



Massachusetts Water Resources Authority

Presentation to the

Mystic River Watershed Initiative Science Forum

Alewife Brook and Mystic River MWRA Bacteria Monitoring Update

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Long Term CSO Plan Alewife/Upper Mystic Update

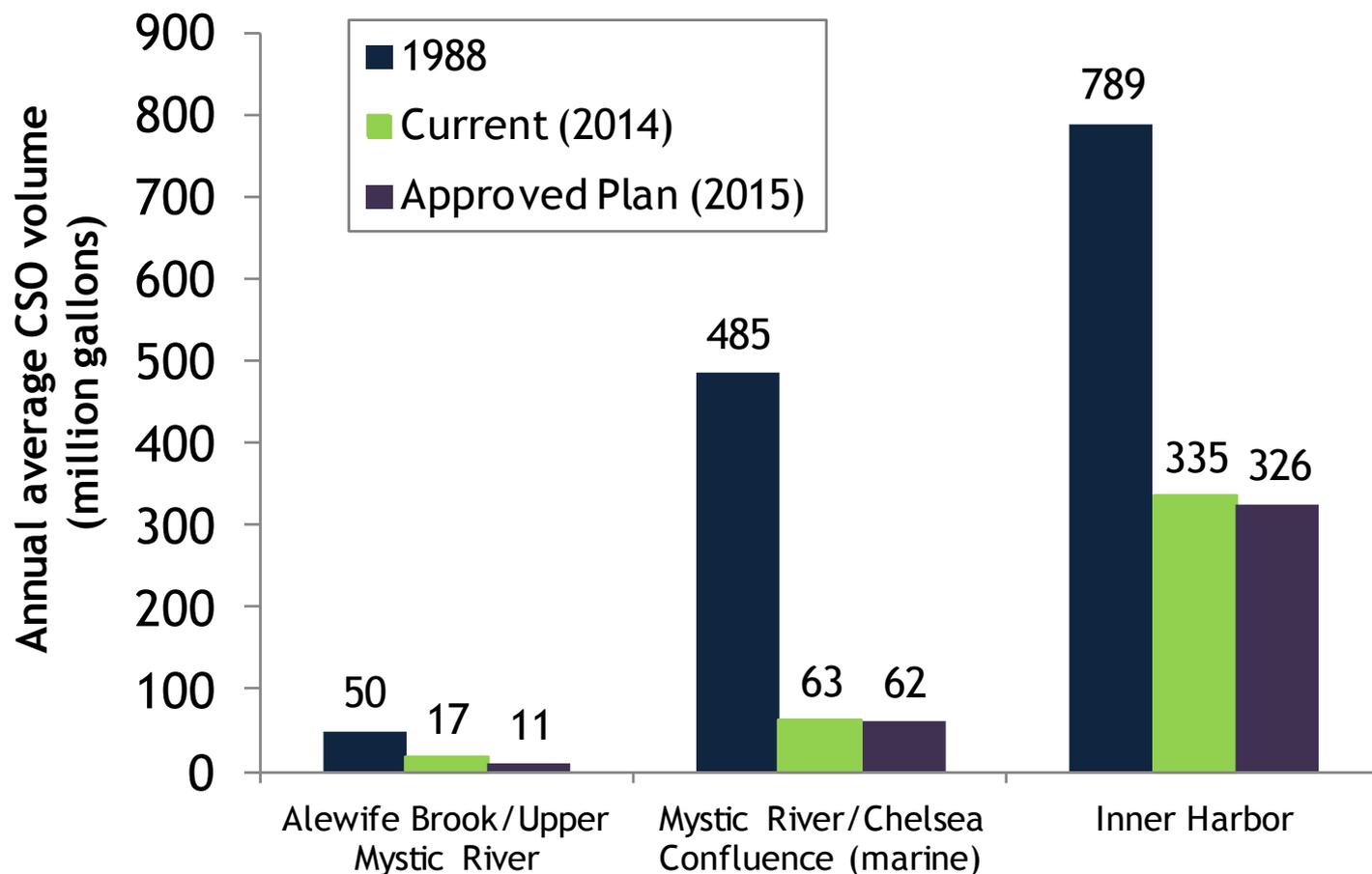
- Long Term Control wrapping up its construction phase – final 3 projects to be completed in 2015
- Next up after 2015: assessment period evaluating LTCP 2018-2020 for Court review and approval
- Last CSO scheduled to close in 2015 – CAM004 In Cambridge, as part of stormwater separation. Of the original 84 CSOs, 34 CSOs will have been closed.





Long Term CSO Plan

Alewife/Upper Mystic Update on CSO control



Projects will provide an 85% reduction in CSO discharges to Alewife with CSO activations from 63/year to 7/year



Long Term CSO Plan

Alewife/Upper Mystic Update

Region	2013 Total Volume	Outfall	2013 Activations
Alewife Brook	5.4 MG	CAM001	0
		CAM002	1
		MWR003	2
		CAM004	6 (to be closed in 2015)
		CAM400	Closed
		CAM401A	2
		SOM001A	2
		CAM401B	8
		To date, 8 CSOS have been closed in the Alewife/Upper Mystic, one remains to be closed	
Upper Mystic	9.8 MG	SOM007A/ MWR205A	5
Downstream of dam	64.2 MG	MWR205	19



Long Term CSO Plan Alewife/Upper Mystic Update

- Goal in Alewife CSO planning: to separate stormwater and increase hydraulic capacity. The plan also includes a (completed) constructed wetland to accommodate the separated stormwater flows.
- Discharges from Somerville Marginal CSO (205 and 205A) are now meeting long term levels of control
- Discharges to Alewife Brook will meet long term levels once CAM004 is closed in Dec. 2015



Bacterial water quality monitoring update

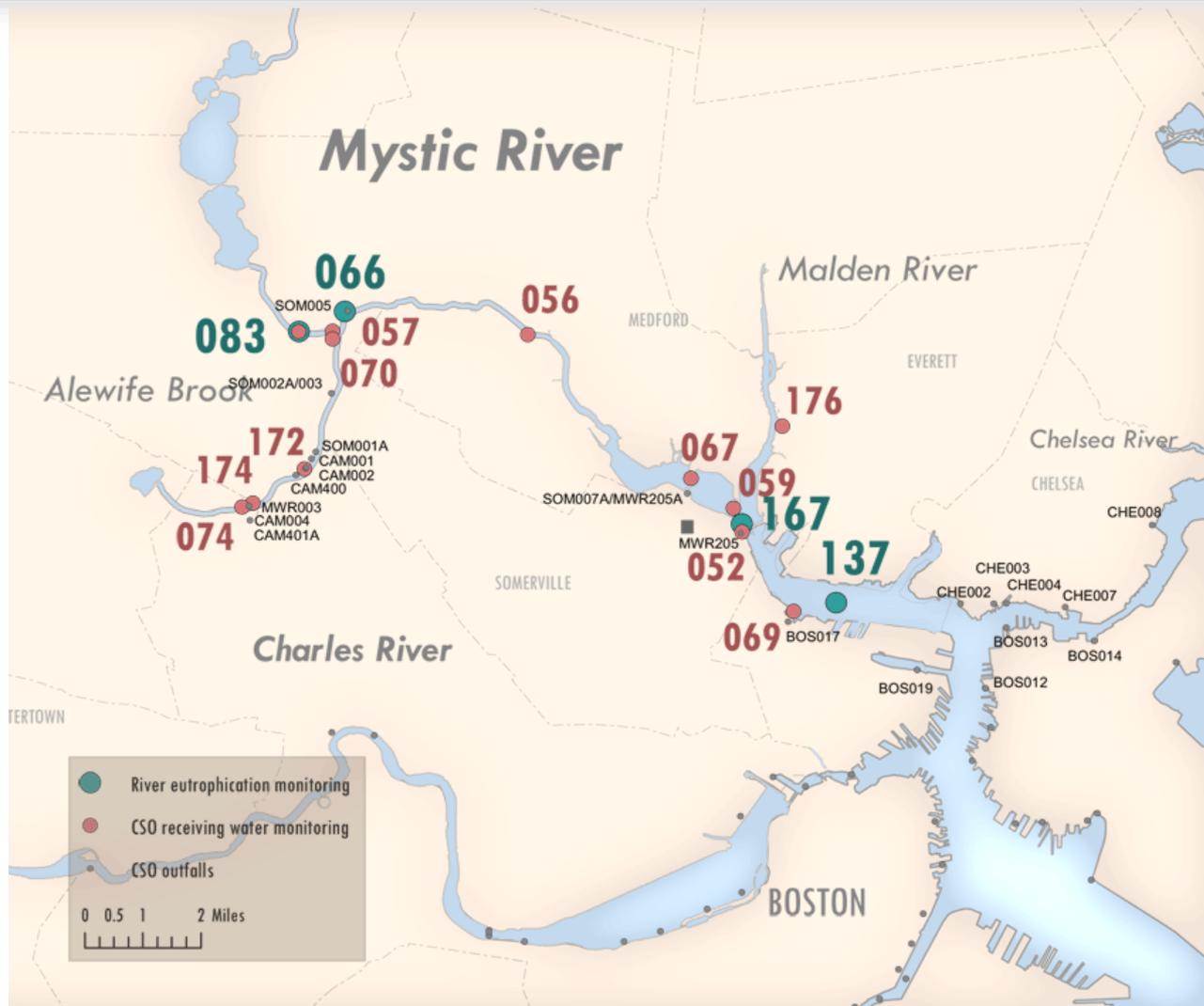




MWRA Mystic River receiving water monitoring

17 MWRA sampling locations in Alewife Brook, Mystic River and Malden River

All sites monitored for bacteria, subset monitored for nutrients, TSS, chlorophyll.





Overview of MWRA's Receiving Water Monitoring Program, Mystic River



- CSO monitoring program for bacteria ongoing since 1989; harbor and tributary eutrophication monitoring since 1995.
- For bacteria, Mystic is part of four regions monitored on a rotating basis, other regions are Charles, Neponset, and harbor embayments; 45 locations total.
- 17 sampling locations in the Mystic area with 20 - 25 visits per location per year, random with respect to weather.



Bacterial indicators measured by MWRA in receiving waters

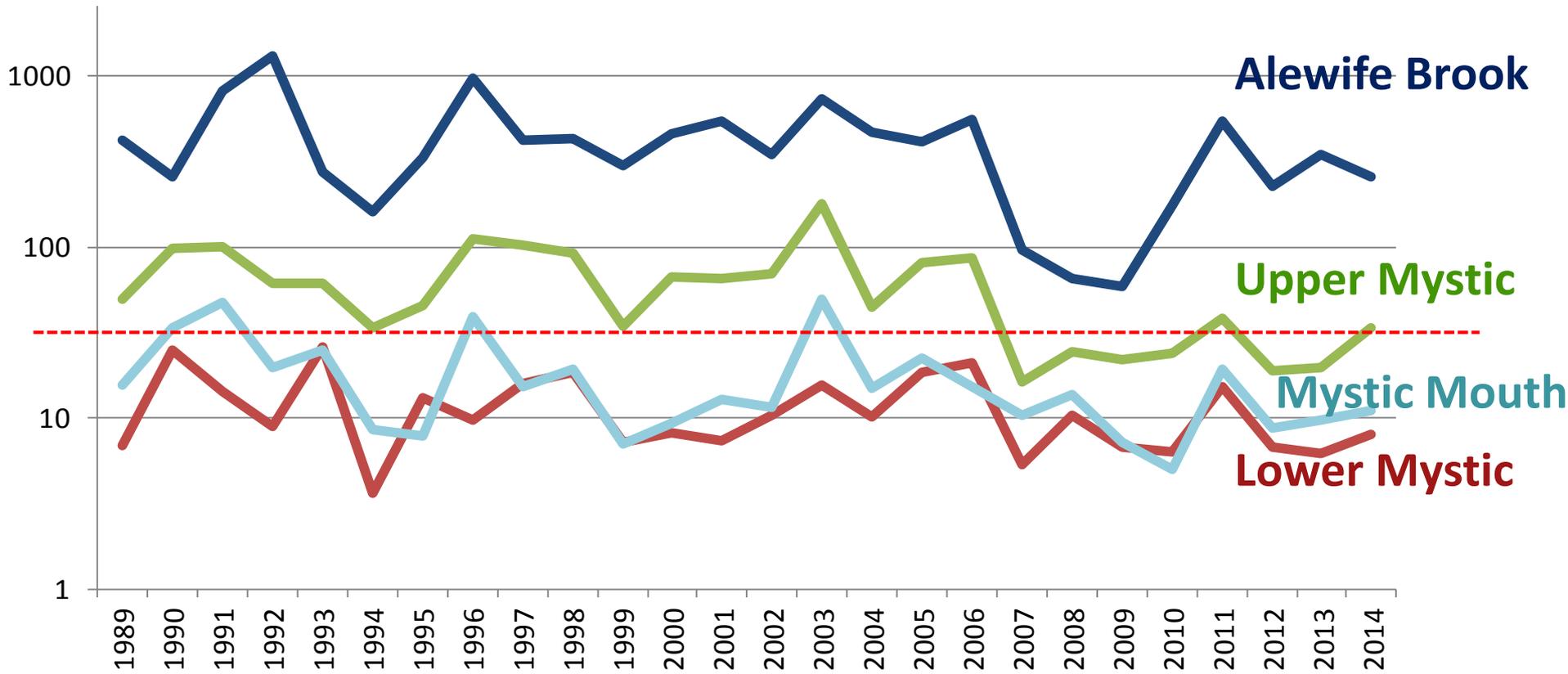
- Fecal coliform in Mass Bay and Boston Harbor, discontinued in freshwater in 2003
- *E. coli* beginning in 2001, freshwater only after 2008
- *Enterococcus* measured continuously since 1989 in fresh and marine waters



- *Enterococcus* is required indicator for marine beaches and marine receiving waters (MADPH, MADEP)
- *E. coli* is required indicator for CSO receiving waters, freshwater
- Fecal coliform is required indicator for shellfish growing waters (FDA/MADMF)



Bacterial water quality over time, by river segment

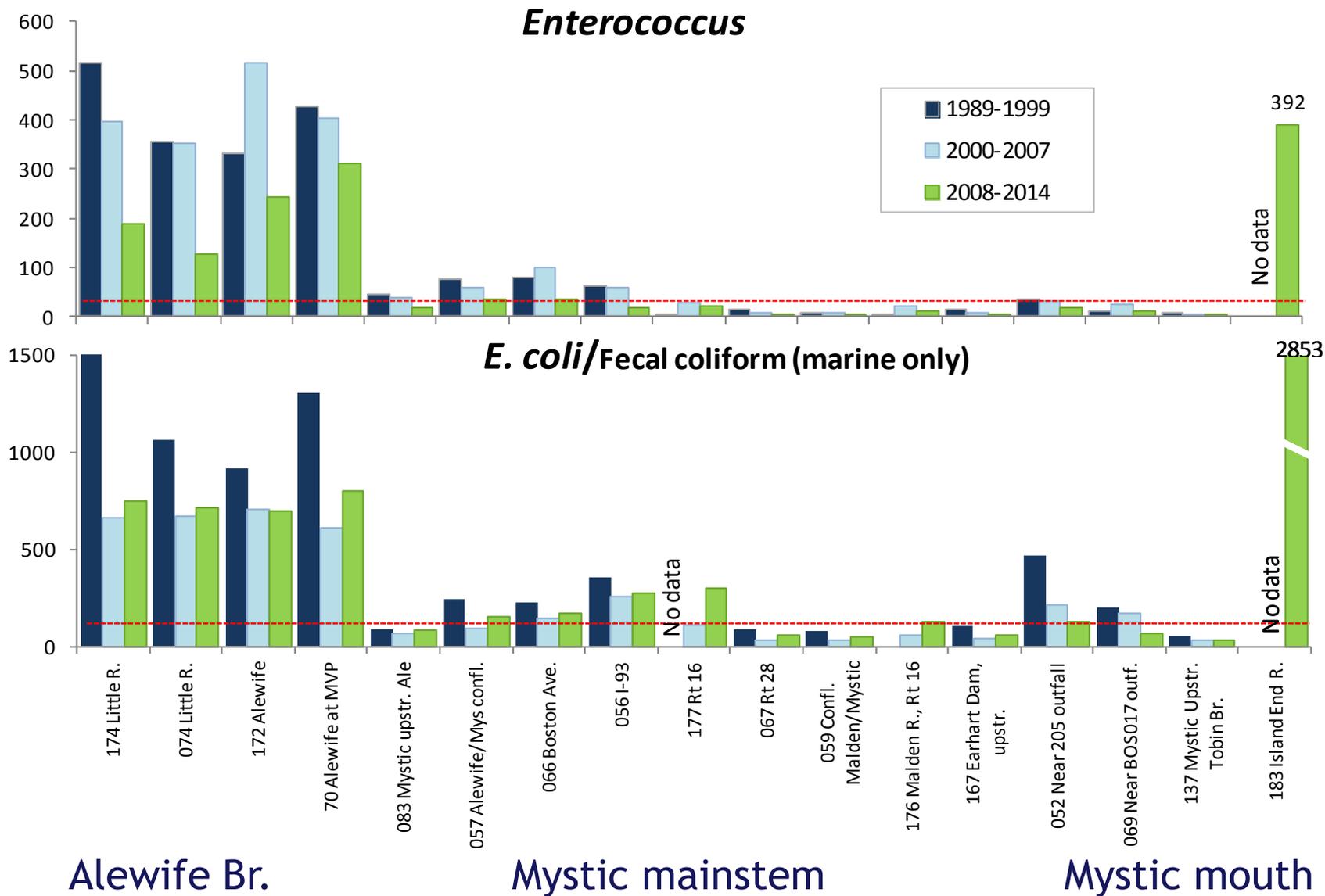


Geometric Mean *Enterococcus*, by Year



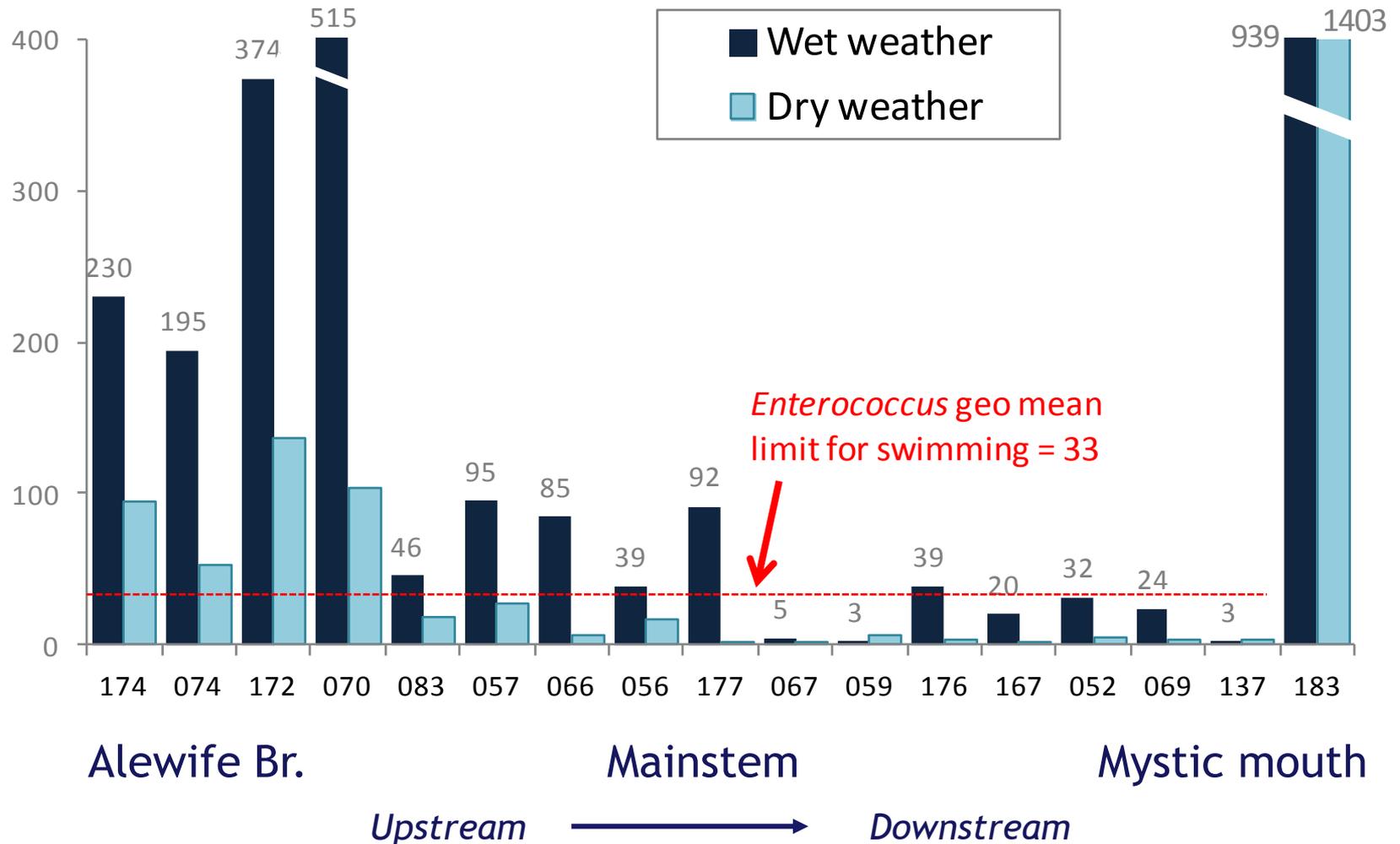
Bacteria water quality change over three phases

Enterococcus and *E. coli*



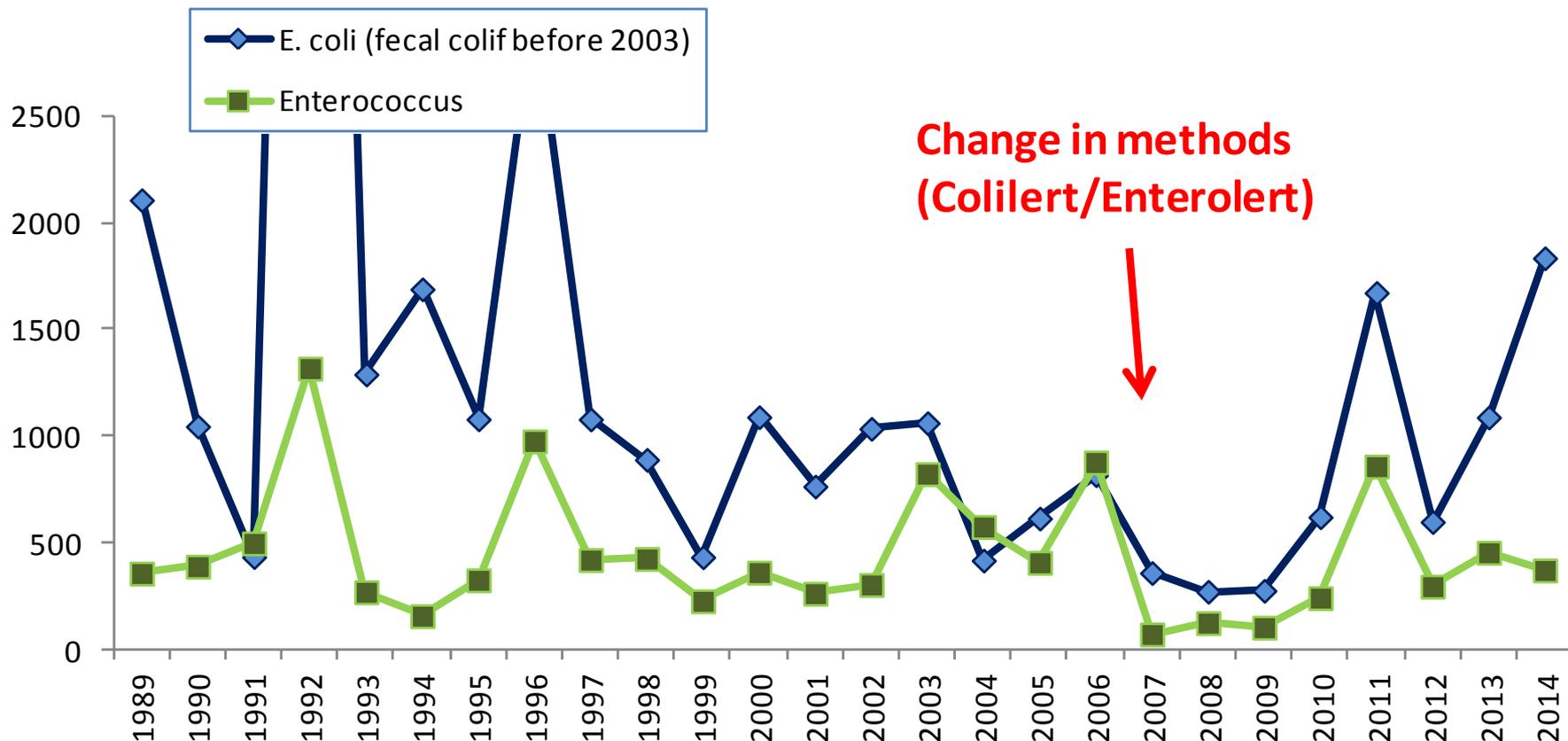


Spatial Variability: 2014 *Enterococcus* in Alewife, Mystic and Island End (geometric means)





Enterococcus method changes



Geometric Mean, by Year,
Alewife confluence (station 70)



Final notes

- 2008 is looking like acceptable cutoff point to evaluate “current conditions” in many harbor regions, though this is a moving target as communities continue to separate stormwater.
- Long Term Control Plan enters assessment phase after 2015, final construction complete in December. 2015 is final CSO annual report.
- *Enterococcus* is less sensitive/abundant indicator, but more robust and indicative of older discharges, bird/dog waste. *E. coli*/fecal coliform is more abundant in discharges but dies off faster, indicative of fresh inputs.





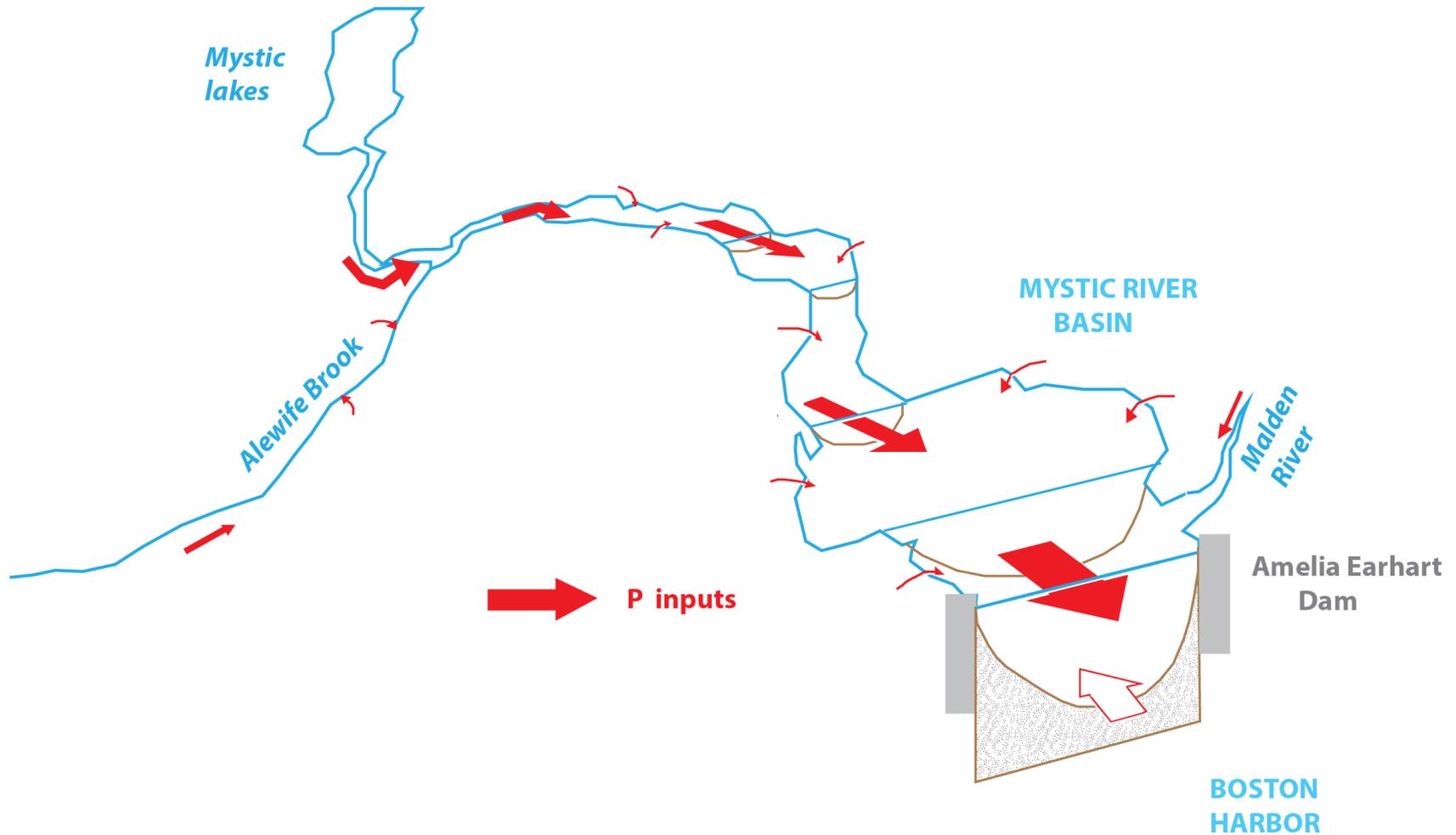
Over-enrichment and the Lower Mystic River Basin

April, 2015

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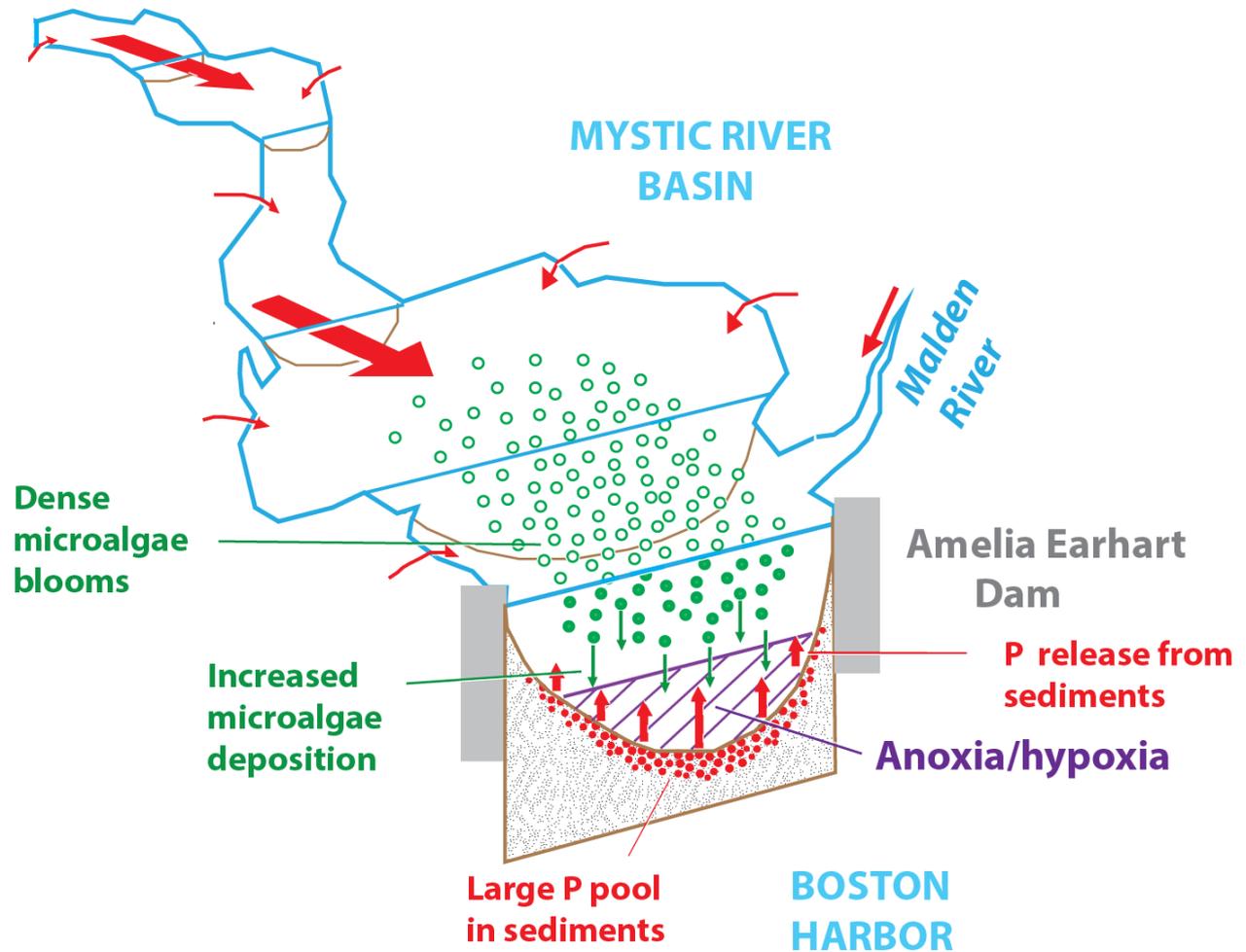


SCHEMATIC OF PHOSPHORUS INPUTS



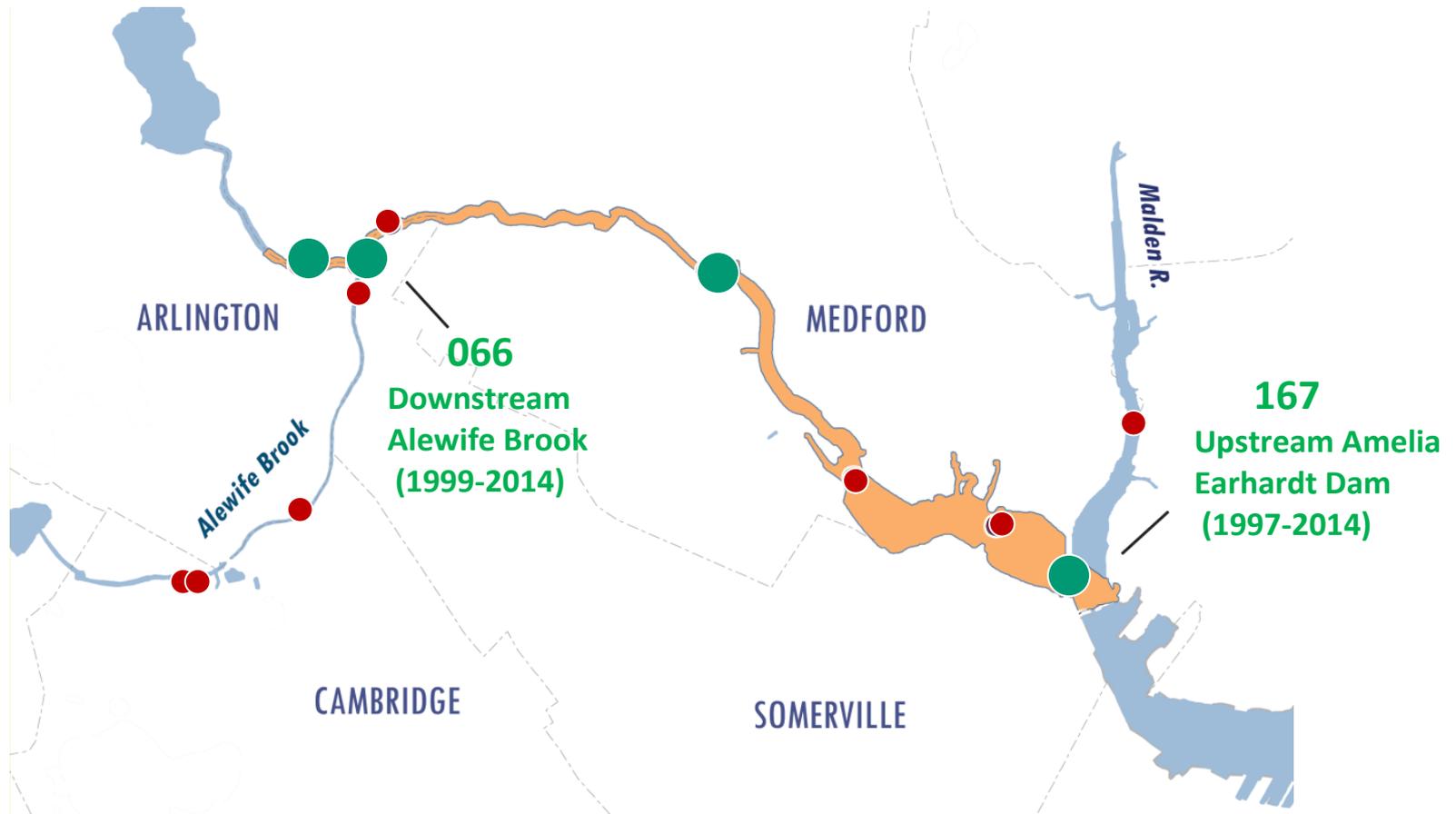


SYMPTOMS OF OVER-ENRICHMENT





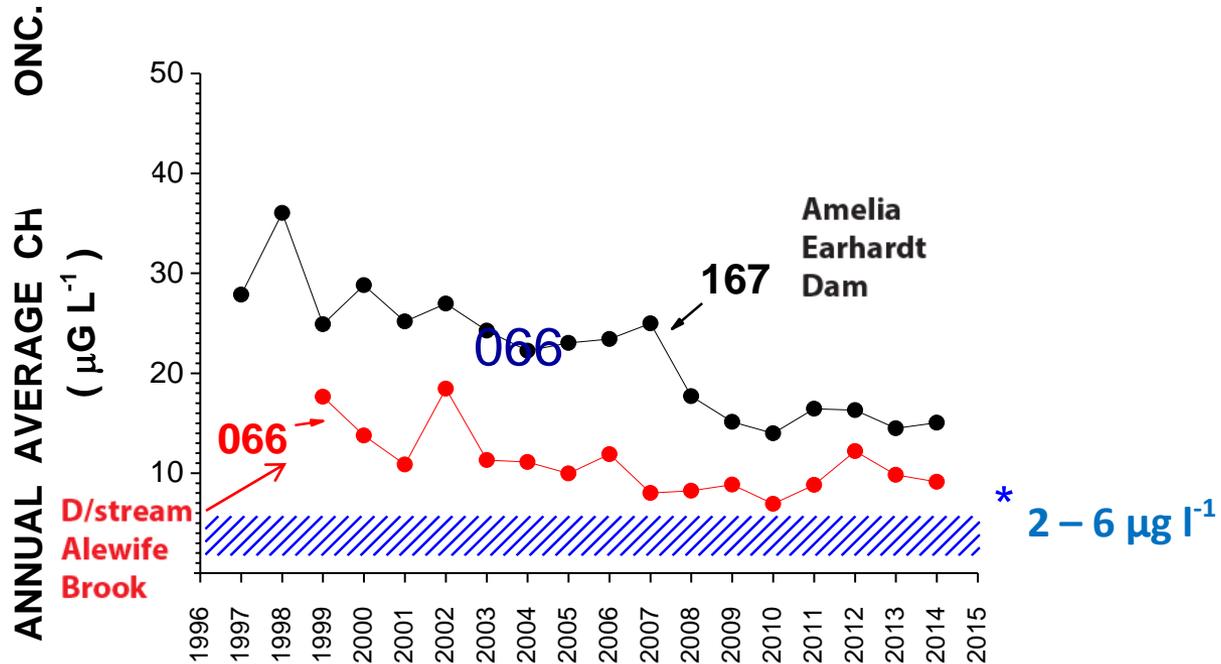
SAMPLING LOCATIONS



● OVER-ENRICHMENT + PATHOGEN INDICATORS



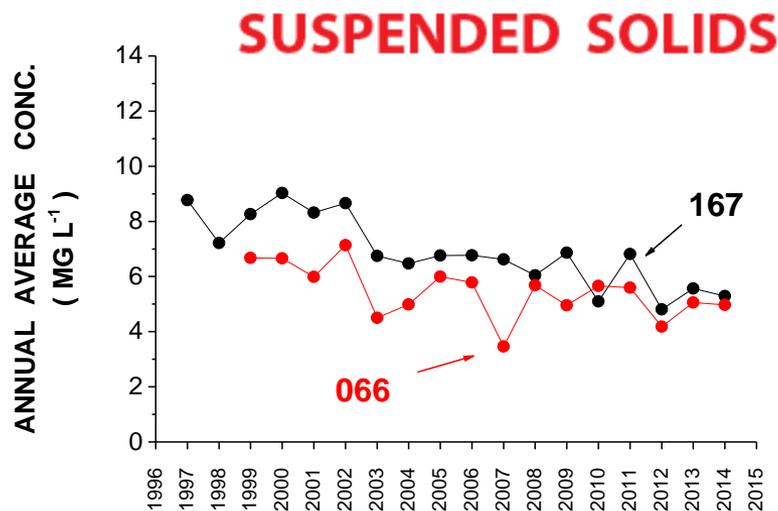
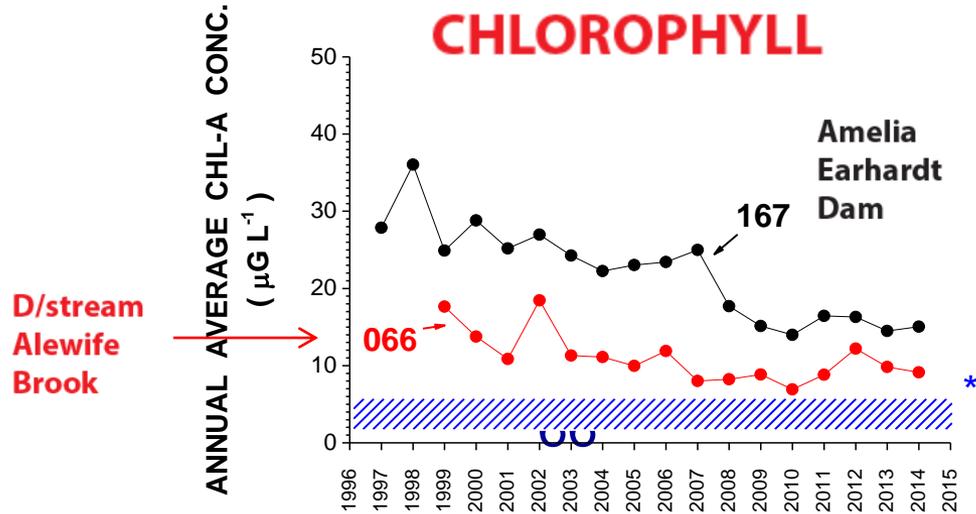
MICROALGAE IN THE WATER



* EPA's reference conditions for lakes and reservoirs in Subcoregion 59 of Nutrient Ecoregion XIV (US EPA Ambient Water Quality Criteria Recommendations, EPA 822-B-01-011)

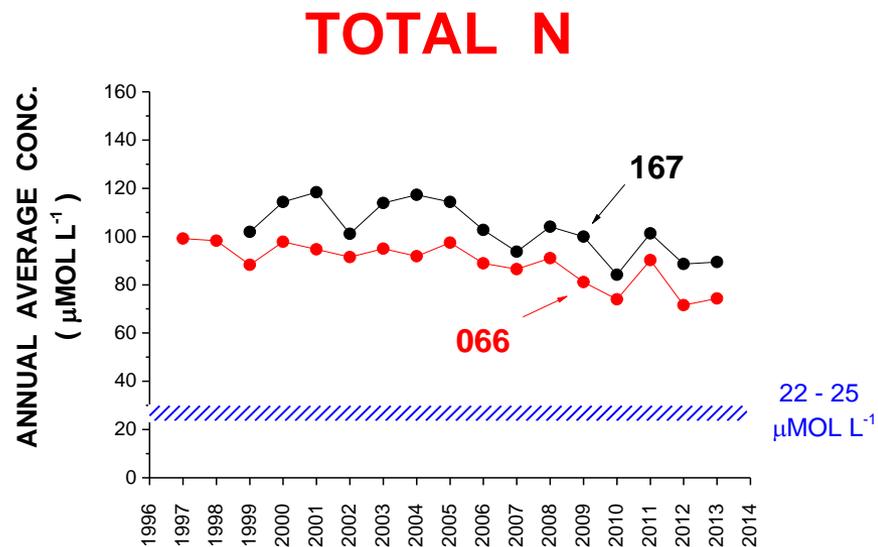
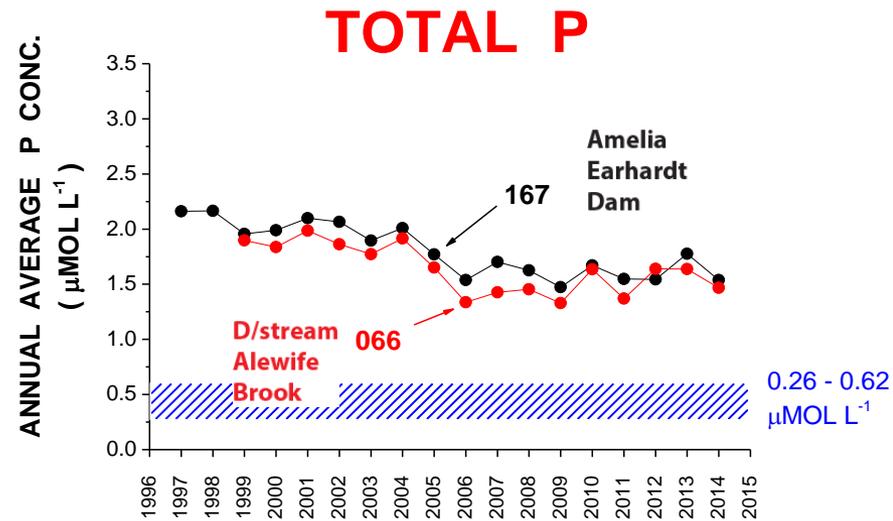


MICROALGAE & SUSPENDED SOLIDS





PHOSPHORUS & NITROGEN

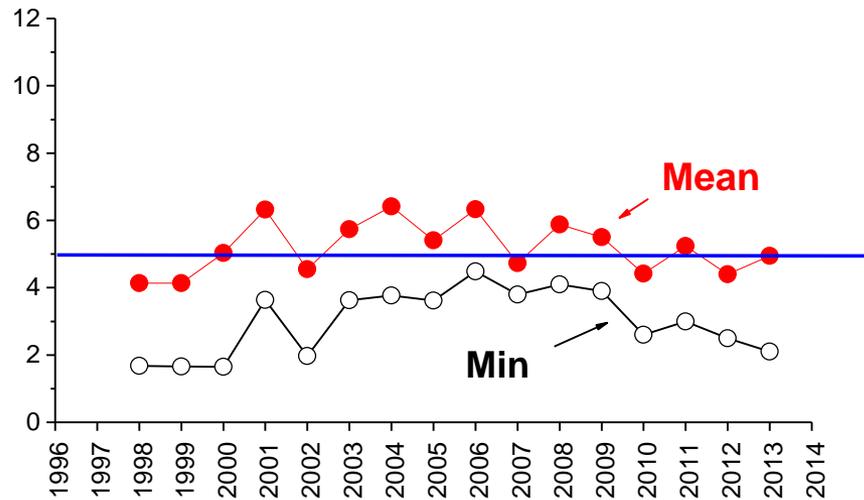




DISSOLVED OXYGEN

BOTTOM DO (167 only)

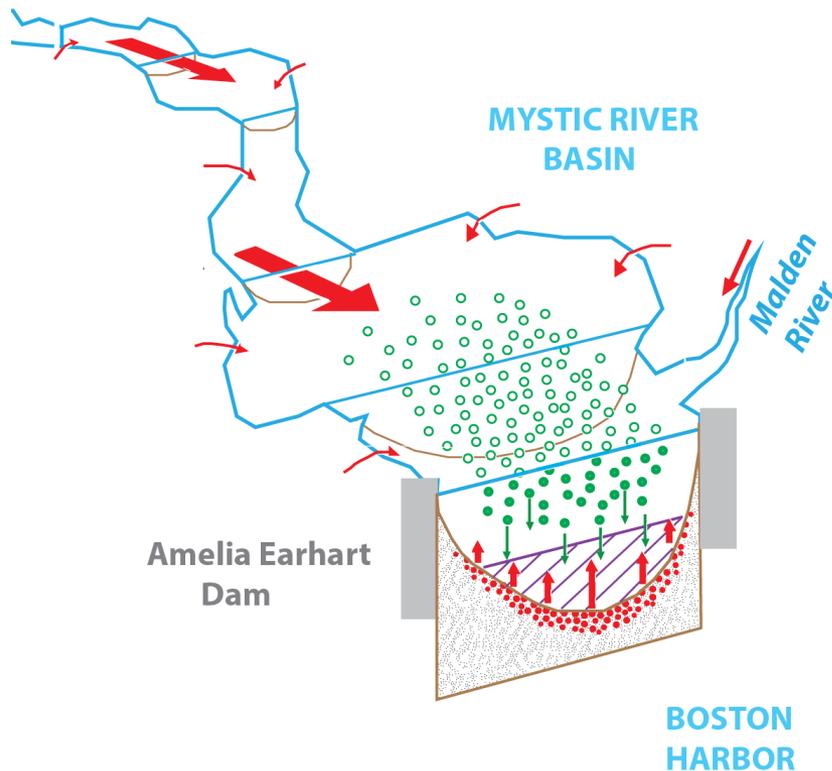
SUMMER AVERAGE OR MINIMUM
DO CONC. (MG L⁻¹)



STATE
STD



SUMMARY



Mystic River basin **continues to be over-enriched**

- microalgae, P much higher than EPA reference conditions
- DO below state standard
- dense rooted macrophyte populations

During past 20 years enrichment related water quality shown real changes

- a decline in microalgae, P and N, and solids
- no trend in DO.

Possible causes of the changes might include

- decline in P inputs?
- increased 'processing' of P by spreading rooted plants upstream ?
- increased basin flushing (river flows or bay-basin exchanges). ?

