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Driving the Workhorse: Maine's Reliance on the Nearshore Environment

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Maine's Reliance on the Nearshore Environment

by Angela Brewer

Maine's nearshore environment is the epicenter of vibrant and evolving estuarine and marine communities. The "nearshore" defines the area of shoreline graced by the highest of high tides down to a water depth that can be explored with an off-the-shelf, low-cost, waterproof camera. This small swath of shoreline experiences seasonality like its terrestrial neighbor just landward of the intertidal zone and can be likened to a bustling urban center adjacent to the vast, stable, and enduring rural character of deeper offshore waters. The nearshore environment is where the action happens. Nearshore habitats are diverse and exciting, hosting abundant macroalgal resources in the coldest months, burgeoning eelgrass beds and their inconspicuous invertebrates in the spring, opportunistic organisms vying for available nutrients and forage in the summer, and the steadfast species tucked away under rocks and in the mud as daylight becomes more elusive. Accompanying these habitats and their inhabitants are the reliable presence of recreators, harvesters, growers, visitors, residents, and the curious and inspired.

The coastal economy in Maine has historically been heavily supported by tourism and fisheries. Though Maine's commercial landings in live pounds have fluctuated since the 1960s, the ex-vessel value of the ocean bounty continues to follow an increasingly lucrative trajectory.[1] Much of Maine's wild harvesting occurs in shallow-water environments, including menhaden fishing to support the lobster industry and collection of mussels, clams, worms, and rockweed. As changing ocean conditions and fisheries regulations challenge wild harvest, fishermen and women are diversifying and adapting. The rapid growth of aquaculture in Maine has additionally intensified the reliance and pressure in these areas. Be they positive or negative, impacts of individual operations, as well as cumulative effects over an estuarine or embayment scale, are not well documented.

As the wild and cultured fisheries sectors evolve, marinas maintain extensive wait lists for seasonal dockage and moorings. Visitors to Maine find packed beaches and are then faced with negotiating filamentous red algae while frolicking in the surf. Salt marshes are slowly being restored through improvements in road crossings that reduce tidal restrictions, yet are being simultaneously squeezed by sea level rise and coastal land development. Despite increased public awareness of the importance of eelgrass, it is under constant threat by damage from invasive green crab and heating of shallow embayments. Overlapping uses of and pressures on the nearshore environment abound, and as climate change compounds these stresses, a comprehensive vision to sustain these revered areas remains elusive.

Amidst these many pressures and challenges, optimism can be hard to come by. Even so, due to political transitions and more readily apparent impacts of climate change, the Maine Department of Environmental Protection's (DEP) Marine Unit has recently improved its ability to monitor nearshore conditions. On the heels of recommendations from Maine's Climate Action Plan, Maine Won't Wait (Maine Climate Council 2020), and the support of the legislature's Environment and Natural Resources Committee, in 2021 a revamped initiative was signed into law that enables the DEP to inventory Maine's eelgrass and salt marsh resources annually on a rotating-shoreline-segment basis (38 MRSA §1805). In 2023, as part of the Marine Vegetation Mapping Program, the DEP surveyed the first segment in the midcoast region, an area that hadn't been mapped for eelgrass distribution in 20 years. The 2023 survey also included low-tide aerial imagery acquisition over Maine's largest freshwater tidal marshes in Merrymeeting Bay, made possible by generous support from The Nature Conservancy.

Additionally, in 2023, the legislature granted General Fund support as a component of the biennial budget for the previously unfunded Marine Environmental Monitoring Program (MEMP; 38 MRSA §410-F). The legislature also improved funding levels for the Surface Water Ambient Toxics (SWAT; 38 MRSA §420-B) program, whose budget had been reduced considerably over the past 20 years. Both existing DEP programs focus in part on identifying and measuring contaminants in estuarine and marine waters and biota, and for the SWAT program, determining potential risks to human health. The monitoring enhancements to the SWAT program will complement ongoing work by the Maine Department of Marine Resources (DMR) that protects public health through biotoxin and bacterial testing. Recent expansion of both DMR's Nearshore

Marine Resources Program to monitor the dynamics of the intertidal biological community and the Aquaculture Program's capacity to assess the condition of benthic habitats (on the bottom of the ocean) in proposed lease areas bolsters the enhanced monitoring plans at the DEP. Cumulatively, recent state support will enable a more complete evaluation of health of nearshore habitats and their inhabitants that contribute to the well-being of our human communities.

With synergies afforded by DEP's and DMR's monitoring in the nearshore environment, and the outcomes from research grants like the Maine Coastal and Marine Climate Action Fund that support Maine coastal and marine climate action, the outlook for leveraging valuable new knowledge is promising. Better characterization of the status of nearshore waters will help prioritize portions of the Maine coastline for preservation, enhancement, or restoration, and allow nimble and educated co-siting of complementary uses. For example, the DEP has been developing assessment methods to determine when estuarine and marine wastewater discharges to the nearshore environment have the potential to prevent intended uses of those areas, including recreation, fishing, aquaculture, shellfish harvesting, and quality habitat. Through these assessments, marine areas with sensitive environmental receptors like eelgrass, as well as estuaries demonstrating persistently low or highly variable dissolved oxygen, which is stressful to biota, are being prioritized for nitrogen-load reductions. Areas without wastewater discharges that demonstrate exceptional condition are becoming apparent. Receiving waters (waters into which treated or untreated wastewater is discharged) that show impressive resiliency despite wastewater discharges are being noted.

Coincidentally, the characterization of nearshore waters and mapping of eelgrass beds will suggest areas that may be ripe for enhancement. Eelgrass mapping occurring on infrequent intervals reveals areas where considerable changes have occurred since prior survey. As four-fifths of Maine's coastline hadn't been mapped for eelgrass distribution in 14–20 years, DEP's mapping efforts during 2023–2026 will demonstrate the extent of areas of eelgrass gains, fragmentation, and complete loss. In locations where fragmentation occurs from structures that scour the bottom or remove habitat, solutions such as so-called conservation moorings are being investigated in Maine. Already common along the coastline of Massachusetts (Massachusetts DMF 2019), conservation moorings involve helical anchors and an elastic rode with subsurface flotation that replaces traditional mushroom anchor and chain systems. Chains have been shown to leave conspicuous scars around anchors as they drag over the bottom during lower tides, thus rendering soft-bottom habitat unsuitable for eelgrass.

In 2022, replacement of traditional moorings with conservation moorings as a way to generate mitigation credits and restore eelgrass habitat garnered the support of the Maine Natural Resource Conservation Program (MNRCP), a program that allocates funds as part of a joint agreement between the DEP, The Nature Conservancy and the US Army Corps of Engineers. Awarded to the towns of Brunswick and Harpswell with implementation by consultant, Stantec, these MNRCP projects will be complemented by an even larger-scale replacement of traditional moorings in the Portland area, which was begun in 2022. The Portland project has been led by the Portland Harbor Master's Office, Portland Harbor Commission, and Stantec, which is pursuing an alternative conservation mooring design to allow eelgrass reestablishment in traditional mooring scars to mitigate eelgrass removal by maintenance dredges. Even more admirable than mooring conversions is the mammoth effort led by the Portland Harbor Master's Office that relocated approximately 150 moorings outside the eelgrass habitat around Portland and adjacent islands during 2022. These projects in Portland, Brunswick and Harpswell will reveal which approaches make sense for Maine's large tidal range, degrees of exposure, and typical recreational vessels, while also educating mooring owners about the values of nearshore vegetated habitat.

Maine's nearshore environment, while still teeming with activity, is less diverse and vibrant below the surface than it once was. Anyone who has spent decades along our rocky shoreline knows that tide pools look quite different from even 30 years ago. Despite the optimism instilled by support for more environmentally friendly moorings and enhanced monitoring and research, it will be difficult to outpace the effects of warming nearshore waters and invasive species in Maine. Yet, there is much to be learned from our neighbors to the south who have been navigating natural habitat alteration and biological range shifts for longer.

Since the 1990s, the vision and persistence of scientists on the eastern shore of Virginia have resulted in thousands of acres of restored eelgrass via annual seeding aided by natural expansion along shallow shorelines once devoid of vegetated habitat (Orth and McGlathery 2012). Pilot-level field efforts currently being supported by Maine's Casco Bay Estuary Partnership are studying when eelgrass seeds are most viable for harvest, an early step in determining how local, manual seed extraction,

storage, and dispersal can enhance the ecosystem values of eelgrass. However, the now ever-present damage being caused by green crabs may stymie restoration or even enhancement plans if no actions are taken to determine feasibility of controlling green crab populations. Over the past decade, towns in parts of Massachusetts have met a similar challenge by setting a bounty on green crabs, thereby paying harvesters per pound to remove the destructive invader. How such a program in Maine could be funded and how benefits to the local economy, marine habitat and even fisheries could be realized is worth discussion.

If Maine is to continue its economic dependence on the nearshore environment through multiple and intense uses, we need to move from coexistence of these uses to the development of strategic co-benefits. Each agency, academic institution, and nonprofit or citizen science organization actively involved in studying the nearshore has distinct goals and reasons they value this environment. Recreators, harvesters, growers, and landowners additionally have defined goals and values, many of which overlap with those studying the nearshore. Despite its small population, Maine has an incredible wealth of regulatory authority, academic expertise, and practical knowledge that needs to be harnessed in productive ways. Nevertheless, the age-old challenge of breaking down silos persists and the collective voice translating science to action is one of many talking in a crowded room. Examples of developing nearshore co-benefits through installation of macroalgae near wastewater outfalls, protection of eelgrass near high-value shellfish beds, or opportunities to convert upland adjacent to high-value marshes for public recreation are few and far between, but can be accomplished with collaboration and concerted efforts. Responsibilities for sustaining our nearshore environment command expediency and even more ingenuity, and there has never been a better time to engage in the pursuit.

NOTES

1 https://www.maine.gov/dmr/fisheries/commercial/landings-program/historical-data

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