



# Willamette Mercury TMDL Modeling Updates

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# Model Overview

- ▶ Link sources of total mercury (THg) to methylmercury (MeHg) in fish
- ▶ Three components:
  - **Mass Balance Model:** Link THg sources in the watershed to instream concentrations using watershed model
  - **Mercury Translator:** Link THg concentrations to MeHg and Hg[II] exposure concentrations
  - **Food Web Model:** Link exposure concentrations of MeHg to fish tissue

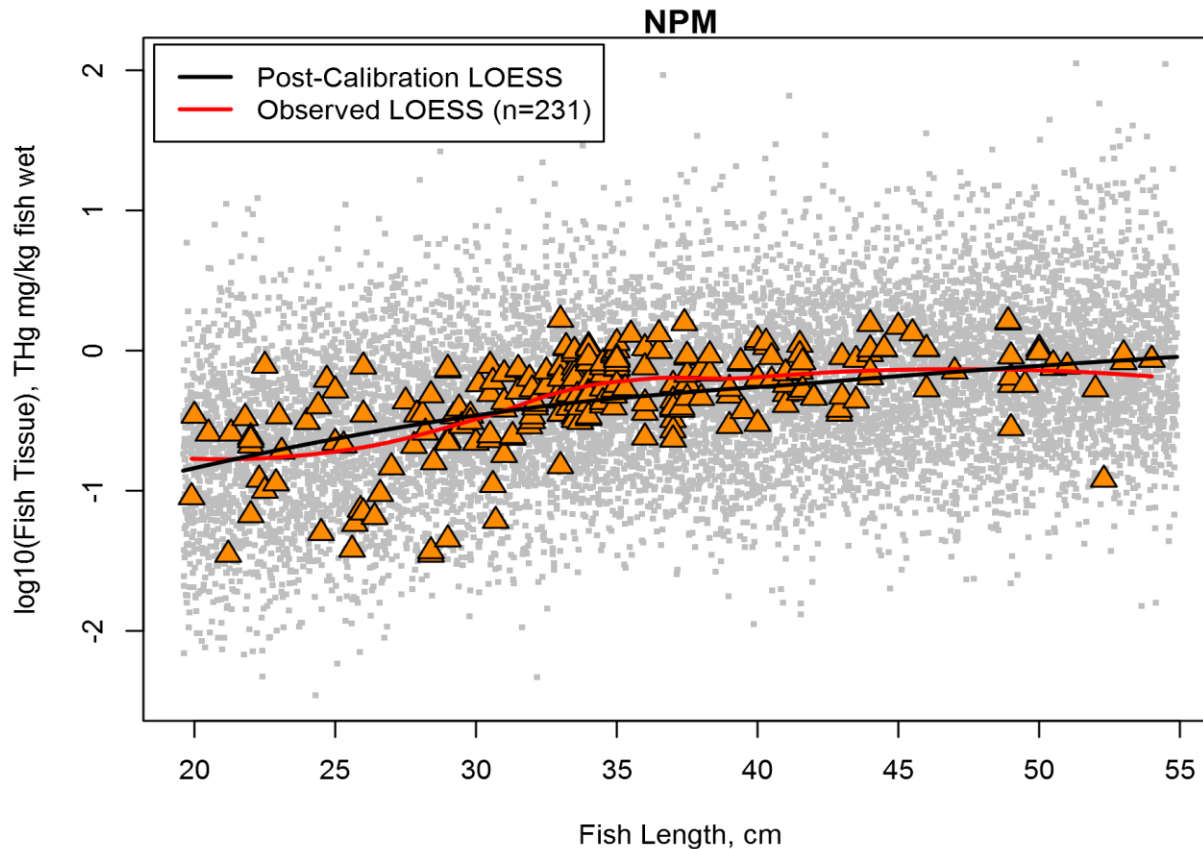


# Food Web Model

- ▶ Final recalibration adjustments completed
- ▶ Improved fit to tails of distribution
- ▶ Proposed final version now under review
- ▶ Supports instream target of 0.14 ng/L total Hg to achieve median fish tissue concentration of 0.040 mg/kg methylmercury based on northern pikeminnow (most sensitive endpoint)

# Food Web Model

## ► Reproduces observed fish tissue concentrations

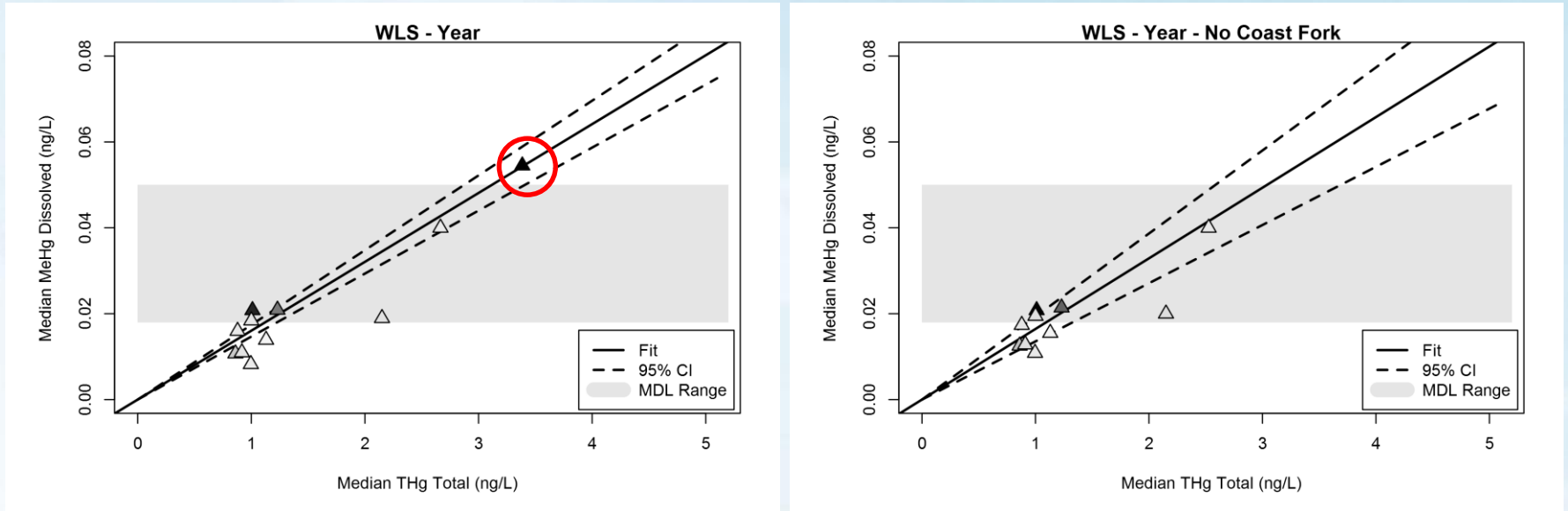


- Orange triangles: 231 observed samples
- Gray dots: 10,000 Monte Carlo simulation runs
- Lines show locally weighted regression (LOES)

# Mercury Translator

- ▶ Performed additional testing and sensitivity analysis
- ▶ Examined whether Coast Fork samples bias results
- ▶ Tested weighted versus ordinary least squares for translator fit
- ▶ Evaluated use of seasonal versus whole-year translator representations

# Inclusion of Coast Fork Data: Does not cause significant change in relationship



- Points are medians by HUC8, filled triangles have greater sample size
- Gray bar shows range of detection limits for individual samples; most medians must be projected into non-detect range using Robust Regression on Order Statistics (ROS)

# Mercury Translator Recommendations

- ▶ Continue use of WLS with weighting by number of dMeHg samples
- ▶ Perform a single Translator analysis that includes samples from the Coast Fork Willamette HUC8
- ▶ Estimate Translator on a full-year rather than seasonal basis
  - Gives higher  $R^2$
  - Allows direct estimate of annual concentration target
  - MeHg exposure likely incorporates effects of transport earlier in the year



# Mass Balance Model

- ▶ Added representation of PGE hydropower dams on the Clackamas
- ▶ Developed user-friendly Excel workbooks to tabulate sources and evaluate allocation options by HUC8
- ▶ Completed evaluation of POTW sources
- ▶ Completed stormwater and MS4 analysis
- ▶ *Ongoing*: Still assembling information on industrial discharges