

Mercury: Physical and Biological Insights

South tip
SF Bay

Darell Slotton, *UC Davis*
Mark Marvin-DiPasquale, *USGS*
Josh Ackerman, *USGS*
Jim Hobbs, *UC Davis*

Alviso
Slough

Pond
A8

Guadalupe
Slough



UC DAVIS

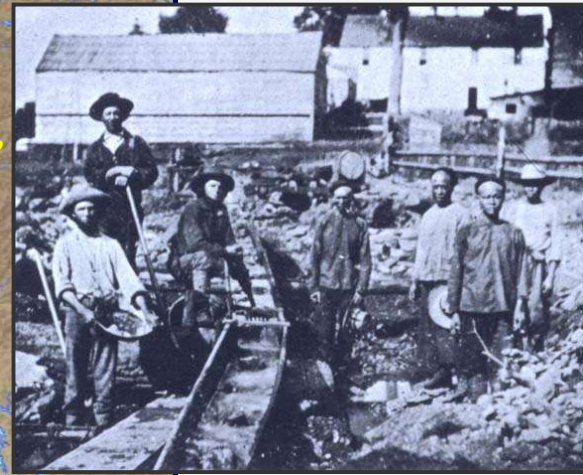
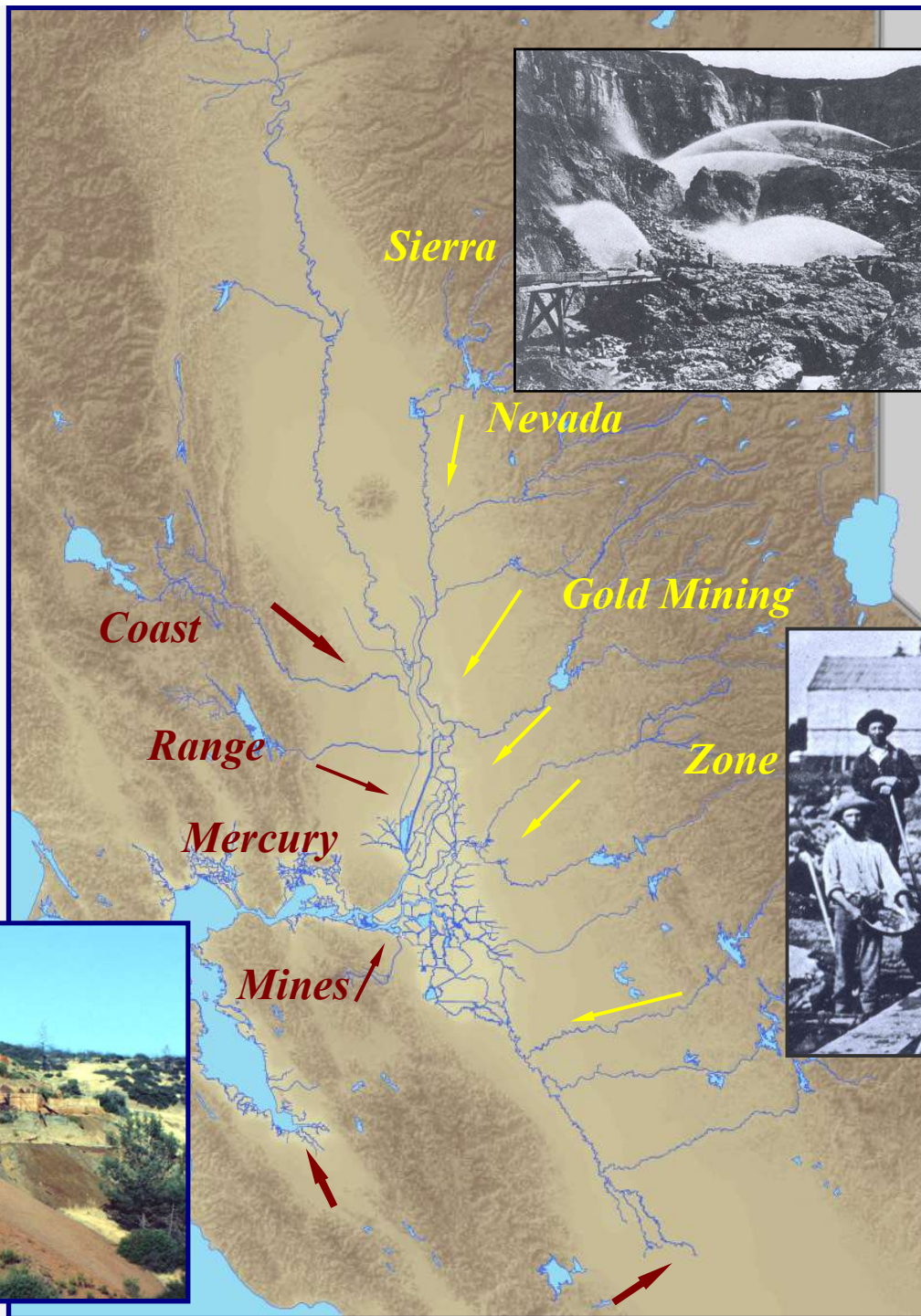


Research/Monitoring Funding:

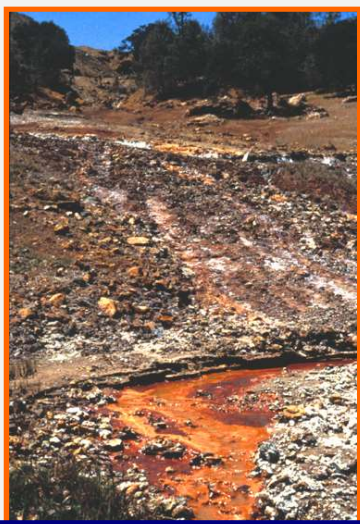
- Resources Legacy Fund
- California Coastal Conservancy
- Santa Clara Valley Water District

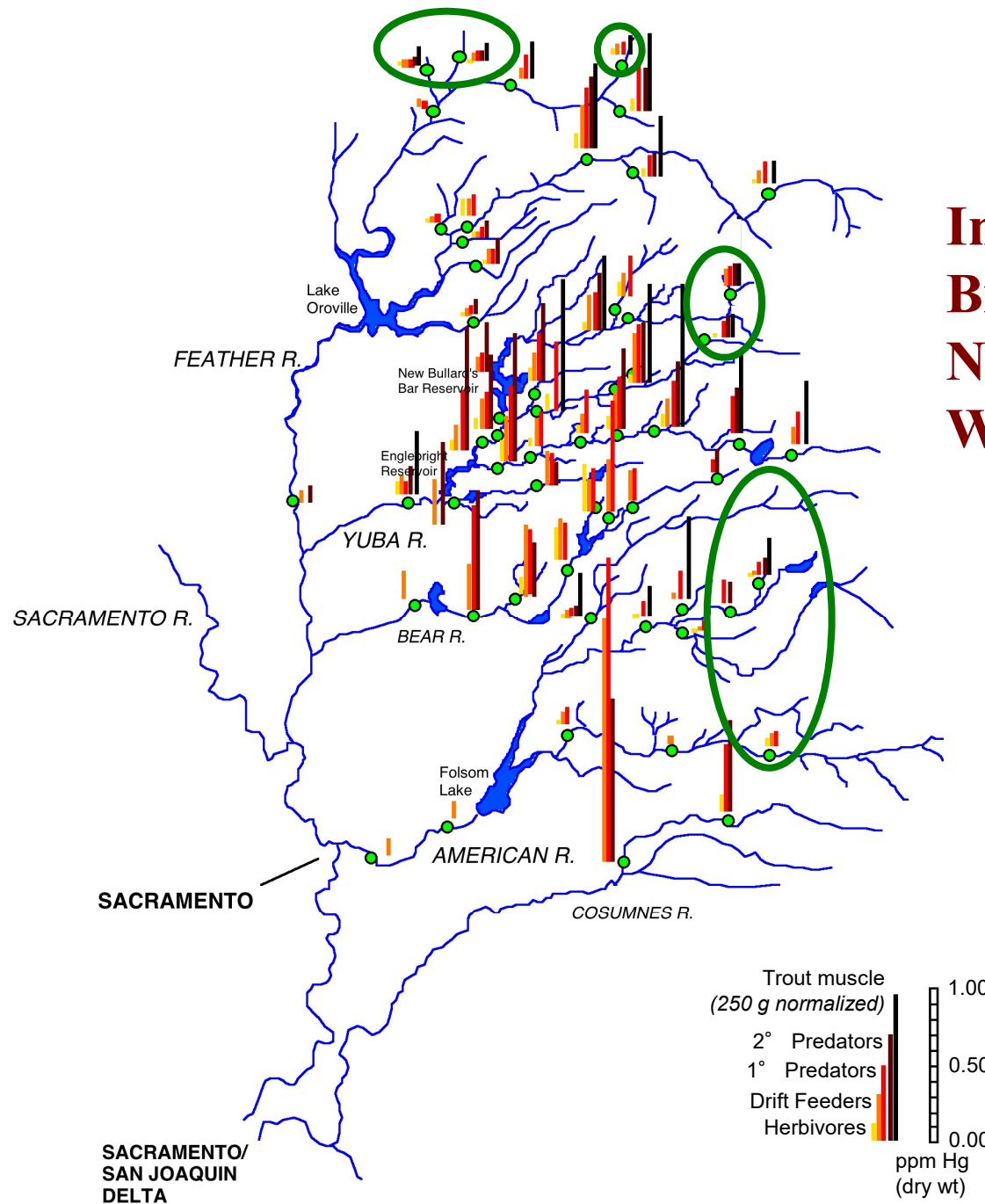
Mercury Sources across the Bay-Delta Watershed

California: Bulk Mercury Contamination



An estimated 6,000,000 kg lost in mining





Invertebrate and Trout Biosentinel Mercury in Northwestern Sierra Nevada Watersheds (1993-1997)

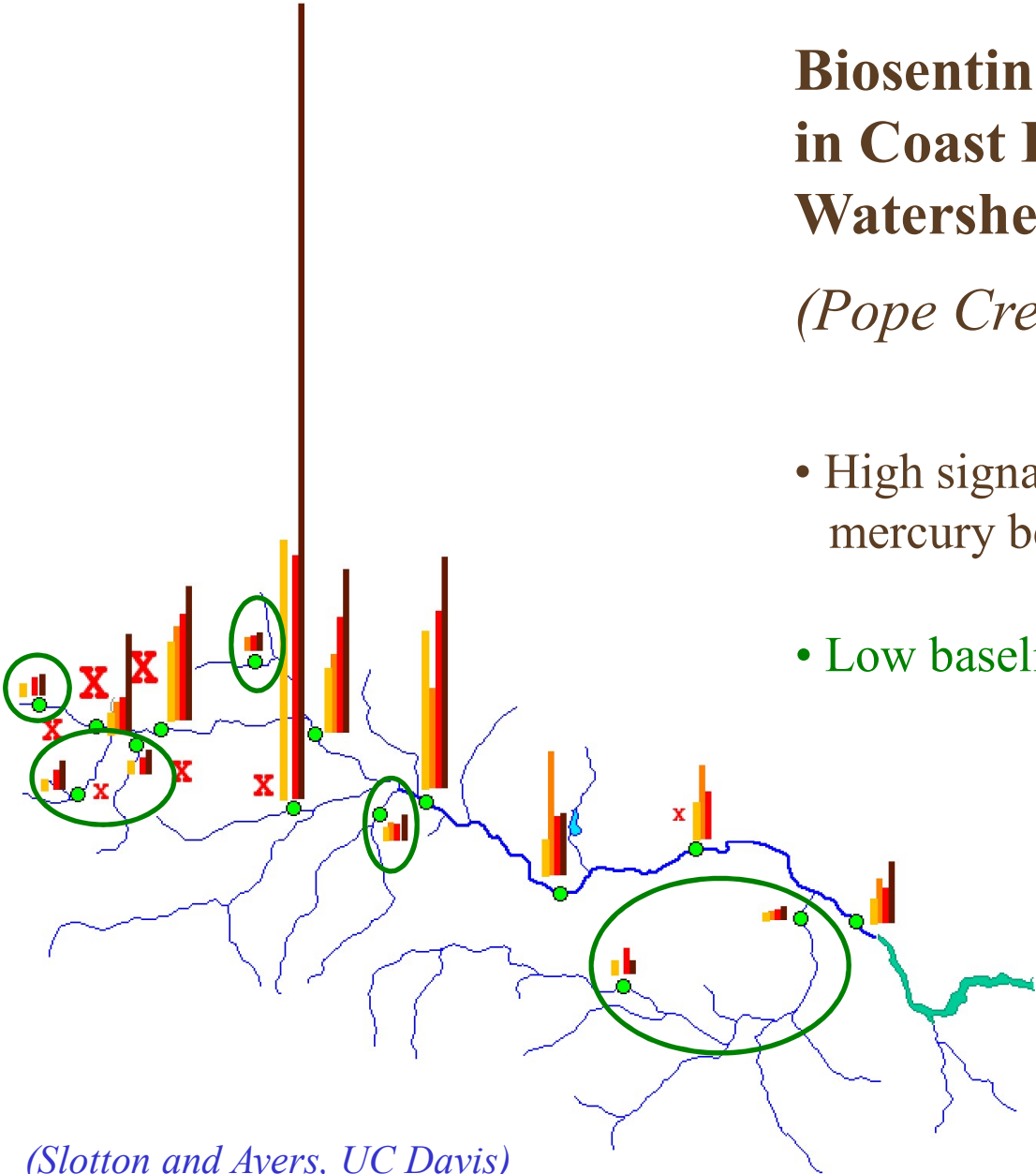
- Strong signal of residual, bioavailable Hg
- Centered on historic gold mining zone
- **Low baseline levels in un-mined rivers**

(Slotton and Ayers, UC Davis)

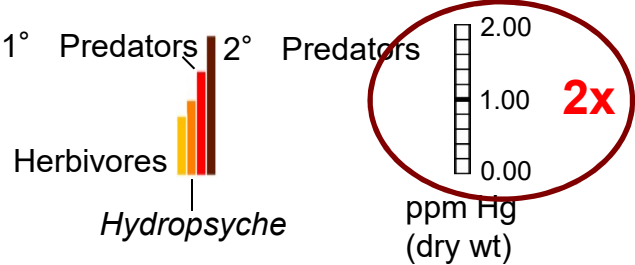
Biosentinel Mercury Signal in Coast Range Mercury Mining Watersheds

(Pope Creek Watershed)

- High signals of residual, bioavailable mercury below abandoned Hg mines
- Low baseline levels in un-mined creeks



X Abandoned Hg mines

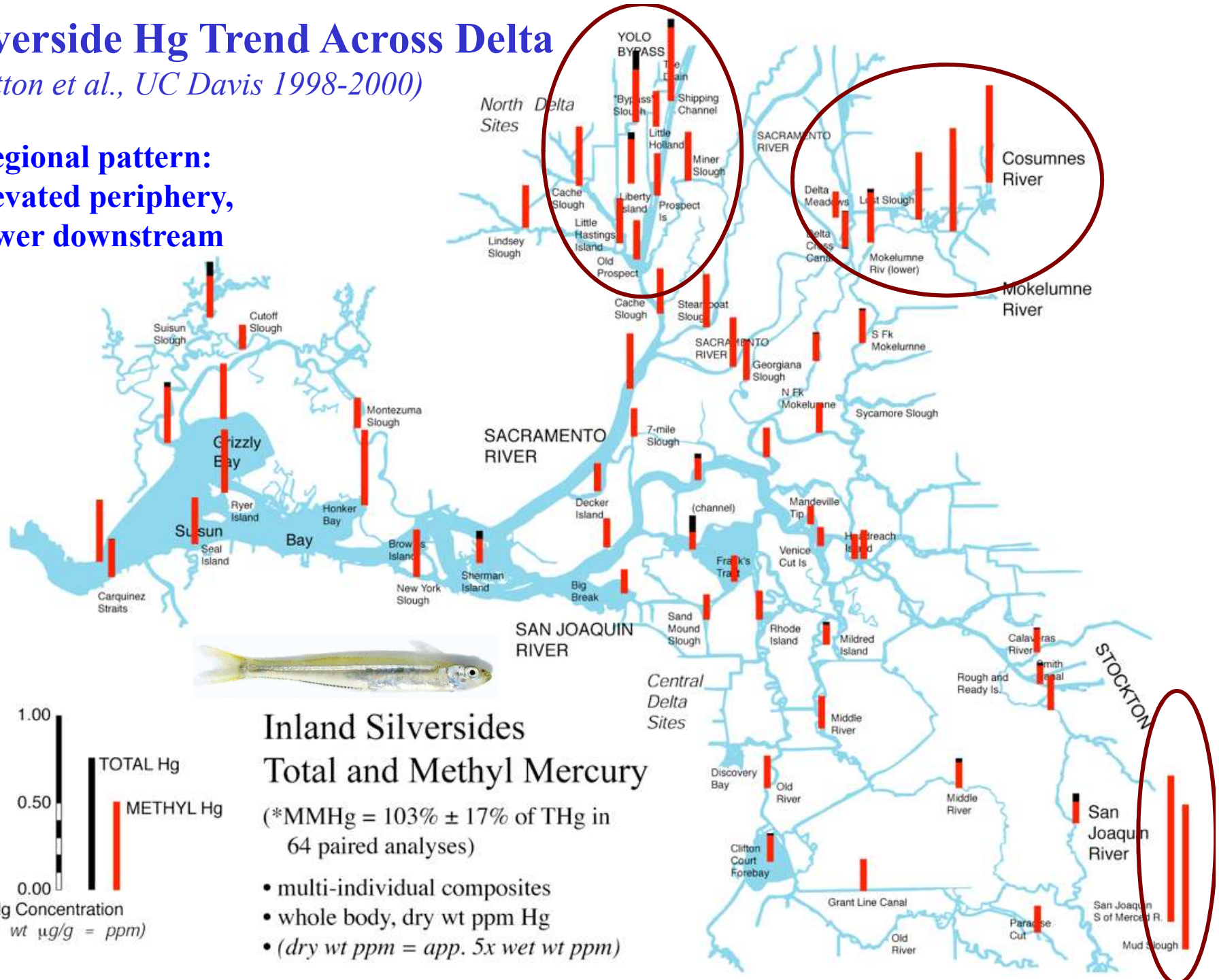


(Slotton and Ayers, UC Davis)

Silverside Hg Trend Across Delta

(Slotton et al., UC Davis 1998-2000)

- **Regional pattern:**
elevated periphery,
lower downstream

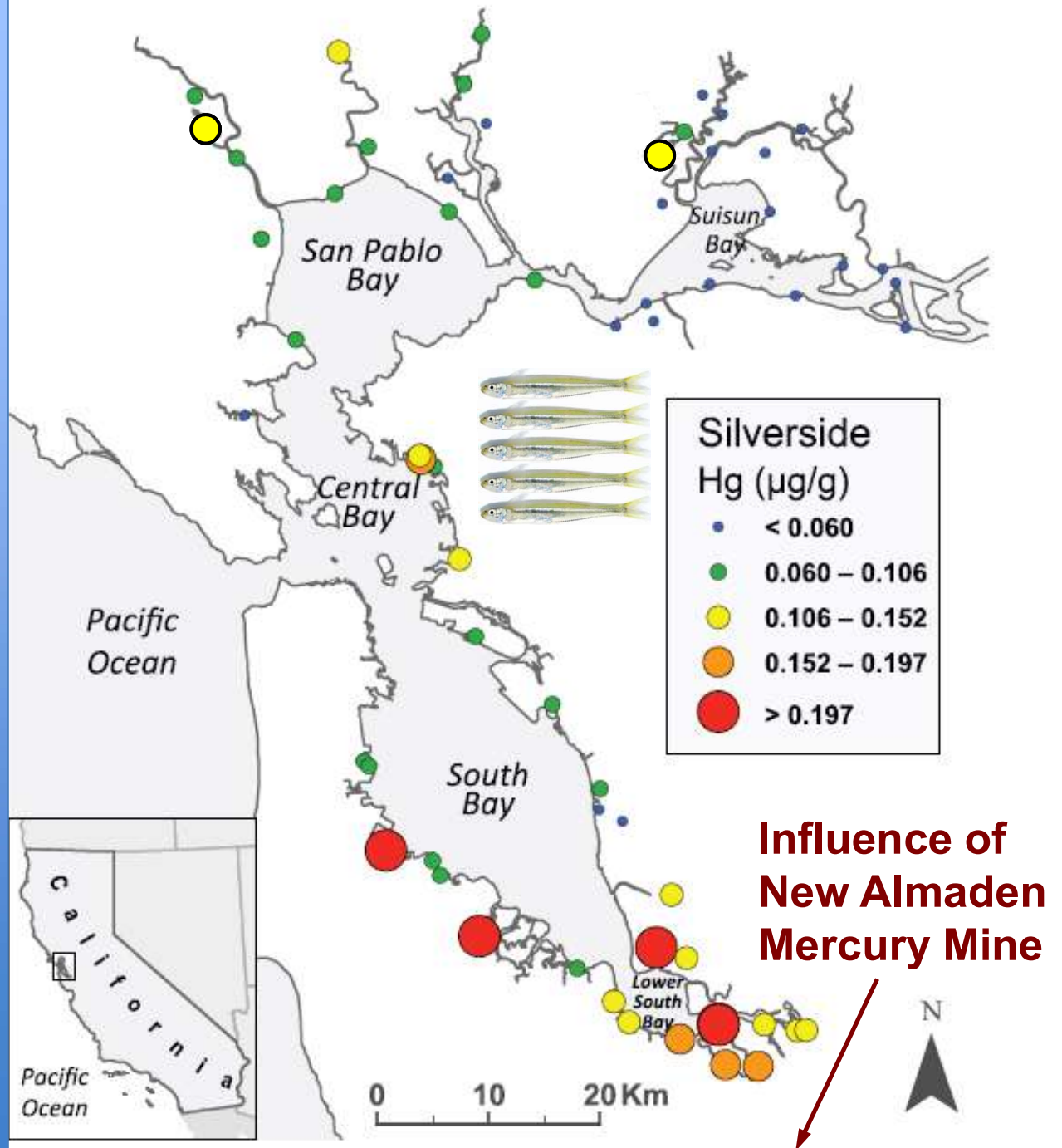


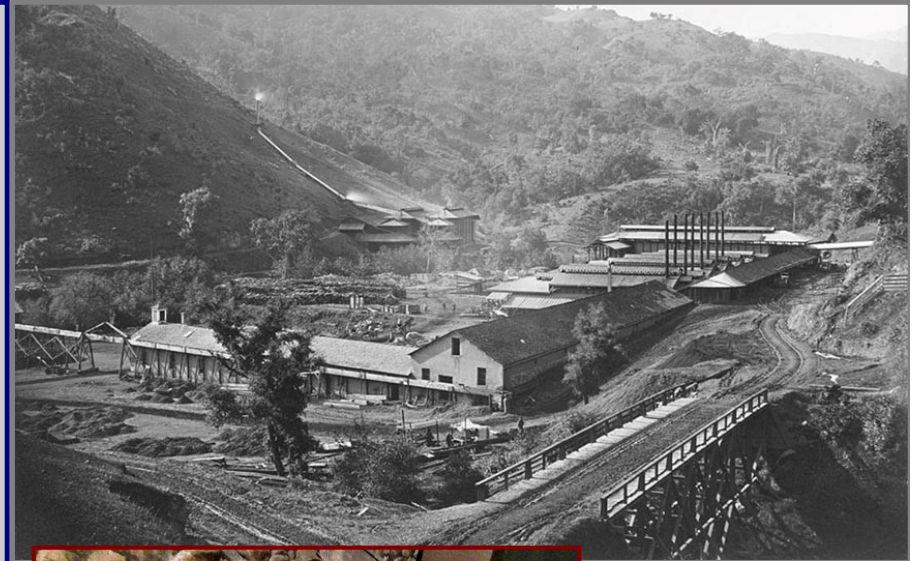
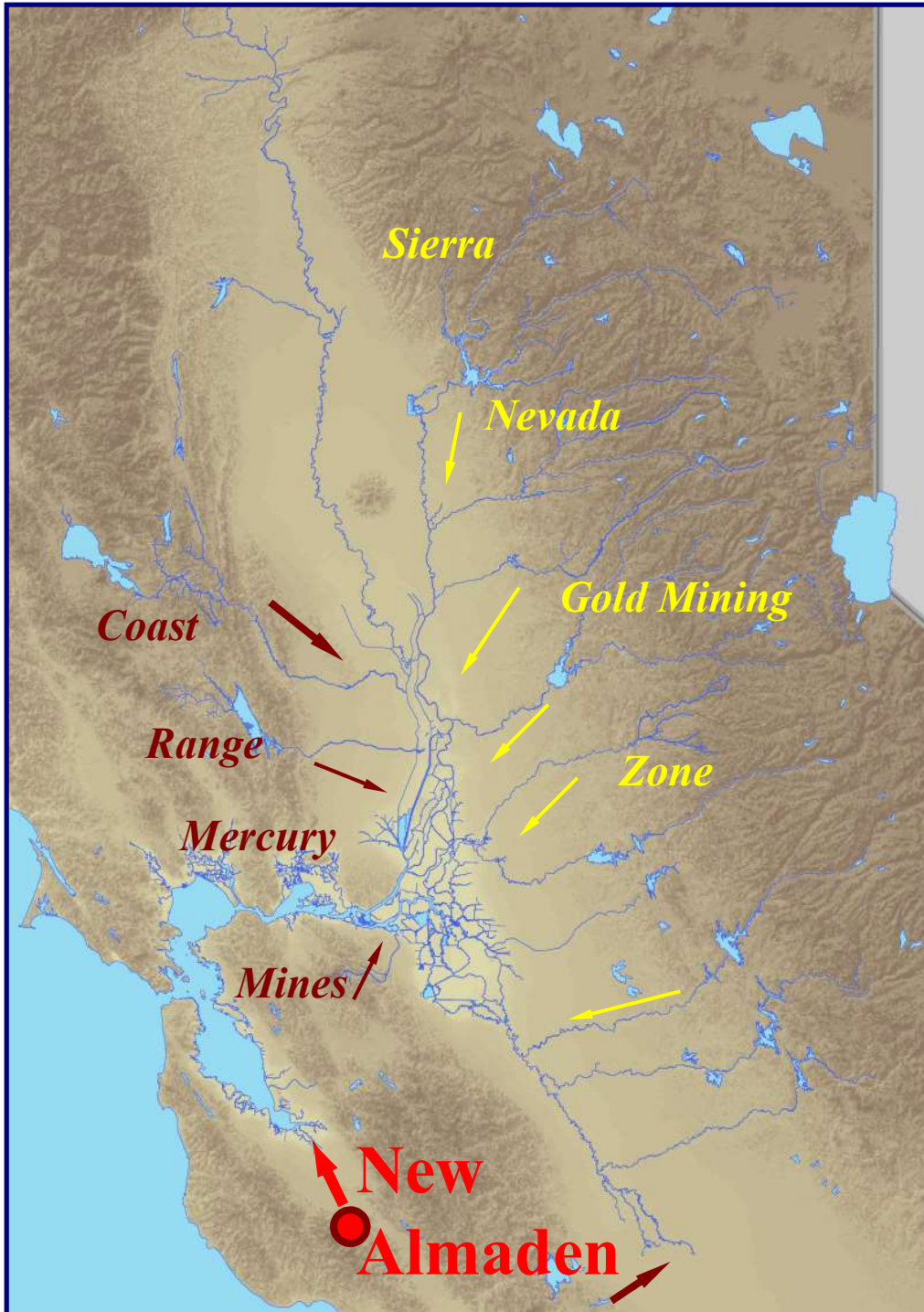
San Francisco Bay Siverside Spatial Trend (2008-2010)

From Greenfield *et al.*
(*Env. Tox. & Chem.* 2013)

SFEI Regional Monitoring
Program (RMP)
and
UC Davis

“Across 99 sites, fish
mercury followed a
broad spatial gradient,
declining with distance
from the Guadalupe
River”





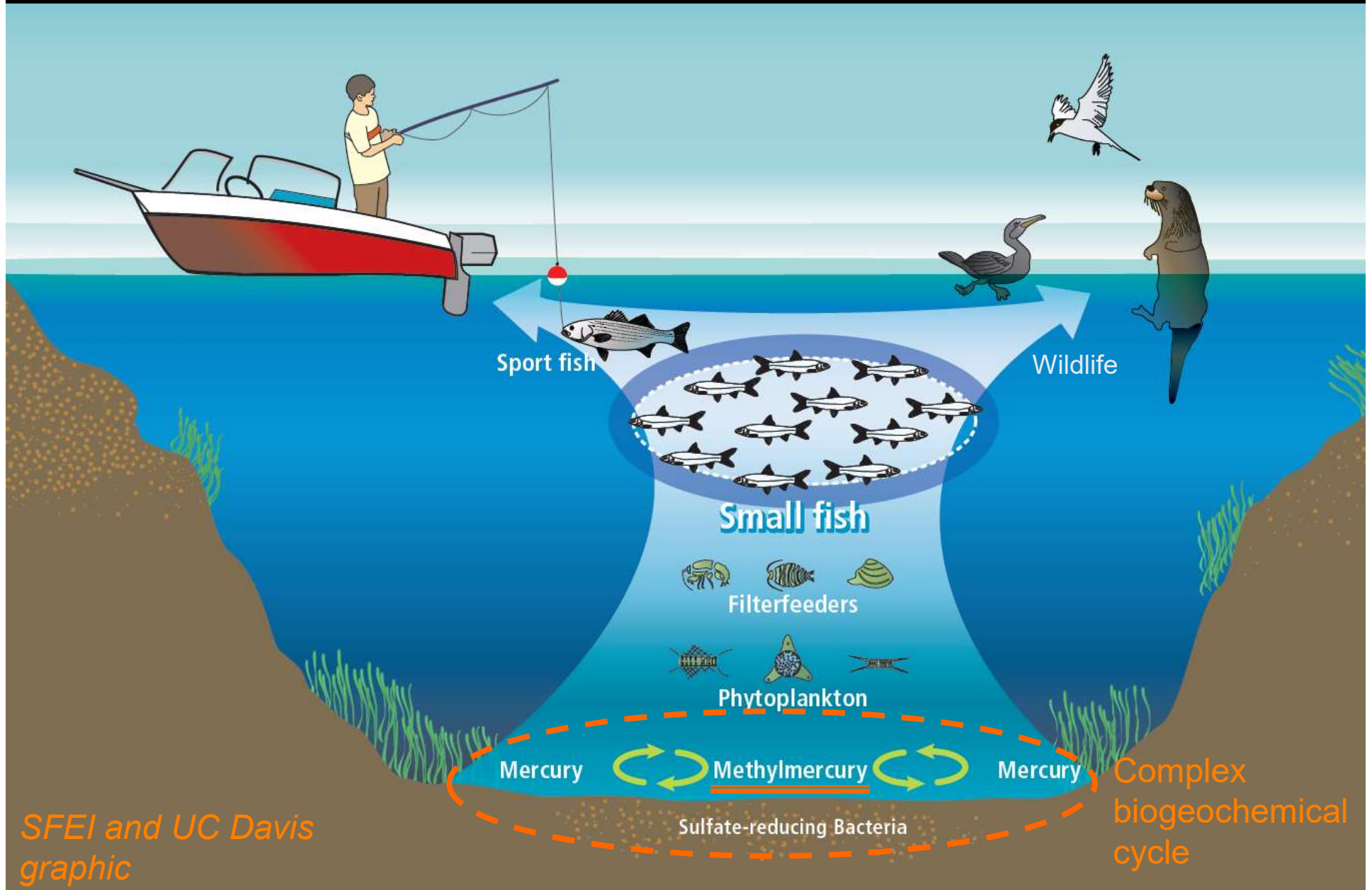
1862



New Almaden

- Largest (most production) mercury mine in N America
- More than a million flasks (76 pounds each):
> 38 million kg of mercury

Methylmercury Production and Movement up the Human and Wildlife Food Chains



SFEI and UC Davis
graphic

Pond A8 Restoration and Mercury: Adaptive Management Science

South tip
SF Bay

Alviso
Slough

Josh Ackerman *et al.*
USGS

- Pond birds (eggs)
- Pond fish



Pond
A8

Guadalupe
Slough



Pond A8 Restoration and Mercury: Adaptive Management Science

South tip
SF Bay



Alviso
Slough

Darell Slotton *et al.*
Jim Hobbs *et al.*
UC Davis

• Slough fish – outside Pond



Guadalupe
Slough

Pond
A8



Pond A8 Restoration and Mercury: Adaptive Management Science

South tip
SF Bay

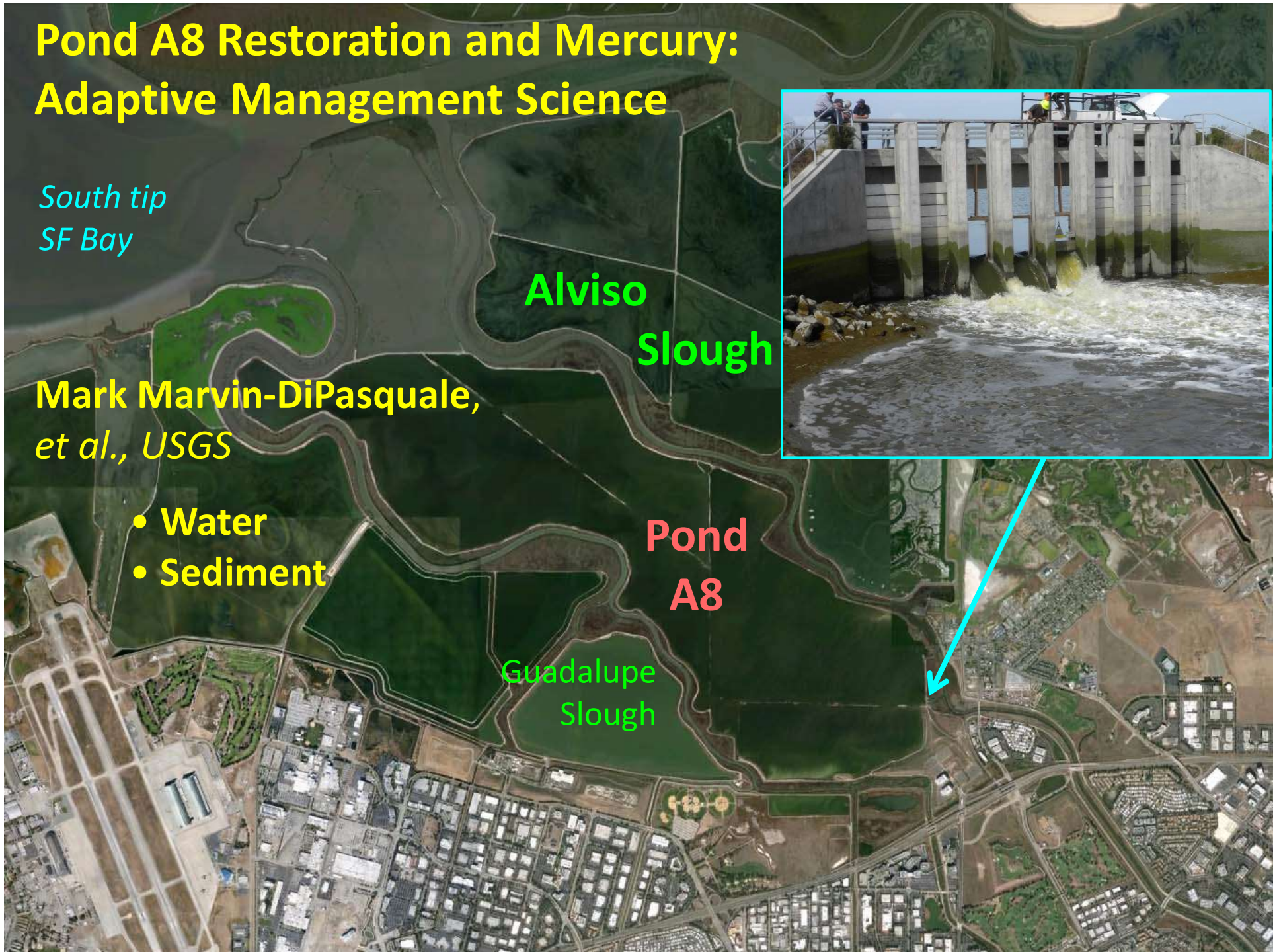
Alviso
Slough

Mark Marvin-DiPasquale,
et al., USGS

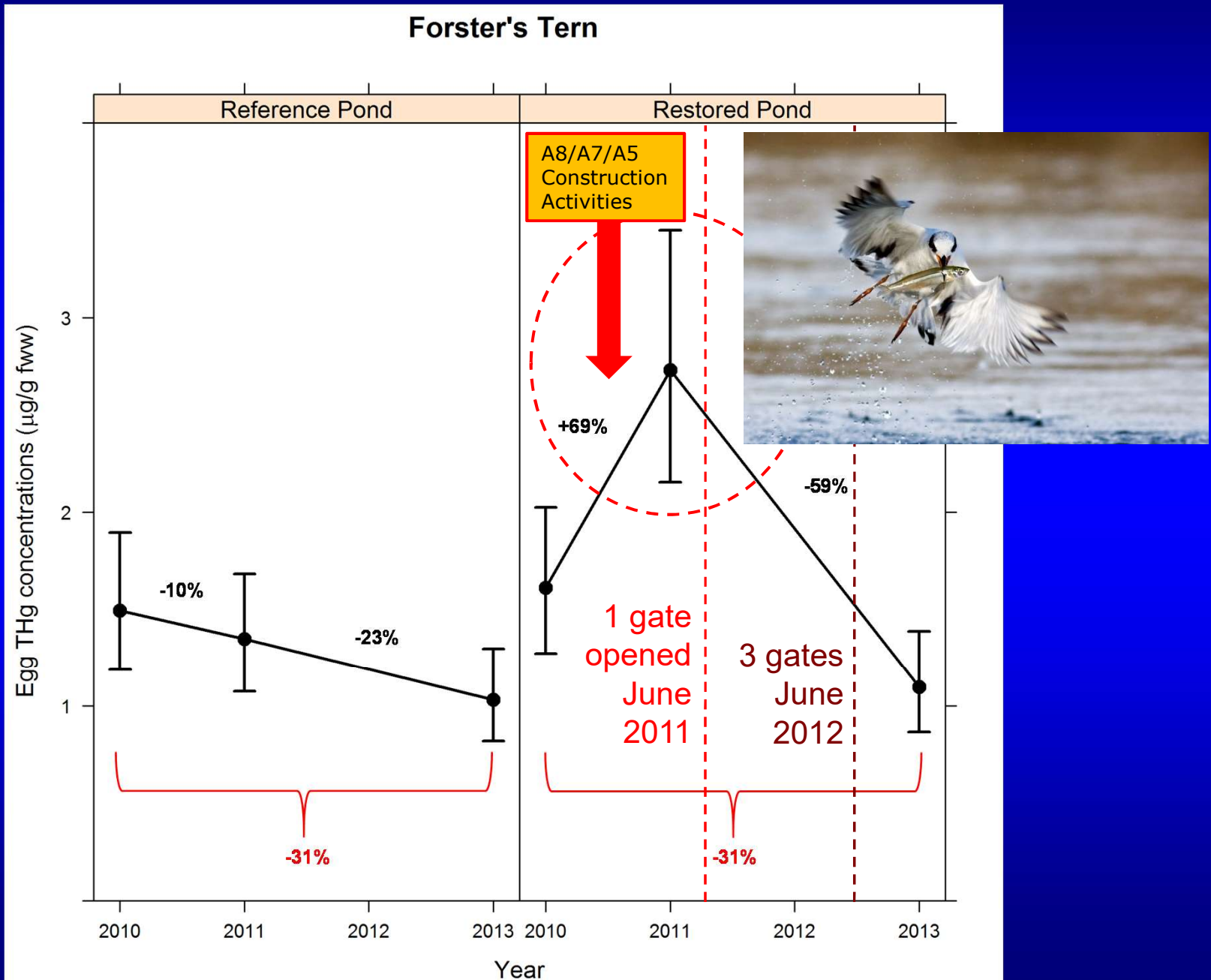
- Water
- Sediment

Pond
A8

Guadalupe
Slough



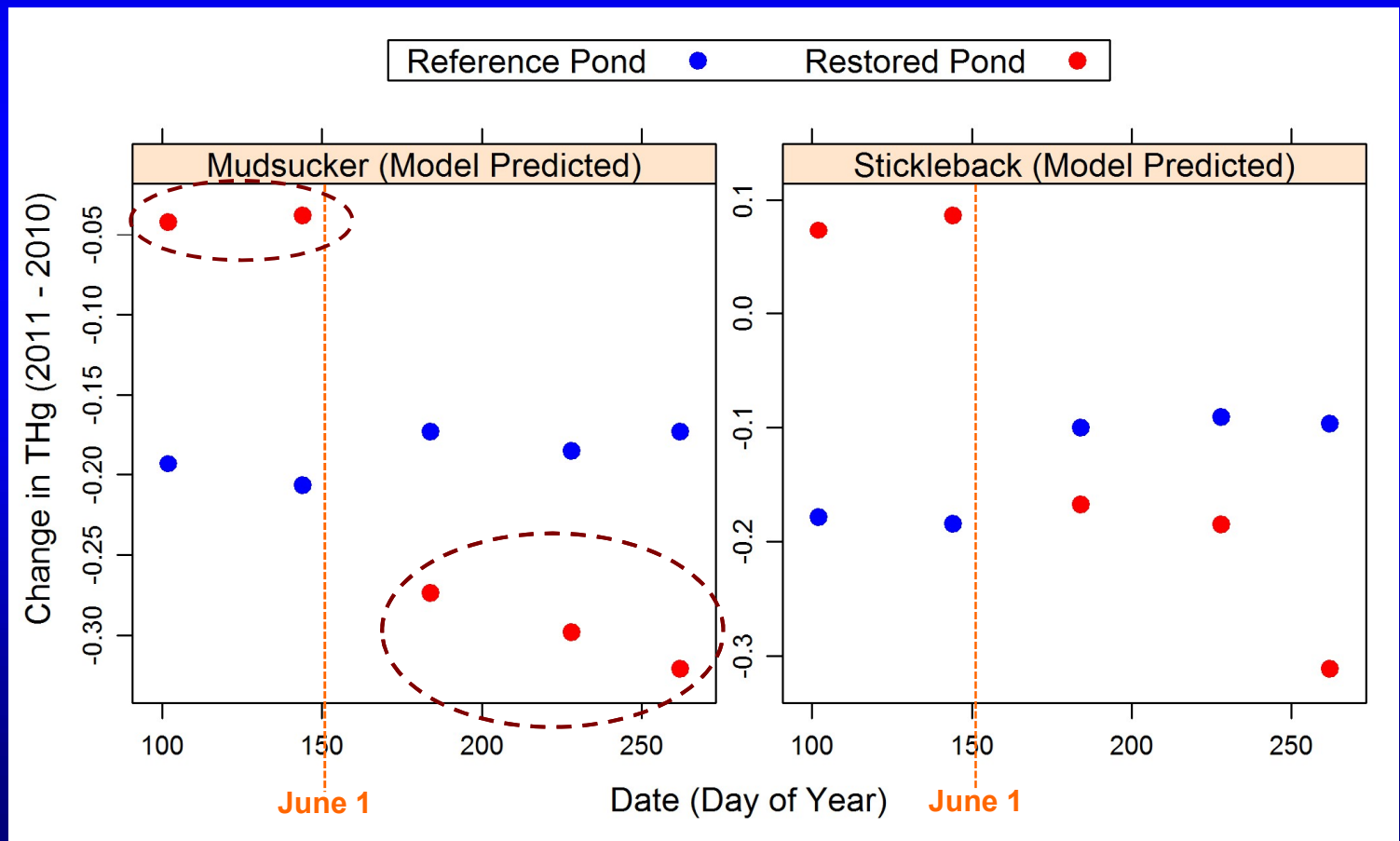
Bird Egg Mercury Response to Pond A8 Restoration



Ackerman *et al.*
2014, USGS
OFR 2014-
1189



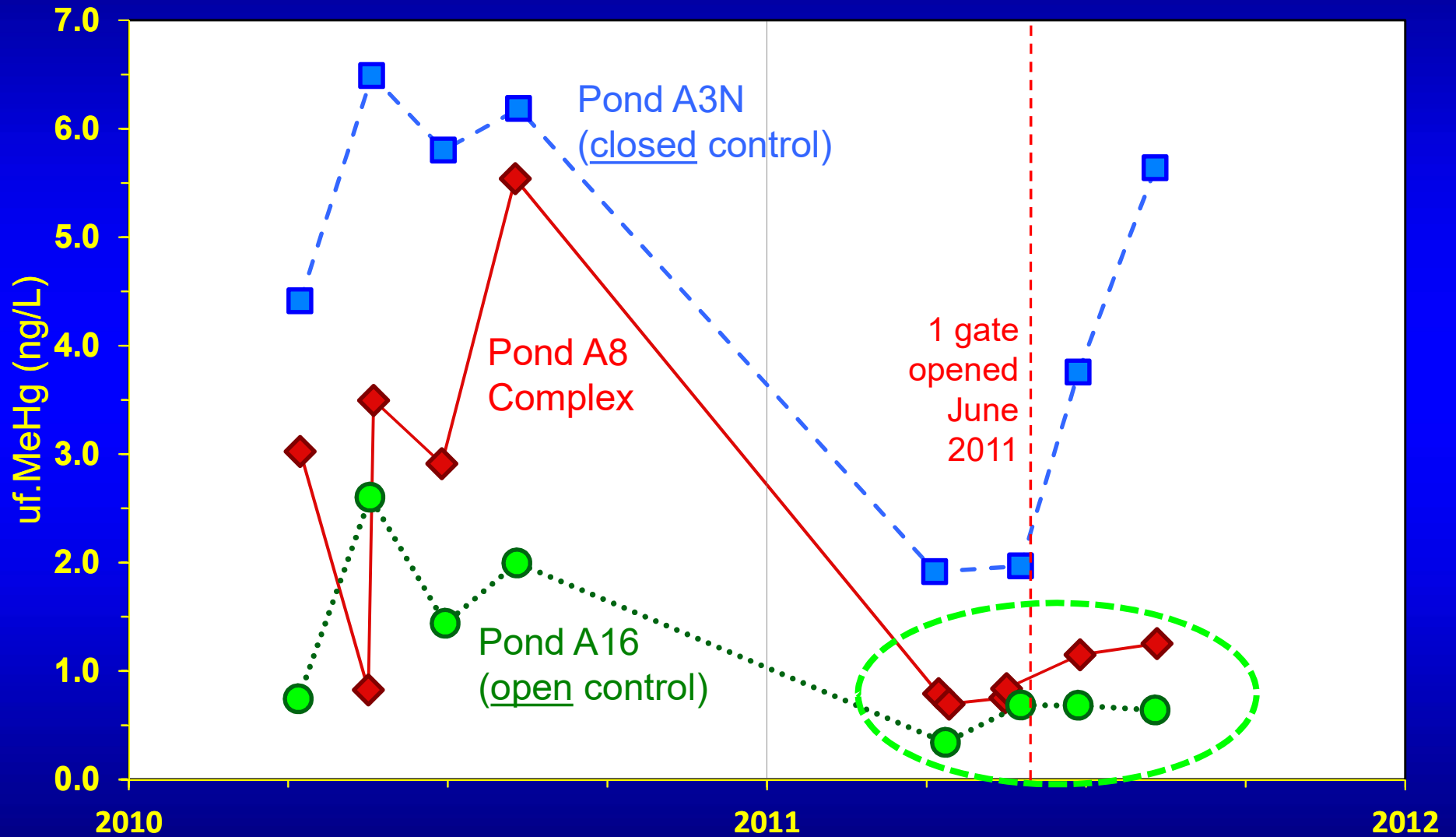
Fish Mercury Response to Wetland Restoration



Josh Ackerman,
et al.

Water Data: Unfiltered Methylmercury

Mark Marvin-DiPasquale,
et al.



Slough Fish: Monitoring Potential Export



Sticklebacks



Siversides

Alviso
Slough

Mallard
(Artesian)
Slough

Mid
Alviso

Guadalupe
Slough

Pond
A8

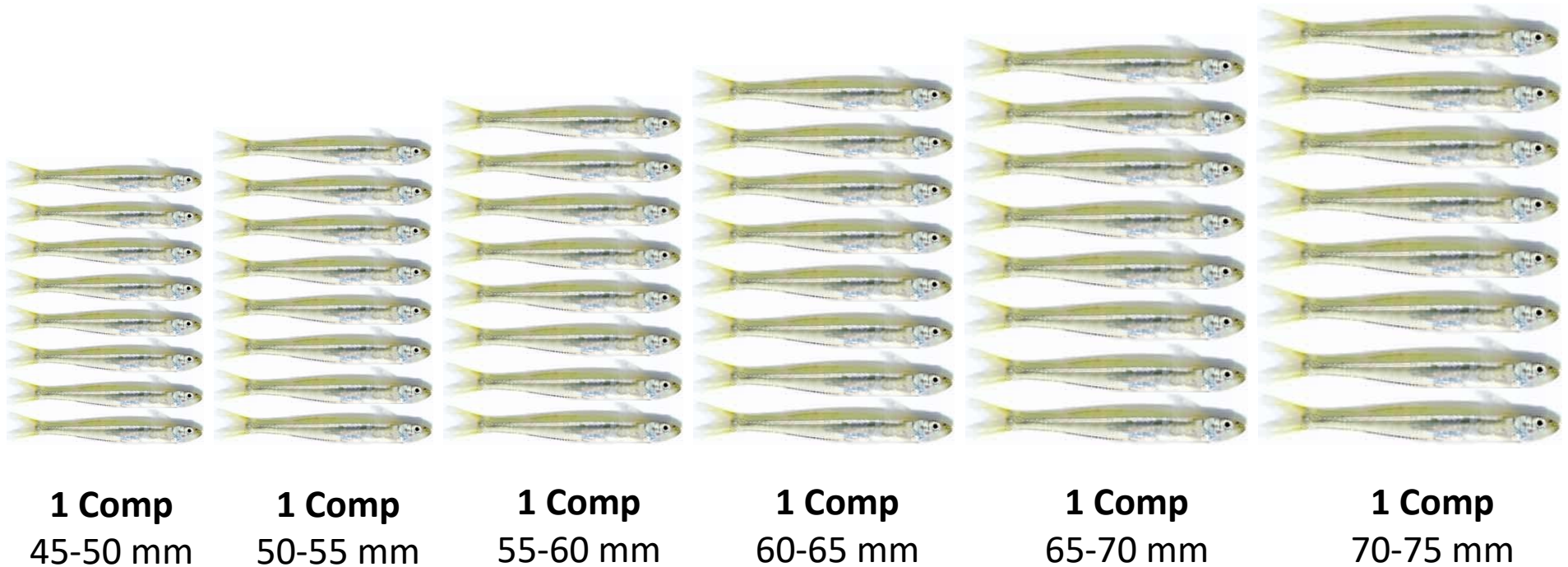
Upper
Alviso



UC DAVIS

UC Davis silverside composites

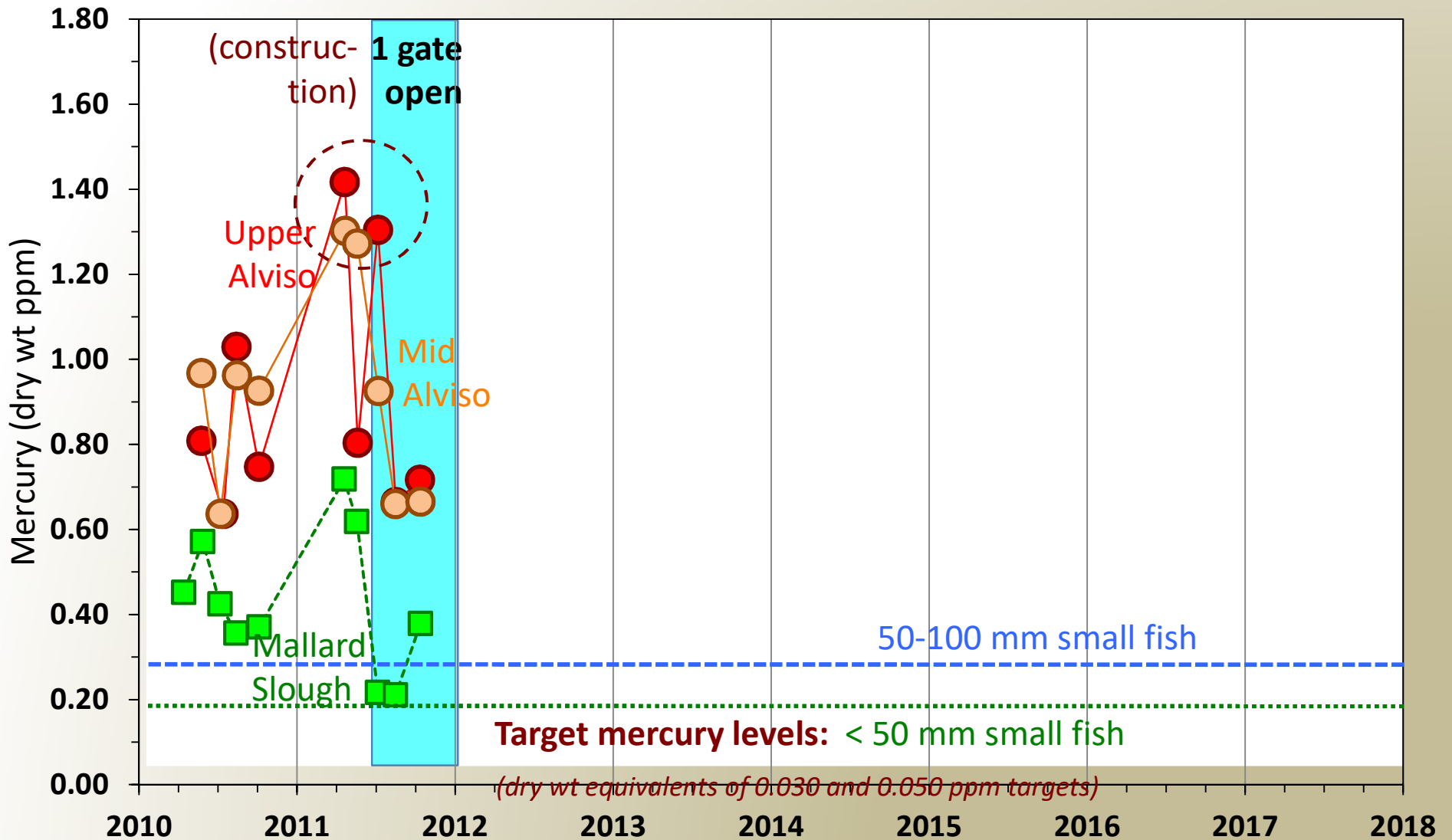
- 6 composites per sample, 6 analyses
- 8 fish per composite, incorporating 48 individual fish
- 5 mm size windows, between 45 and 75 mm (2-3")



- Replication + size vs mercury information
- Graphs: mean concentration of the 6 comps/sample

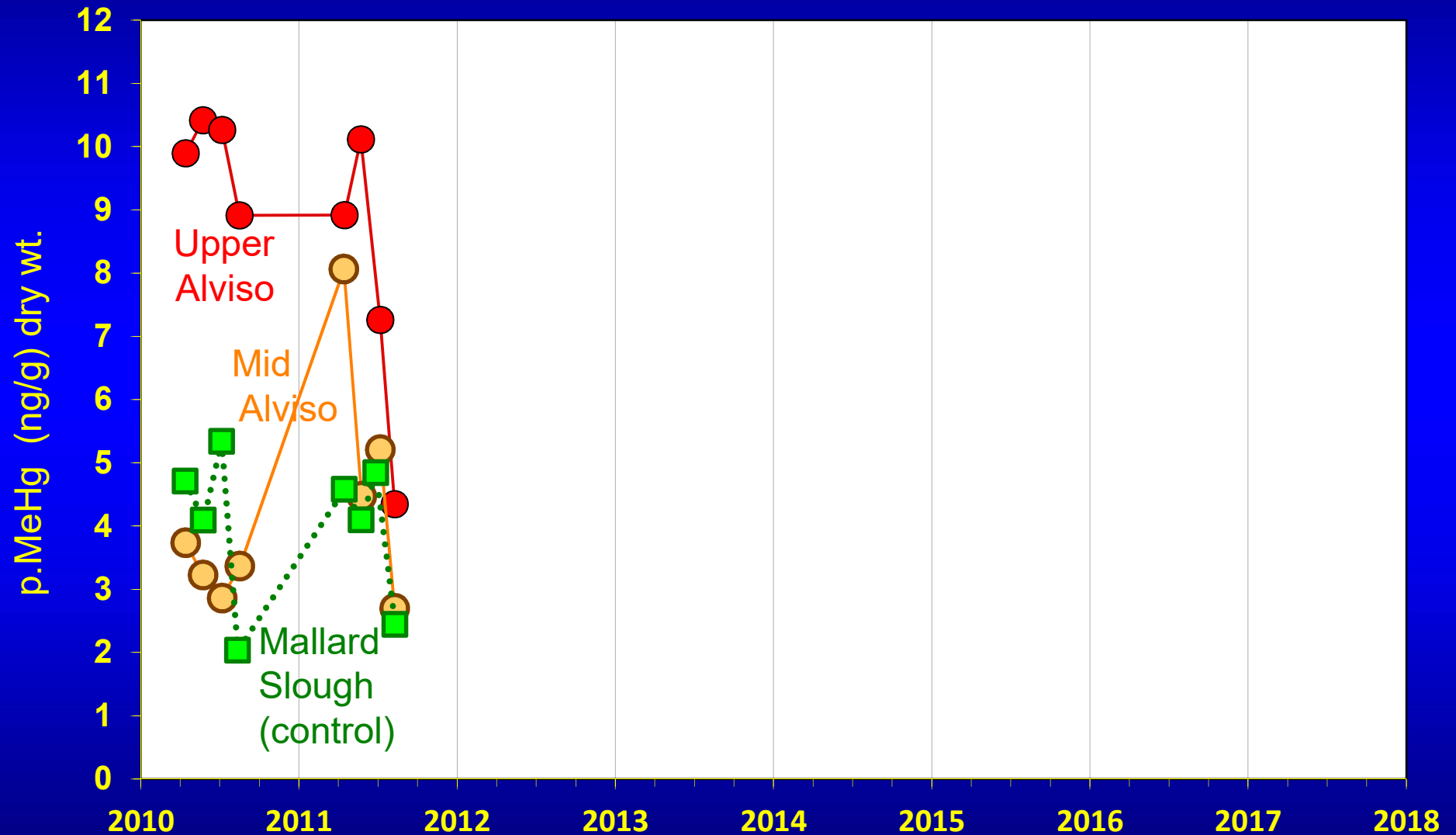
Mississippi Silverside Mercury in Relation to Pond A8 Notch Opening

(means of 6 comps x8 fish = 48 fish per point)



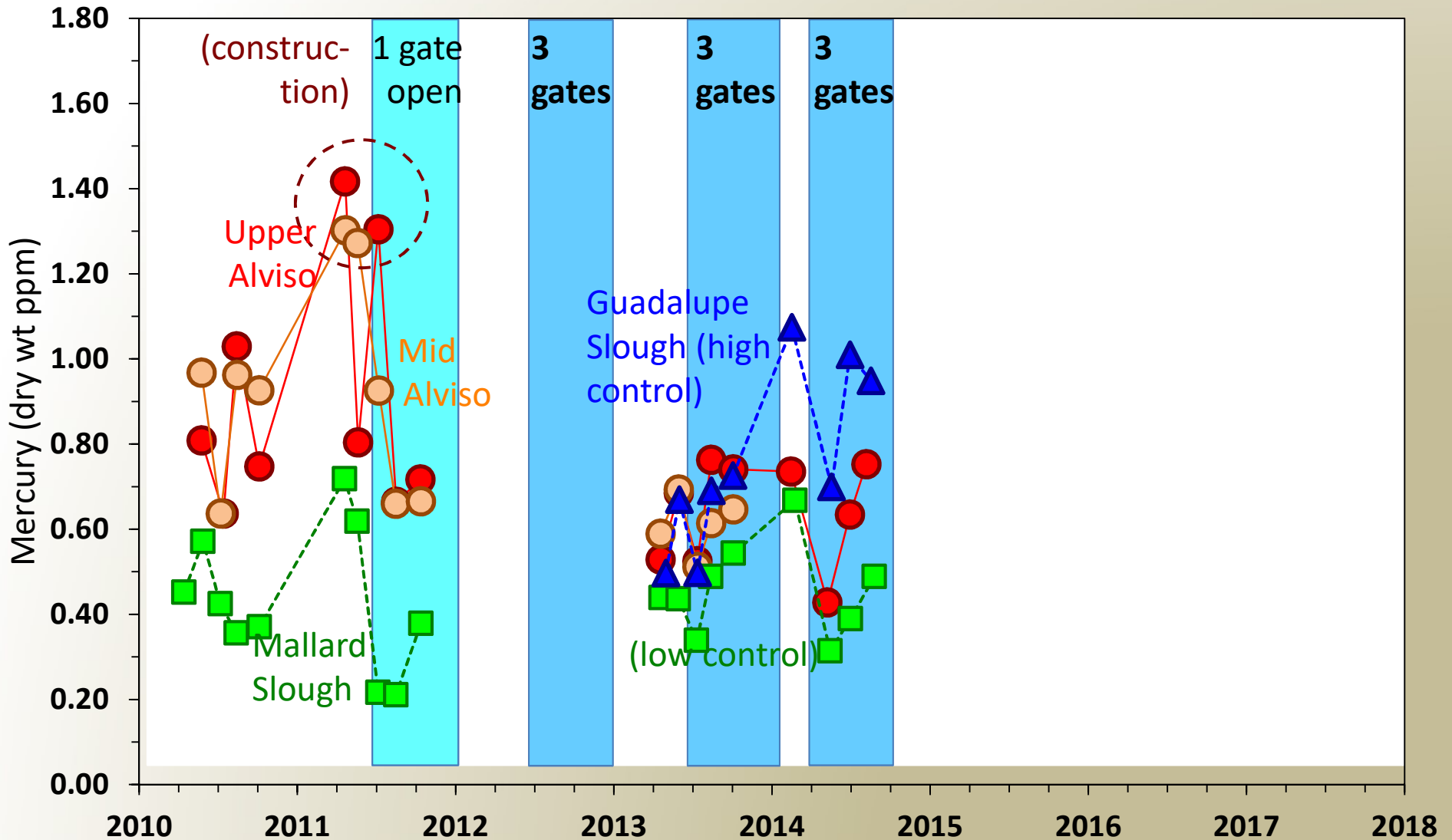
Water Data: Aqueous Particulate Methylmercury

Mark Marvin-DiPasquale,
et al.



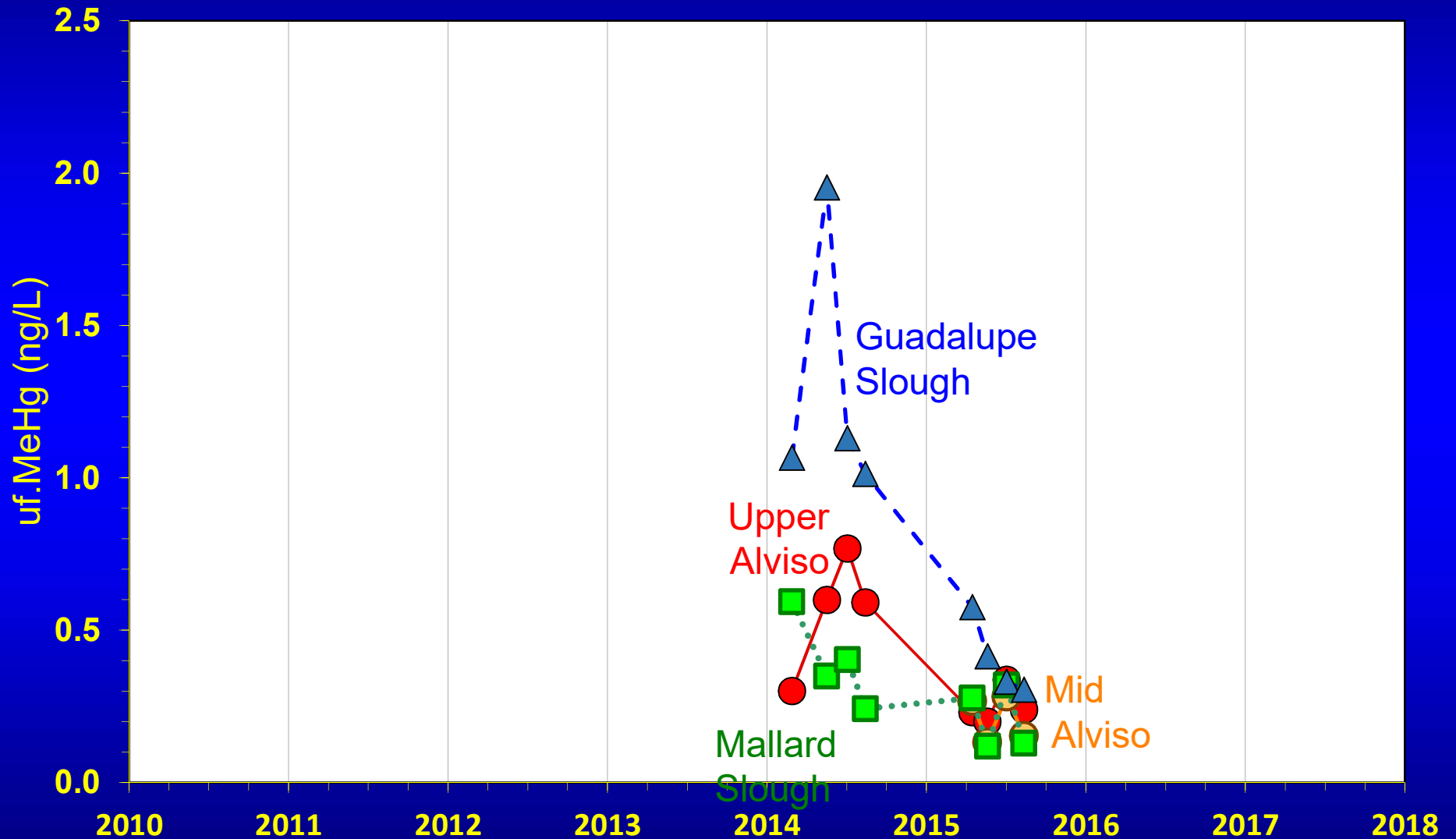
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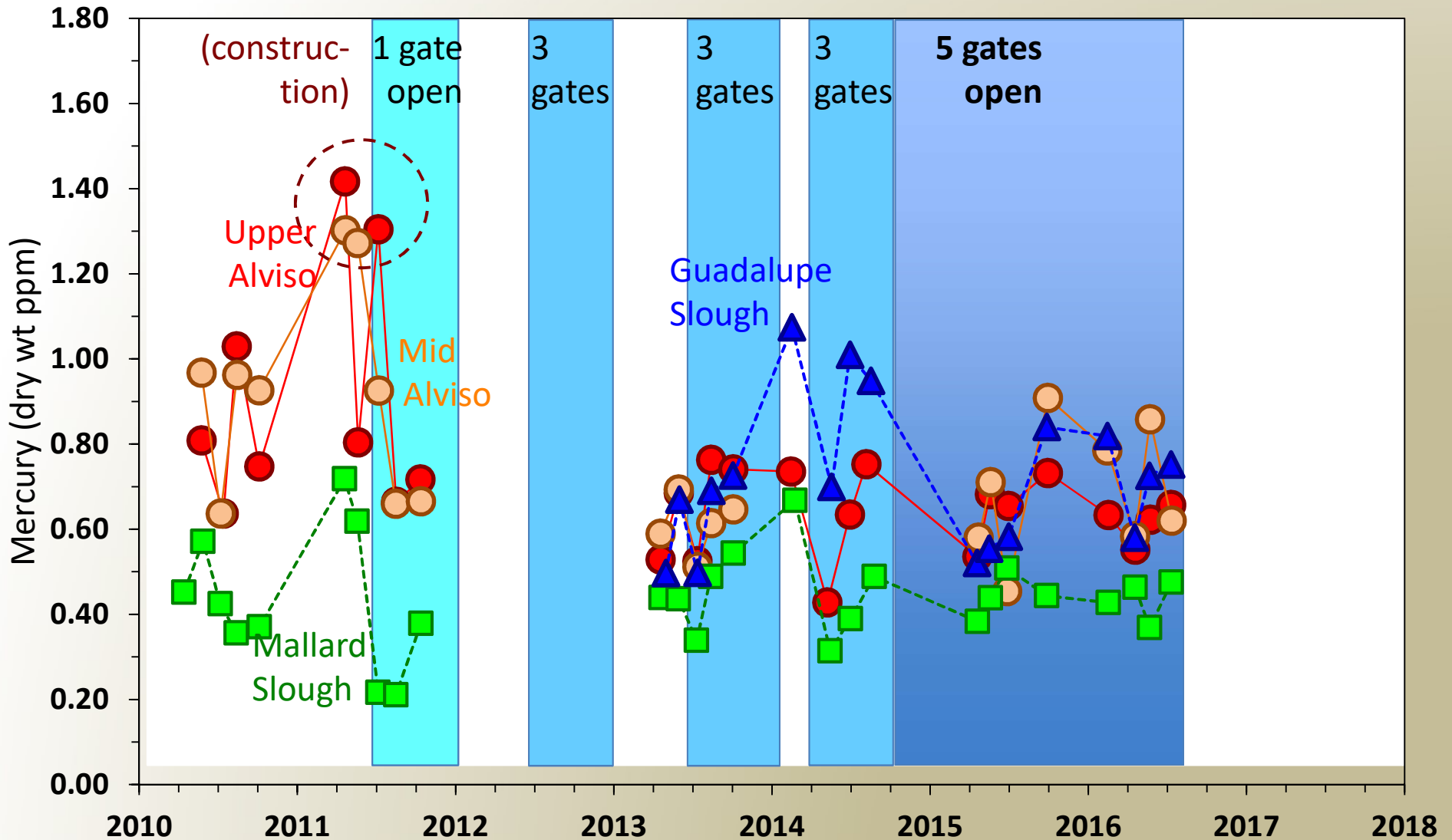
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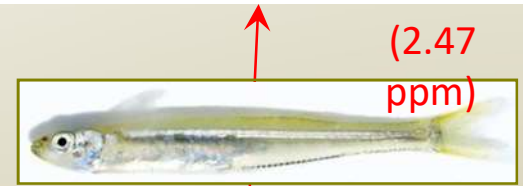
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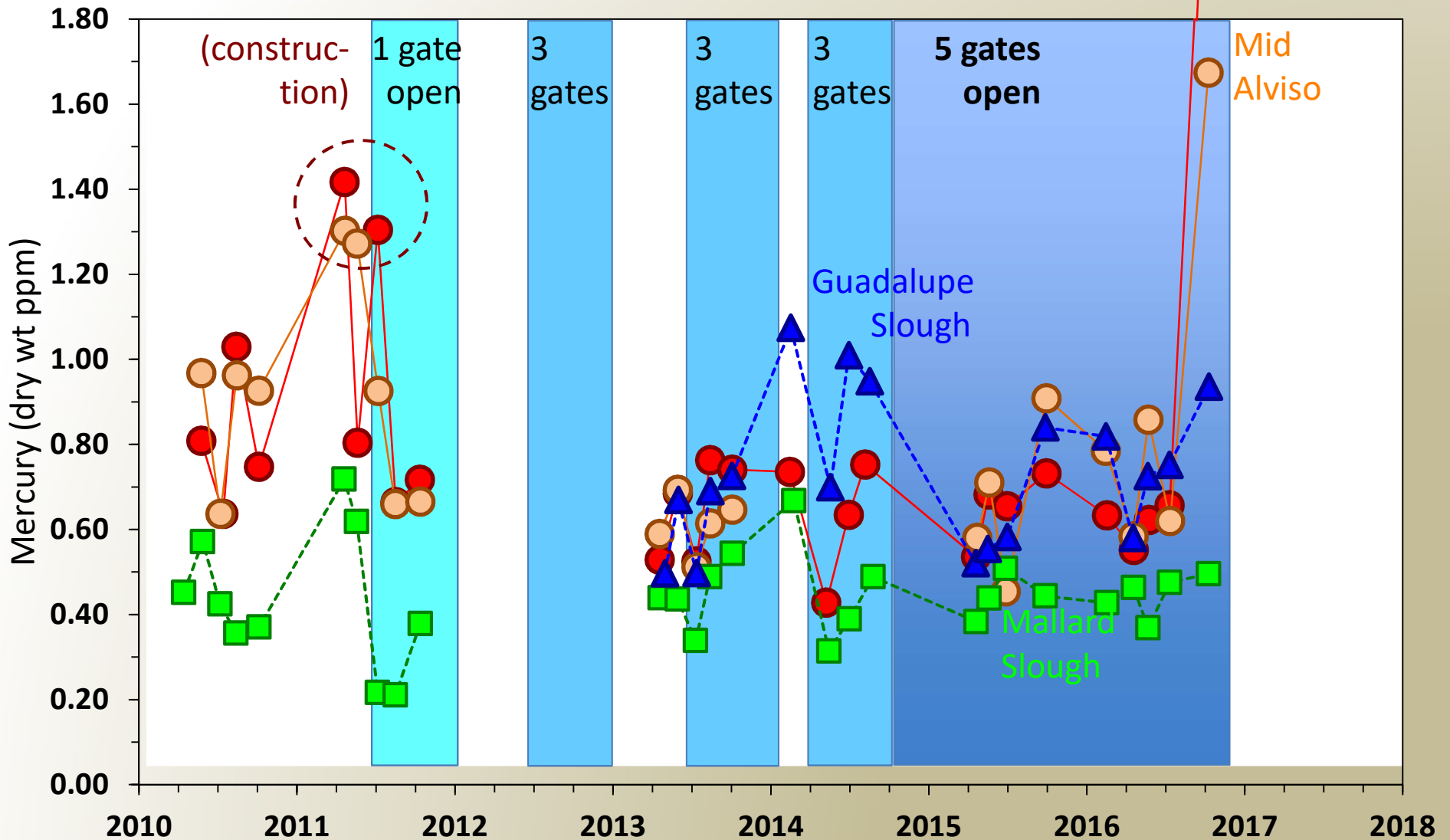
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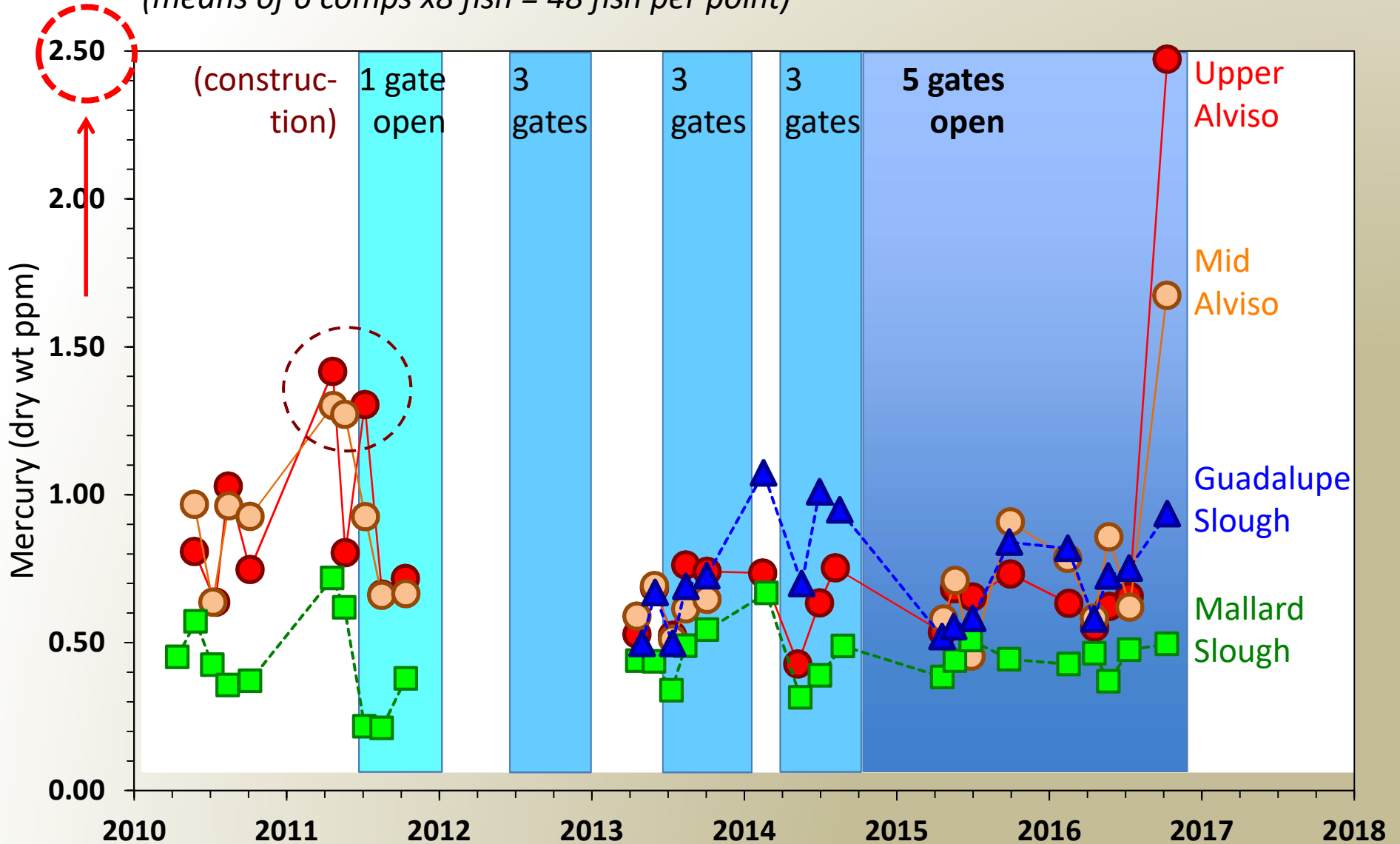
(Upper Alviso)

Mid Alviso

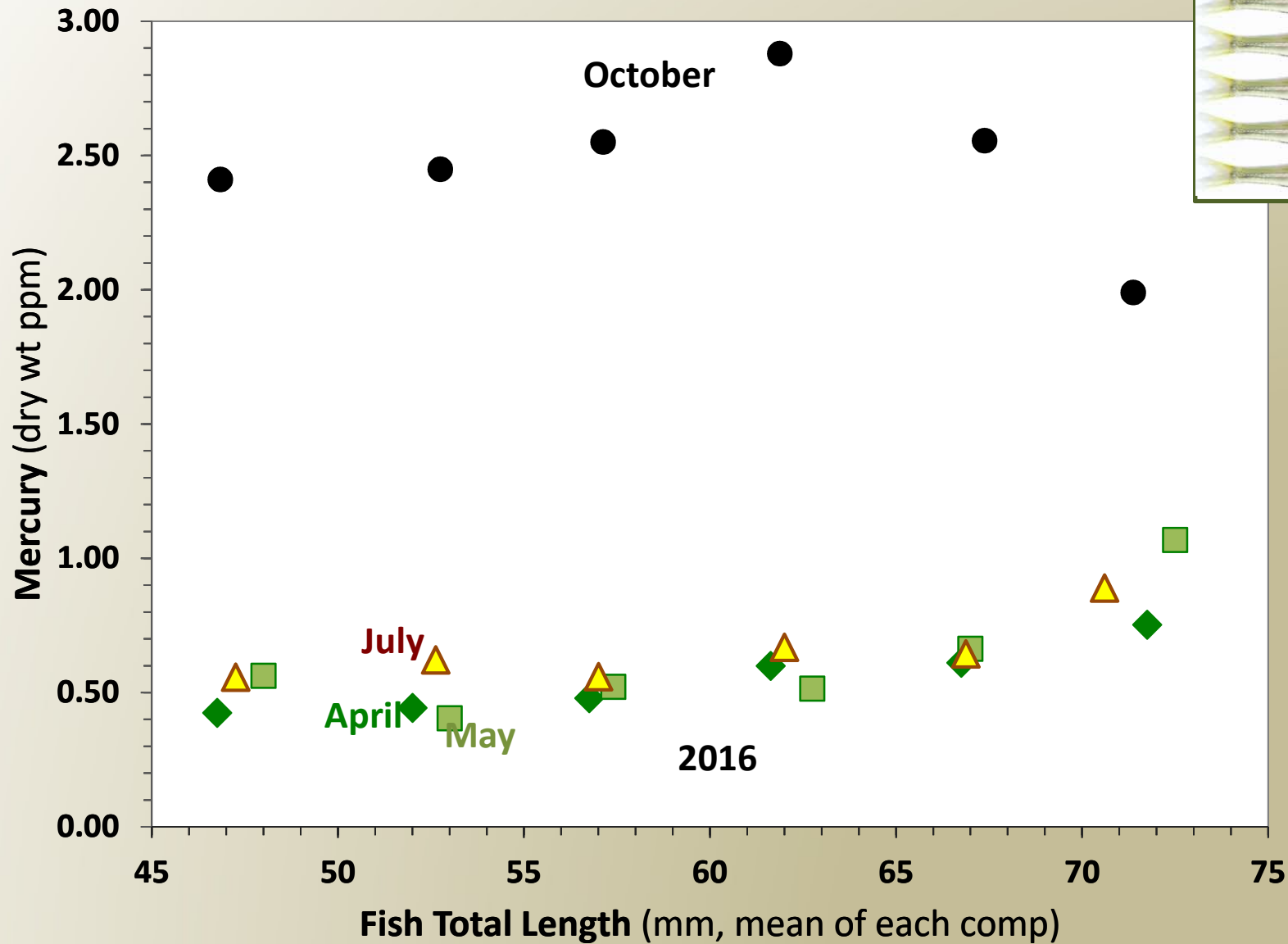


Mississippi Silverside Mercury in Relation to Pond A8 Notch Opening

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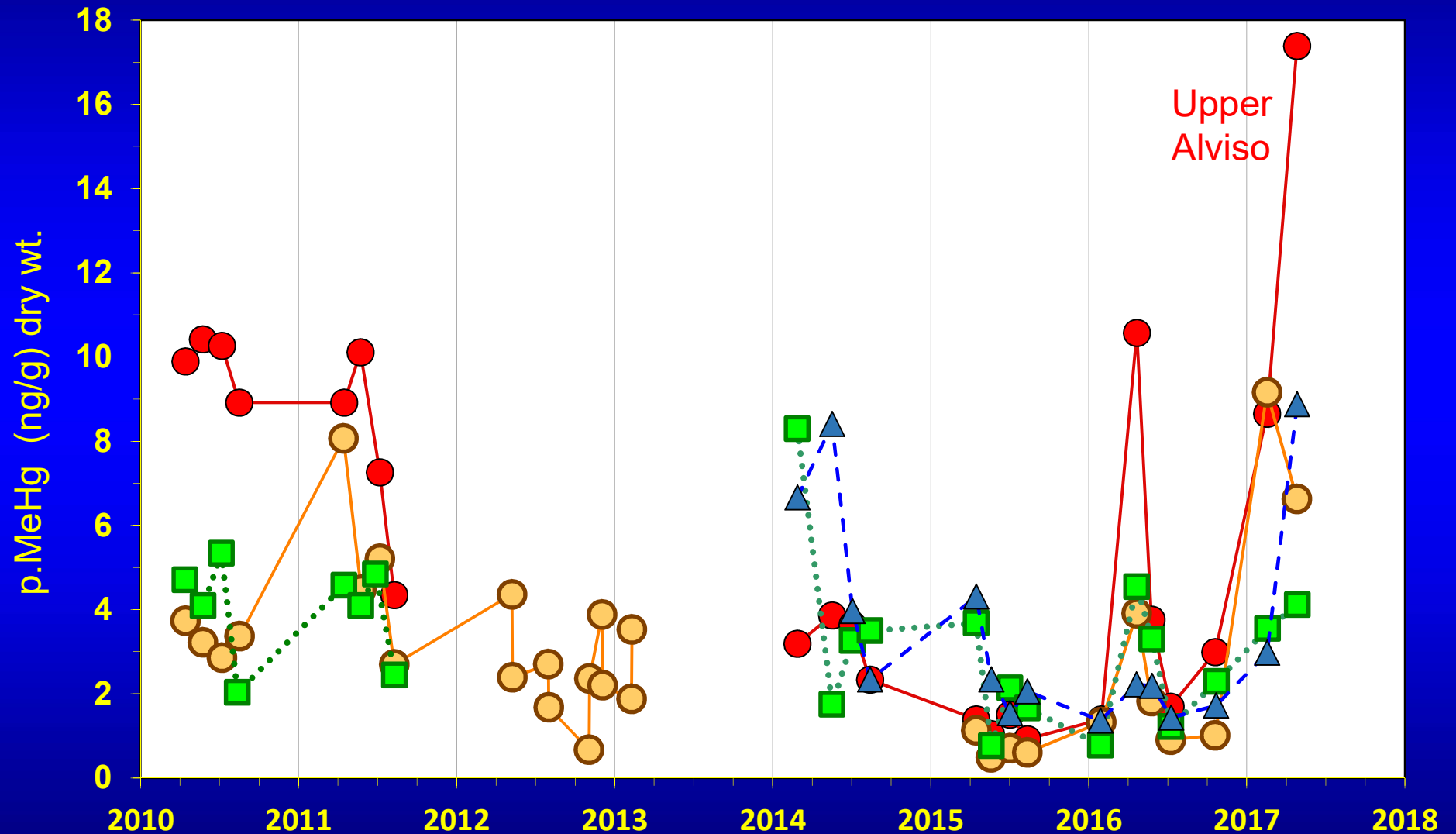


Alviso Slough Mississippi Silverside Mercury: Showing all composite analyses, by size & date



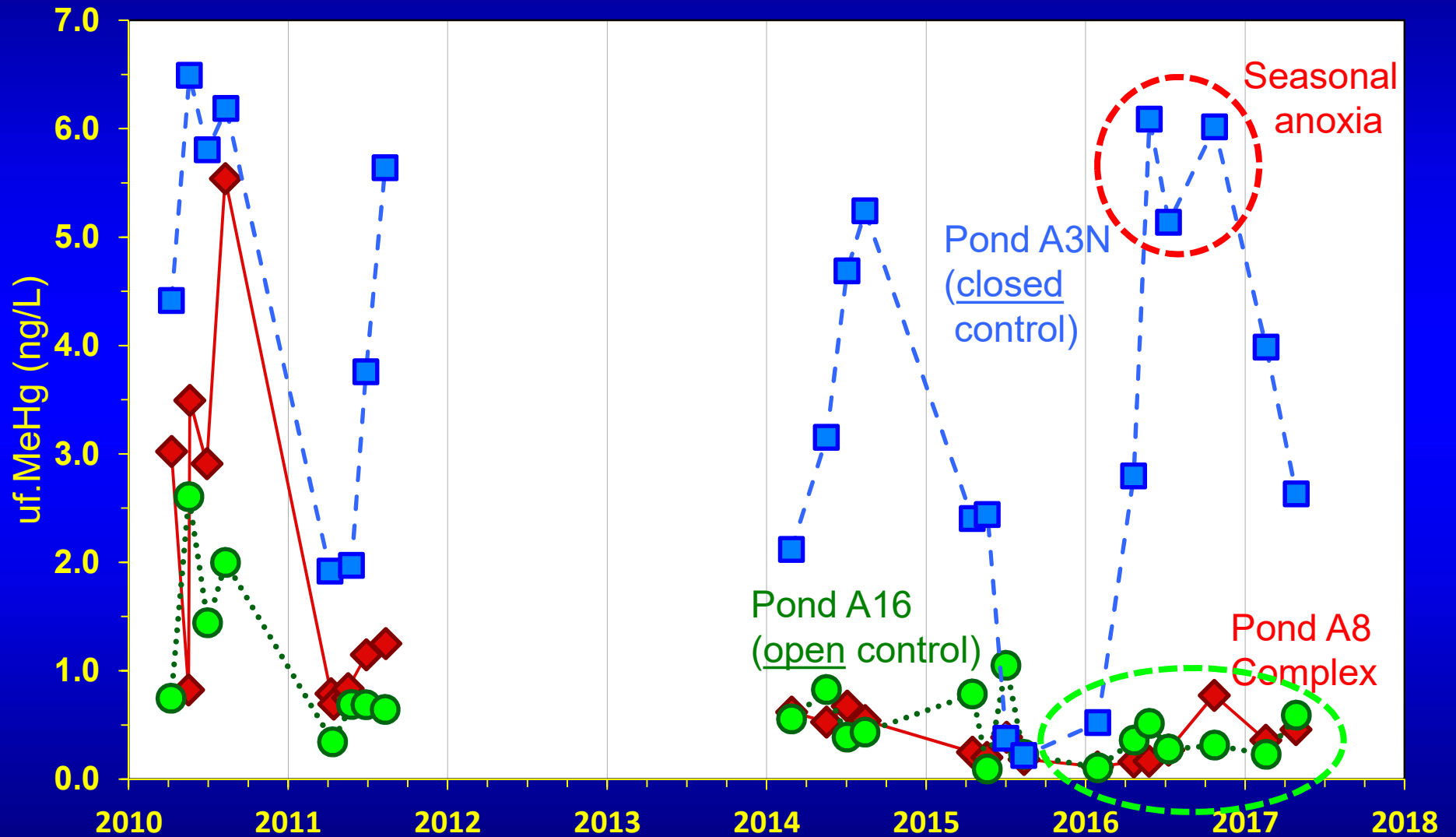
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Mark Marvin-DiPasquale,
et al.



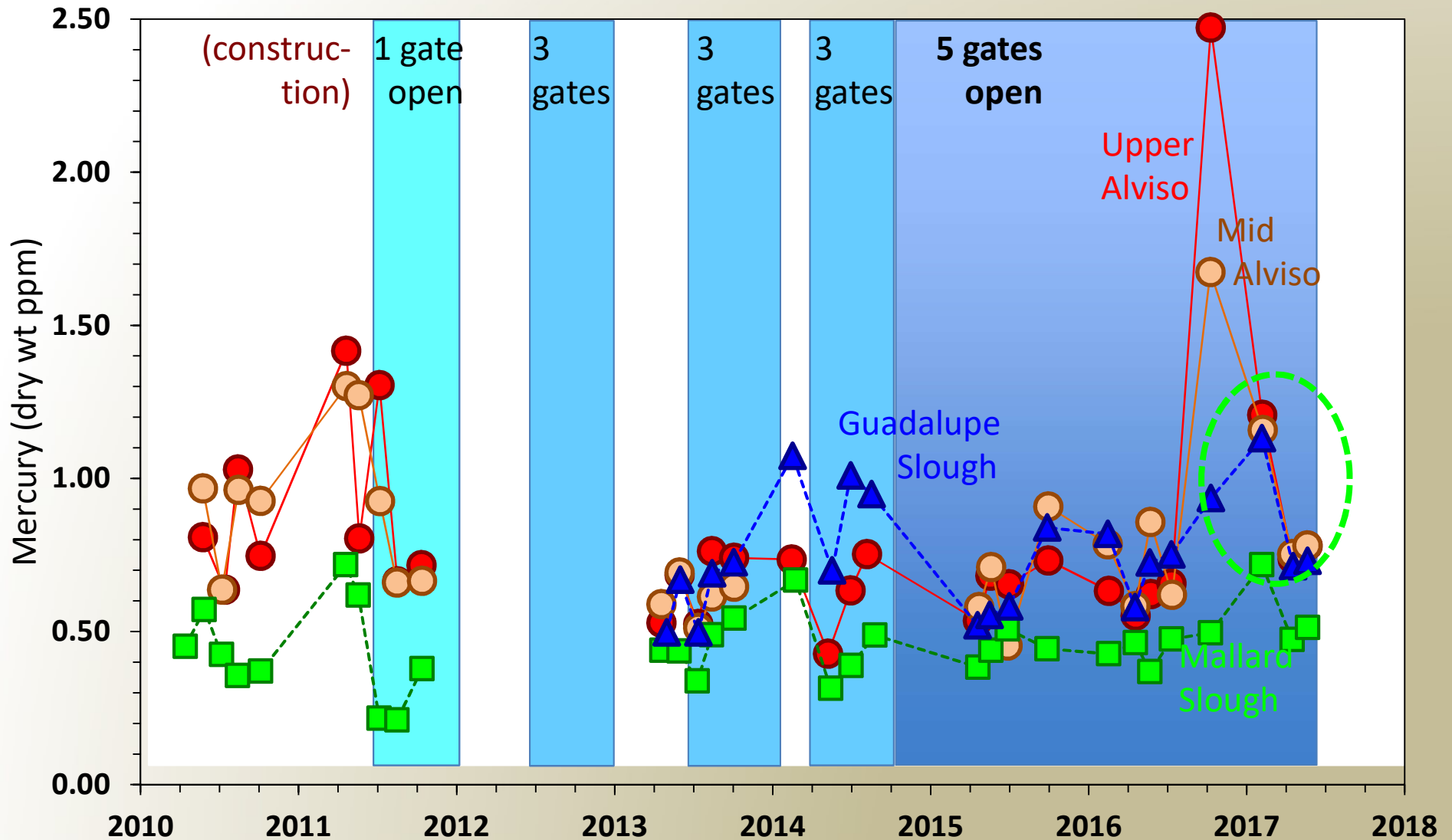
Water Data: PONDS Unfiltered Methylmercury

Mark Marvin-DiPasquale,
et al.

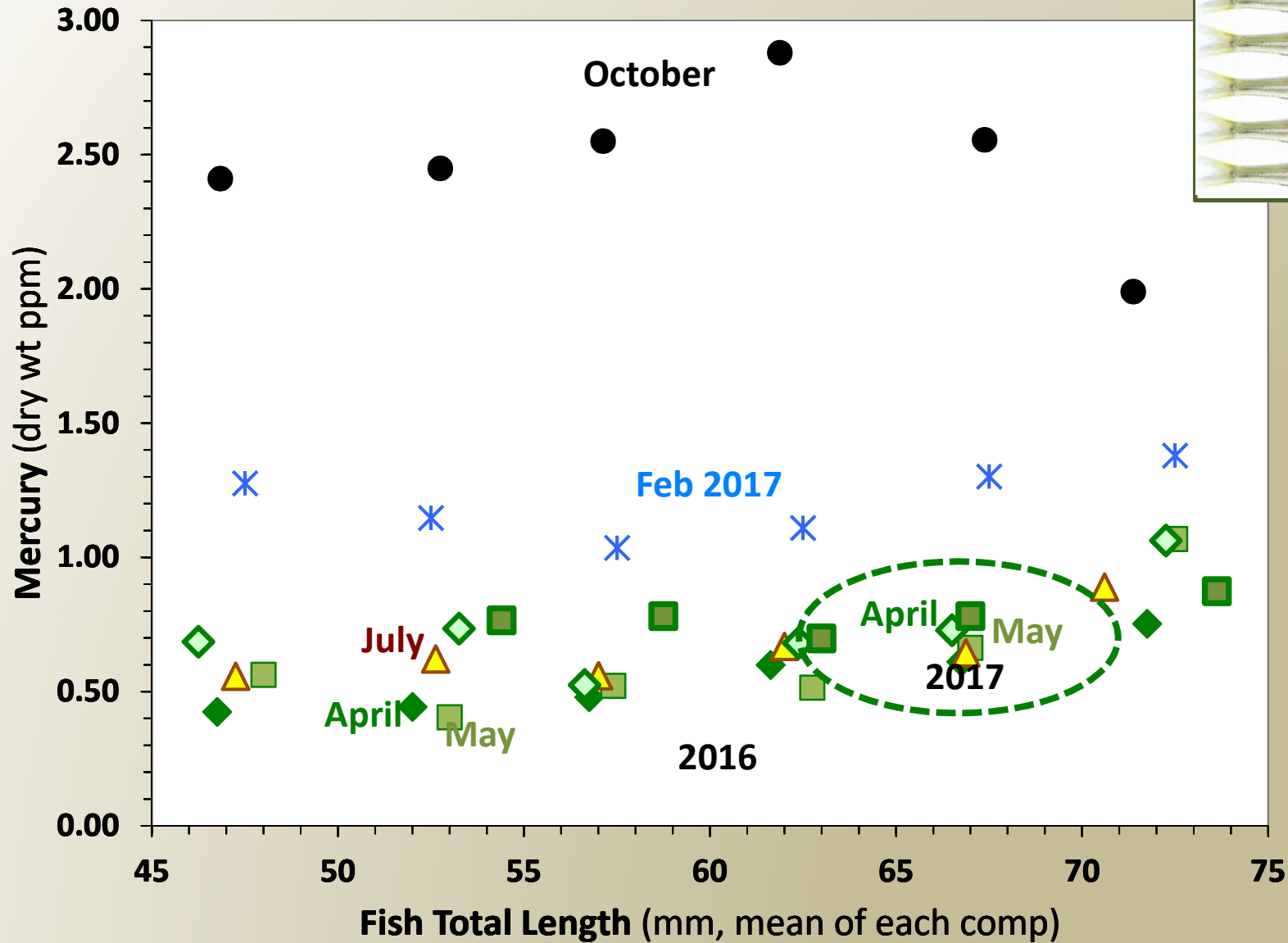
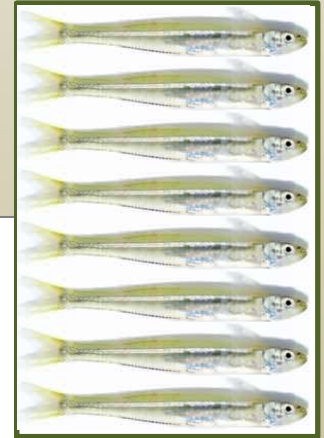


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