Overview of control studies for the Delta MeHg TMDL

Challenges addressing on-site *and* receiving water objectives under the Delta MeHg TMDL

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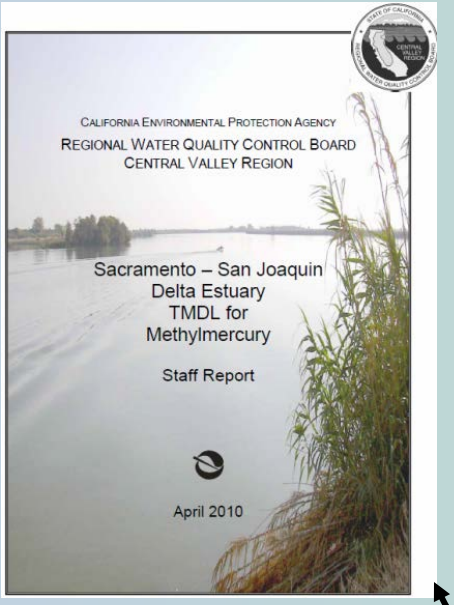
Mercury Pollution in Northern California
Delta Tributaries Mercury Council

MCCORD ENVIRONMENTAL

Overview

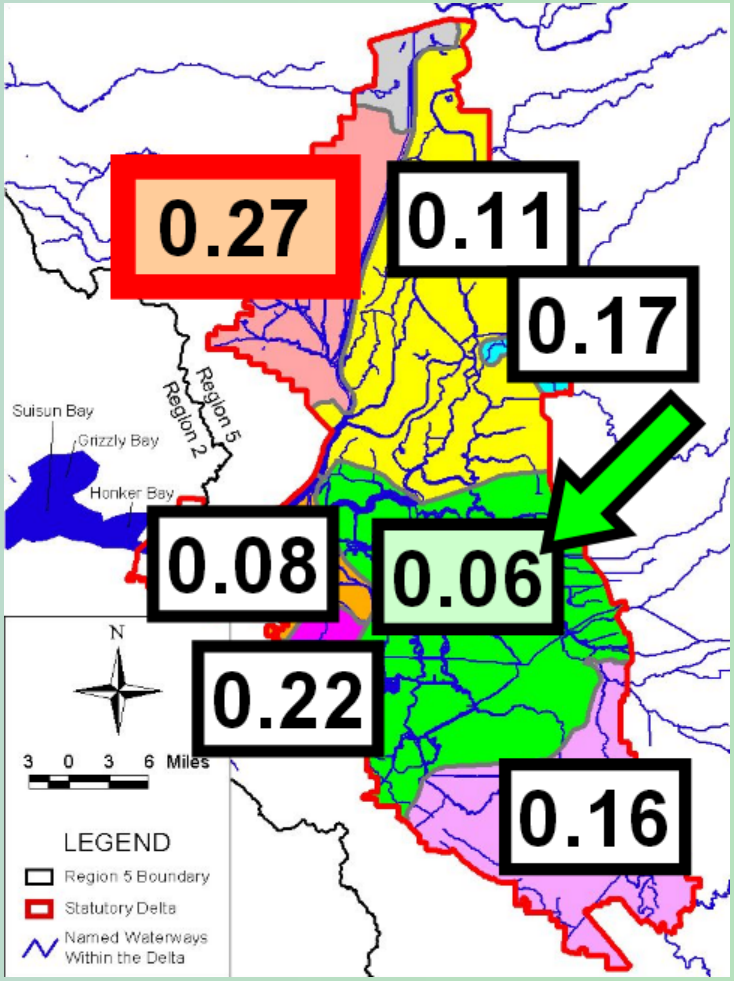
- Regulatory Issues & Study Approach
- Three Control Study Approaches
- Conclusions, Recommendations, and Next Steps



Reduce MeHg **discharges**
at minimal cost **on site**

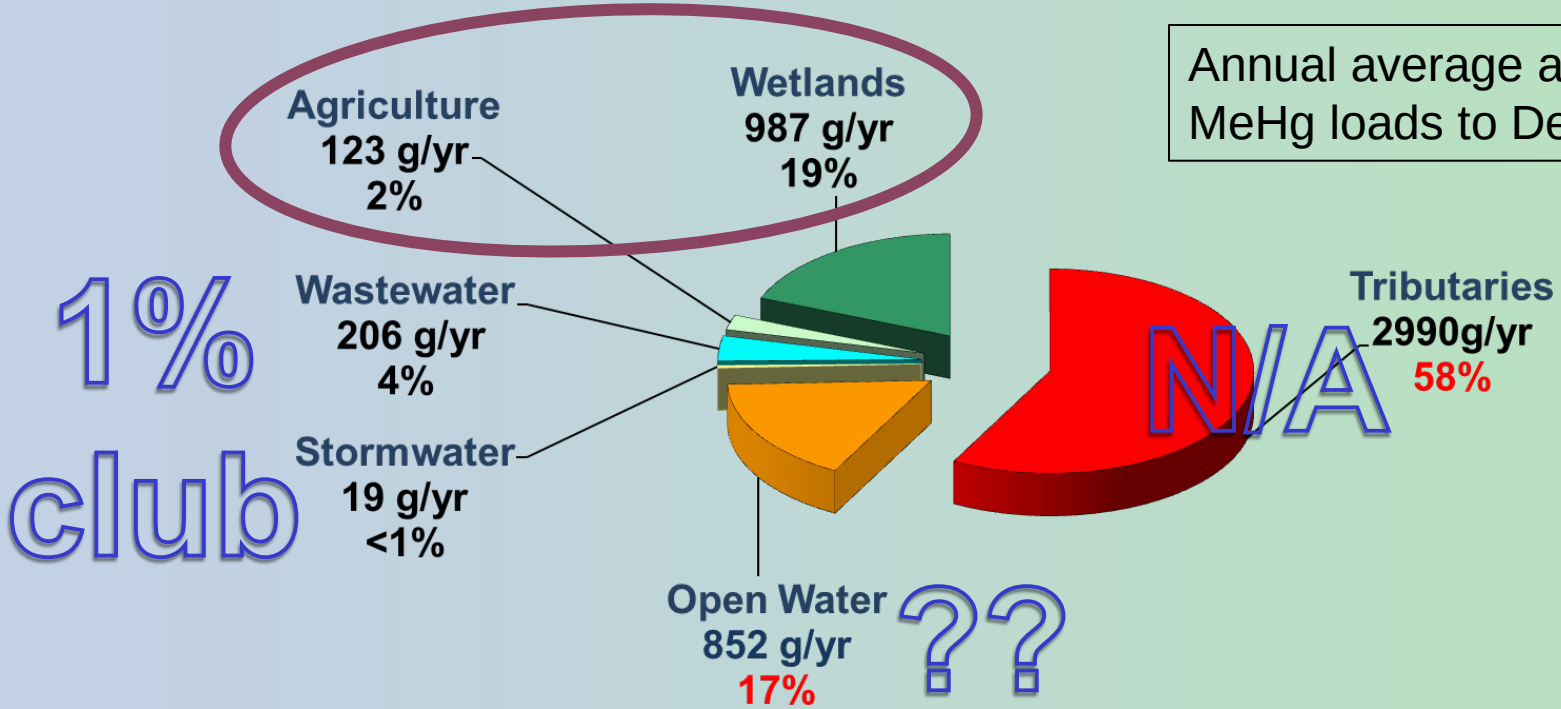
REGULATORY ISSUES & STUDY APPROACH

MeHg Highest in "Restoration Central" – the Yolo Bypass



MeHg (ng/L) in the Delta's open waters

TMDL Phase 1: **Characterize** MeHg Controls **by Category**



Annual average and % MeHg loads to Delta

- **Processes** driving MeHg production?
- **Constraints** on practices & effectiveness?

Final Study Reports to Show

- **Effectiveness** of the control method at reducing methylmercury in discharge;
- Estimates of **cost** if the control method were implemented;
- Potential, redirected environmental **impacts** of the control method; and
- Overall **feasibility/scalability** of implementing the control methods.

Phase 1

Effective Date ➔

- **Control studies**
- Pollution prevention
- Exposure reduction
- Discharge monitoring
- NPS compliance pts.

- *Statewide objective & TMDL*
- *Upstream TMDLs*
- *Pilot offsets projects*

TMDL Review **~2020**

Re-assess allocations & schedules

Phase 2

- Implement methylmercury controls
- Monitor fish

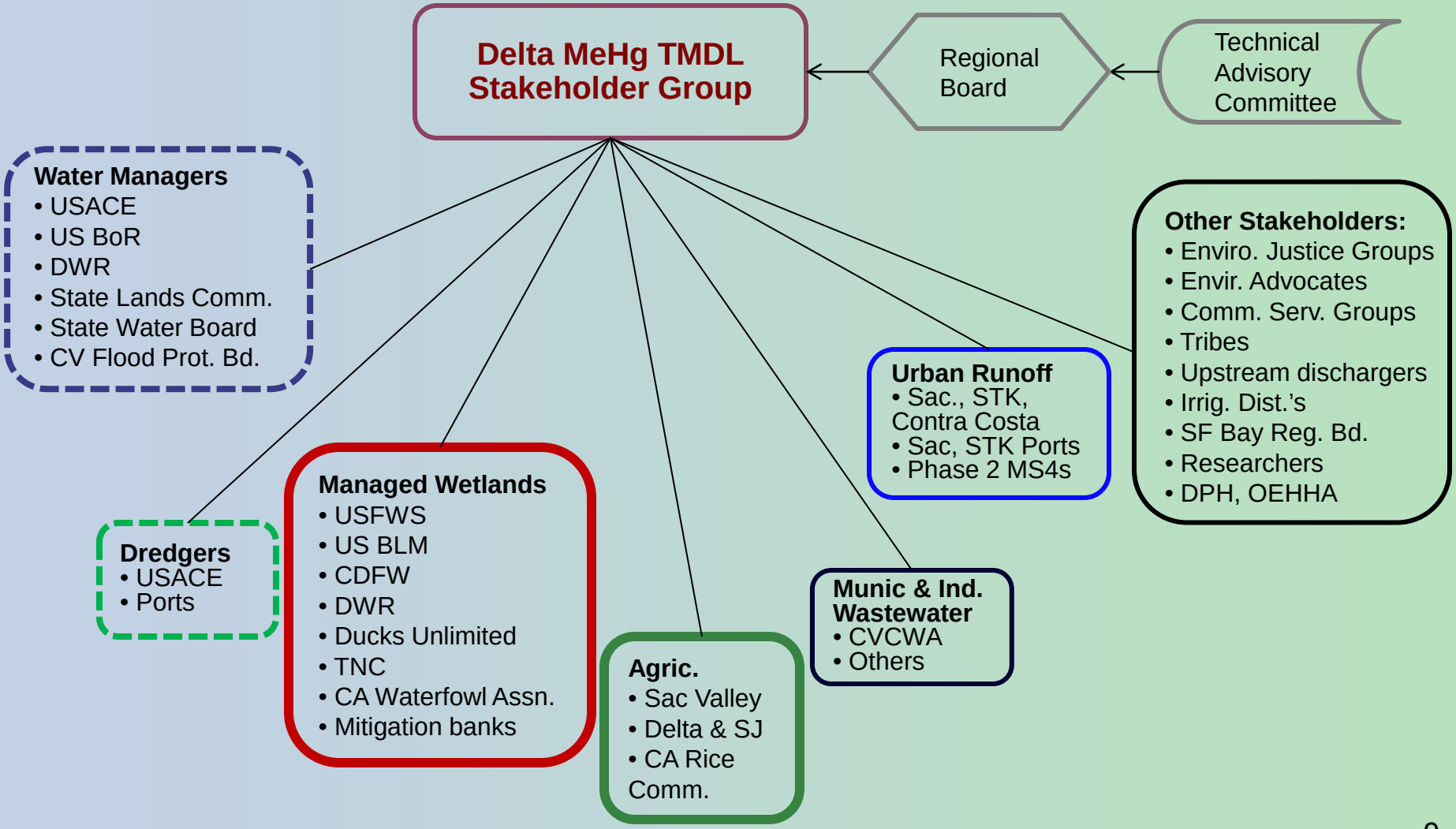
2030

Attain Allocations

Working together

THREE CONTROL STUDY APPROACHES

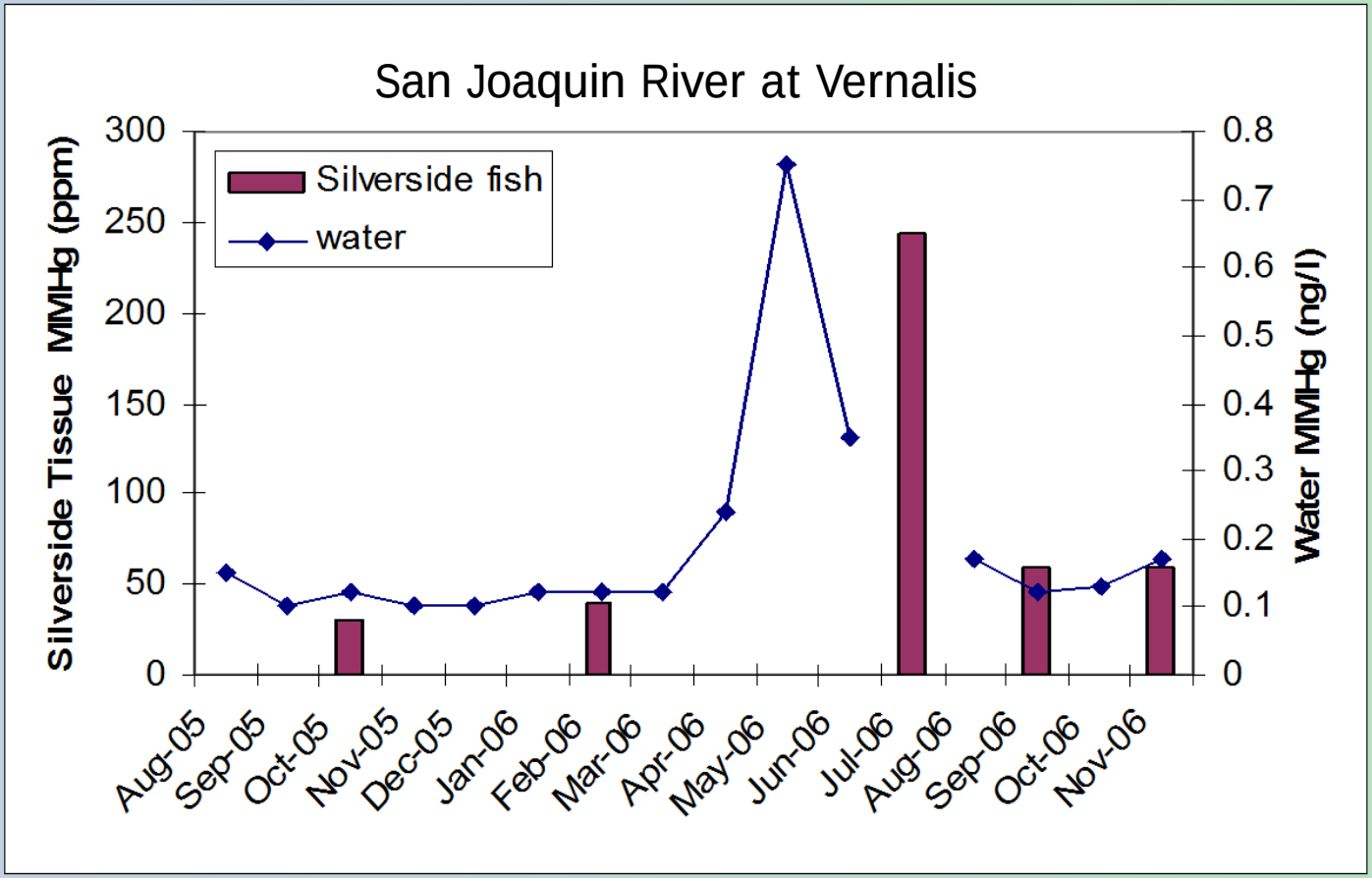
Delta MeHg TMDL Stakeholders



NPS Control Study Workplan

- **What we know (USGS):** Synthesis of key findings & knowledge gaps
- **What to do (MLML):** Management practices described & scored
- **Where to do it (DU):** Land uses by subarea

Likely Bypass-wide Effect of Fish-Friendly Flood Pulses

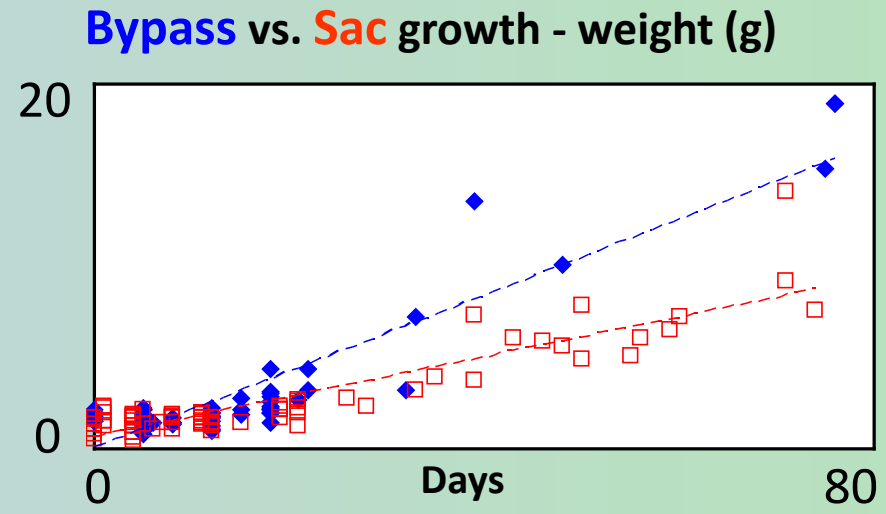


Spring flood pulse
in water & fish

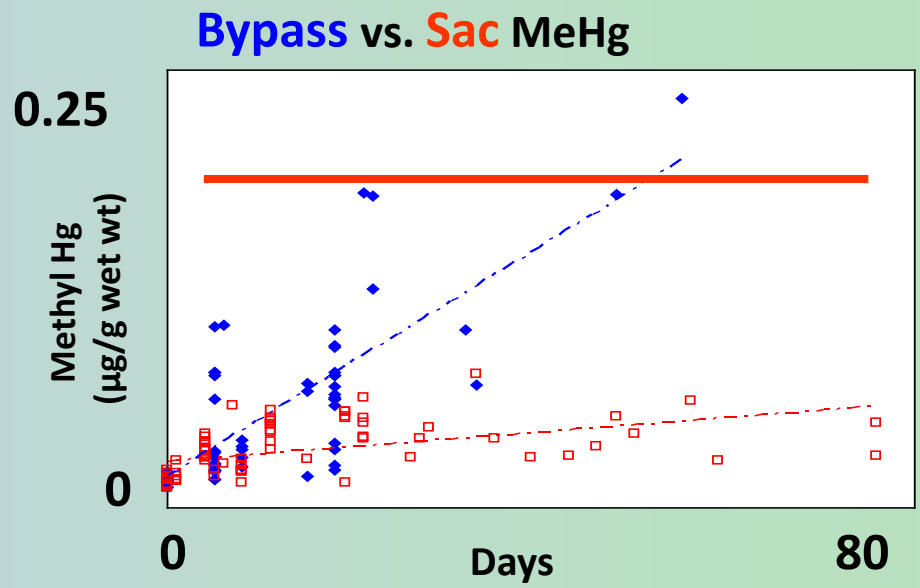
Water data: Foe et al., 2008
Fish data: Slotton, 2012

Nigiri Project in Upper Bypass, Salmon Rearing Data (2005)

Juvenile salmon grew faster and larger in Bypass than in Sac. R.



They also accumulated MeHg faster and more, (but still <TMDL obj.)



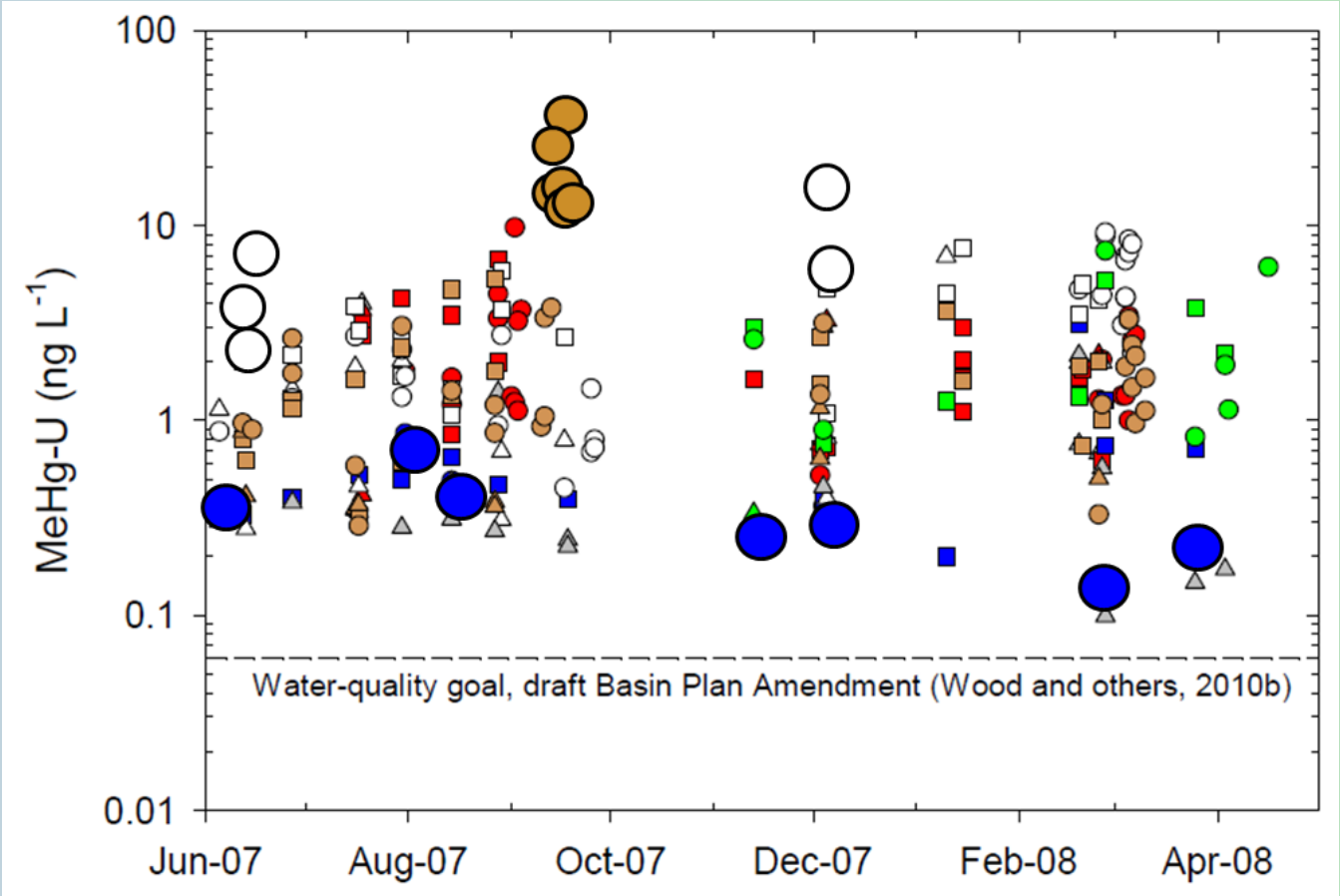
Source: Henery et al., 2010

Bypass rice fields always & everywhere exceeded TMDL goal

Wild rice high at harvest

White rice high at floodup & winter

Permanent wetlands low [MeHg]



	Supply Canal	White Rice	Wild Rice	Fallow	Seasonal Wetland	Permanent Wetland
Inflow	△	△	▲	▲	▲	▲
Center		□	■	■	■	■
Outflow		○	●	●	●	●

USGS science for a changing world

Alpers et al., 2014

NPS Management Practices to **E**valuate or **A**pply

Biogeochemistry

- Apply coagulant

Need data

Soil / Vegetation

- Burn soil & veg.
- Till / incorp. veg.
- Bale & remove veg.
- Graze veg. w/ livestock

Tough to manage

Hydrology

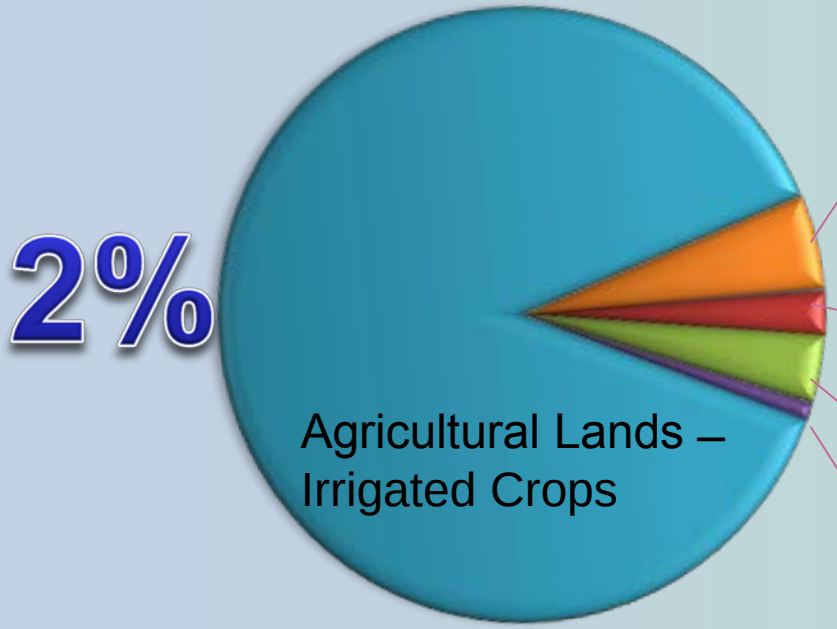
- Incr. residence time
- Flood & hold
- Use perm. ponds
- Recirculate drainage
- Raise ditch water depth
- Schedule discharges
- Use drip irrigation
- Flush marshes
- Stagger flood/drain events
- Reduce flooding period
- Incr. currents
- Pre-flood wetlands
- Delay fall flood-up
- Irrigate in series

Uncertain on-site impacts

6 Major NPS Land Uses; Minimal Control Options

~430,000 acres

<60,000 acres



Natural Hydrology Systems – Brackish-Fresh Tidal Marsh

Managed Wetlands – Permanent Wetlands

<0%

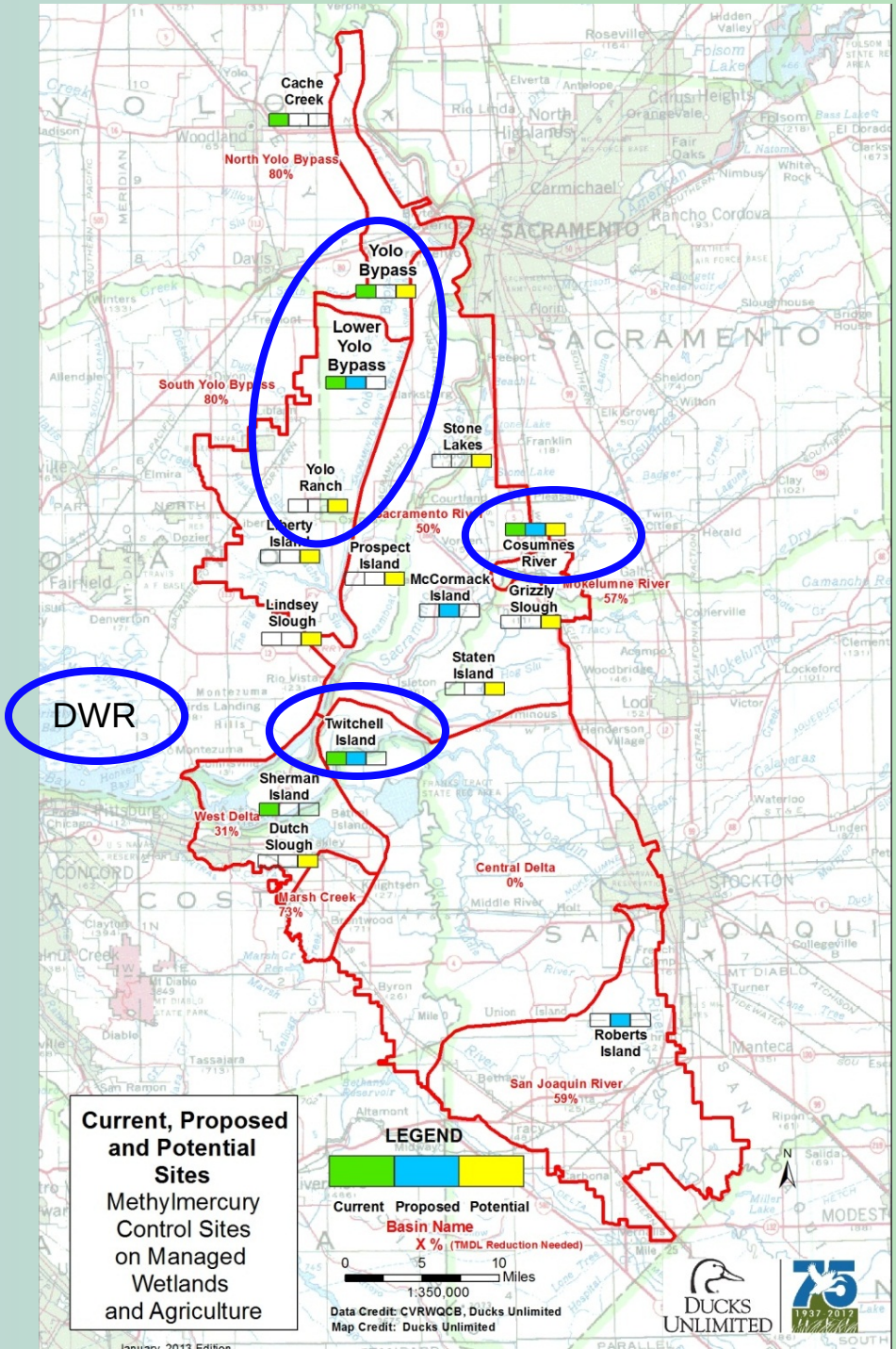
Agricultural Lands – Flooded

Managed Wetlands – Seasonal Wetlands

Natural Hydrology Systems – Floodplains

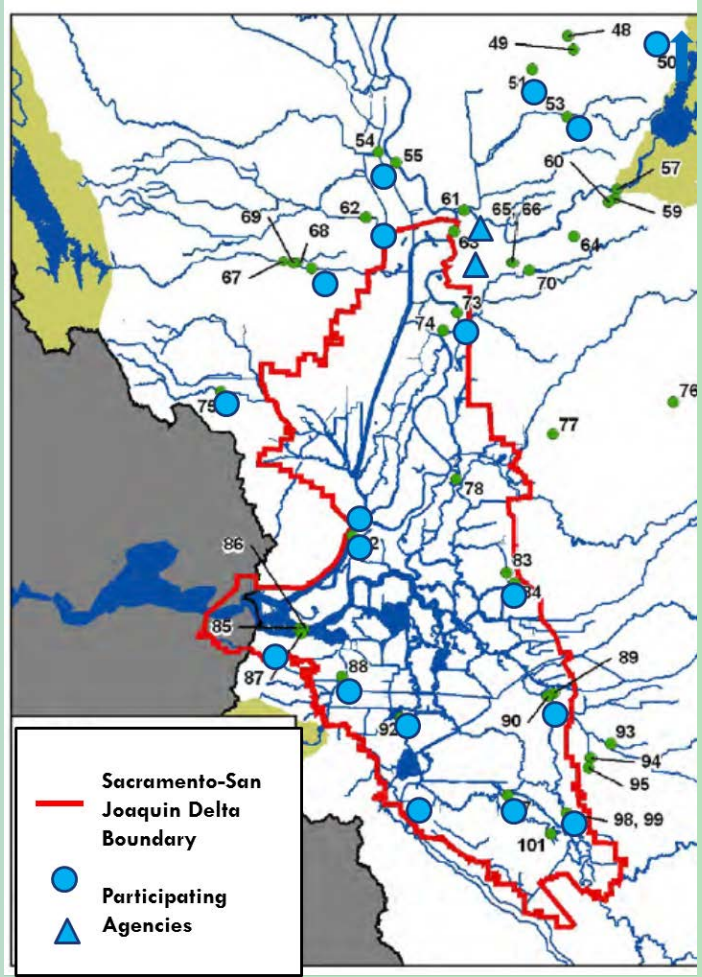
N/A

Current NPS Control Study Sites

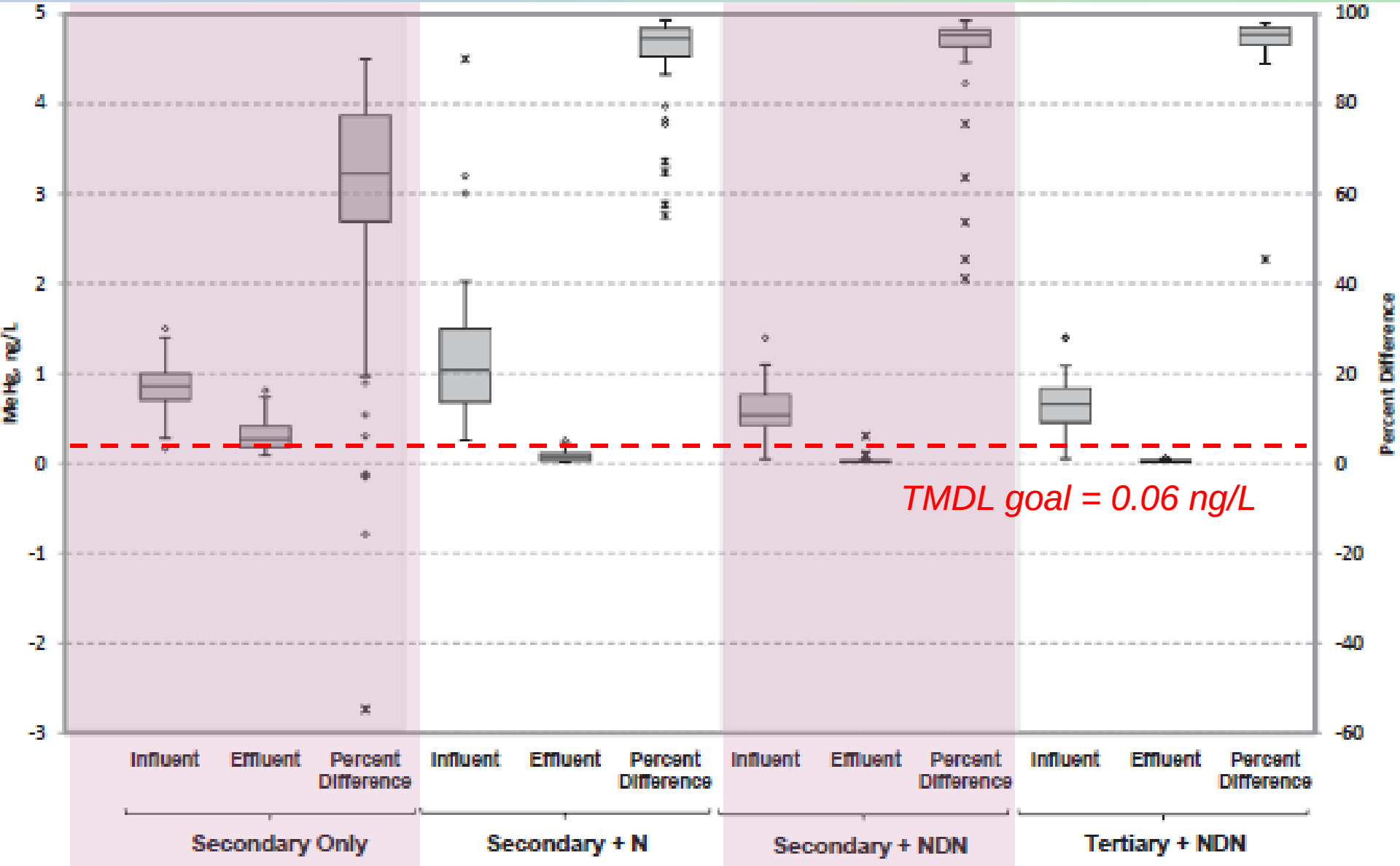


CVCWA Special Project

- 14 of 15 POTWs in TMDL, 96% of total flow
- $3 B in recent & planned upgrades
- Study focus: effectiveness of pollution prevention & treatment improvements

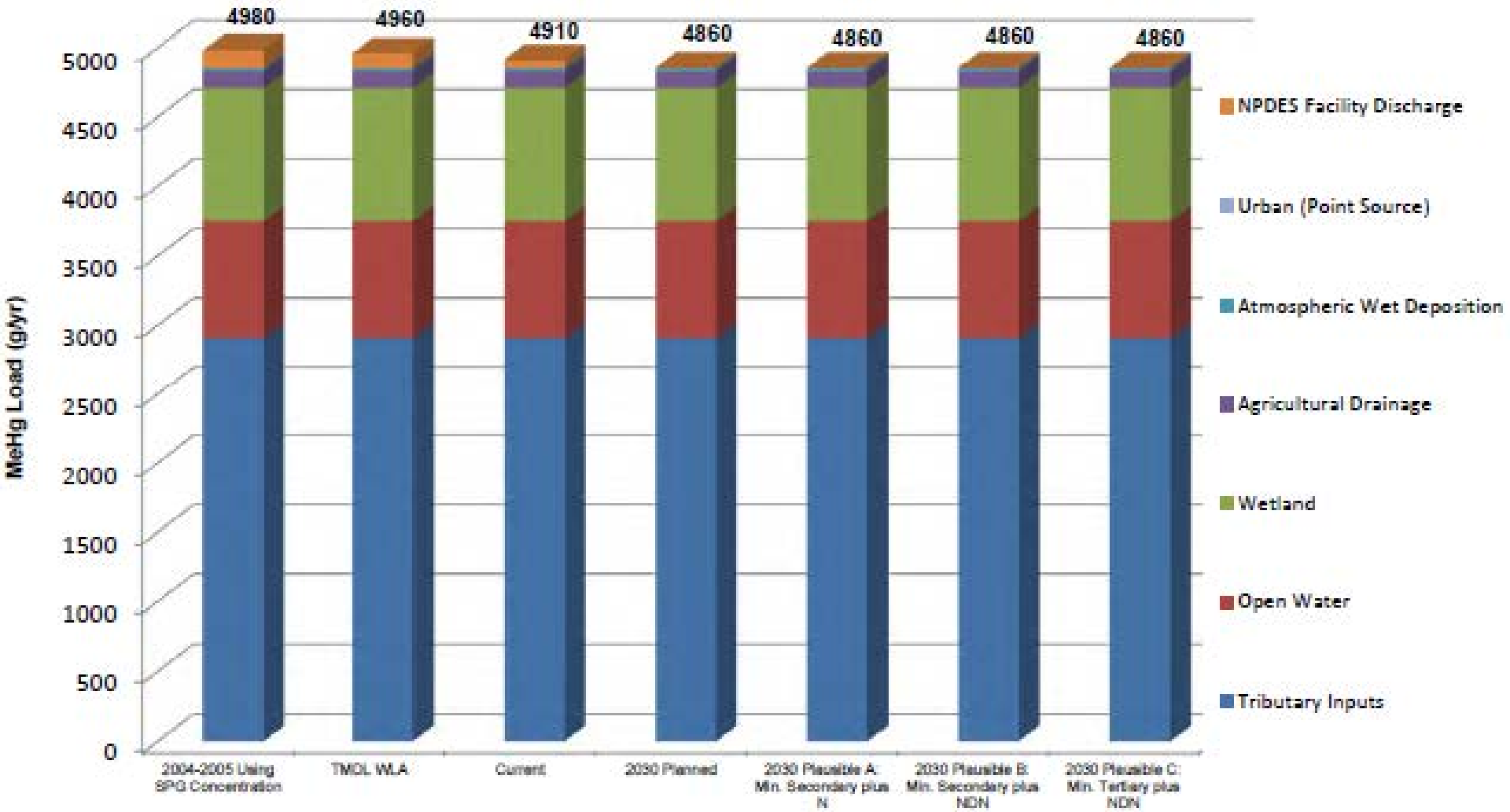


WWTP MeHg In & Out



Trivial Benefits from More WWTP Reductions

POTW loads will be lower in 2035



And give some more…

- Participate: MERP
- Implement?: Hg Pollution Prev. Plans
- Next (2016-2018): Reconn. advanced nutrient removal effects; monitor non-drought conditions (influent & effluent)
- Support: Delta RMP Hg monitoring; collaborative numerical modeling to examine attainability

Urban Stormwater Studies

- **Sacramento**: LID infiltration reduced THg, MeHg, RHg loads
- **Stockton**: Retention basins [THg] reduced; [MeHg] n/c
- **Contra Costa**: LID infiltration=removal; [MeHg] varied but 0.06 ng/L unachievable
- **Port of Stockton**: Storm drain maintenance ?? MeHg
- **Phase II MS4s**: Sed. & erosion control (no studies)

Future focus:

- Understanding BMP design factors
- Service area-wide assessments
- Long-term compliance plans

CONCLUSIONS, RECOMMENDATIONS, AND NEXT STEPS

Long-term Approach

- Conceptual ➔ Mechanistic ➔ <u>Scale</u>
  - Science synthesis
  - Management Practices evaluations
  - Land use analysis
- Long-term interests
  - Cost-benefit
  - Attainability
  - Trading
  - Modeling
  - Climate change
  - Reconciliation

What's Next??

- TAC interaction?
- Delta RMP monitoring?
- Statewide program?
- Pilot offset projects?
- Delta-wide modeling?
- TMDL attainability?

For more information

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