WATER QUALITY BENEFITS OF REESTABLISHING OXIC CONDITIONS IN THE BOTTOM OF A HYPEREUTROPHIC DRINKING WATER RESERVOIR

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CONTENT

Background

Ecosystems Services lost

Hypolimnetic Oxygenation System (HOS)

Evaluation of HOS

Evidence:

- Water profiles
- Bottom water quality
- Chlorophyll
- Mercury in zooplankton and water

Conclusions

• Reestablishing ecosystem services of oxic bottom waters

HODGES RESERVOIR Background

- San Diego, CA
- Source of water for potable treatment
- Backup water supply
- Pump storage hydropower
- Wildlife habitat
- Recreation: boating and fisheries



HODGES RESERVOIR Ecosystem Services Lost



- Eutrophication: Anoxic bottom waters
 - ➢ Internal nutrient loading → Algae
 blooms
 - Lost of cold-water habitat for fish and zooplankton
 - ➢ Release of manganese and iron →
 Potable water treatment
 - ➢ Production of MeHg →
 Bioaccumulation → neurotoxin



Hypolimnetic Oxygenation System (HOS) 2020

Water quality solutionReestablishing oxic bottom water conditions

Control internal nutrients loading

Potable water treatment

View of the HOS at Hodges Reservoir, 2021





HODGES RESERVOIR Evidence: Water Quality Profiles at Station A during July



HODGES RESERVOIR

Evidence: Bottom Water Concentration at Station B



HODGES RESERVOIR

Evidence: <u>Bottom Water</u> Concentration at Station B



HODGES RESERVOIR

Evidence: <u>Surface Water</u> Concentration at Station B



HODGES RESERVOIR Evidence: Chlorophyll at Station A (0 - 6 m)



HODGES RESERVOIR Evidence: Sechi Disk at station A



2021 water turbidity low, similar to 2018 during dry year

> 2021 seems to have less algae, but water clarity has not drastically improved

HODGES RESERVOIR Evidence: <u>Bottom Water</u> Concentration at Station B

Total Manganese (Mn)



HODGES RESERVOIR Evidence: <u>Bottom Water</u> Concentration at Station B



HODGES RESERVOIR Evidence: <u>Mean Hypolimnetic</u> Concentration at Station B



Methylmercury (MeHg)

HODGES RESERVOIR Evidence: Methyl Mercury in Zooplankton Accumulation



Zooplankton (250um) station A

Conclusions

HOS reestablishing ecosystem services of oxic bottom waters in Hodges Reservoir?

(2021)

- Reestablishing oxic bottom water conditions
 - DO and OPR higher
 - Nitrate in bottom water
- Control internal nutrients loading
 - Lower ammonia, and higher nitrate in bottom waters
 - Lower chlorophyll and TP in surface water
- Potable water treatment
 - Lower Mn
- MeHg bioaccumulation
 - Low SRB activity (sulfate in bottom waters)
 - Lower MeHg in zooplankton and water



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CLIFFS

THANK YOU!

HODGES RESERVOIR Evidence: <u>Bottom Water</u> Concentration at Station B



PRE-OXYGENATION RESULTS



- 2018: high anoxic conditions higher concentration
- 2019: high sulfide concentration: runoff sulfate particles

- Sulfate Reduction Bacteria (SRB) produces sulfide
- 2017: low sulfide flux in coprecipitation with Fe2+ → FeS



CONCLUSION



MeHg=methylmercury, Hg(II)= dimercury