

Treatment wetlands & bioreactors for agricultural runoff

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(in collaboration with many others over the years e.g.:

Kelleen Harris, Pam Krone, Miles Daniels, Gage Dayton, Sierra Ryan, Cara Clark, Bryan Largay, Rob Burton, Miles Daniels, Peter Martin, Melissa Boyd, Diem Phan, Woutrina Miller, Jen Hogan, Bryn Phillips, Keith Starner, Arlene Haffa, John Skardon, Marc Los Huertos, Doug Smith, ...)

Presentation to Elkhorn Slough Symposium, Moss Landing, CA. 24-Jan-2017

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² Central Coast Wetlands Group / MLML

³ University of South Carolina

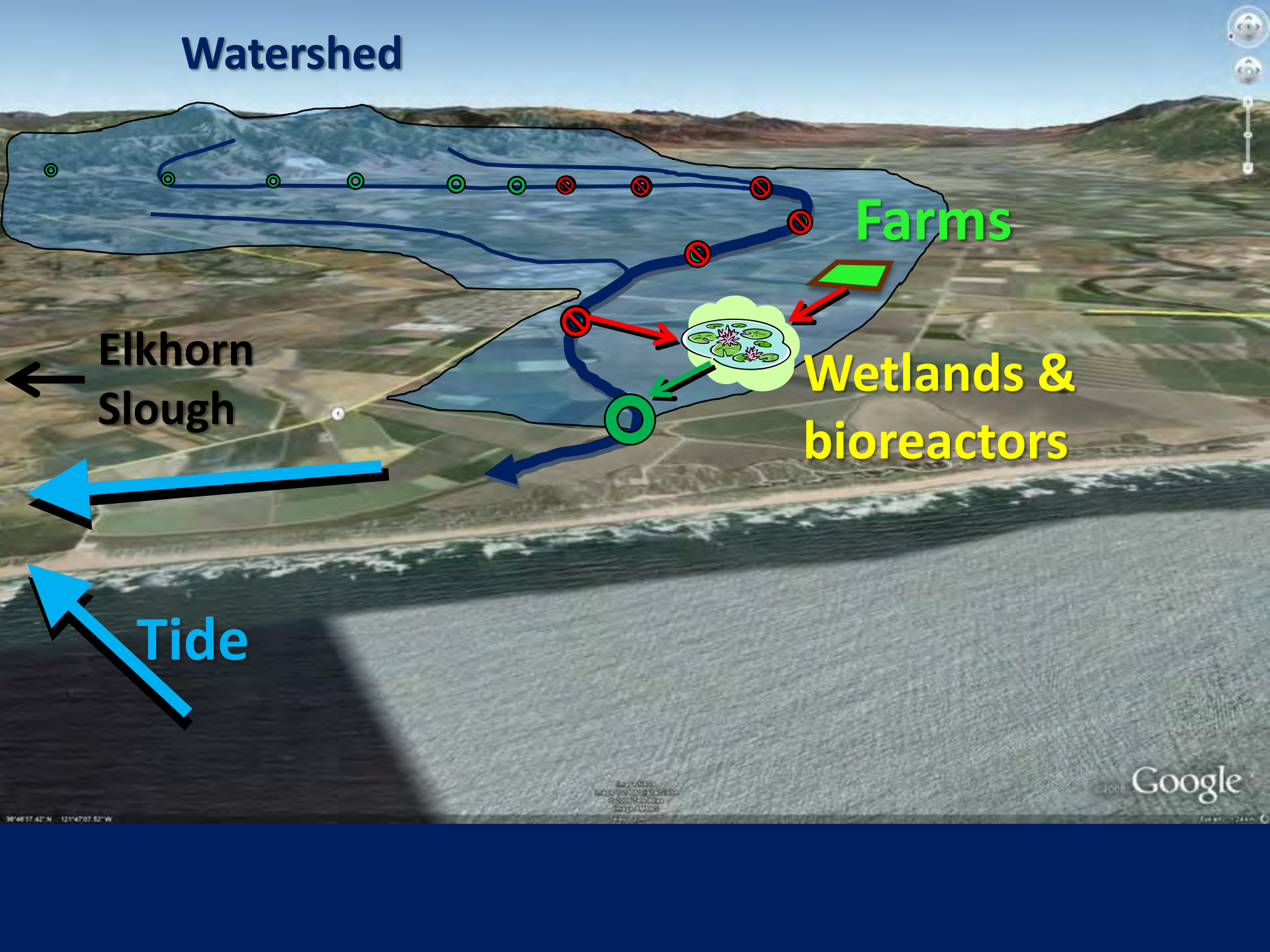
Watershed

Farms

Wetlands & bioreactors

Elkhorn Slough

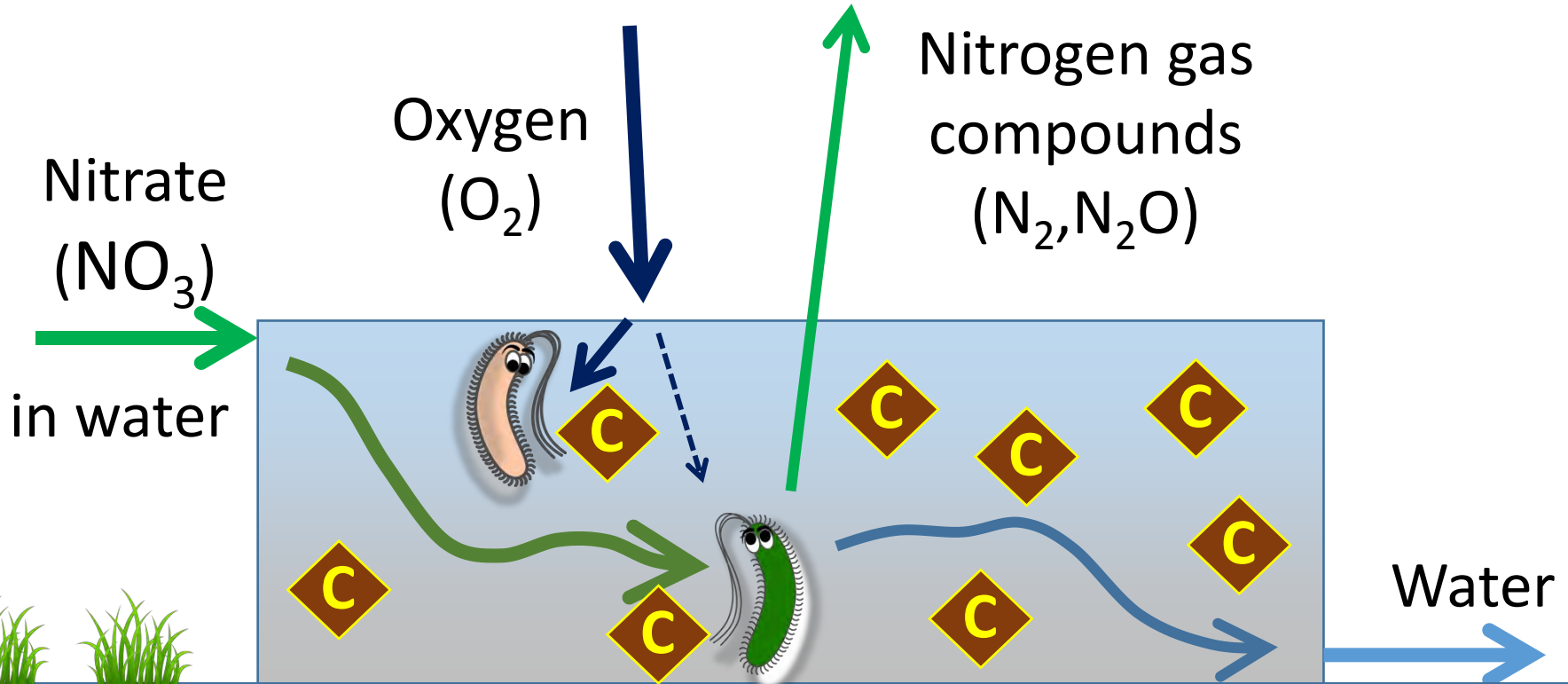
Tide



36°48'17.42"N - 121°47'07.52"W

Google

Atmosphere



Aerobic bacteria

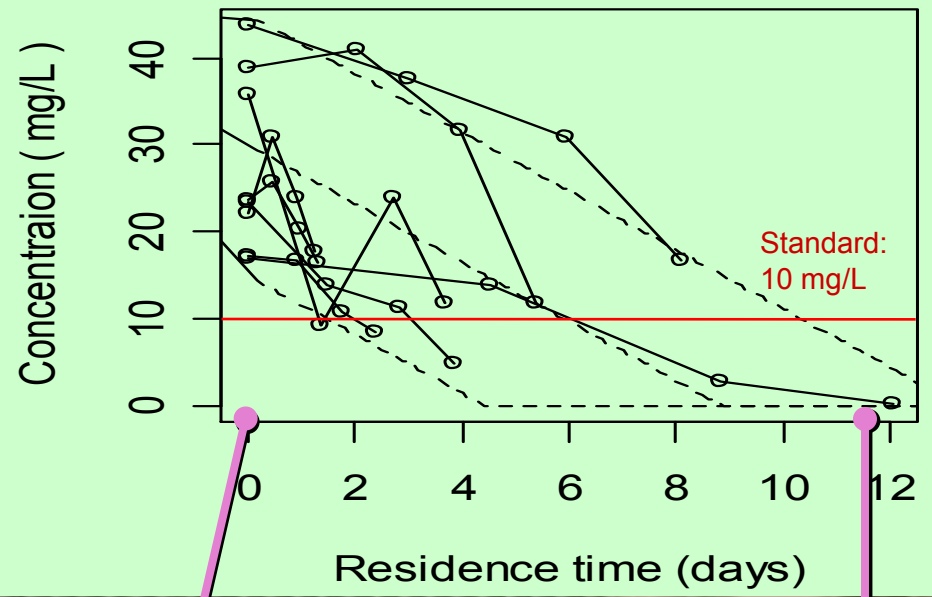


Anaerobic bacteria – includes denitrifiers



Carbon i.e. bacteria food e.g. dead plant matter, woodchips

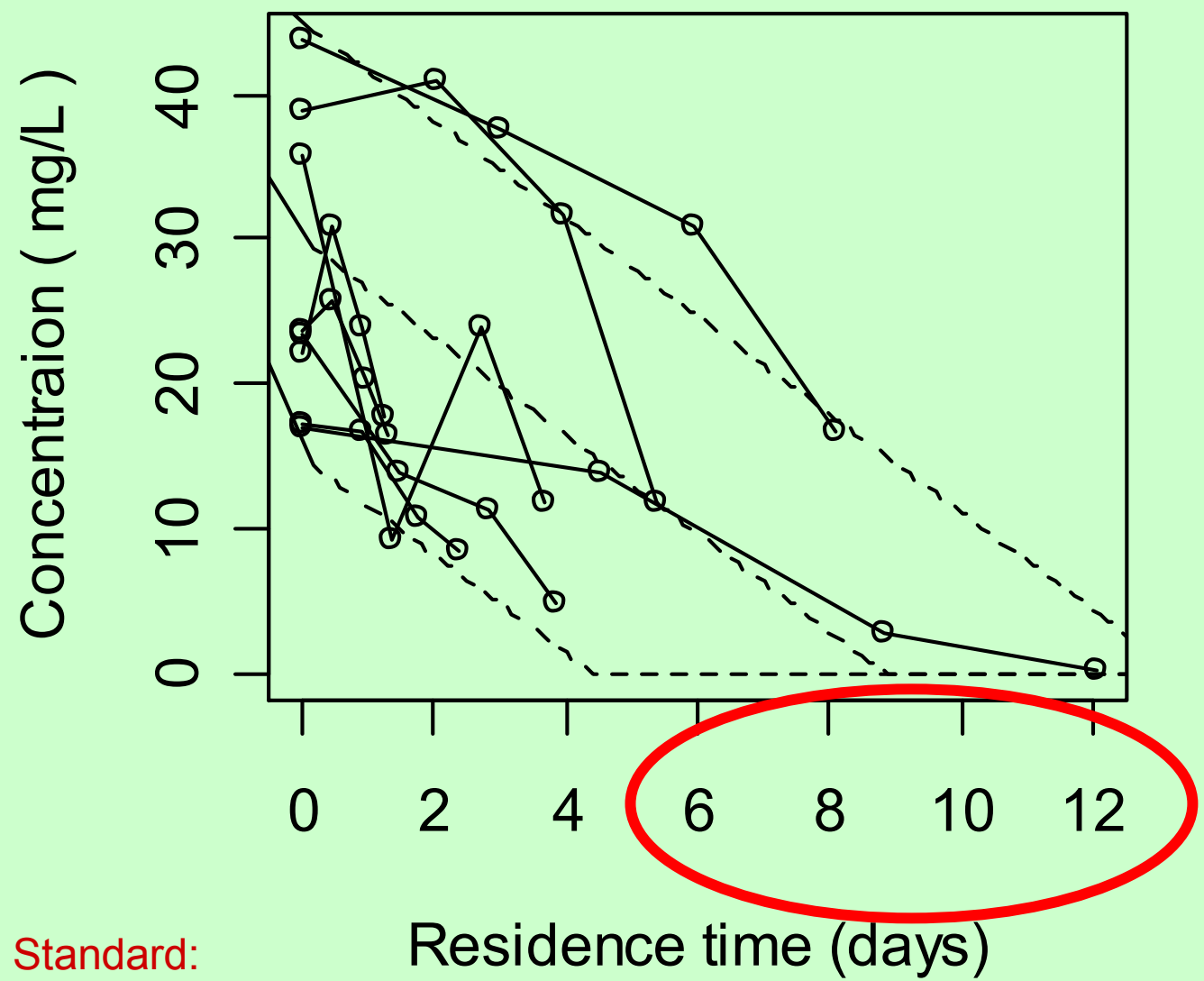
The Molera Rd Experimental Treatment Wetland



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Nitrate
concentration
~
Reduction
through
wetland

NO₃



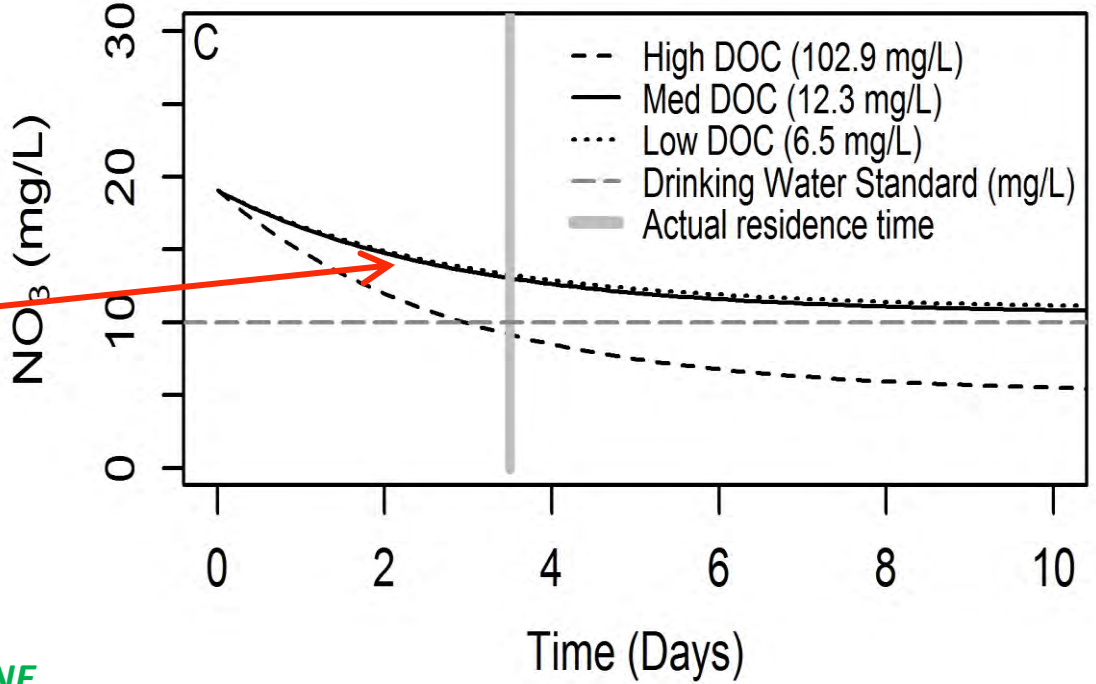
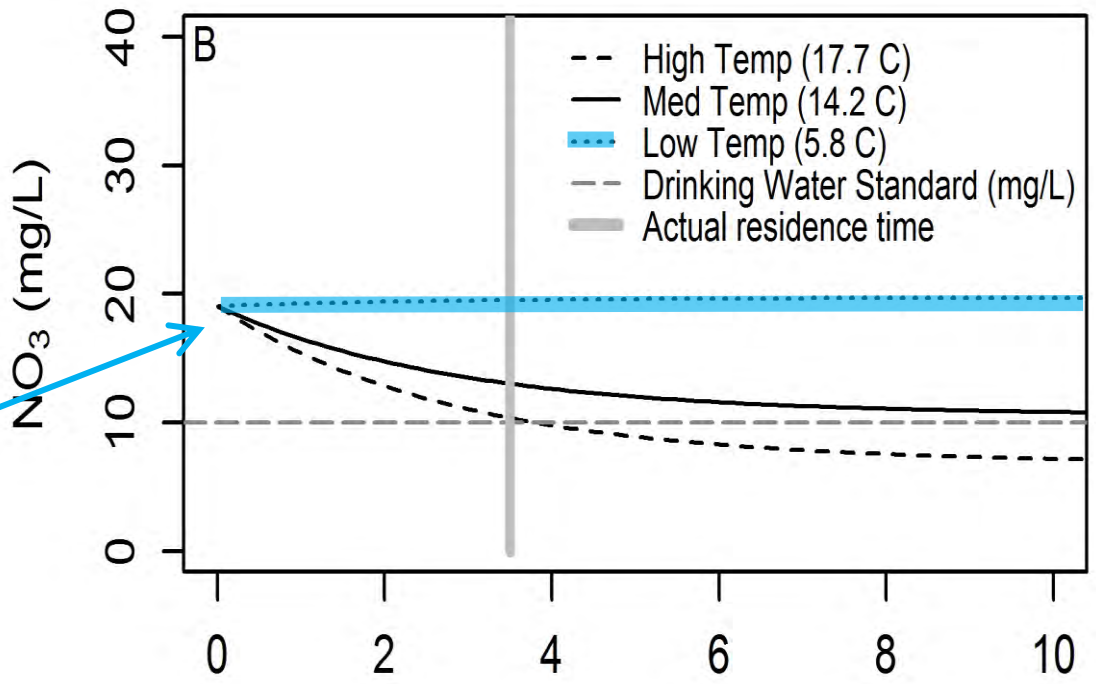
Standard:
10 mg/L

CA Central Coast climate is notable

Crops grown year-round

But **Too cold** for denitrifying bacteria in winter.

Also, wetland function limited by carbon supply.





Note: This one is not our bioreactor, but it's a great local example of typical practice

Molera Rd Experimental Bioreactor #1a - RIP



Molera Rd Experimental Bioreactor #1b



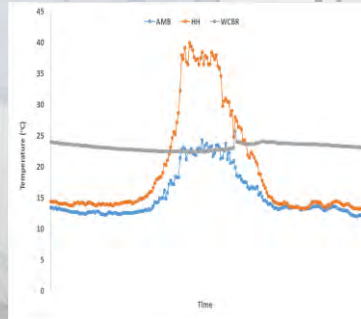
Molera Rd Experimental Bioreactor system #2



Molera Rd Experimental Bioreactor system #2



CSUMB On-Campus Experimental Bioreactors



MLML Experimental Woodchip Bioreactor #1



Full-scale replicated experimental bioreactors

- 12 channels = 4 treatments x 3 replicates
- Each channel 80 ft x 5 ft - sized to treat runoff from a 5-10 acre farm block, with ~1-day residence time
- Replicates reduce uncertainty, and decrease risk
- Treatments to be investigated:
 - Control
 - Cool woodchips – ambient temperature
 - Warm woodchips – passively heated
 - Ulva, then “natural” vegetated wetland ?

