Intake Barrier System for Water Quality Improvement from Iron Gate Powerhouse Releases to the Klamath River

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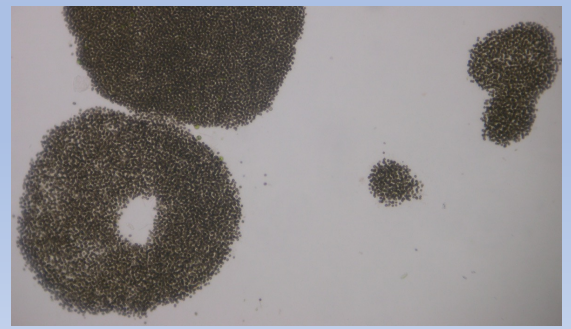
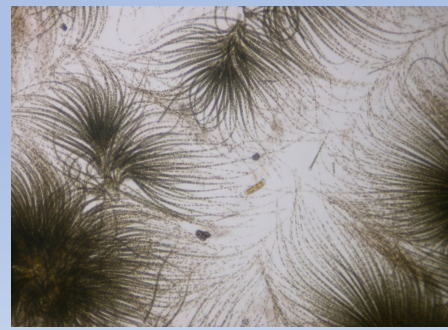
Problem

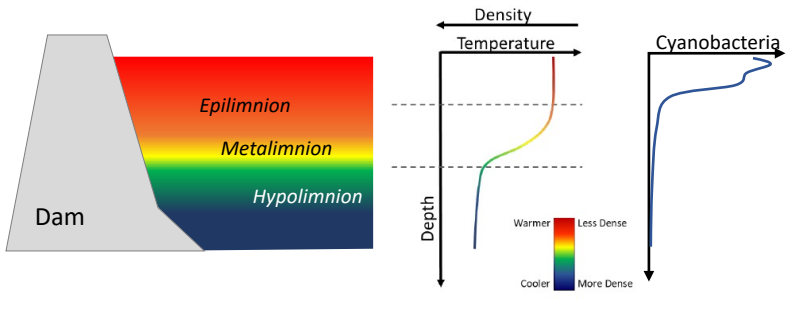
- Iron Gate Reservoir algal blooms
- Public Health: Reservoir and Klamath River
- Dominant species: cyanobacteria
  - Toxin producing
  - Buoyancy compensating organisms
  - *Dilichospermum sp*, *Microcystis sp*, others
- Outlet works screened to water surface

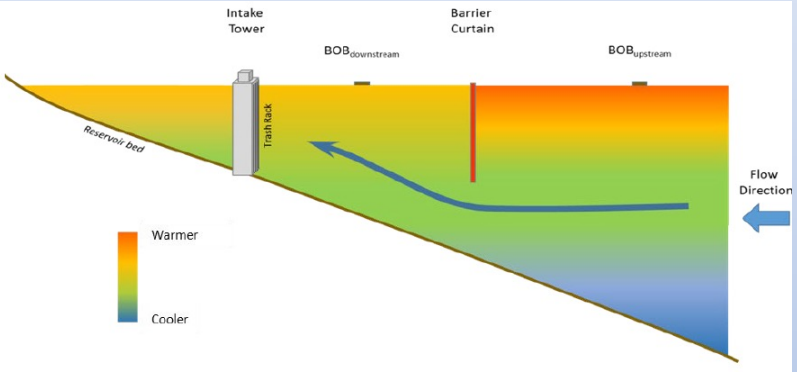




Approach

- Strategy
  - Utilize buoyancy compensation attribute of cyanobacteria
  - Seasonal thermal stratification
  - Barrier to maintain near-surface waters in reservoir while releasing waters from below the photic zone to minimize release of cyanobacteria to Klamath River





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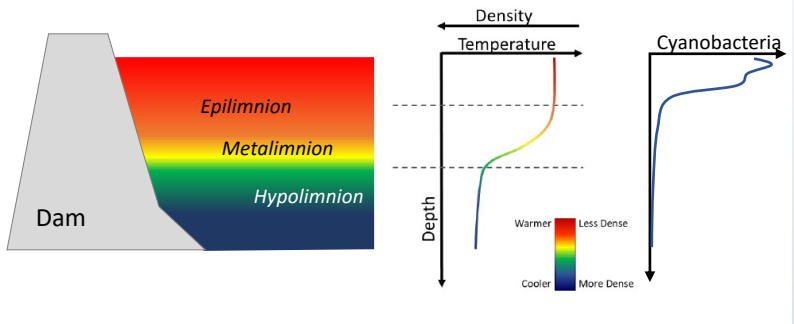
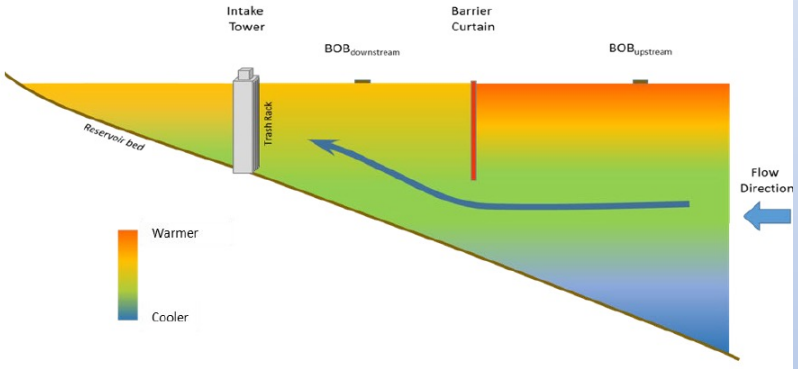




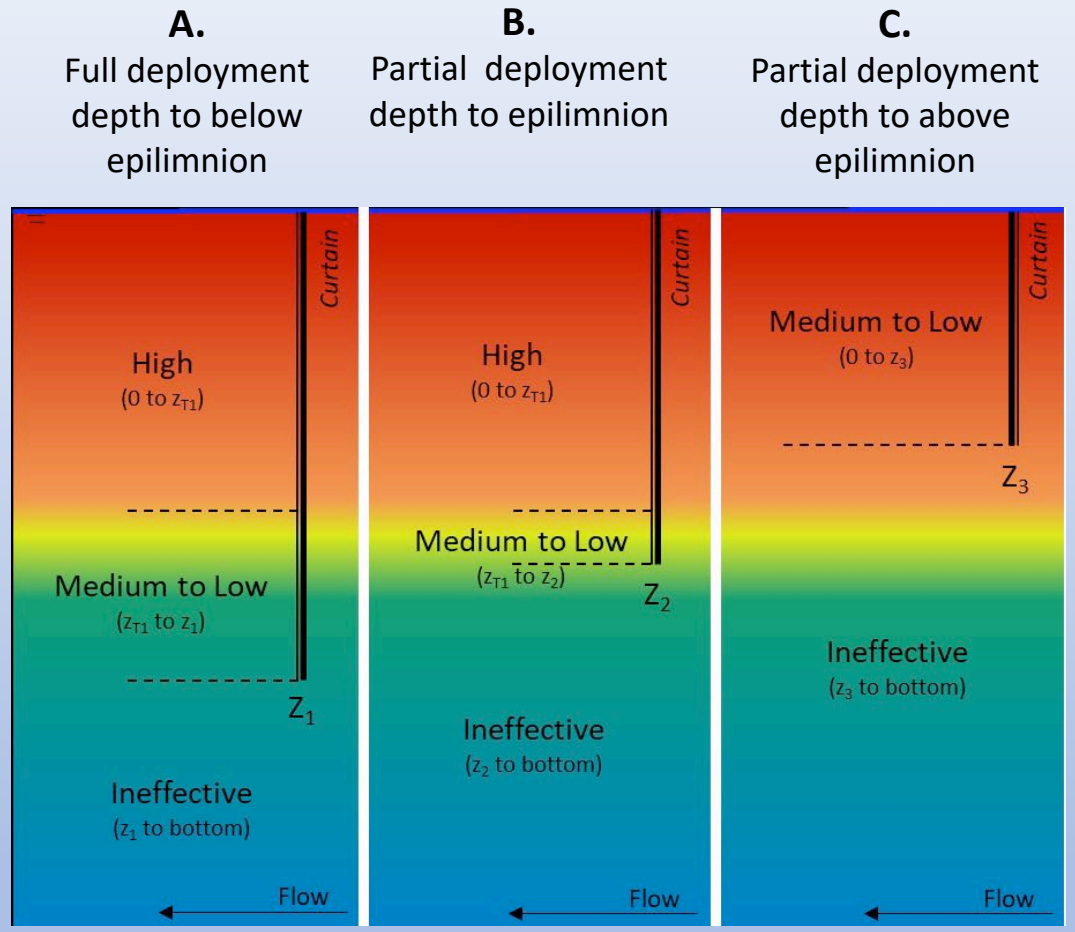
- Barrier
  - Impermeable coated nylon fabric
  - Horizontal length 245 m, maximum depth of 10.7 m.
  - Floating boom suspends in reservoir and weighted chain maintains curtain vertical
  - Design depth 10.3 meters

Findings

- Curtain efficacy a function depth and degree of thermal stratification
- Efficacy based on Wedderburn #

$$Wn = \frac{g' h^2}{(u^*)^2 L}$$

  - Assessed on a sub-daily basis using local meteorology and thermal profiles
  - Wn < 1.0: indicates unstable conditions, isothermal or near isothermalepilimnion
  - Wn > 1.0: indicates stability in the epilimnion (i.e., stratification)
- Curtain effective at design depth



Wn	=	Wedderburn number
g'	=	Reduced gravitational acceleration due to the density difference across the epilimnetic thermocline (meters per second squared; m/s^2)
h	=	Depth of the mixed layer (m)
u*	=	Characteristic shear velocity (meters per second; m/s)
L	=	Fetch represented by the reservoir open water length in the direction of the wind (m)

Pre- and Post Curtain Deployment