Delta RMP Mercury Monitoring: Findings from the First Four Years

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DTMC September 2021

Delta RMP Mercury Monitoring

- Began in 2016

- Stations spread across the subareas

- Smaller effort initially

- More intensive monitoring in 2018 and 2019 to inform reevaluation of the TMDL

Figure 1. Map showing the boundary of the Delta, the eight subareas delineated in the TMDL, and the sampling stations for fish and water in year 3 of Delta RMP mercury monitoring. Lower Mokelumne River 6 station was not sampled for water until October 2017.
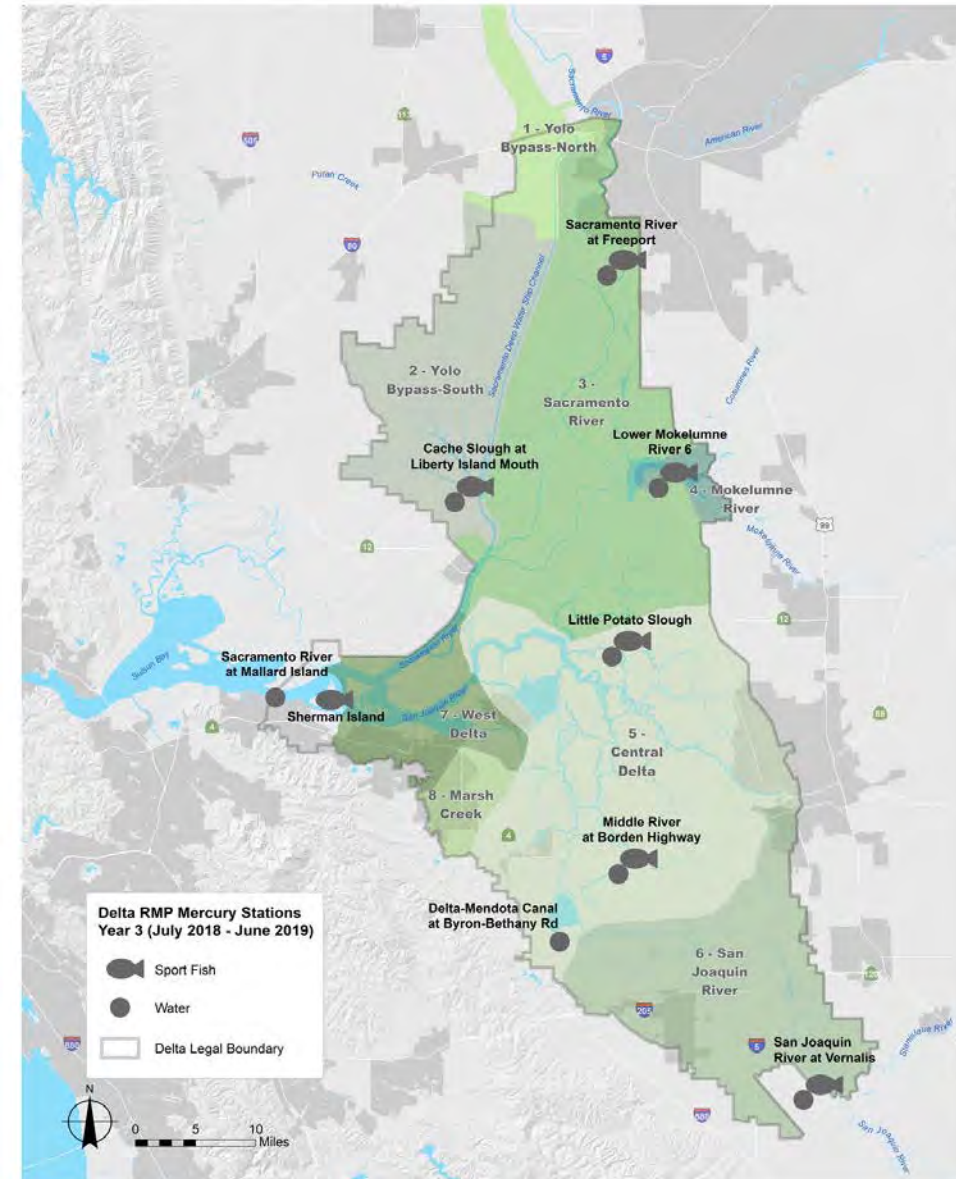
Black Bass: Average Concentrations 2016-2019

- Spatial pattern consistent with past data – high concentrations around periphery, lower concentrations in Central Delta


Figure 3. Length-adjusted (350 mm) mean MeHg concentration (ppm wet weight) in black bass at each station. Mean of four years of sampling from 2016-2019. Error bars show ± 2SE.
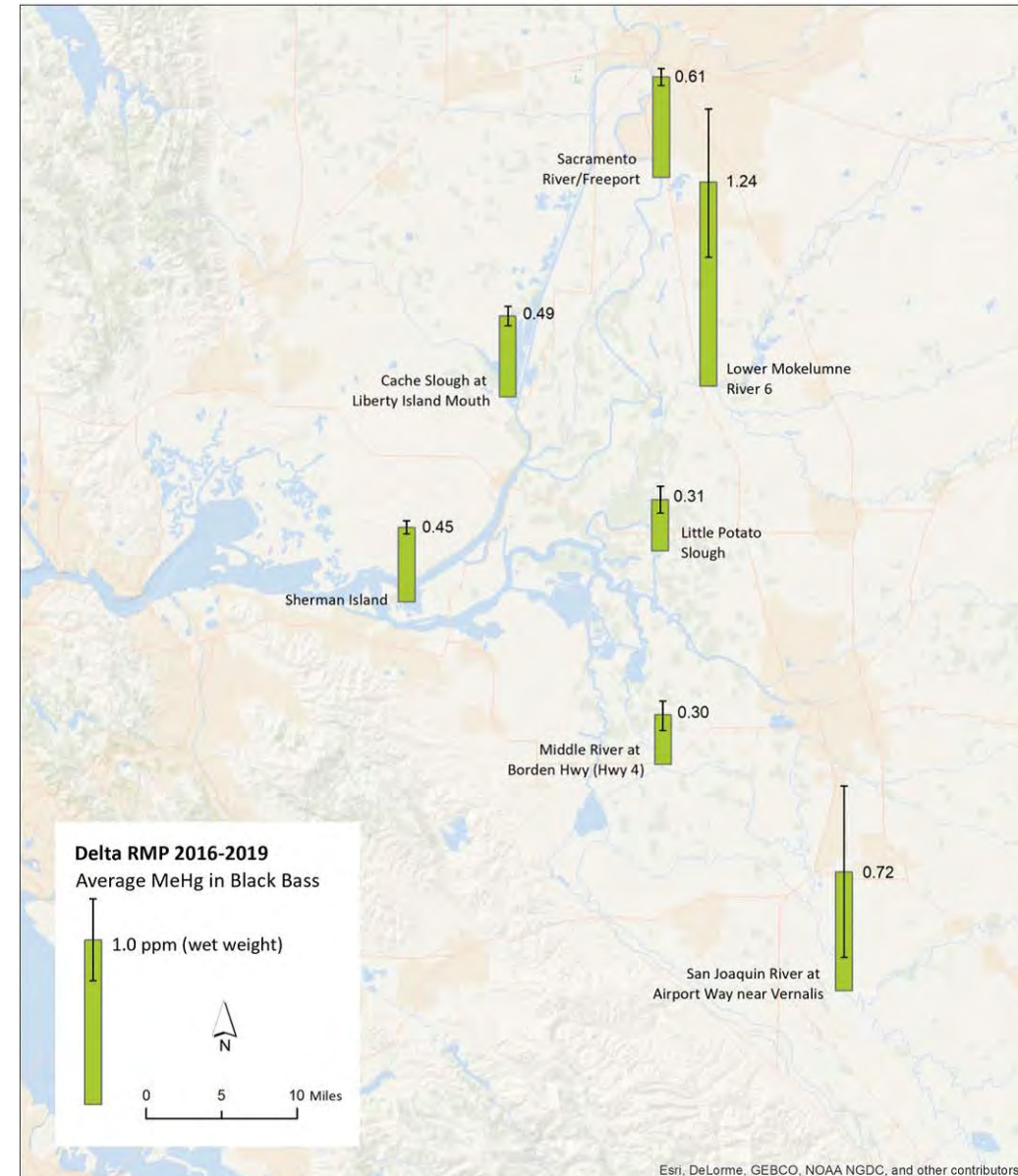
Black Bass: Are trends over time in MeHg similar or different among Delta subareas?

- Answer: **Different!**

- Two stations have very high interannual variation, and reach very high concentrations (> 1.4 ppm)

- Concentrations are much less variable over time at the other four stations, very consistent with "historic" data
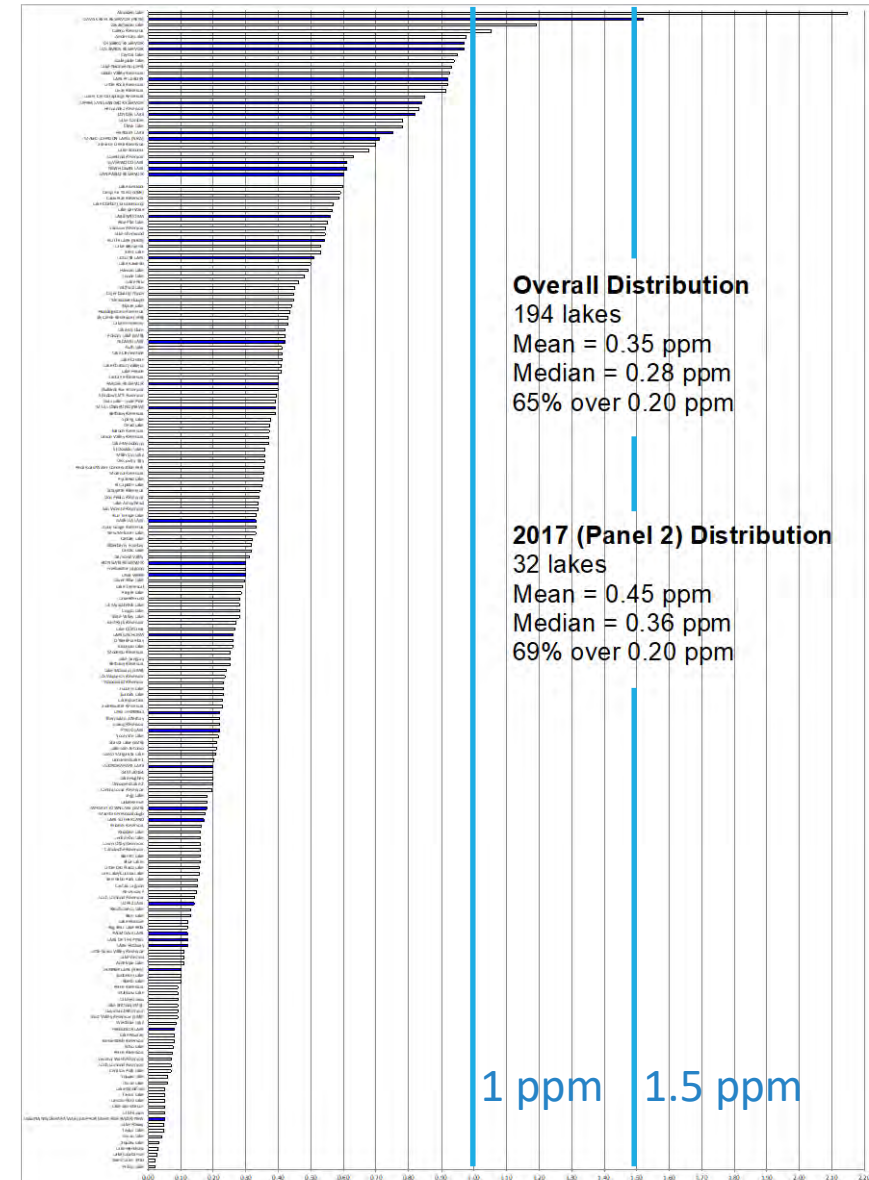
- Water data showed similar patterns

Figure 2. Long-term time series of mean MeHg (ppm wet weight) in black bass for Delta RMP stations and nearby stations sampled historically. Red line shows the 0.24 ppm TMDL implementation goal. Details provided on page following the graphs.
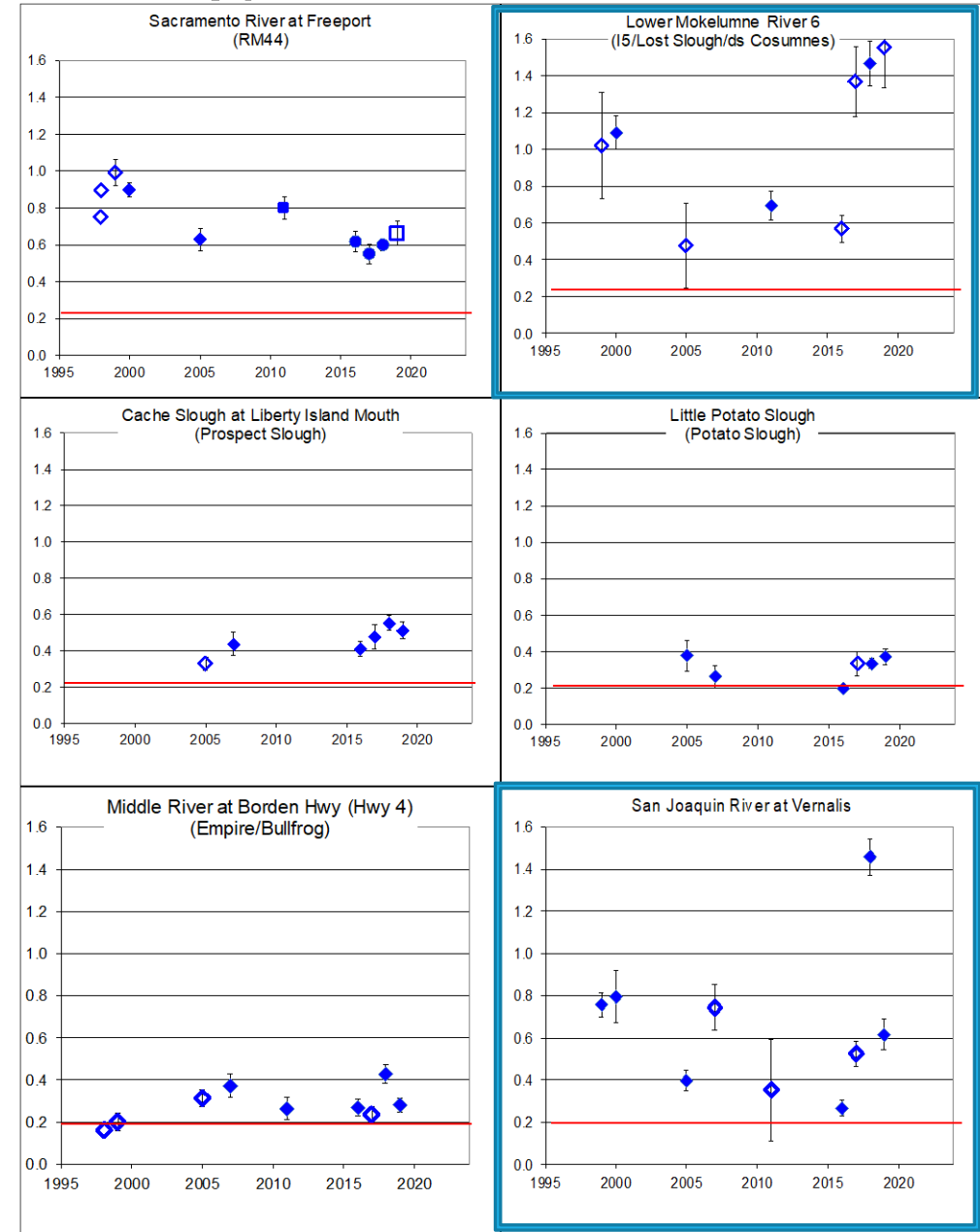
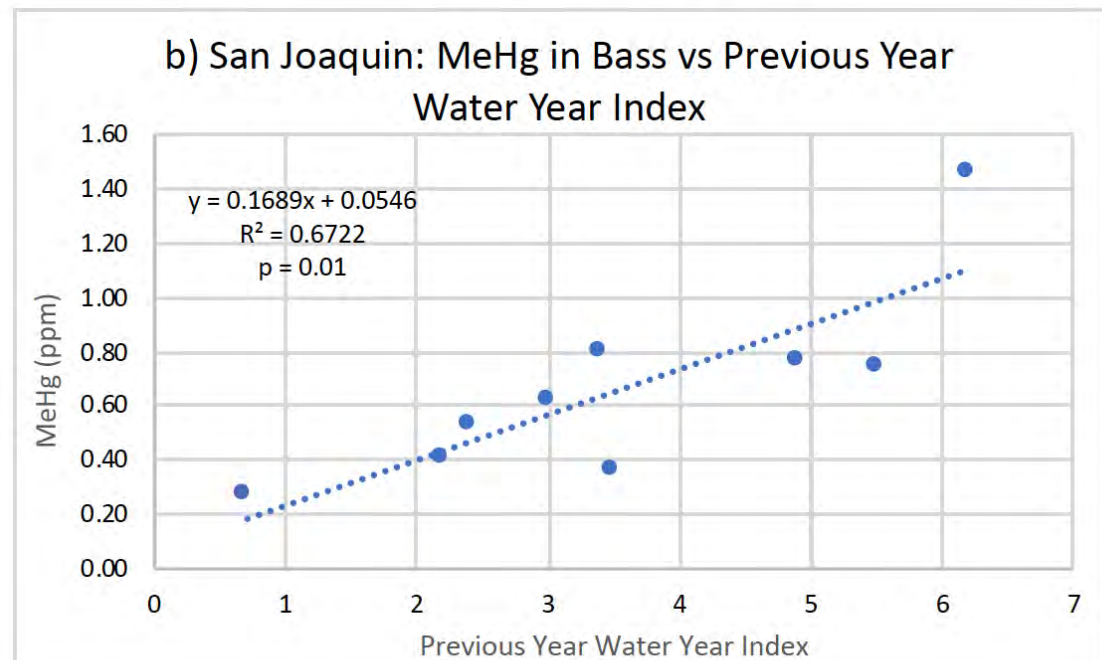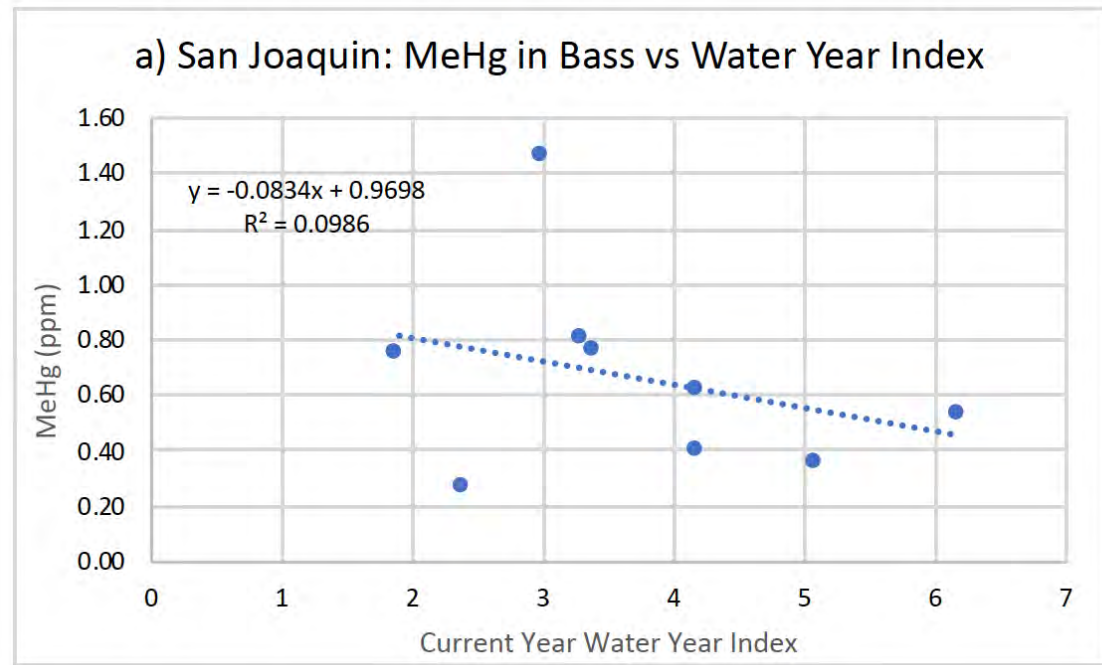# Black Bass: Maximum Concentrations in the Delta Are Very High

- Comparison to statewide length-adjusted largemouth bass dataset for lakes

- Only two lakes out of 194 lakes had means higher than 1.4 ppm

Figure 6. Mean mercury concentrations in 350 mm black bass in California lakes. Most recent sampling year for each lake is shown. Blue shading indicates lakes sampled in 2017.

Overall Distribution
194 lakes
Mean = 0.35 ppm
Median = 0.28 ppm
65% over 0.20 ppm

2017 (Panel 2) Distribution
32 lakes
Mean = 0.45 ppm
Median = 0.36 ppm
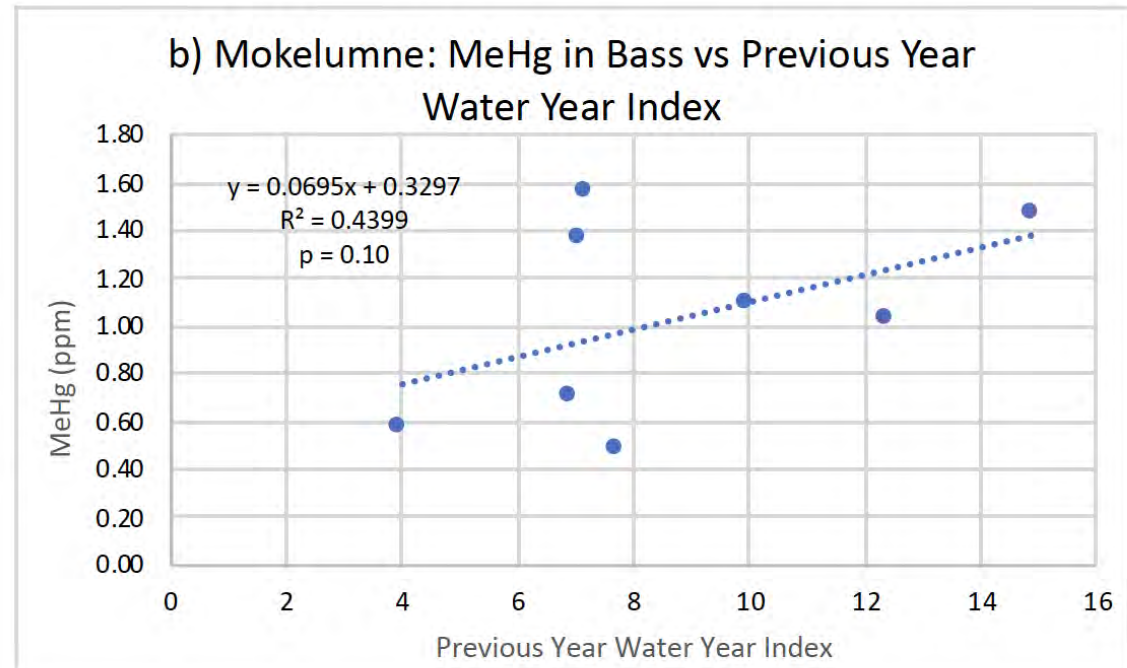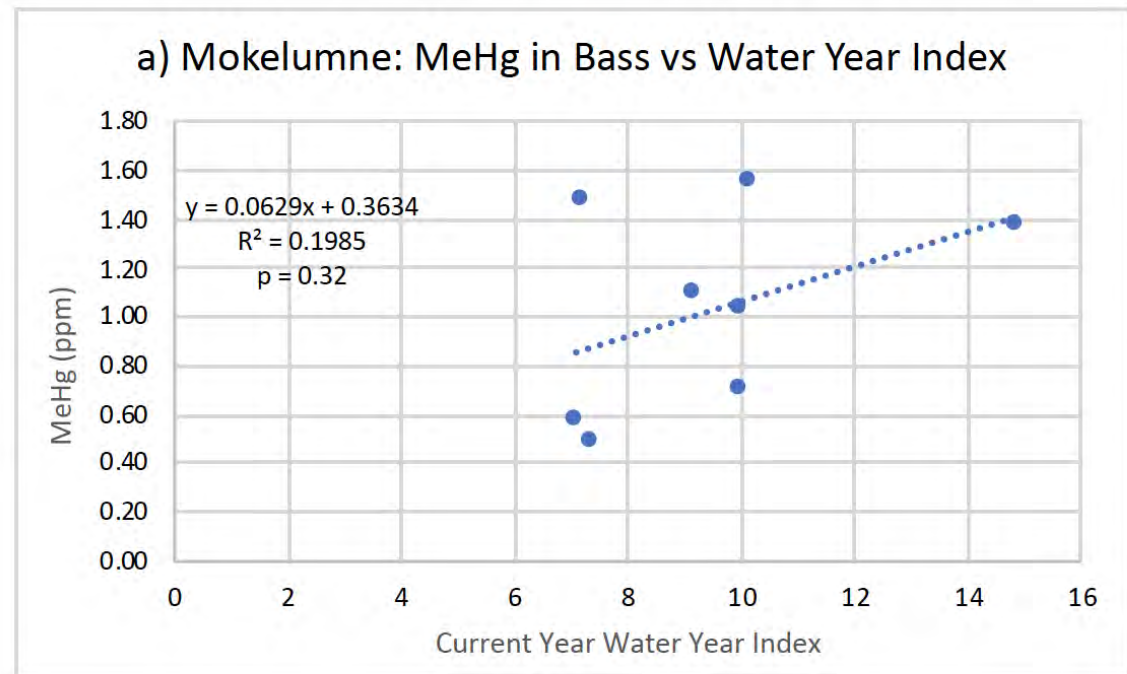69% over 0.20 ppm

1 ppm   1.5 ppm

Black Bass: What Is Causing the High Interannual Variation?

- Obvious possibility: interannual variation in flow and floodplain inundation

- Relationship not significant for current water year data

- Relationship at Vernalis is significant using prior year water data (almost significant at Mokelumne)

- Suggests hypothesis of a lag time

- More data needed

a) San Joaquin: MeHg in Bass vs Water Year Index

$y = -0.0834x + 0.9698$
$R^2 = 0.0986$

MeHg (ppm) vs Current Year Water Year Index

b) San Joaquin: MeHg in Bass vs Previous Year Water Year Index

$y = 0.1689x + 0.0546$
$R^2 = 0.6722$
$p = 0.01$

MeHg (ppm) vs Previous Year Water Year Index

Black Bass: What Is Causing the High Interannual Variation?

- Relationship to previous water year not as well supported by Mokelumne data

a) Mokelumne: MeHg in Bass vs Water Year Index

$y = 0.0629x + 0.3634$
$R^2 = 0.1985$
$p = 0.32$

b) Mokelumne: MeHg in Bass vs Previous Year Water Year Index

$y = 0.0695x + 0.3297$
$R^2 = 0.4399$
$p = 0.10$

Water Monitoring

- Generated a robust dataset, especially for 2018 and 2019

Figure 11. Concentrations of unfiltered and filtered methylmercury over monthly timescale at Delta RMP stations. The top six panels are input sites to the Delta and the bottom panels are export sites. Panels on left and right represent west and east locations, respectively.
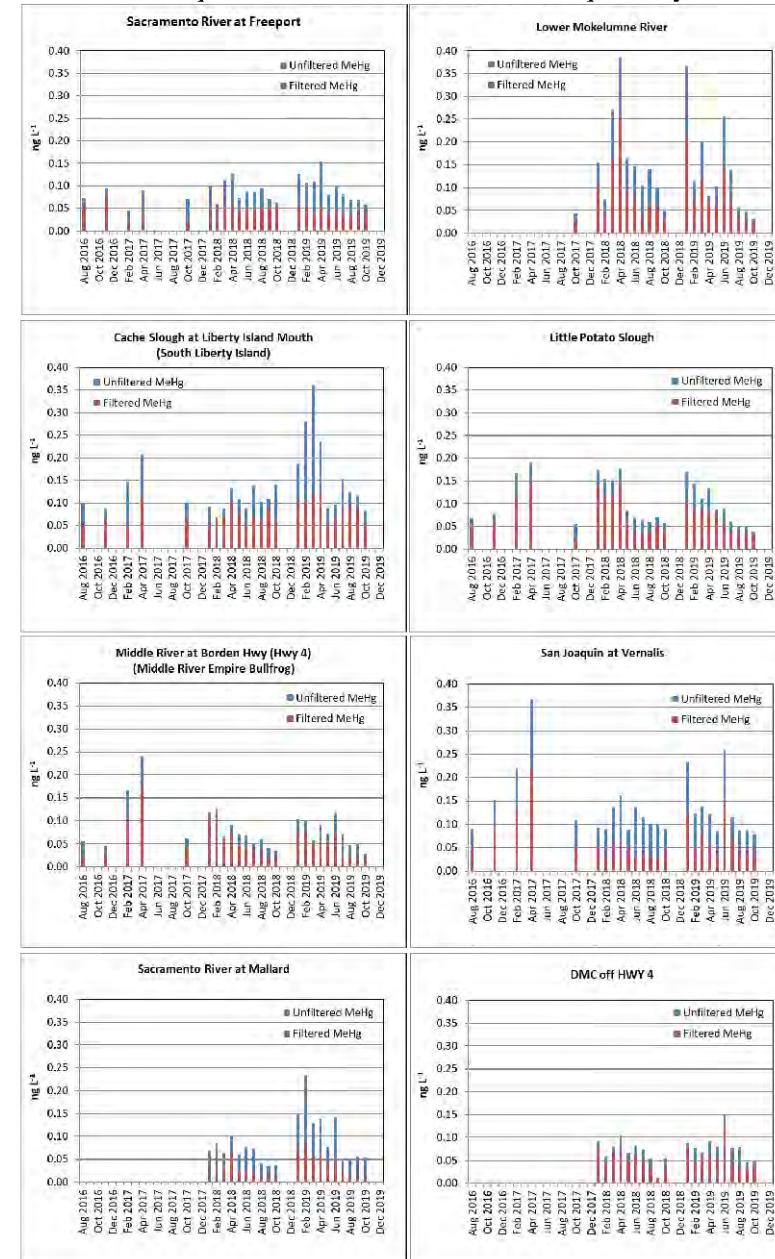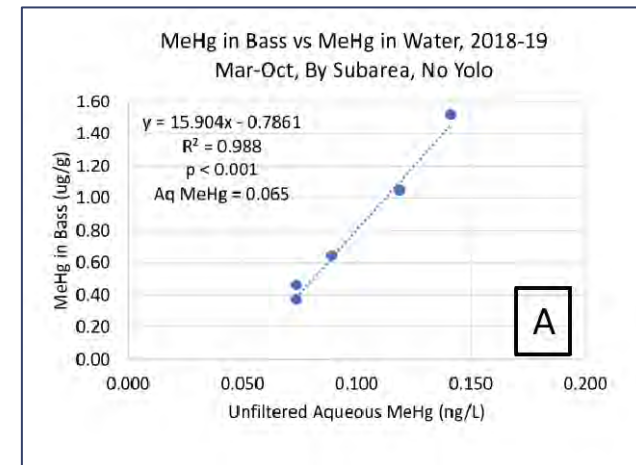
What is the relationship between MeHg in black bass and MeHg in water?

- TMDL linkage analysis was based on a limited dataset

- Robust dataset for bass and water from 2018 and 2019 exhibited a very similar relationship to that observed in 2000
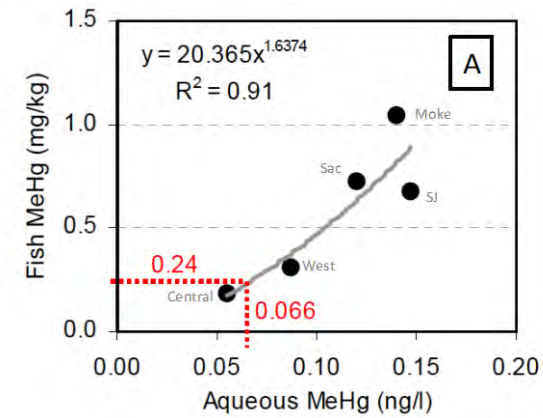
From TMDL
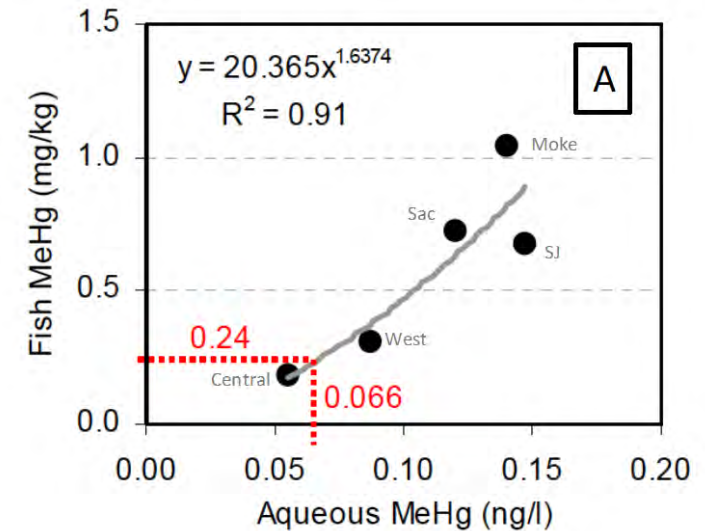
Using Delta RMP Data

What is the relationship between MeHg in black bass and MeHg in water?
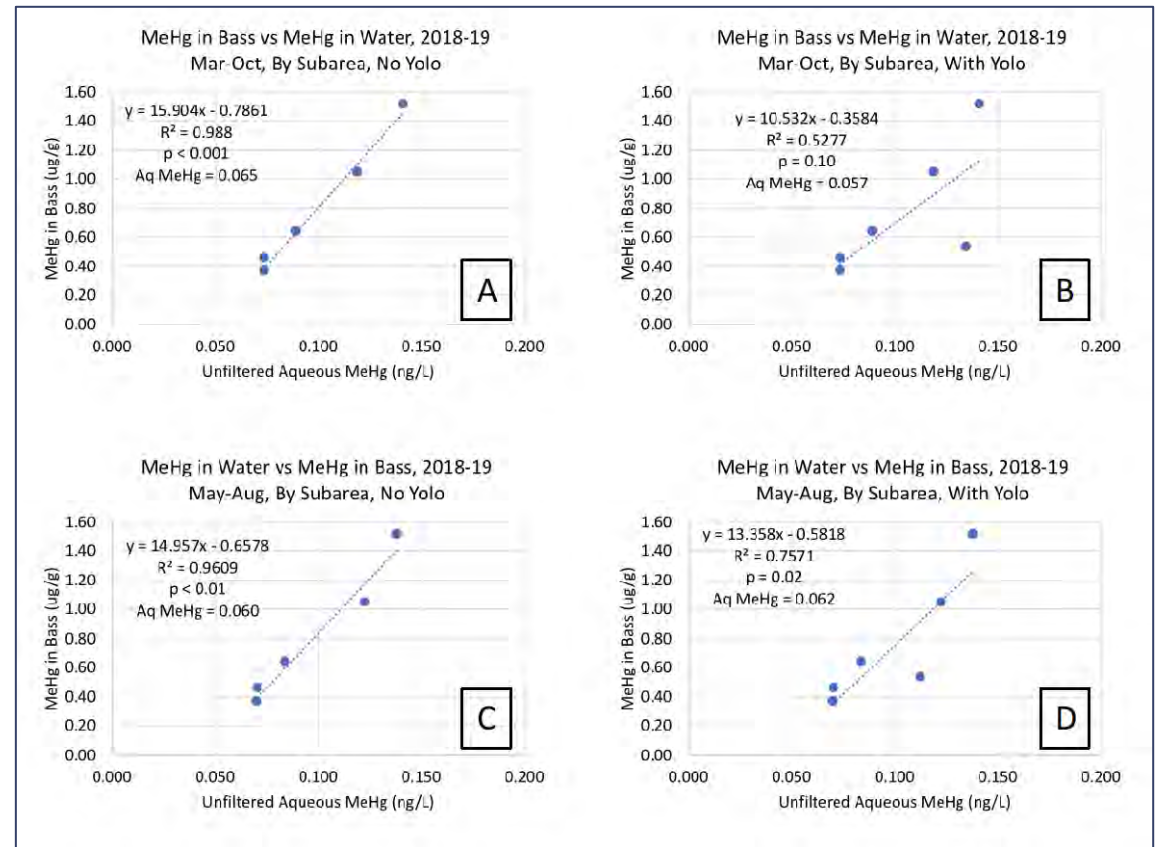
- Yolo Bypass a bit of an outlier

From TMDL

Using Delta RMP Data

No Yolo   With Yolo

Mar-Oct

May-Aug

Highlights from the First 3+ Years of Delta RMP Mercury Monitoring

Significant progress in answering management questions

Supported a reevaluation of the TMDL

Interannual variation is very high

Concentrations of high concern observed

Hypothesis generation: hydrology appears to be a driver

Supported development of a leaner design

What's Next?

Continued black bass monitoring
- ◦ Core stations
- ◦ Restoration stations

Continued water monitoring (Mar, Apr, Sep)

Prey fish monitoring was designed and planned, but permit was denied due to Delta smelt concerns

Acknowledgements

Delta RMP

Autumn Bonnema

Jessica Heath

April Sjoboen Guimarães

Delta RMP Mercury
Subcommittee

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