



Progress on Treatment of PCB-Impacted Sediments with Bioamended Activated Carbon

Kevin R. Sowers

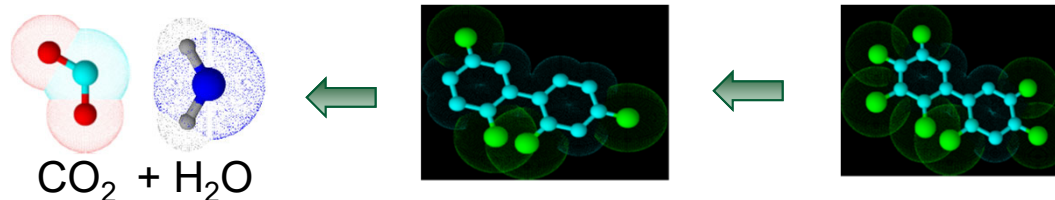
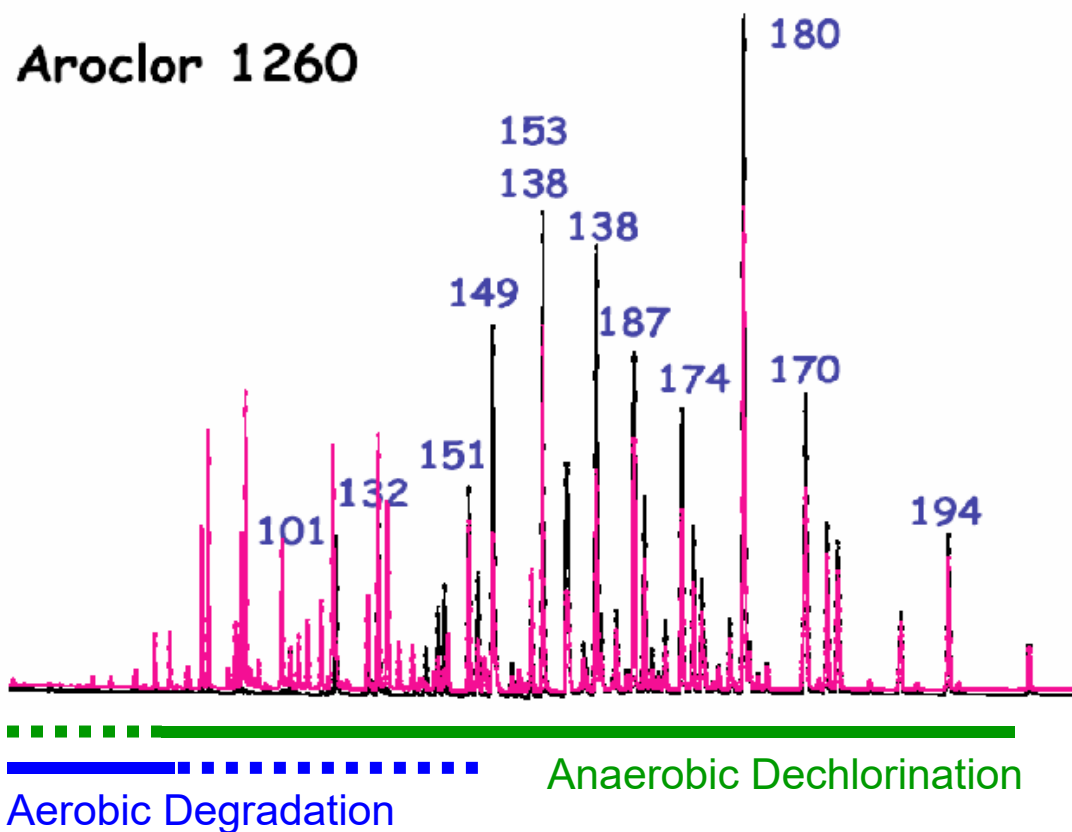
University of Maryland – Institute of Marine & Environmental Technology

Rayford Payne, Upal Ghosh and Harold May

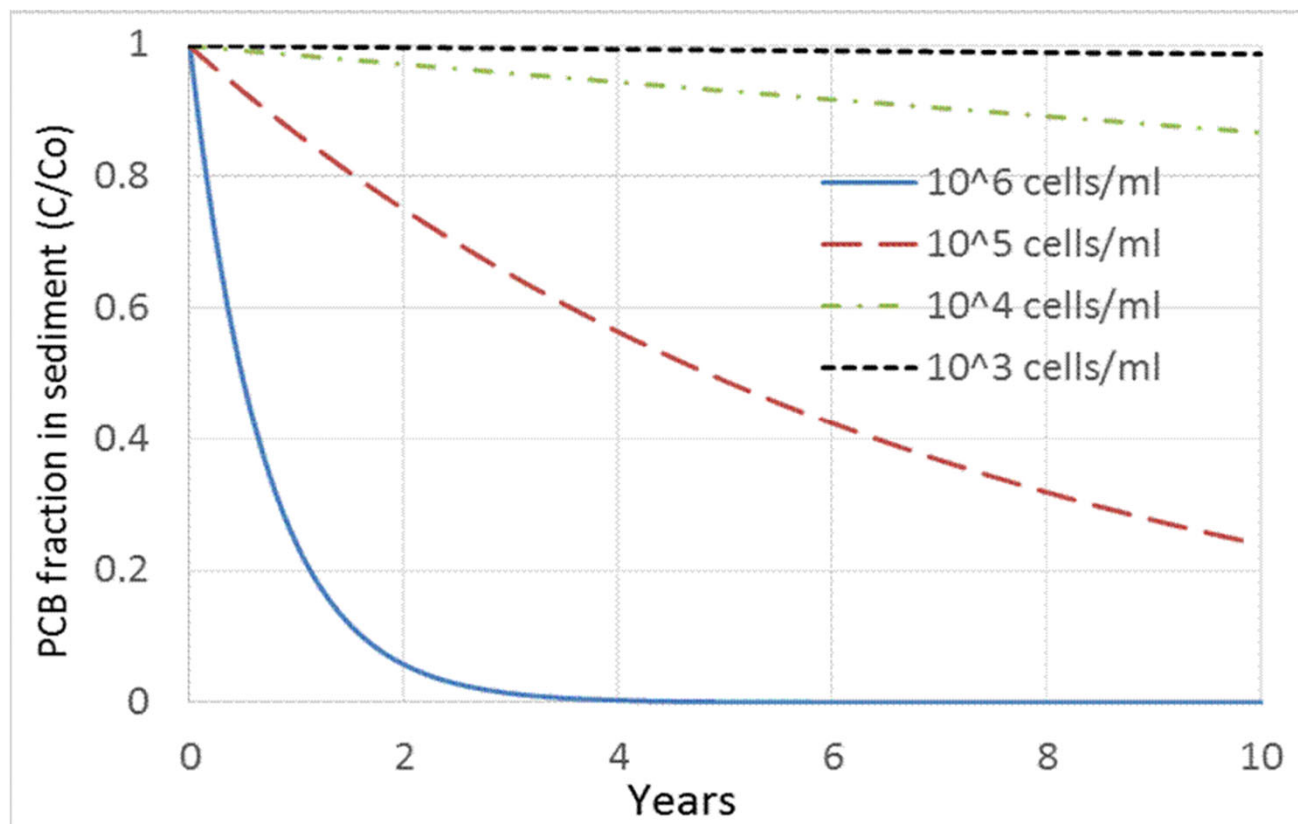
International Conference on Remediation and Management of Contaminated Sediments

February 11-14, 2019
New Orleans, Louisiana

How bioaugmentation works

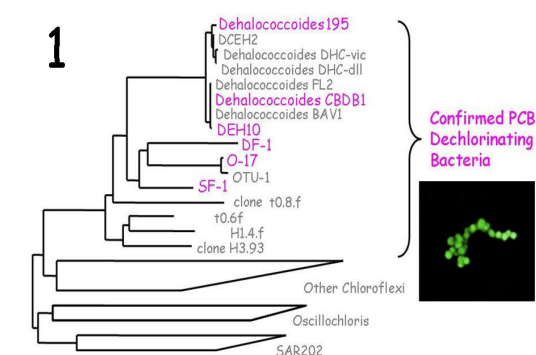


Why Natural Attenuation is Slow

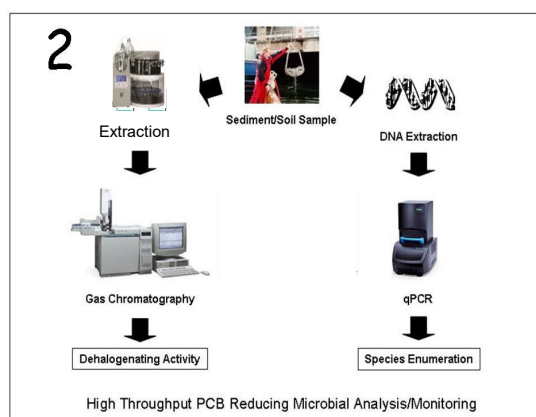


- Low rates in environment due to low cell numbers

Technology/Methodology Description



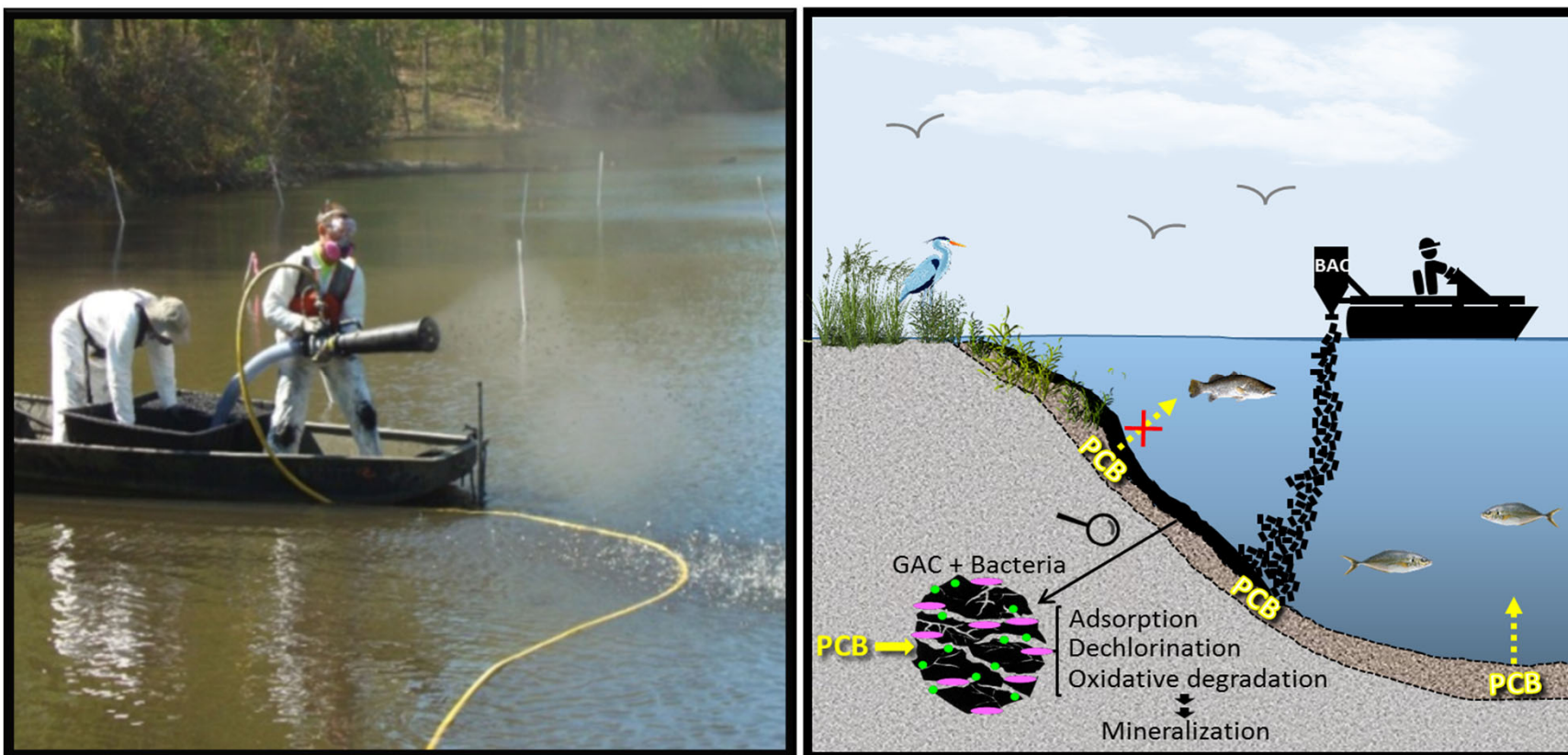
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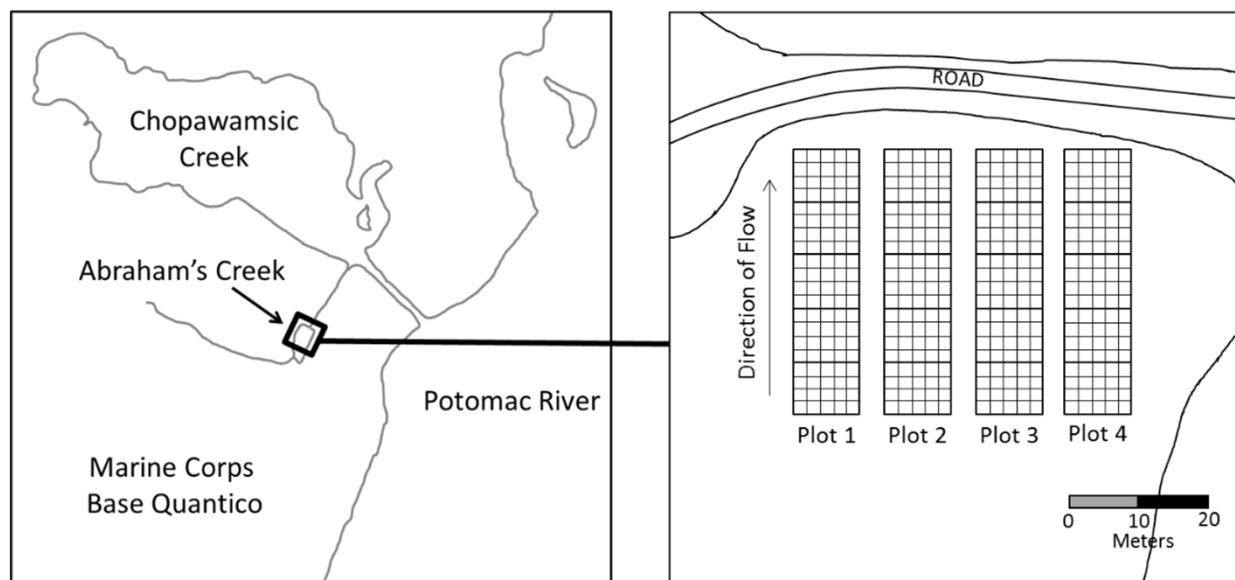
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Application of Bioamended AC



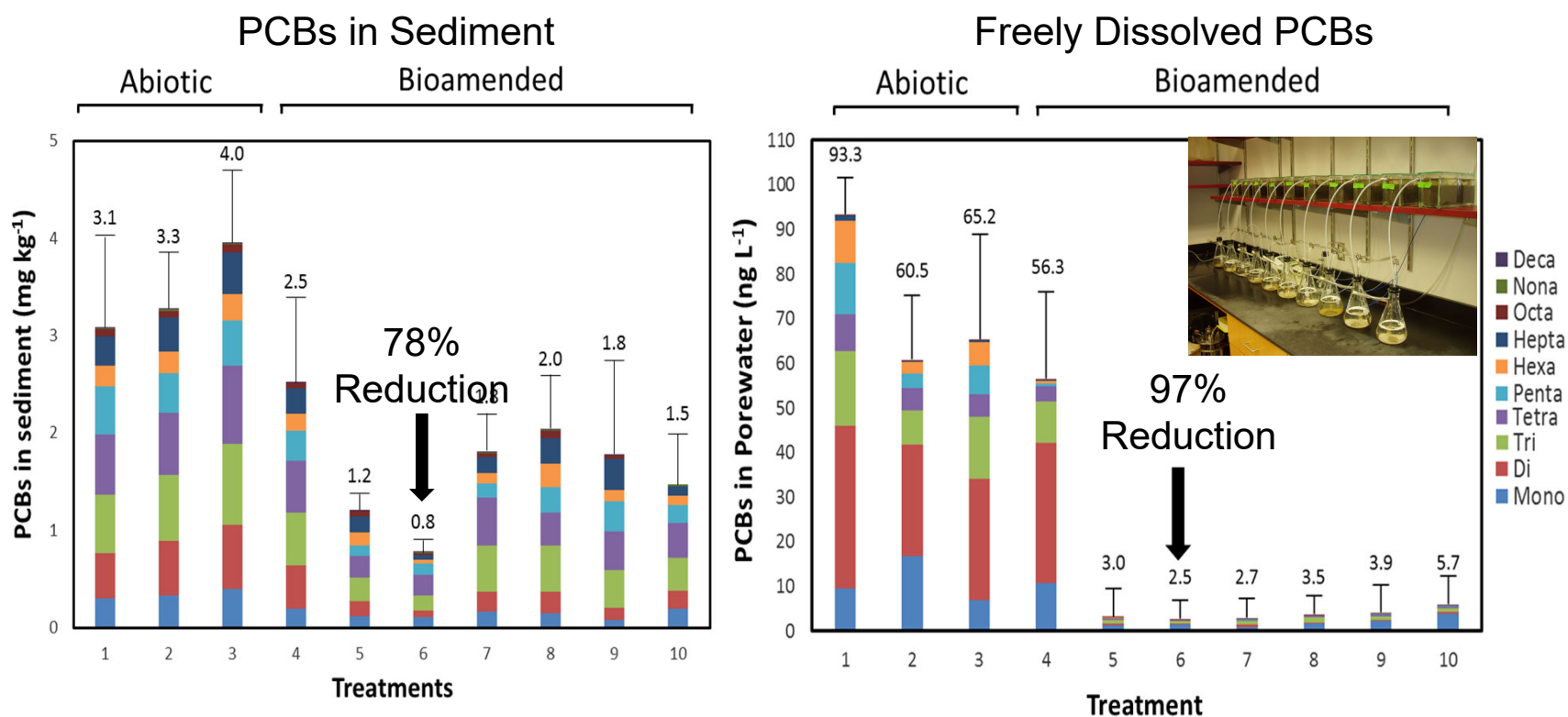
Abraham's Creek VA – April 2015



- Abraham's Creek is an 8 acre/32,000 m² watershed outflow
- Original contaminant likely A1260
- Currently contaminated with an average 5 ppm PCB
- Treatments in four 400 sq. m plots
- Load rate = 1 ton SediMite + 10^{12} cells/400 sq. m

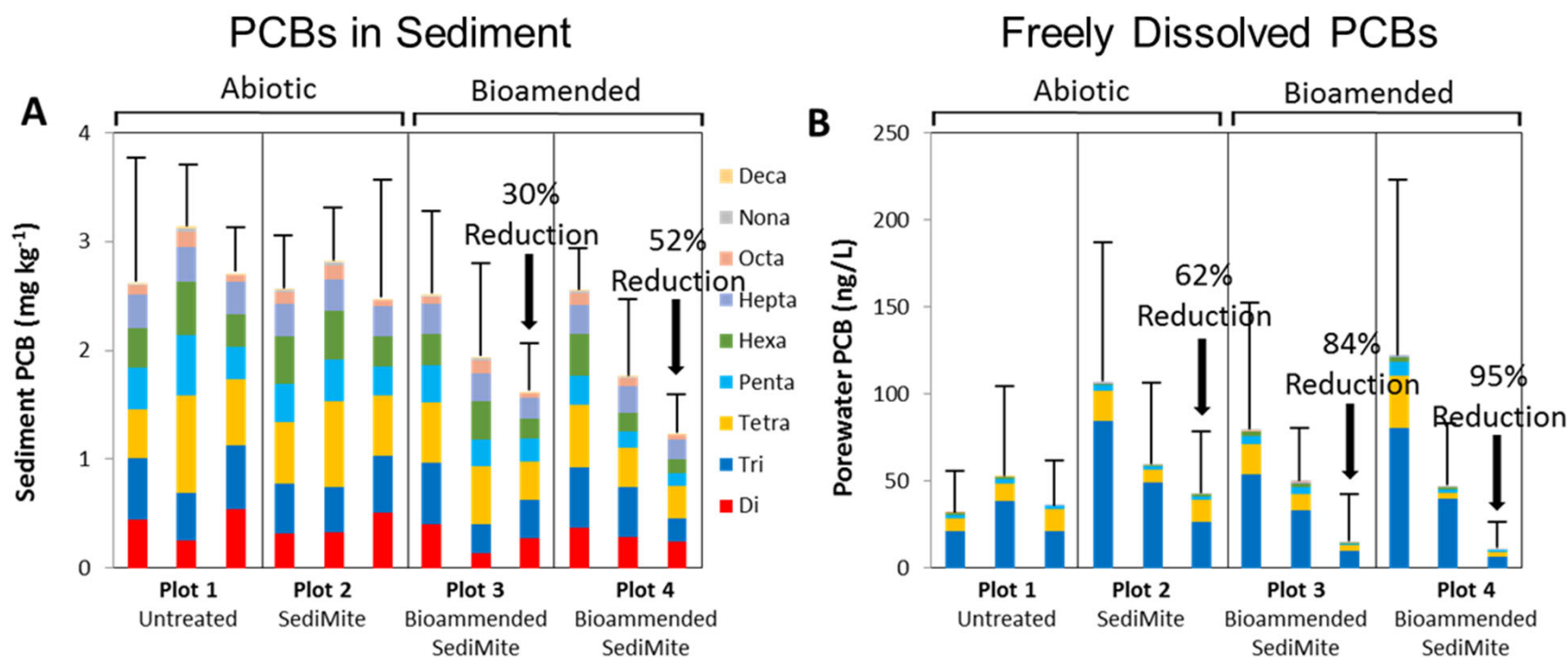


Treatability Study – Results



- Bioamending with 10⁵ cell/g yielded greatest reduction of PCBs after 375 days
- DF1 and LB400 were most robust bioamendments
- Addition of carbon source slightly stimulated PCB degradation
- Mono- to nona-chlorobiphenyls were reduced indicating both anaerobic & aerobic activity

Abraham's Creek VA – Results



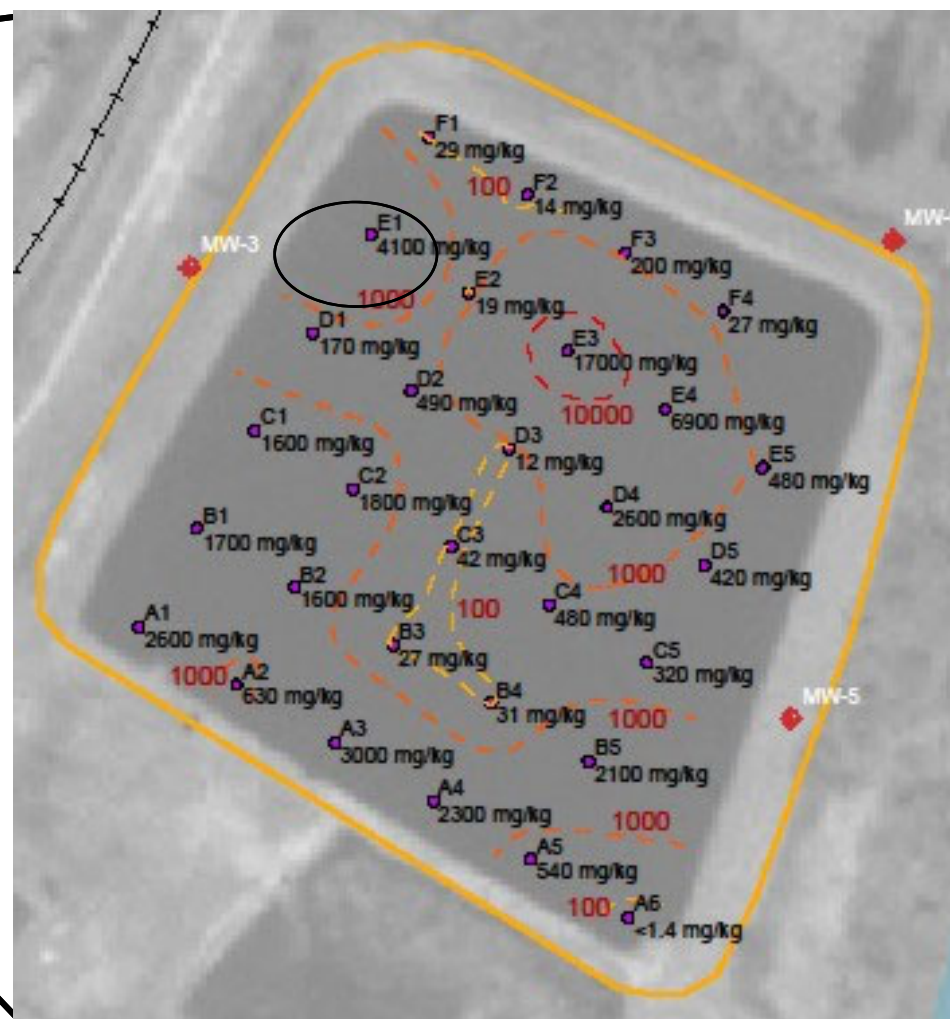
- 52% reduction in total mass of PCBs after 409 days
- 80% reduction in total mass of coplanar PCBs
- 95% reduction in dissolved PCBs
- All homolog groups dechlorinated or degraded

In Situ Treatment of High PCB Concentrations

- Waste Water Emergency Overflow Pond primary treatment until mid-70's
- Area 6 acres/24,000 m²
- Aroclor 1248 (<17,000 ppm) from glass fabric production
- Adjacent to Roanoke River
- Site is currently in VA DEQ voluntary remediation program



WWTP Emergency Overflow Pond



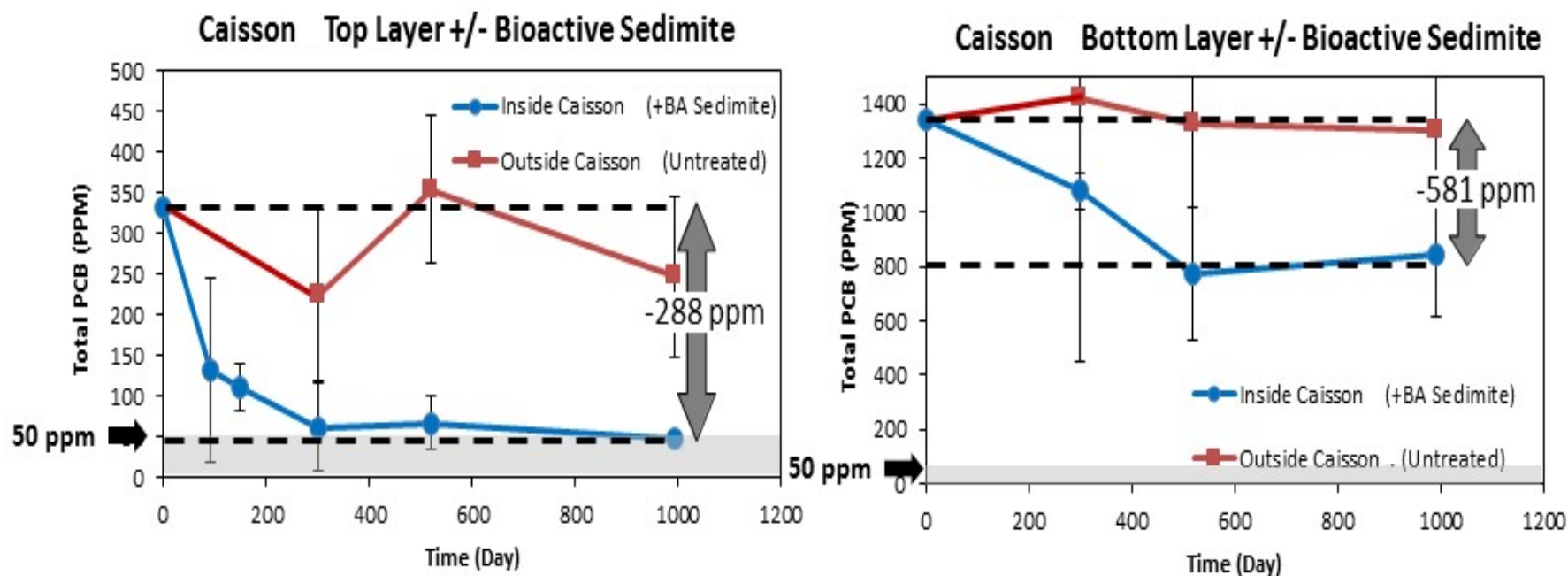
Treatment Goals

- VA DEQ voluntary remediation program requires reduction of PCBs to <50 PPM
- Of currently accepted technologies: dredging is expensive and does not eliminate liability; capping does not remove or reduce levels of PCBs at site
- *In situ* treatment with Bioamended Activated Carbon:
 - cost-effective for town
 - degradation of PCBs
 - negates requirement for extensive waste management
 - maintains function of WWTP as an emergency overflow basin

In Situ Study - Deployment

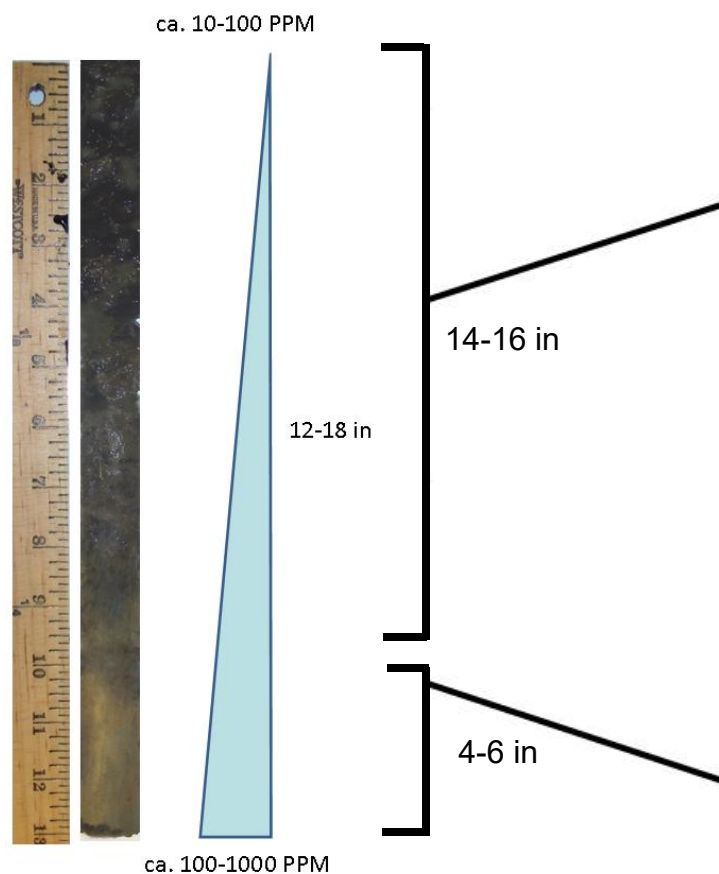


Effect of Treatment

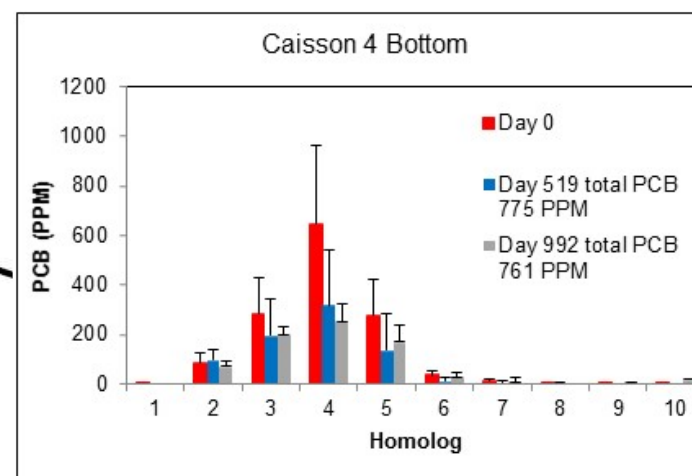
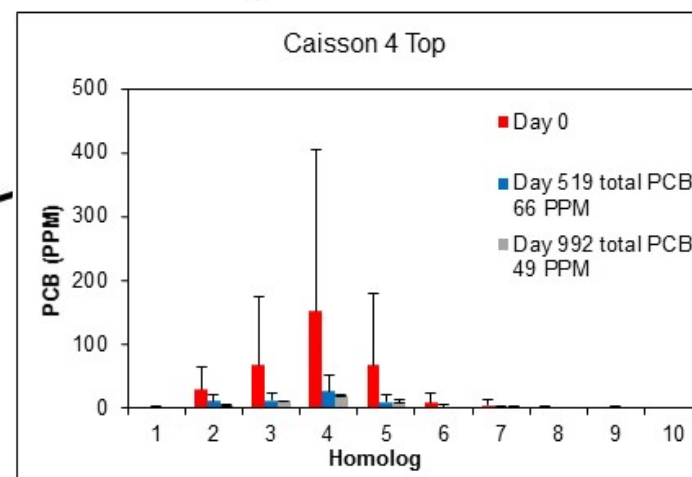


PCB Depth Profile

PCB Conc increases with depth



Bioaugmentation Treatment

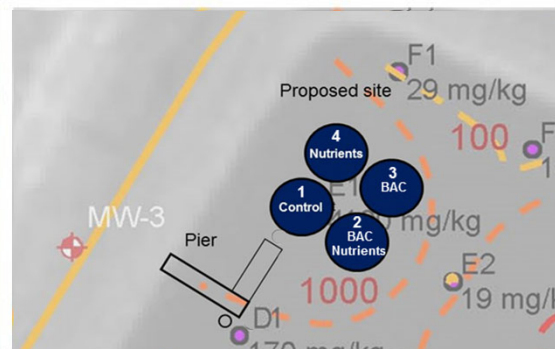


Conclusions – *In Situ* Test

2.5 years after initial treatment

- PCBs in upper 14 inches of sediment degraded below 50 PPM
- PCBs in 0-4 inch bottom layer of sediment reduced 45%
- Mixing sediments during application increases activity

Pilot-Scale Field Study



- Four - 80 sq. ft (7.4 sq. m.) caissons
- PCB levels 500 – 1500 PPM

Pilot-Scale Field Study – Deployment of BAC

18 March 2015

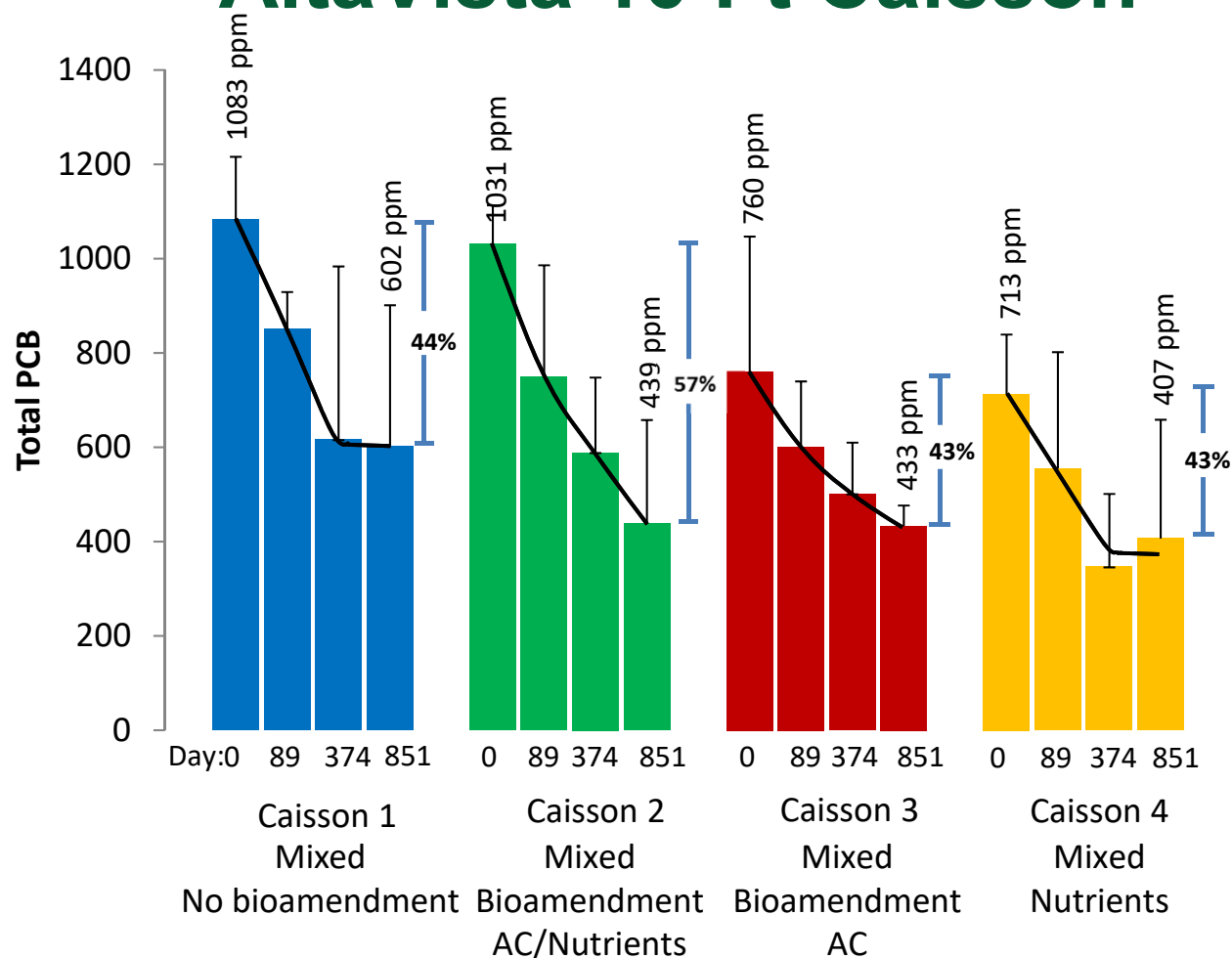


Pilot-Scale Field Study



- Applied approximately 1200 lbs bioamended SediMite
- Sump pump used to homogenize sediments

AltaVista 10 Ft Caisson



- Mixing alone has some stimulatory effect (Caisson 1)
- Treatments with bioamendment continue to degrade
- Treatments without bioamendment have leveled off

Conclusions – Pilot Study

2.3 years after initial treatment

- Mixing alone has some stimulatory effect (Caisson 1)
- Treatments with bioamendment continue to degrade PCBs
- Treatments without bioamendment leveled off after 1 year

Full-Scale Treatment - Approaches



Approach I - Tilling in Bioamended SediMite to access PCBs at bottom



Approach II - Mix Bioamended SediMite with circulation pumps

Questions

