



Restoring the Chesapeake Bay Watershed: Scaling up Biochar from Laboratory to Policy

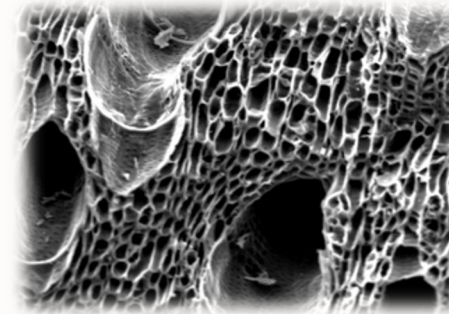
Charles Hegberg
Sr. Project Consultant
RES, LLC





Presentation Agenda

- Chesapeake Bay Watershed TMDL Program
- Research & History of Biochar in CBw
- Expanding Biochar in the CBw
- Closing

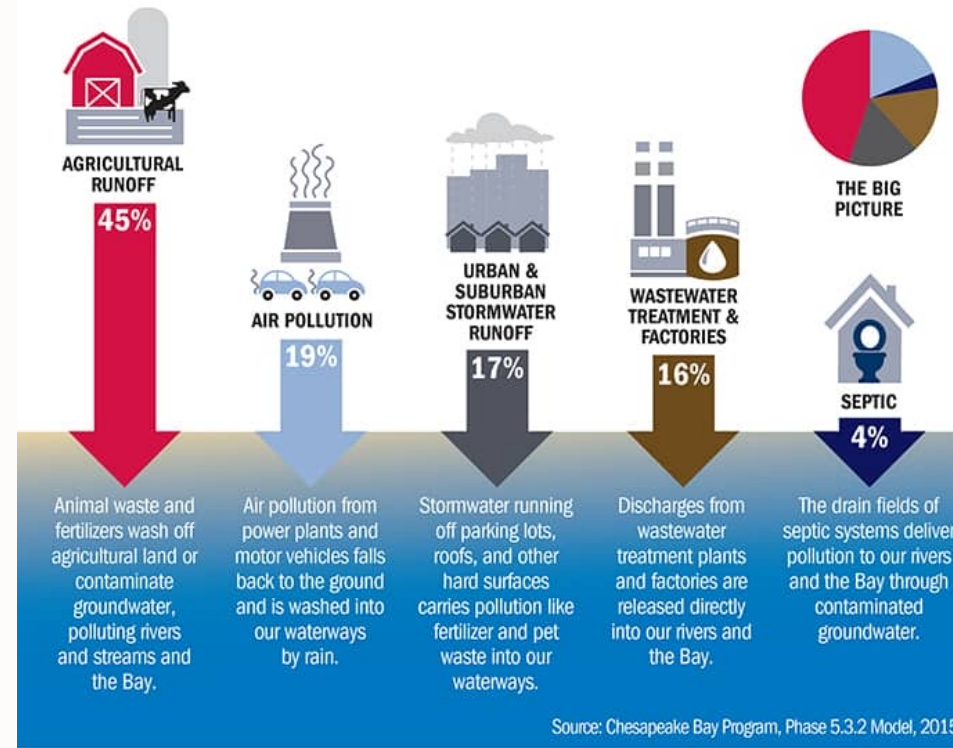


Scaling Biochar From Laboratory to Policy



- Largest estuary in the USA
- Six states & District of Columbia
- 166,534 km² (64,000 mi²)
- Population - 18 million people
- 14:1 Land-to-water ratio
- EPA TMDL put the Bay on a nutrient pollution diet
 - 84.4m kg (186m lbs.) - TN
 - 5.4m kg (12m lbs.) - TP
 - 2.9b kg (6.5b lbs.) - TSS

SOURCES OF NITROGEN POLLUTION IN THE CHESAPEAKE BAY



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Research & History of Biochar in the CBw



Advancing Biochar in the Chesapeake:
A Strategy to Reduce Pollution from Poultry Litter



2010

1ST Poultry Litter to Char (2007)
USBI founded in 2009
CBw TMDL Established (2010)
Biochar growth followed research (2010)
USBI Biochar 2018, Wilmington, DE
USBI Biochar 2022, Morgantown, WV
STAC Biochar Workshop 2023, Hershey, PA



2020 Forest Action Plan

Part I: Forest Resource Assessment



2020

“One of the potential uses of biochar is reducing stormwater runoff, as biochar improves water infiltration in soil. This could lead the Maryland Department of the Environment or the Chesapeake Bay Program to credit practices that use biochar as increasing reductions in stormwater or addressing total maximum daily loads (TMDLs).”

“...there are potential opportunities to utilize biochar sourced from wood waste throughout Maryland and the Chesapeake Bay Watershed as a tool to reduce stormwater and nutrient runoff. However, the uses of biochar are limited by approved crediting from the Chesapeake Bay Program. The Bay Program has not yet evaluated or approved biochar under the Bay Program's expert panel process and it is not currently eligible for credit in the Woodland (sic) (Watershed) Incentive Program (WIP).” Pg 57



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Various Biochar Enhanced BMP Installations & Retrofits

Micro Bio-Infiltration Swale, Pennsylvania



Failed Infiltration Basin, Delaware



In-Situ Soil Amendments, Delaware



RSC Outfall, Washington D.C.



Living Shoreline Installation, Delaware

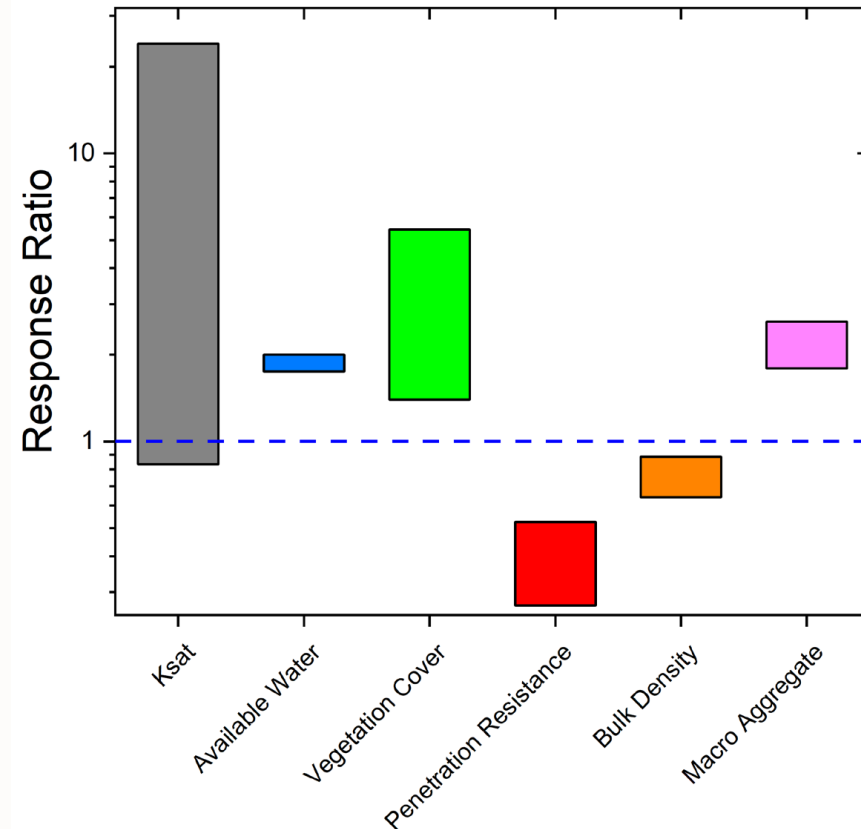


Soil Amendment Conclusions

Take Away Points

- Biochar is an effective tool for water management in soil restoration, applicable at multiple scales.
- Highest benefits in urban soils lacking organic carbon and suboptimal hydraulic properties.
- Pneumatic fracturing to enhance deep drainage can improve infiltration for large/intense storms.
- Managed turf can often exceed impervious surfaces in runoff and pollution.
- Tilling temporarily boosts soil infiltration, with effects lasting about a year due to settling and mower use.
- Applying biochar at 2% significantly improves soil permeability, cutting annual runoff by up to three times, with reductions of 35-68% compared to untreated soil.
- Amending soil with 2% biochar at a ratio of 8:1 to 12:1 effectively manages runoff for 1-acre of roadway.
- Biochar soil treatment is economical, with costs between \$40,000 to \$45,000 per impervious acre.

Generalized Research Summary



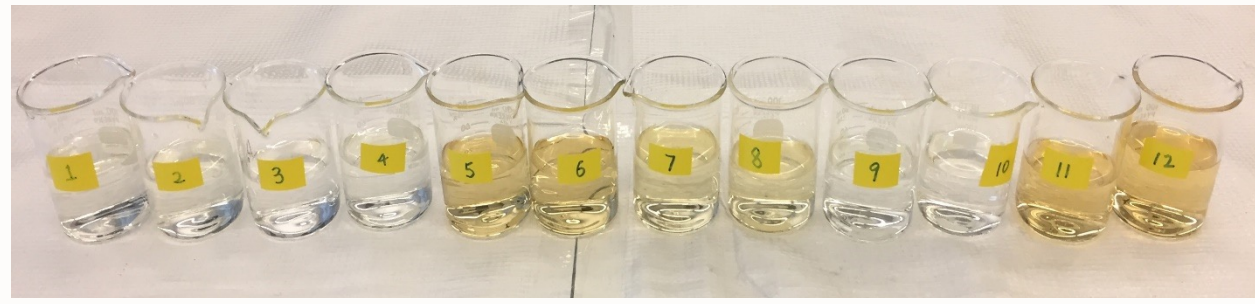
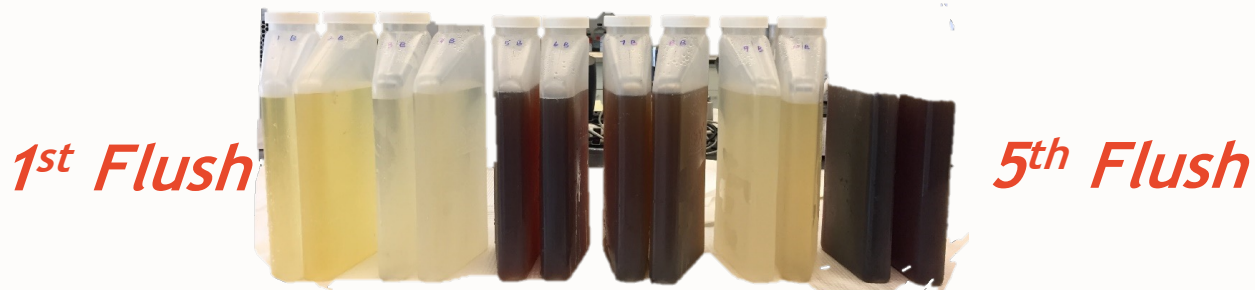
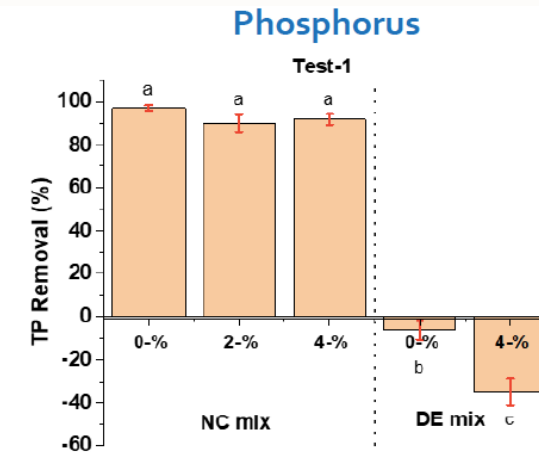
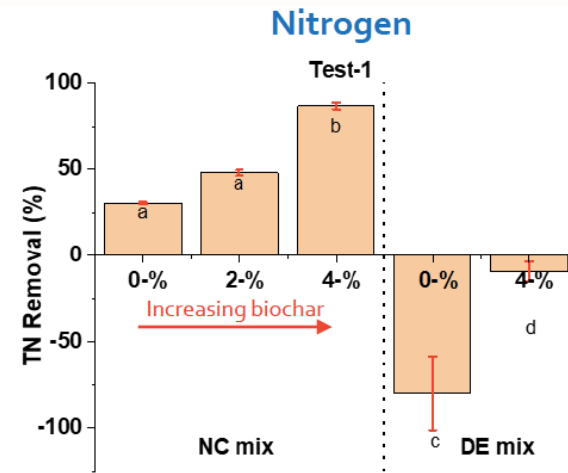
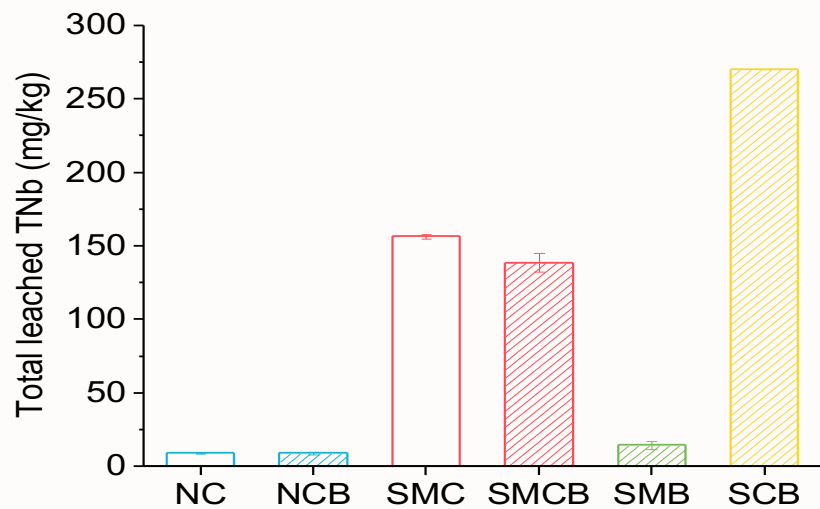
The range of response ratios for K_{sat} and related soil parameters for all sites except MDTA US-279. Data are based on measurements more than 1 year after 4% biochar incorporation.

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Akpinar, D. (2023). Assessment of biochar addition to natural soil and engineered soil mixtures: Effects on soil structure, plant growth, and hydrology [Doctoral dissertation, University of Delaware]

Nakhli, S. A. A., Akpinar, D., Chowdhury, S., Bowser, M., & Imhoff, P. T. (2023). Biochar as a Roadway Soil Amendment for Reducing Stormwater Runoff. Report to Maryland Transportation Authority. Department of Civil and Environmental Engineering, University of Delaware.

Enhanced Bioretention Conclusions



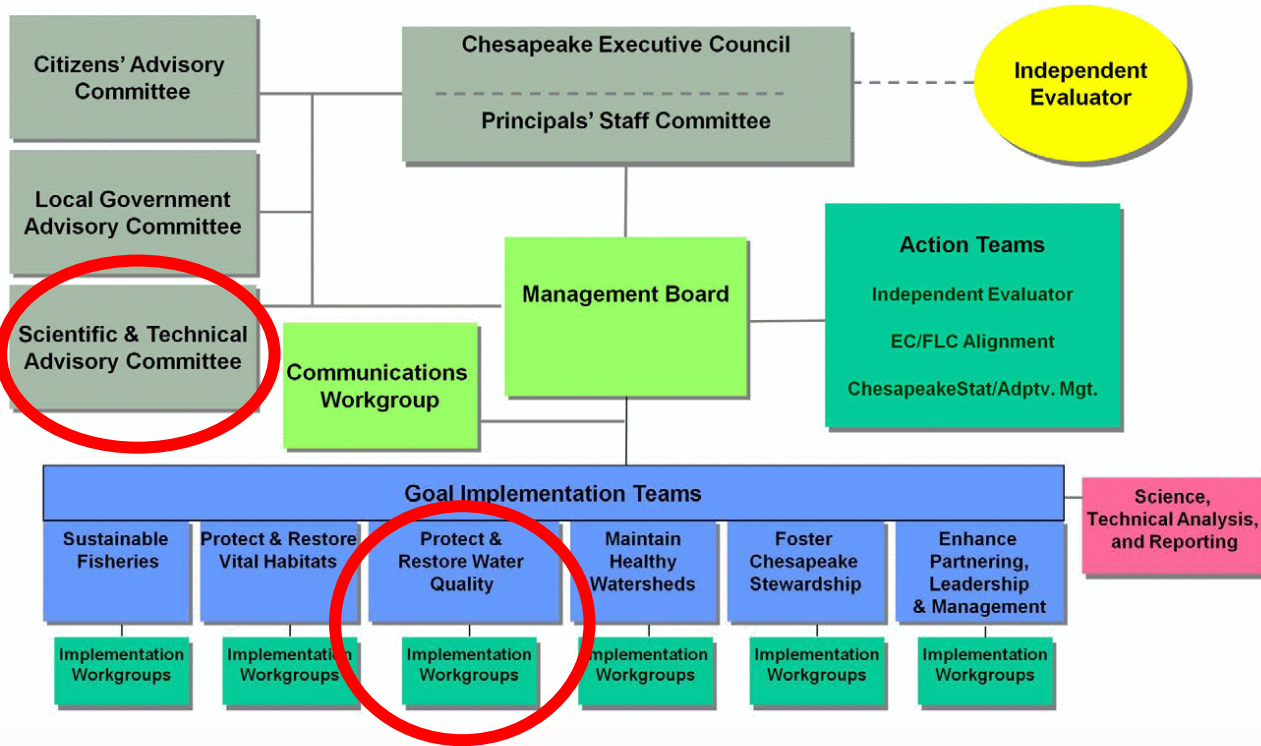
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The Big Lift – Expanding Biochar in the CBw

CBP Organizational Structure and Leadership 09-20-10



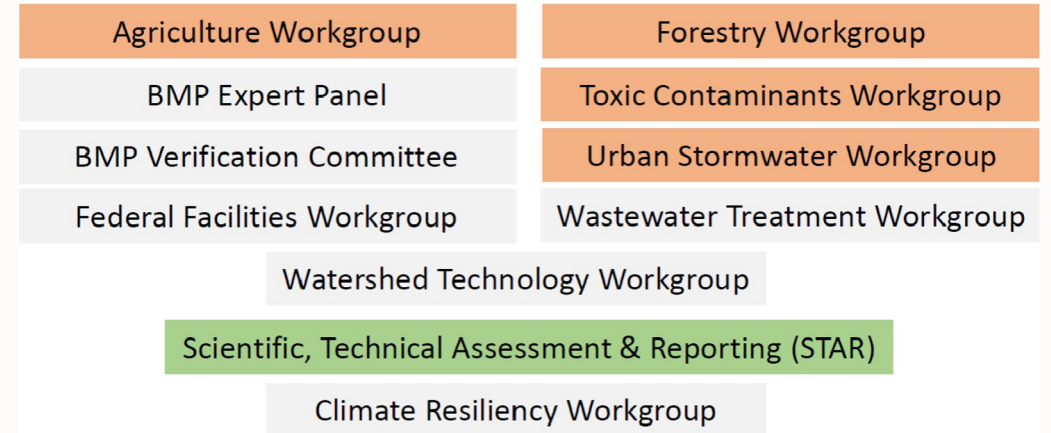
BIOCHAR WORKSHOP

May 25th & 26th, Hershey, PA

SCIENCE TECHNOLOGY & ADVISORY COMMITTEE



GOAL IMPLEMENTATION TEAM (GIT3) WATER QUALITY



Scaling Biochar From Laboratory to Policy



The Big Lift – Expanding Biochar in the CBw



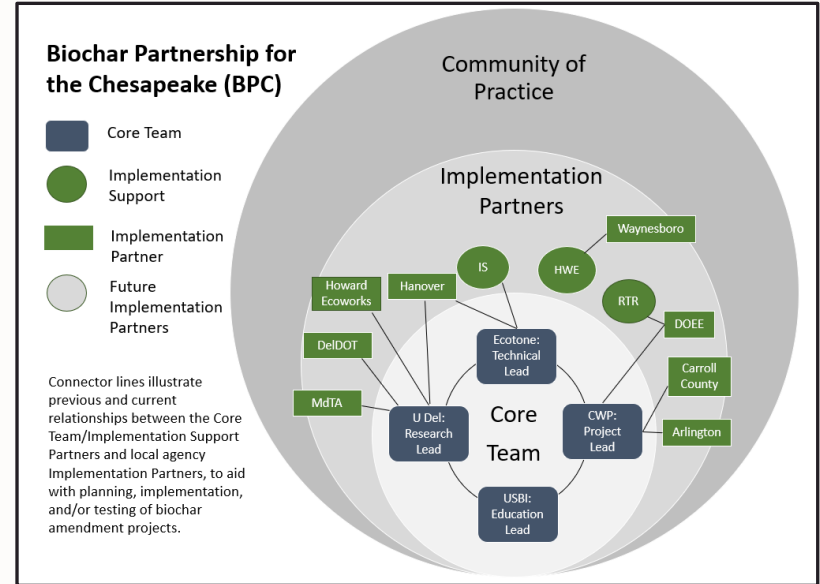
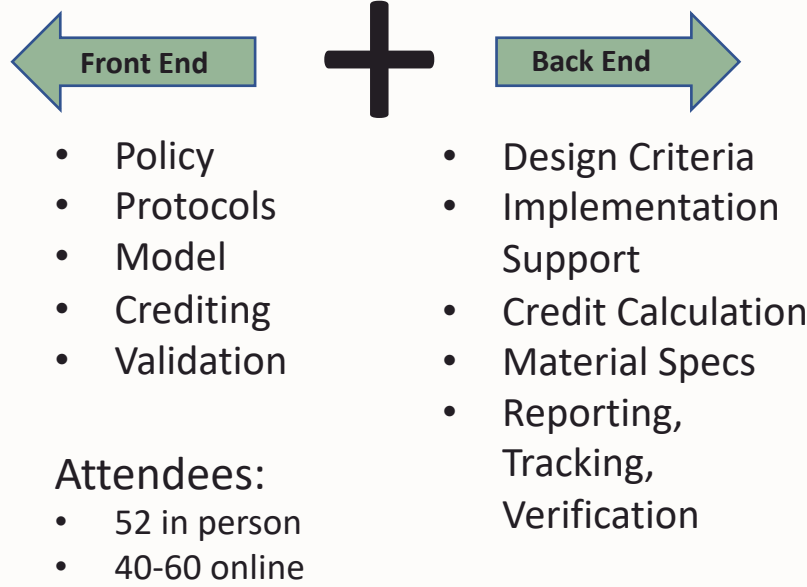
STAC BIOCHAR WORKSHOP
May 25th & 26th, Hershey, PA

Workshop Outcome Goals:

1. Integration of biochar in Chesapeake Bay model for nutrient & climate
2. Biochar crediting in existing BMPs & protocols



NFWF INSR GRANT 2023-2025



Scaling Biochar From Laboratory to Policy



Workshop Outcomes & Report Recommendations

Using Carbon to Achieve Chesapeake Bay (and Watershed) Water Quality Goals and Climate Resiliency: The Science, Gaps, Implementation Activities and Opportunities



A diverse array of biochars are available (photo credit Sanjai Parikh)
Image credit: <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=22132>

STAC Workshop Report
May 25-26, 2023
Hershey, PA



STAC Publication 2024

- Provide recommendations to Chesapeake Bay STAR and STAC for
- Integration of biochar in Chesapeake Bay model for nutrients and climate, and
 - Biochar credit in existing BMP and protocols.

5 KEY recommendations to CBP STAC to accelerate the use of biochar in the CBW. These are:

- Incorporate biochar into Chesapeake Bay models.
- Support biochar credit in BMP protocols.
- Endorse expanded research, NRCS outreach, and funding for biochar validation.
- Advocate for increased biochar application based on scientific evidence.
- Provide letters endorsing broader partnership collaborations.

Scaling Biochar From Laboratory to Policy



CBw Task Force

Have knowledge of biochar or a strong willingness to learn more about its potential impact and use.

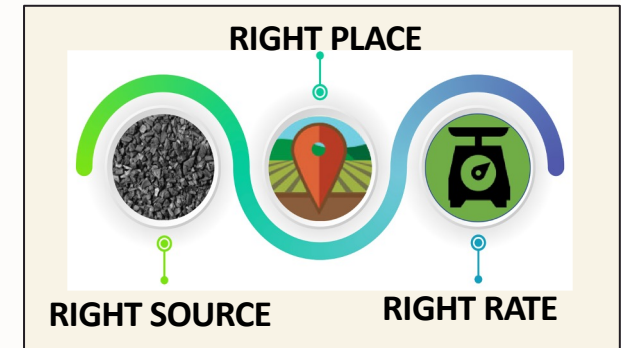
Geography

To ensure inclusivity, we are proposing representatives from different areas:

- NY/PA
- MD/DE
- VA/WV
- DC

Members may include:

- Biochar Champions
- Stormwater Representatives
- Academic Researchers
- Government Officials
- Environmental NGOs
- Biochar Producers



DEMAND & SUPPLY CONCERN
Bay policy will drive biochar demand. Issue will be local production.

Scaling Biochar From Laboratory to Policy



The Big Lift – Expanding Biochar in the CBw



Website

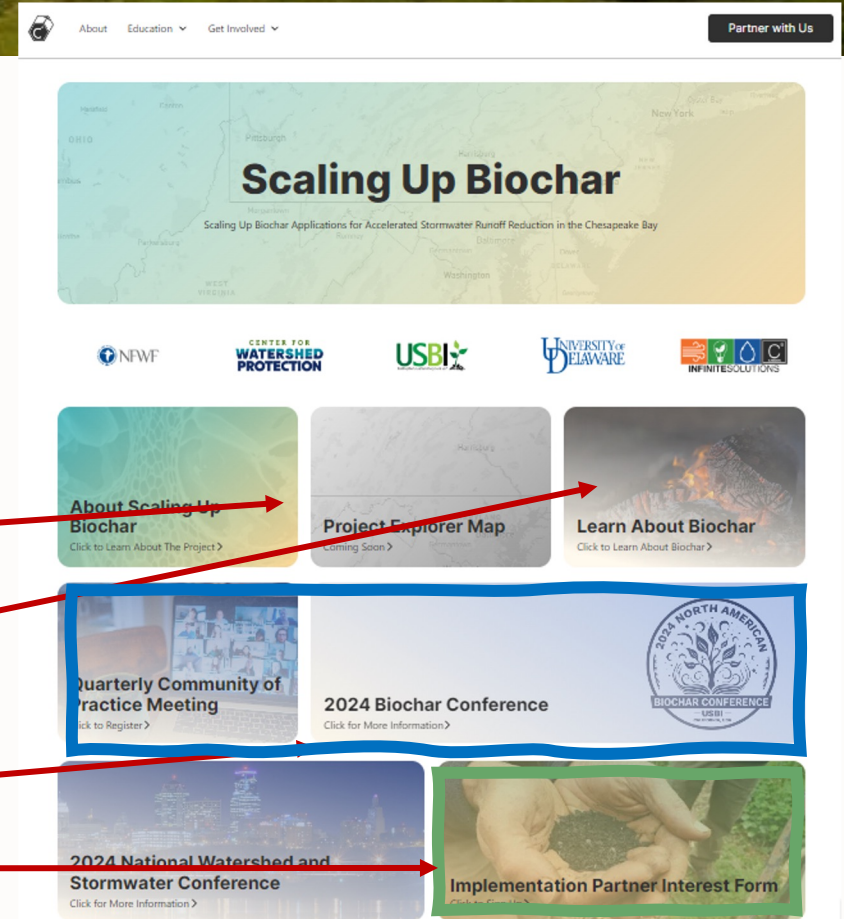
www.scalingupbiochar.com
info@scalingupbiochar.com

Current and past project map

Links to educational materials, technical info

Events and conferences

Project submission



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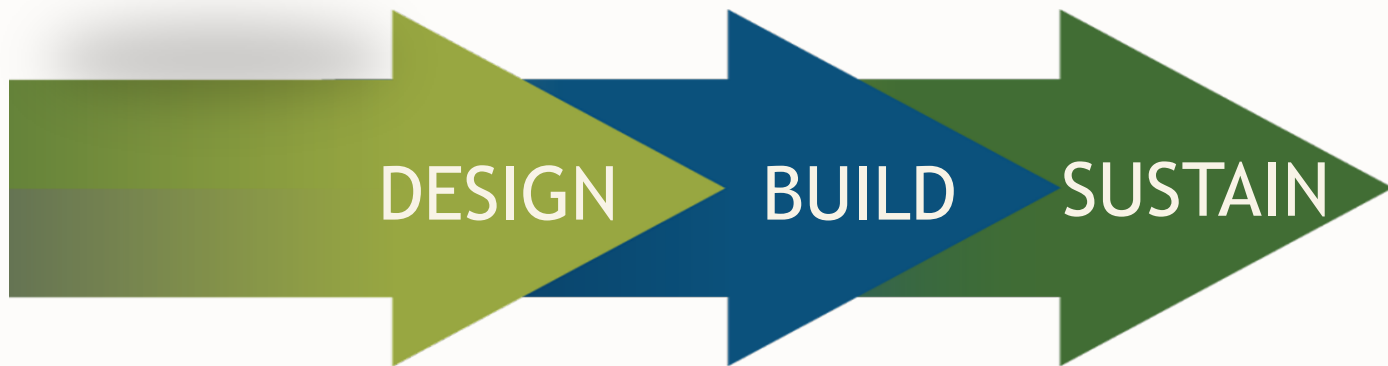
- **Scaling easier said than done**
- **Never as fast as you hope**
 - Every level has a different pace (Private, Government, Academic)
- **Environmental markets take time to build**
 - Don't overload biochar conversations
 - Be willing to pivot your messaging
 - What is important today will change by tomorrow
- **Partners / Patience / Perseverance**
 - Develop strong networks within all sectors
 - Look for sector champions, but expect they will change
 - Need collaboration and teamwork – rising tides raise all boats
- **Just do it!**
 - Slide biochar into all projects possible
- **Collect the Data – Wins Every time**



Scaling Biochar From Laboratory to Policy



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