

Technical Workgroup Meeting Water Resources Studies

*Mercury Assessment and
Potential for
Bioaccumulation*

October 23, 2012

Prepared by: **Tetra Tech
and URS**

Review of RSP Updates

- Additional background information and glossary
- Added vegetation and soil sampling
- Additional details on other sampling methods (water, sediment, fish)
- Additional modeling methods
 - Harris and Hutchison
 - Phosphorous release model
- Pathway assessment
- Study integration
 - Schedule
 - Study Interdependencies



Added Vegetation and Surface Soil Sampling

- Sampling in the inundation zone
- Characterize occurrence of vegetation and organic soils
- Characterize mercury concentrations in vegetation and soil
- Primary purpose is for potential mitigation efforts



Additional Details on Water, Sediment, and Fish Tissue Sampling

- SAP/QAPP will be attached
- Sampling methods and analytical procedures



Modeling and pathway assessment

- Modeling using three methods
 - Water quality modeling as part of reservoir model
 - Quantitative model predicting methylmercury generation
 - Harris and Hutchison Model
 - Good correlation between area flooded, volume flow rate, and final methylmercury concentrations in fish
 - Phosphorous Release Modeling
 - Similar to above, more parameters, predicts timing of methylmercury in fish
- Pathway Assessment
 - Assessment of pathways
 - Can mercury in water reach outside ecosystem?



Predicting Mercury in Fish

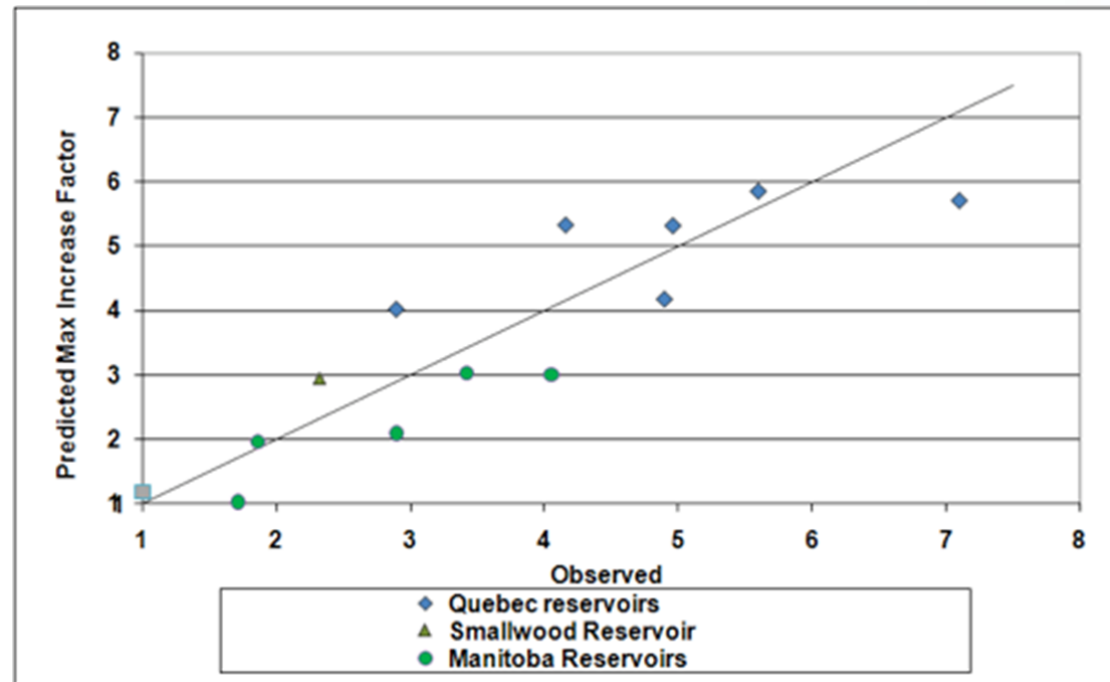
- Magnitude of impact to fish based on surface area, reservoir volume, flow
- Fill and flow through reservoir control concentrations in fish
- Simple formula predicts maximum mercury concentration in fish

Peak increase factor =

$$1 + K_1 * \frac{\text{Area flooded}}{Q + K_2 (\text{Area total})}$$

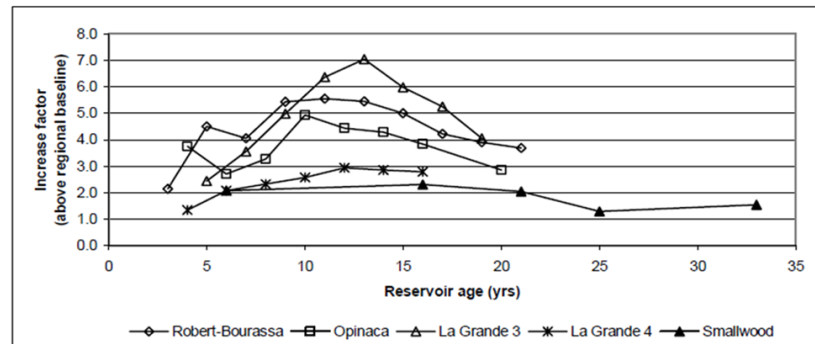
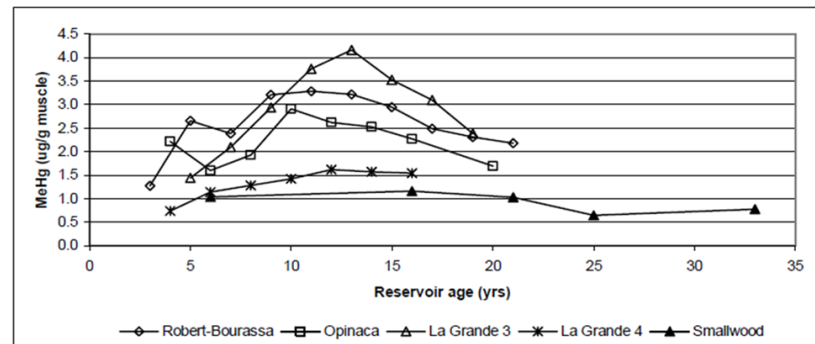
(Harris and Hutchison, 2008)

Reed Harris, 2012

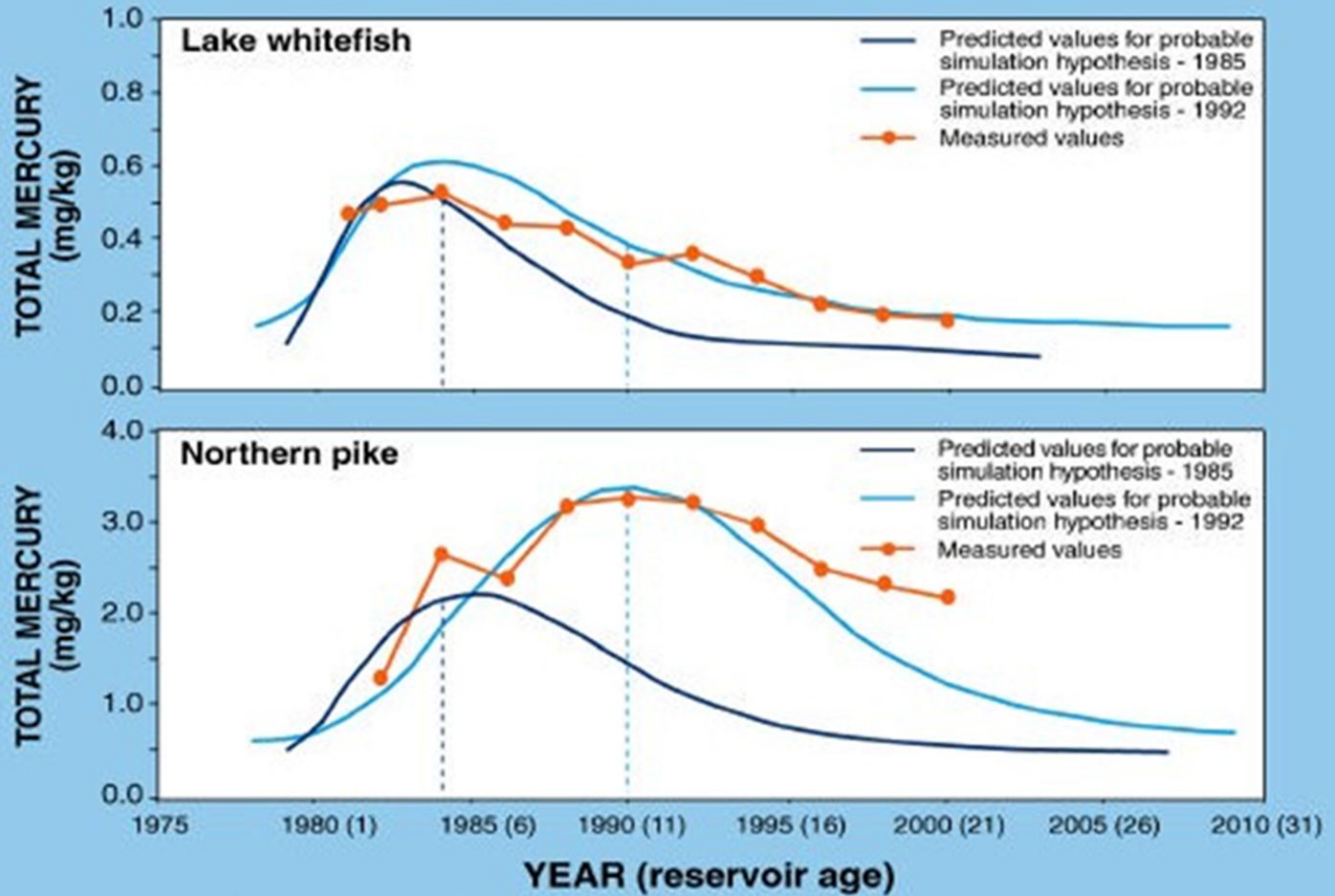


Predicting mercury concentration over time

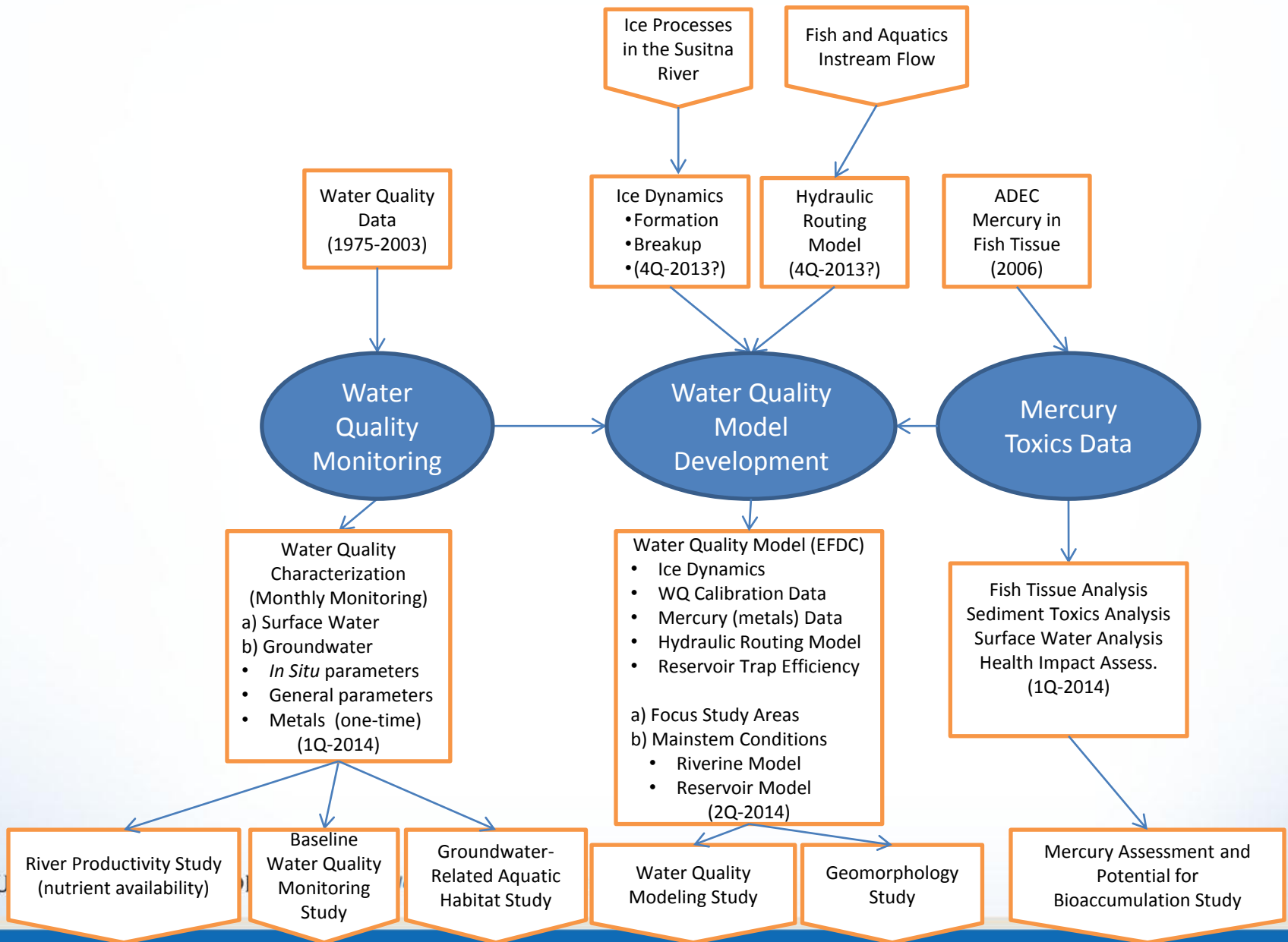
- Methylmercury concentrations return to background over time (15 to 35 years)
- Timing of peak and return to background varies with many factors
- Hydro-Quebec model can predict curve with some accuracy



ROBERT-BOURASSA RESERVOIR



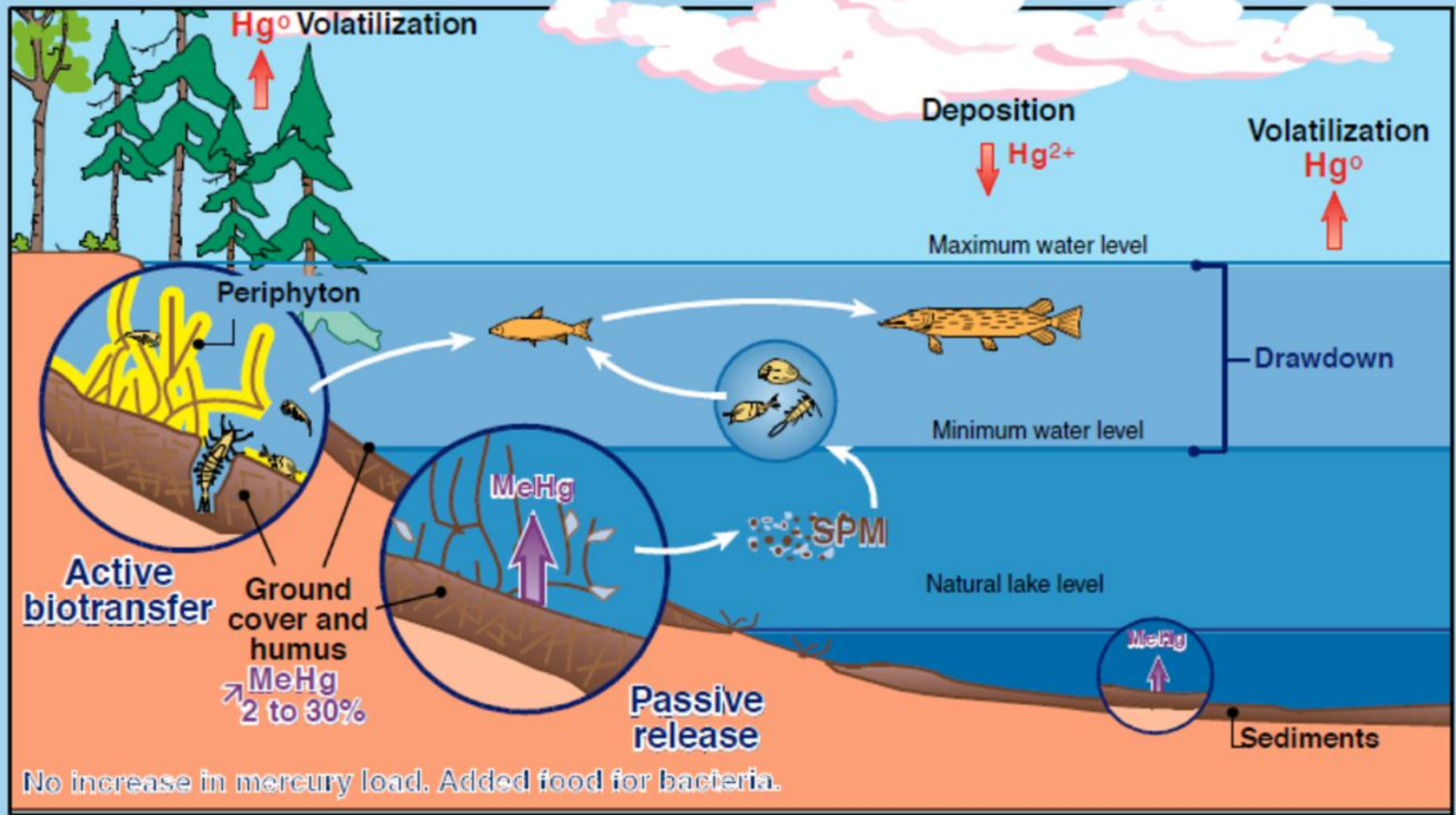
INTERDEPENDENCIES FOR WATER RESOURCES STUDIES



Summary of 2012 Activities

- Fish samples collected from upper Susitna
 - Unfortunately some samples lost due to power outages (need to stay frozen)
 - Six samples collected (trout, burbot, grayling)
 - Result should be available by end of month
- Background research
 - Reviewing ADEC methylmercury database
 - Reviewing methylmercury data generated by USGS for Susitna
 - Review other studies of mercury analysis and modeling





- Methylmercury transfer
- Hg²⁺ and Hg⁰: Inorganic mercury
- MeHg: Methylmercury
- SPM: Suspended particulate matter

From Hydro-Quebec (2003)