Water Quality Modeling

RSP includes TWG Consensus on Model Selection

Model Selection

- Environmental Fluid Dynamics Code (EFDC) selected (consensus from August 17, 2012 TWG)
  - Model Resolution
    - Main Channel (250m – 1km)
    - Focus Areas (100m – 250m)
  - Multiple Scales – One Model
    - Mercury model within Main Model
    - Focus Area model within Main Model

Water Quality Modeling

Additional Work in Response to Agencies' Comments on PSP

Influence of Groundwater on Transfer of Metals

Approach

- Intense Sample Areas
  a. Identify specific "Focus Areas"
  b. Samples across each transect (100 to 500 meters depending upon location morphology)
  c. Sampled periodically
  d. Continuous sampling for field parameters
  e. Piezometers on each transect
  f. Seepage meters as part of Instream Flow Study

Water Quality Modeling

Additional Work in Response to Agencies' Comments on PSP

Models (Surface Water)

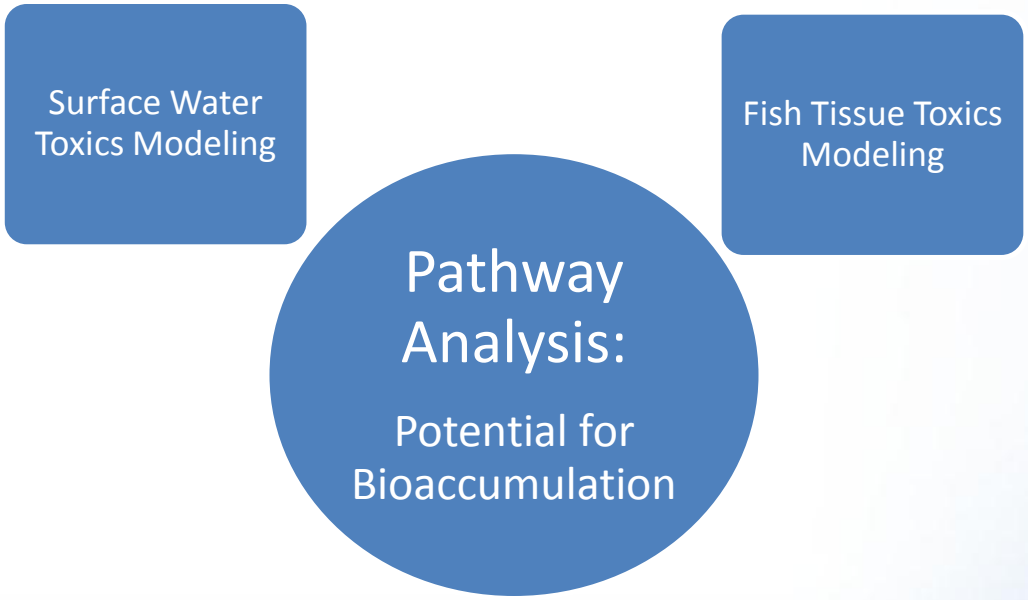
1. Reservoir
2. Riverine
3. Focus Area
4. Mercury Model

Models (Fish Tissue)

1. Reservoir/Riverine Boundary

Interpretation of Toxicity Model Results

- Combining Model Results

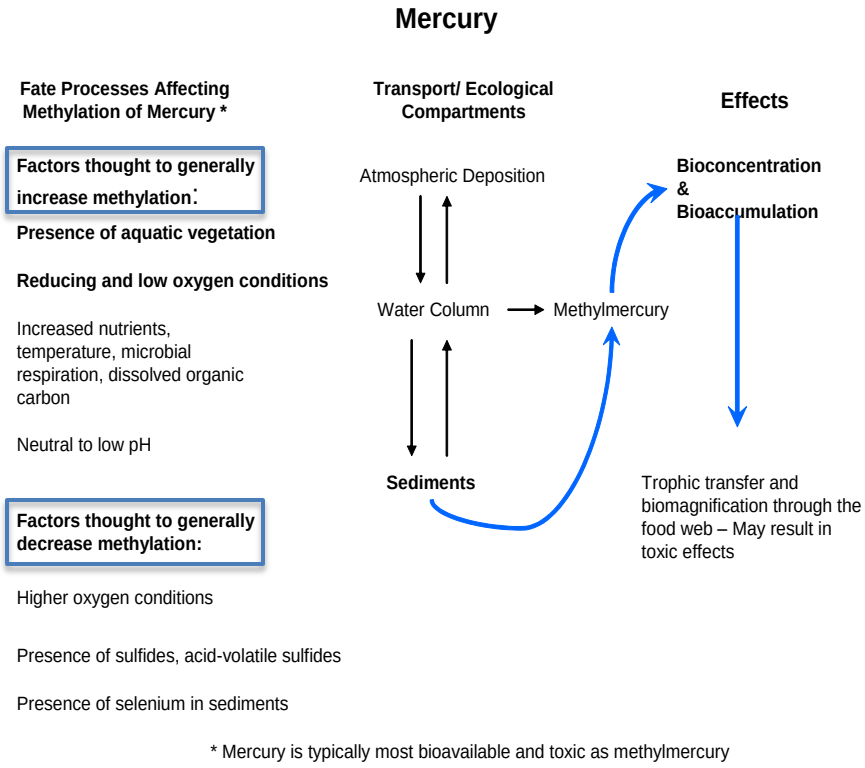


Water Quality Modeling

Actions

1. Examine Reservoir conditions (factors) that promote methylation and transfer of mercury between media.

Pathways Analysis Example: Step 1



Water Quality Modeling

Actions

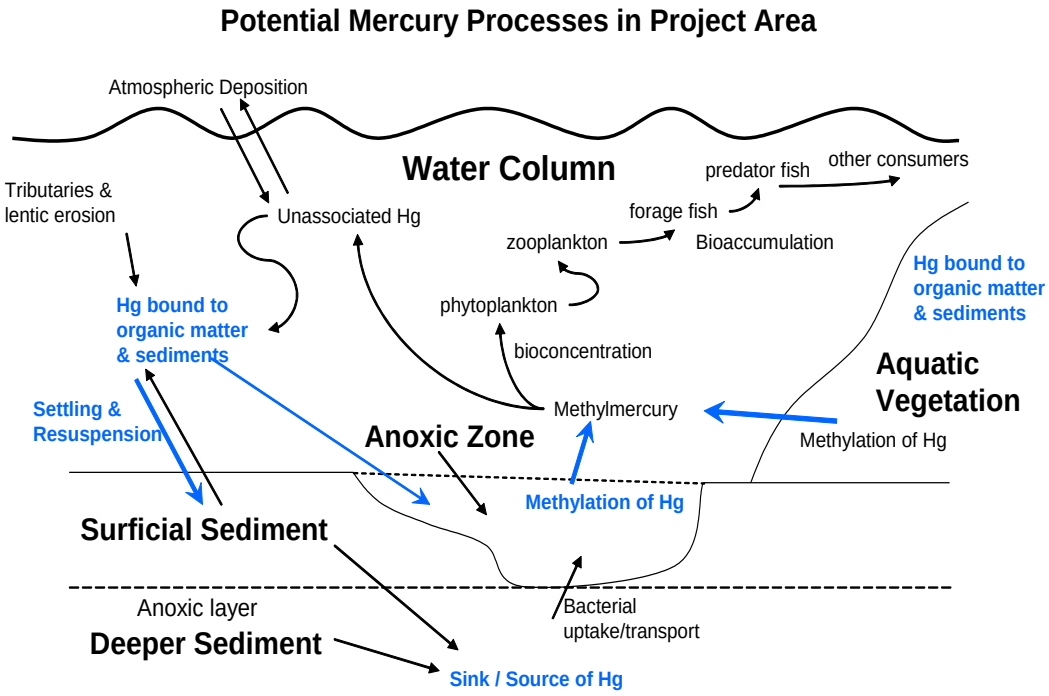
2. Determine if a potential for mercury mobilization and bioaccumulation in the reservoir
3. Are fish likely receptors of mercury mobilization?

(Combine fish tissue results with modeling results to determine if a toxicity pathway is likely)

Note:

Highlighting will indicate likely transfer pathways in the reservoir (based on existing information)

Pathways Analysis Example: Step 2



INTERDEPENDENCIES FOR WATER RESOURCES STUDIES