Wetlands and Seagrasses: Nature's Superheroes
in the Fight for Coastal Resilience in Southeast New England

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On July 15, the Southeast New England Program hosted "Wetlands and Seagrasses: Nature's Superheroes in the Fight for Coastal Resilience in Southeast New England," which welcomed Dr. Phil Colarusso, an EPA marine biologist; Dr. Rachel Jakuba of the Buzzards Bay Coalition; Caitlin Chaffee of the Narragansett Natural Estuarine Research Reserve (NERR); and David Morgan, a SNEP ORISE Fellow; as they each presented on their work related to the restoration and protection of wetlands and eelgrasses, and the species that depend on them.

In addition to providing critical habitat, these ecosystems also provide tremendous value to coastal communities by providing a natural buffer to mitigate storm surge during inclement weather; they filter out contaminants as water flows through them and into estuaries, and they store a significant amount of carbon in their soils. These features make them critical in the continued effort to withstand and lessen climate change.

Wetlands and seagrasses were once dominant throughout the coastal landscape but are now in a state of flux. As human-induced climate change continues to warm our atmosphere and oceans, these critical ecosystems and the species that depend on them are under increasing strain to adapt.

Marshes are dynamic systems, and their sizes are consistently changing, but globally these systems are in decline as more of their territory is being lost than can be naturally replaced. Though development has proven an historical threat to many of these systems, the primary regional drivers to their degradation today is climate change and nitrogen pollution. In Buzzards Bay, 26%-66% of salt marsh area has been lost between 1938 and 2016 with the rate of marsh degradation increasing over the past decade. To counter marsh loss, several of our speakers presented on how to slow this degradation and bolster marsh resilience to climate change.

One strategy involves the creation of runnels – curved trenches carved through the marsh to facilitate the movement of water. If too much water sits on top of the marsh, the marsh grass can drown, die, and cause the ground to destabilize. These runnels increase the movement of water and prevent pooling, which decreases stress on these systems. Dr. Rachel Jakuba and Buzzards Bay Coalition are working to monitor the impacts of runnel systems on impaired marshland to better understand the efficacy of the approach.

Another idea is to protect the marshes of tomorrow. Caitlin Chaffee of the NERR discussed her organization's work to find and protect underdeveloped areas from development to allow salt marsh to migrate inland. Though the coastal edge of these marshes would continue to erode away, the integrity of the marsh can remain intact if allowed to migrate (though the carbon stored at the marshes' edge would still be lost and released to the environment). The Reserve has also worked to develop a strategy to prioritize sites for marsh migration and areas for protection.

Each of these approaches require strong monitoring programs, which proved to be another major theme. Both Dr. Rachel Jakuba and Caitlin Chaffee presented on their programs' long-term monitoring strategies for coastal marshlands and how they intend to make data-driven decisions about future restoration efforts.

The case for eelgrass is just as strong. Throughout his presentation, Dr. Phil Colarusso stressed the contributions that healthy eelgrass beds can have on carbon sequestration. These ecosystems act as

natural filters and can pull carbon out of the water column and store it in the sediments below. Different than trees on land, the primary mechanism of carbon storage isn't in the organism itself (trees store their carbon in their trunks and roots) but in the soil. This was demonstrated in Dr. Phil Colarusso' s research by showing that the carbon content of older eelgrass beds was greater than those of younger beds. Unfortunately, the downside is that the same areas can potentially be a significant source of carbon and other greenhouse gases if they're allowed to degrade. Restoration of these ecosystems is less straightforward, however. Seeding is often prone to failure and transplanting grasses shoot by shoot doesn't offer much more of a guarantee – Dr. Colarusso shared a fitting anecdote of an eelgrass restoration project that he was involved with, which required hand planting 16,000 eelgrass shoots only to have them wiped out shortly after by a recent storm).

Many of the restoration practices of today are not expected to outrun the climate impacts of tomorrow. In response to one audience member who wondered if "restoration [was] even worth it" in the long run given current climate projections, Dr. Phil Colarusso reminded the audience that stress to these ecosystems is cumulative. "There's not much that we can do immediately about climate change, but there are plenty of other stressors (water quality, dredging, boating, etc.) on which we do have the ability to effect change in the immediate timeframe. We can reduce stress from these other sources and increase resilience to these native populations [to] help them endure the stress that we can't immediately remediate (i.e., climate change, sea-level rise)." This of course does not detract from the importance of addressing climate change; but it does serve to emphasize the importance of restoration and conservation work alongside that effort; and to find and implement projects that give these ecosystems the greatest chance for success.

Even if we stopped all carbon pollution on Earth tomorrow, there is still a degree of climate change that we've already set in place with past emissions --global systems take time to right themselves, and because of this, we can already see how these ecosystems are changing, and how the animals that depend on them are actively working to adapt to those changes. ORISE Fellow, David Morgan presented the preliminary results of his ongoing research, which predicts the relative range changes of ten bird species throughout the SNEP region. Using these ten species as indicators for greater ecological change, David Morgan's research identified zones of climate refugia within the SNEP region –regions that are expected to be more resilient to climate change – as priority areas for restoration and protection in order to give these species more time to adapt.

As our climate continues to change, restoration and conservation work remains relevant – not just to restore to environments that once were, but to ensure that those environments can continue to exist in a warmer world.