August 11, 2021 Tidal Marsh Ecology Webinar
Questions & Answers

For Robert Isdell & Amanda Guthrie

Is 16 years too short a period to see the benefit of age with living shorelines, specifically with respect to soil parameters?
For marshes, 16 years is a relatively short geologic time for nutrients to accumulate. Since we sampled living shorelines across a range of ages, we were able to generally detect a trend of increasing nutrients as living shorelines age. This trend allowed us to calculate expected times for soil nutrient equivalency. As living shorelines are rather new, we do not have a lot of older sites to use for comparison. It would be great to sample even older living shorelines to see how the trend trajectory compares!

For more information on the soil dynamics of living shorelines, you can access the article by Dr. Chambers et al. here: https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=1020&context=biolfac or here: https://doi.org/10.1016/j.ocecoaman.2020.105401.

With land subsidence and sea level rise, new wetland areas are forming. Have these areas been compared to man-made shorelines?
Marshes are migrating landward due to land subsidence and sea level rise, and the ability of the older marshes to adapt to climate change is site-specific. Living shorelines are expected to similarly adapt to changing conditions, and living shorelines may adapt to climate change better because the rock sill can trap sediment.

Do you anticipate similar findings with living shorelines that are designed without a sill? Do you have any plans to look into living shorelines constructed in a different manner?
I do think that the results could be similar for many of the metrics. The bivalves will lag behind given the absence of the sill, but at the moment, when the living shoreline structurally looks like a natural fringing marsh, it looks like the mobile species quickly move in and use the site. The sediment accumulation may differ if you don't have a sill structure of some sort to reduce the energy behind the sill and increase sedimentation.

Have these results been published?
Yes, Robert's presentation is going to be published in PeerJ August 13. And Amanda's presentation about nekton was accepted (this morning!) to an Ecological Engineering special issue about nature-based features.

Isdell RE, Bilkovic DM, Guthrie AG, Mitchell MM, Chambers RM, Leu M, Hershner C. 2021. Living shorelines achieve functional equivalence to natural fringe marshes across multiple ecological metrics. PeerJ 9:e11815 http://doi.org/10.7717/peerj.11815

You can also access the figures and analyses if you visit: https://osf.io/7vzdp/

Can the marsh sills be "seeded" to speed up the transformation?
It depends on what you're seeding. If it's plants, transplants (plugs) are much more effective than actual seeds in the early stages of living shoreline development while the sediment stabilizes. If you're thinking about mussels, seeding seems like a great option, but we don't have any commercially available mussel stock. Wild harvesting ribbed mussels to transplant into living shorelines ultimately hurts the natural marsh from which they were harvested, and survival in the new living shorelines is extremely low until the grasses reach a high density. If you're thinking about seeding the sand with organic matter, then yes, that is an option, but only if allowed by the US Army Corps of Engineers and other permitting agencies.

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Robert based off your results how can we improve the soil chemistry in designing living shorelines? Can we improve our designs?
Per Karen's talk, clean, coarse sand fill is still required to reduce potential water quality impacts. In order to supplement with organic matter, which would help speed things up, there would need to be a regulatory change or a policy adjustment working cooperatively with the regulatory agencies.

Why do you suppose there is a population difference between a revetment and sill?
To add to my response, armoring is replacing key intertidal features including very shallow waters, vegetation and the link to the terrestrial habitats. For fish, the loss of the shallows and vegetation means they have lost those valuable forage and refuge opportunities. Scientists at CCRM have documented that offshore of armoring the water depths are deeper (and that continues to deepen with scouring at the toe of the structures) as well as energetic -- both not enticing to a small fish.

Robert, any suggestions about what material to use to increase C in our designs?
Dr. Bilkovic sent the following thoughts about your question: "All Organic Matter amendments are not equal, ideally Spartina detritus would be the source of Organic Matter. A wetlands scientist ages ago told me that they experimented with a different source of OM and the plants did not thrive."

Did the study reveal any design or location aspects that help living shorelines survive and perform better?
The design of the living shoreline is mostly determined by the wave energy setting and environment. All our sites were in moderate/higher energy zones so they had a rock sill. The rock sill was built within the tidal "frame" (i.e., the rocks are mostly covered at high tide), and allowed nekton and other species to enter the marsh through "windows" (gaps within the sill). For nekton, we did find that surrounding settings – like more nearby marsh habitat and larger low marsh areas— did increase the amount of juvenile and forage base nekton we found for both types of marshes.

At what density/spacing should those clumps be planted?
Densities in our natural marshes were almost always > 100 stems per square meter, and went up to >350 per square meter. We also know that ribbed mussels have a strong positive relationship with Spartina stem density. We don't have data yet on what the optimal density/spacing for initial planting should be to reach these optimal densities, but we are pursuing funding to try and answer that question.

Has anyone looked at the source of the sand? i.e. a difference in nutrient levels from different sources?
Not to our knowledge, but this would be an interesting topic to investigate.

What plants should you plant on your shoreline to prevent erosion? Within the Virginia area, here are some plants to use along your shoreline.
https://www.vims.edu/ccrm/outreach/teaching_marsh/native_plants/salt_marsh/index.php
It all depends on your area and what plans are natural in that area

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For Bryan Watts

Where can I find a published report of your findings that gives the research methods for the surveys?
The results presented are only preliminary and will be published in the near future. For the 1992 study, the accepted methodologies have since changed.

Assuming other bayside communities (i.e., Maryland) are doing similar studies, could the declining birds just have moved to other bay areas versus going extinct? Any comparisons with like studies in other bayside communities?
All Chesapeake Bay regions are experiencing similar trends with salt marshes, so it's unlikely the birds found enough suitable habitat elsewhere to maintain the population levels found in 1992.

Are you using any of the data provided by other bird counts in the area?
Citizen science data is very important and useful, like eBird. But for this type of study looking at specific locations, access is not easy and there isn't much citizen science data available for the locations we studied.

For Karen Duhring

What limits the depth of the living shoreline marshes? If by depth you mean where can the plants grow, they are limited by the tide range. The low marsh plants generally do not grow below the mid-tide elevation. The width or horizontal extent in a landward direction is limited by competition and shade from upland plants.

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