Incorporating Freshwater Mussels in the Chesapeake Bay Partnership: A Responsive STAC Workshop Proposal

Steering Committee, Institutional affiliation, Expertise

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Introduction

Oyster populations have long been recognized[v] as a central component to Chesapeake Bay restoration due to critical connections to public engagement, water quality and habitat. Conversely, the restoration of freshwater mussel populations has received little attention from partners working on Bay restoration issues yet has the potential to offer comparable benefits to those of oysters in upper watershed communities where the Chesapeake Bay Program (CBP) partnership has struggled to engage. The explicit consideration of mussels was identified in the 2010 Executive Order 13508 on "*Protecting and Restoring the Chesapeake Bay Watershed*" which specified for the CBP partnership to evaluate the role of oysters *and* mussels for restoring the bay. A recent peer reviewed literature survey[vi] suggests freshwater and estuarine mussels exhibit significant potential for ecosystem services (i.e. water quality), however mussel restoration has yet to be considered by most partnership initiatives. This workshop aims to further explore such opportunities.

A compelling engagement tool

Freshwater mussels are well-suited to enhance interest and engagement in upper watershed communities to help achieve restoration targets and engage stakeholders. These organisms were historically ubiquitous in upper portions of the watershed, where the relevance of Bay-specific biological targets (i.e., striped bass, crabs and oysters) may be limited, ineffective or even alienating. CBP Partnership restoration efforts have made substantial progress to-date, but a large portion of the remaining effort needs to come from voluntary efforts in communities which are secluded from the mainstem Chesapeake Bay. Mussels, and their corresponding host fish species (e.g. American eel), may serve as stronger engagement tools in these communities than the traditional Bay fauna. Moreover, freshwater mussels are especially engaging due to their important links to sport fisheries (e.g. shad, bass), their unique life histories, and survival strategies. Mussels are long lived[vii], highly diverse and have a captivating life history which is largely unrecognized by the public. All these factors lead to intriguing engagement opportunities.

Mussel communities provide ecosystem services for habitat provision and stabilization, water quality, and they play an essential ecological role that benefit local community water resources. Freshwater mussels improve stream health, function and habitat by creating three-dimensional structures and stabilizing stream bottoms, in turn improving habitat for local aquatic life[4]. The importance of freshwater mussels to stream health is exemplified by their role as an indicator within the Chesapeake Bay Benthic Index of Biological Integrity (BIBI) [viii]. Mussels improve water quality through filter feeding. A recent literature review (Kreeger et al. 2018) of bivalve filtration and pollutant removal in the Mid-Atlantic suggests that freshwater mussels offer significant potential for local and downstream water quality improvements. Further, the habitat range (ubiquitous for freshwater) for these organisms is extensive across the 64,000 square mile watershed of the Chesapeake Bay. These ecosystem benefits are challenging to comprehensively quantify as they exist along many different gradients (e.g. species diversity, geography), but the scientific literature suggests that they are comparable to those of oysters. This STAC workshop will provide both a detailed consideration of mussels' ability to improve water quality in the Chesapeake Bay Watershed and develop strategies for how mussel restoration can be effectively achieved to meet water quality goals for local communities.

Mussels exist where enhanced water quality efforts are most needed. However, the full extent of the ecosystem services freshwater mussels provide for new Watershed Agreement Outcomes remains largely unexplored. Several scientific, technical and logistical questions remain which require attention. We propose a STAC workshop to address these critical knowledge gaps and generate key recommendations on how the Chesapeake Bay partnership can effectively incorporate mussel restoration to advance Local Engagement, Stream Health, and Water Quality outcomes.

Workshop questions and product deliverables

(1) **What scientific literature, data and funding resources are already available? (to be drafted prior to workshop)**

a. Literature review of (1) mussel ecosystems services (e.g. filtration rates, habitat, etc.) directly related to Chesapeake Bay Outcomes (e.g. Water Quality, Stream Health); (2) factors which have degraded mussel populations in the watershed
b. Review and summarize known information on (1) freshwater mussel species by state and major river basin; (2) funding mechanisms which support freshwater mussel restoration; (3) state, federal and private data sets which summarize mussel populations/ habitat suitability; (4) current watershed mussel restoration efforts (i.e. hatcheries, restoration sites, NGO efforts) (5) examples of mussels serving as indicator species, i.e. biological standards (6) approaches to mapping suitability of habitat for freshwater mussels.

(2) **How does the restoration of mussels intersect with the partnership's Best Management Practice framework?**

a. Evaluate currently approved BMPs which have the potential to influence current mussel populations or future restoration opportunities. Identify BMPs which need additional guidance to improve outcomes for freshwater mussel populations and BMPs which represent valuable opportunities for mussel restoration efforts.
b. Evaluate the potential for mussel restoration to be included as a standalone BMP, a supplemental component to currently approved BMPs (i.e. stream restoration, living shorelines) or as a separate factor to be incorporated into the model. Provide prioritized recommendations for moving forward.
c. Evaluate watershed estimates of ecosystem services with bounds of uncertainty.

(3) **How can the partnership most effectively incorporate freshwater mussel restoration to enhance current outcomes including engagement, stream health and water quality?**

a. Provide prioritized programmatic recommendations for enhancing the Chesapeake Bay partnership's outcomes through mussel restoration.
b. Identify challenges to accelerating mussel restoration efforts (e.g. genetics consideration, hatchery support).
c. Identify and prioritize knowledge gaps, resource needs, and partnerships which will support these efforts.

Management Relevance, Fit for STAC Workshop, and Urgency

This proposal leverages the results of a previous CBF workshop. In July 2018 CBF convened a meeting to discuss the potential for connecting freshwater mussel conservation efforts with Chesapeake Bay restoration objectives. Interest was high, and over 50 partners participated, including attendees from each watershed state. The group identified organizing a STAC workshop as an effective next step to address questions and add expertise. A STAC workshop represents an ideal forum to advance this dialogue due to the combination of technical support and the institutional understanding of the current framework of the CBP partnership's broad inter-governmental efforts.

This proposed workshop is timely as it can build on multiple previous efforts. Convening this workshop on the heels of 2018 CBF workshop can continue the engagement of these previously convened partners and further develop strategies to help improve engagement and accelerate pollutant reductions. Further, substantial progress has been made in freshwater mussel propagation restoration science, making further hands-on study more feasible than it was in previous decades. Specifically, PENNVEST recently announced a new hatchery in Philadelphia which will produce ½ million mussels per year for restoration in the Susquehanna and the Delaware Rivers. This represents the first STAC proposal by this collective group although several members have substantial history working with the Bay Program and STAC (see citations). Further, this effort brings experts to the table that have not historically been involved in the partnership, helping to broaden diverse and constructive dialogue on Bay issues. The result of this workshop will directly inform a variety of audiences including BMP expert panels; Water Quality and Stream Health Goal Implementation Teams (GITs); government partners at local, state and federal level; and the entire Chesapeake Bay partnership. Deliverables produced will provide recommendations on how freshwater mussel restoration can be sustainably achieved, improve water quality, achieve greater stream health and function, and engage the public in communities across the watershed.

Logistics, Timeline and Budget

The steering committee will meet monthly to discuss objectives and identify important resources leading up to a two day in-person meeting to address the questions at hand. Travel expense reimbursement will be limited to invited guests and steering committee members. The in-person meetings will be held in the Chesapeake Bay Watershed and will utilize free spaces such as CBF facilities (likely Virginia Beach or Annapolis). The steering committee will also hold several conference calls following the workshop while developing the final products. We request a budget of **$8,500** which will largely consist of travel and lodging for non-federal attendees and catering expenses. Potential fiscal partners supporting this initiative include CBF which can offer a venue at no charge. The timeline for the workshop is flexible although it will need to accommodate diverse schedules including the mussel restoration season.

Jul-Sep 2019	Oct-Dec 2019	Jan-Mar 2020	Apr-May 2020	Jun-Jul 2020
Meeting to plan literature/data review, finalize guest and presenter lists, divide report writing responsibilities, distribute invitations	Develop draft reviews and distribute to workshop participants, Develop agenda and key activities for workshop	Host workshop; agenda to include external presentations, breakout sessions, synthesis efforts and establishing consensus; discussion of key points.	Steering committee to meet directly (1-2 weeks) after the workshop to synthesize and plan outcomes	Initial drafts of all report components shared 45 days after workshop conclusion, Review and finalize draft 45-90 days after draft

Guest presentations *(to be refined by steering committee)*

(1) The role of genetics in mussel restoration (2) Successful sister watersheds: Clinch & Delaware River initiatives (3) Mussel gardening initiatives and other outreach opportunities (4) Lessons learned from the Oyster BMP expert panel (5) When might restoration work and when will it not? (6) The role of marine mussels

Breakout sessions *(to be refined by steering committee)*

(1) Ecosystem Services provided by freshwater mussels (2) Mapping out mussel restoration opportunities (3) Mussels as a tool for engagement (4) Propagation considerations of mussel restoration

Potential Participants *(Estimated 35+ steering committee, confirmed in bold, to be refined by steering committee)*

MUSSEL EXPERTISE: Matt Ashton (Maryland Department of Natural Resources), Janet *L.* Clayton (West Virginia Department of Natural Resources), **Julie Devers (USFWS),** Curt Elderkin at The College of New Jersey, **Catherine Gatenby (USFWS), Jess Jones (Virginia Tech/USFWS),** Jenny Landry (New York Department of Environmental Conservation), Jen Stanhope (USFWS), Caryn Vaughn, University of Oklahoma**, Mary Walsh (Western Pennsylvania Conservancy), Brian Watson (Virginia Department of Game and Inland Fisheries),** Bane Schill (West Virginia-USGS), Nevin Welte (Pennsylvania Fish and Boat Commission)

NUTRIENT DYNAMICS: Jeff Cornwell (University of Maryland), Mark Luckenbach, (Virginia Institute of Marine Science)**, Todd Lookingbill (University of Richmond)**

OUTREACH AND ENGAGEMENT: Leo Lutz, (Local Governments Advisory Council / Mayor of Columbia Borough, PA)**, Rick Mittler, (Chesapeake Bay Foundation-Education), Ben Watson (James River Association),**

CHESAPEAKE BAY FRAMEWORK AND MODELING: Lew Linker (Chesapeake Bay Program), James Davis-Martin (Virginia Department of Environmental Quality/WQGIT), Gary Shenk (Chesapeake Bay Program)

BMPS, STREAM HEALTH AND STREAM RESTORATION: Alana Hartman (West Virginia DEP/SHGIT), Neely Law* (Center for Watershed Protection/SHGIT), Mike Rolband (Wetland Studies and Solutions), Bob Siegfried (Resource Environmental Solutions),Mike Selckmann (Interstate Commission on the Potomac River Basin), **Louise Finger (Virginia Department of Game and Inland Fisheries), Lisa Kellogg (Virginia Institute of Marine Science)**

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[i] Former STAC Member, Co-author: Progress toward the Restoration of Chesapeake Bay in Time and Space. 2018. TS-716-18.

[ii] Steering Committee member: Factors Influencing Fish Habitat Function in the Chesapeake Bay Watershed: Application to Restoration and Management Decisions. 2018.

[iii] STAC reviewer of the Water Quality and Sediment Transport Model.

[iv] Current STAC Member, Lead author: Assessing the Chesapeake Bay Forage Base: Existing Data and Research Priorities. STAC Workshop Report. 2014. STAC Publication Number 15-005. Steering Committee member: Factors Influencing Fish Habitat Function in the Chesapeake Bay Watershed: Application to Restoration and Management Decisions. 2018.

[v] Luckenbach, M. et al. Evaluation of the Use of Shellfish as a Method of Nutrient Reduction in the Chesapeake Bay. STAC Review 2013.

[vi] Kreeger, D, C.M. Gatenby, and P. Bergstrom. (2018). Restoration potential of several native species of bivalve molluscs for Water quality improvement in mid-Atlantic watersheds. *Journal of Shellfish Research*. 37(5), p1121-1156.

[vii] Jones, J. Freshwater Mussels of Virginia (Bivalvia: Unionidae): An Introduction to Their Life History, Status and Conservation. *Virginia Journal of Science.* 2015.

[viii] https://www.potomacriver.org/wp-content/uploads/2017/05/ChessieBIBI_Report_Final_5-25-2017.pdf