When we zoom out from our little corner of the world as far as we are able, to capture the larger, world view, it is really scary. Record high temperatures in India and Pakistan which climatologists are watching closely; the early wild fires in New Mexico and Arizona; the condition of the Colorado River resulting in unprecedented drought conditions. These are extremes that risk becoming normal. And yet, they are so far away from Pleasant Bay. So why worry?

Zooming into Cape Cod and more specifically Pleasant Bay and the surrounding communities, and perhaps we can be lulled into thinking it isn’t as extreme. While it may be true that we aren’t experiencing such widespread climate catastrophes, there are indisputable changes happening to our Bay. The Friends of Pleasant Bay acts at every opportunity to support science, education and conservation. How can members of our communities learn about and combat climate change on a local level? Since 1985, FOPB has worked tirelessly behind the scenes to continue to address our collective responsibility to preserve and protect the Bay. You can find an impressive list of the studies, programs, research, and conservation efforts that FOPB has supported on our website. We can view those efforts as a microcosm of what can be accomplished in a bigger arena. We can be an example of what four communities that border such a diverse and valuable estuary can accomplish through science, education and conservation.

It's not just the Bay we’re protecting. Mere protection is not enough. We are supporting a new mindset, a cultural shift, one that looks to the past in order to protect the future. Pleasant Bay is fortunate to have many resources, including educators, scientists, engaged citizens, and an ecosystem that is still very vibrant, and an indigenous historical connection.
which we hope to restore. Sailing gives the illusion of being one with the wind and water, and that is almost true. I’ve come to think of it as floating on top of the water, no matter what type of vessel you’re in. As we become aware of what lies underneath, and our impact on that unseen environment, it is eye-opening. I am sure I’m not alone in this way of thinking. My own eyes have been opened by the research FOPB has supported, by the studies that have been conducted, by the school grants that FOPB has offered, and by the work of this board, in particular and all the FOPB boards that preceded it.

Pleasant Bay can be that shining example of diverse community working towards common goals of preservation and protection. We hope you enjoy the articles in this and all our FOPB newsletters and thank you for your continued support of the Friends of Pleasant Bay.

Suzanne Leahy
PRESIDENT

Climate Change Impacts on Pleasant Bay Ecosystems

Walking along the bay shore on an August afternoon, you may see the sunshine reflecting from the water’s surface as hundreds of small schooling fish race through the dense seagrass meadows. But what’s happening below where you can’t see is a mystery. The flowering seagrass plants, known as eelgrass, emerging from the bottom are playing a critical role in protecting water quality by intercepting human-derived nutrients and pollutants, trapping suspended particles in the waters, and stabilizing the shoreline against erosion. Over the last couple decades, scientists from Cape Cod National Seashore and Center for Coastal Studies have observed significant losses of salt marsh and seagrass meadows in Pleasant Bay, thereby diminishing the vegetation’s protective capacity.

One of the most vital functions of seagrass meadows, however, is their support of coastal food webs by providing critical food, shelter, and nursery habitat. The importance of these habitats to the small crustaceans, worms, clams, and snails that make up the base of the coastal food web cannot be overstated. Samples were taken from each of the 48 stations shown in Figure 1, and a total of over 67,000 individual invertebrates belonging to 146 species were identified. Seagrass meadows supported the largest number of species, including juvenile and adult scallops. The vegetation and water quality of Pleasant Bay are threatened by the human activities on the lands surrounding the Bay, known as the watershed, local recreational uses, and global climate change. The primary causes of salt marsh losses are coastal development with hardened
Climate Change Impacts

and the impacts of increasing erosion and sea level rise. The causes of eelgrass losses are quite different, and are driven by poor water quality with high levels of nitrogen and phosphorus, primarily from residential septic systems and fertilizers. Furthermore, average air temperatures have increased approximately 5-8°F during summer and fall over the last several decades, which is directly related to rising water temperatures. The warming water temperatures conspire together with poor water quality conditions to exacerbate the threats to seagrass meadows and the invertebrates and fish they support. Though we know eelgrass is sensitive to warm temperatures (above 80°F), modeling research shows that there are areas within Pleasant Bay where eelgrass may be able survive in a future with warmer seas. More research is needed to assist management efforts, which should consider these areas that have been identified as refugia for resilience of these critical habitats, and target efforts in those areas to keep improving water quality conditions.

Overall, Pleasant Bay-wide ecological condition is good in key indicators of degradation, phytoplankton biomass and oxygen concentrations. The poorest conditions were observed in the areas furthest from the inlet and in the salt ponds. Continued air temperatures increases and changing precipitation regimes associated with climate change can have profound impacts on the biota and water quality. Restoring healthy water quality to Pleasant Bay will encourage natural ecological processes and will support the coastal marine communities in their adaptation to warming temperatures and other climate change impacts.

Map showing the number of species found in sediment samples taken from 48 stations across Pleasant Bay. Size of the circle indicates number of species with larger circles depicting higher invertebrate diversity. Credit: Agnes Mittermayr.

Gem clams (Gemma gemma), one of the most abundant invertebrates in the bay and only a few millimeters at full adult size. This sample is stained pink, but in nature these clams can range from white to purple in color. Credit: Agnes Mittermayr.

A tiny scallop (3mm) using eelgrass as nursery habitat. Credit: Sophia Fox.
Sipson Island and the Sands of Time

Written by Sarah Griscom

As geologic features go, Cape Cod is just a baby, created in the past 25,000 years. Mile-high glaciers that moved across our region during the Pleistocene started to melt and seas rose, with sea level finally stabilizing around 4,000 years ago. The sand grains that grace our beaches and make up our protective barrier islands today were mostly formed from rocks pulverized over and over by the moving glaciers, then transported by river runoff. The glaciers left behind an icy, lumpy Cape terrain. Sipson Island is one of the “lumps”—a product of dynamic forces that have not finished shaping our bay.

The beaches that surround Sipson Island are continuously replenished, in part by the natural erosion of sediments from its coastal banks. Sand from the western cliffs feeds into the Pleasant Bay system. Lost sand in one area is balanced by a gain somewhere else—be it a shifting sand flat, beach, dune, or the slow infilling of the bay. From historical deeds and aerial photographs, one can see that Sipson Island actually gained acreage and moved eastward through accretion on that side. A viewing platform, once in the middle of the island, now lies much closer to the western cliff. On a longer-term scale, however, such sediments are making a one-way journey across the continental shelf and into the deep sea.

In much of the Pleasant Bay system revetments have been built to halt the loss of land and protect structures and roads, cutting off the natural replenishment of sand. These hard structures also increase the erosional energy of waves hitting the shore. This starves the beaches of sand, and over time impacts marshes and eelgrass beds close to the revetments. The effects of climate change—sea level rise, increased storm activity, more flooding events—make sand replenishment even more critical. In the coming century, our community will have cause to appreciate the gifts of a protective barrier beach, an extensive marsh, and all the Pleasant Bay islands.

Fortunately, scientists are watching and measuring changes in our system. New research by the Center for Coastal Studies suggests that recent changes in longshore transport of sand along the outer beach may have major effects on the Pleasant Bay system in the coming decades. Stay tuned: we hope to hear more from these scientists about their studies of the Cape’s dynamic, shifting coastlines.
How Will We Respond to Climate Change?

Written by
Ted Keon, Director of Coastal Resources in Chatham, MA

Public awareness and concern over climate change has increased in response to the more frequent climate-related natural disasters and events being witnessed firsthand. Reporting of climate change and many related issues, such as sea level rise, storm intensity and frequency, drought, wildfires etc., is commonplace and the science and data supporting man’s role in climate change is increasingly difficult to deny. The ability to specify exact values and timeframes (i.e. how much sea level rise by any given time) is being further refined as the science progresses and data improve but there is little doubt that future conditions will be different and “things just won’t look the same”. Obviously, climate induced changes have significant implications for Pleasant Bay and Cape Cod as a whole.

The science will continue to advance but it is not clear if more refined knowledge will translate into proactive change(s) and efforts to address those changes that are looming. In many cases I believe it will. While more needs to be done, public planning and decision-making regarding hazard identification and resiliency planning/execution for public projects has begun and will continue to be a focus of current and future projects. However, public infrastructure represents only a small fraction of the shorefront and surrounding areas of Pleasant Bay. Will we see similar responses at the private and individual property scale to adapt to current and coming changes necessary to preserve the health and vitality of Pleasant Bay and its ecosystem? Unfortunately, I am less optimistic on this topic. This is not a condemnation of property rights but simply recognition of human nature given the substantial economic incentive not to change but rather to hold the line and not give ground. This has already had serious implications for modifying ecosystems and habitat along the Bay shoreline and will only be compounded with coming climate change impacts.

Pleasant Bay and Cape Cod have been anything but static over the period since the glaciers retreated several thousand years ago leaving a pile of unconsolidated sediment to be reshaped by natural forces into the landform we now inhabit. We have all seen historical maps and charts of how things used to look not that long ago. However, it is hard to envision how the Bay will look in the not-so-distant future with a few feet of sea level rise. Beaches, intertidal habitat, and marsh systems used to freely migrate as water levels changed, beaches over-washed, and upland eroded providing more area for expansion for these natural ecosystems. These natural processes are becoming increasingly constrained by human development. It’s easy to map where land will become inundated with higher water levels, but it is difficult to assume property owners will willingly let their back yard erode away or become marsh for the greater good of the system.

Climate change is coming in multiple forms, it will be up to us to determine if we will adapt in an environmentally responsible way or try to rigidly control a highly dynamic system and fight what will ultimately be a losing battle with Mother Nature.
The future of the recreational maritime industry is in electric propulsion. Electric powering of boats is a great way to mitigate the environmental impact of gas motors, which, despite oil injection technologies and the addition of ethanol to fuel, remain significant polluters to our waters, affecting all aspects of marine life and the ecosystem.

In 2006, Arey's Pond Boat Yard became the first electric outboard dealer in the Pleasant Bay area. We have also installed nine electric inboards in custom-built boats to date. All but one of these electric motors have been imported from Europe where the market is ahead of the United States. However, more US companies are investing in the future of electric propulsion and big brand outboard manufacturing companies are now advertising 100 HSP and larger electric outboards.

Designers and engineers still grapple with issues related to the weight, size, and need for ventilation of the batteries. Placement of the batteries is critical in determining that the boat remains balanced for performance. These are issues that will get worked out in time and eventually marinas will be providing charging stations instead of gas pumps. At Arey's Pond, we are incorporating a dock with a proper charging station into our upcoming bulkhead restoration.

Currently, at Arey's Pond we have over 30 sailboats with electric outboards. The experience of going down the Namequoit River under electric power is serene and quiet, free of obnoxious outboard noise, and there is added peace in knowing that the ecosystem of Pleasant Bay is protected. In time, as battery technology improves, the market will go all electric; gas motors will be a tool from the past. At Arey's Pond, our goal is to have 100% of our customers' boats using electric propulsion by the year 2030.

Written by Tony Davis, Arey's Pond Boatyard
Pleasant Bay Pollinator Pathway
A Cape Cod Lawn

Our pollinators are in trouble due to humanity’s disregard for their habitats. Why should we care? Our pollinators are an important part of our ecosystems. The National Academy of Science estimates that 75 percent of the flowering plants on Earth rely on pollinators to fruit or set seeds. This provides much of our food and food for the wildlife around us. **We can protect the pollinators by taking a few simple steps in our own landscapes that will help to readjust the ecological balance in favor of the pollinators.** It will diversify our properties and bring nature to us. Watching birds build nests is fascinating.

Who are the pollinators? Most people will name the honeybee. However, it is a vast range of other creatures that do most of the pollination work, including our wild native bees, wasps, butterflies, moths, and beetles. To help them find pollen and to support their life cycles, we need to plant more native plants on our properties.

Native plants are a better source of pollen and nectar, insects depend on native plants, and their colorful flowers bring joy to our landscapes. They also require little or no soil amendments, and many are drought and salt spray tolerant.

Are perfectly manicured lawns perfect? Our society has conditioned us to believe that a perfect green weed-free lawn demonstrates our status and good citizenship. If the pollinators could speak they would tell us **NO.** The lawn does not provide them food, or a place to complete their life cycles and lawn treatments often include chemicals that are harmful to pollinators.

Turf lawns consume the equivalent of 32 gallons of water per day for every man, woman, and child in the U.S. Private and public irrigated lawns make up 40 million acres in the U.S., which equates to the size of New England. The EPA estimates that 40-60 percent of fertilizer applied to lawns to keep them green end up in surface and groundwater. Cape Cod is a fragile piece of land. Pleasant Bay is a treasure that we should be protecting.

Some lawn is necessary for recreation, but how much do we really need? Less lawn saves time, and money, and protects our waters. Many people are starting to discontinue the lawn treatments and embrace clover, violets, thyme, and moss in their lawns. This is what we call a Cape Cod lawn! Others are shrinking the size of their lawns in favor of more flowering native plants that enhance the landscape and support pollinators. To learn more about what you can do, go to www.pollinator-pathway.org/towns/cape-cod and join the grassroots movement and be part of the pollinator pathway to Pleasant Bay.

Written by Carol Alper, Master Gardener, Orleans
What Can I Do to Combat Climate Change?

Written by
Mon Cochran, Friends of Pleasant Bay

Global warming can feel inevitable. The globe is so huge, and each of us so small, that it can be hard to imagine what I as an individual can do to make a positive difference. In fact, there are a number of things that each of us can do to reduce our carbon footprints. Here are nine examples:

Make sure your home is energy efficient with proper insulation, and draft-proofed windows and doors. On Cape Cod the Cape Light Compact will conduct a free energy audit for you, and may provide energy efficiency repairs at no cost. If you are in rental housing, lobby your landlord to make sure the property is energy efficient.

Small changes to your behavior at home will help you use less energy. Simple changes include wearing an extra layer and turning down the heating, turning off lights and appliances when not needed, and replacing light bulbs with LEDs.

Eat less meat, and especially beef. Meat production generates more than twice the greenhouse gases of plant-based foods. About sixty percent of agricultural land is used for livestock grazing, land which could be supporting plants that absorb greenhouse gases.

Buy fresh, seasonal produce that is grown locally to help reduce the carbon emissions from transportation, preservation and prolonged refrigeration. Sustainable agriculture uses up to 56 per cent less energy, creates 64 per cent fewer emissions and allows for greater levels of biodiversity than conventional farming.

Reduce the size of your lawn by planting trees, and protect those already on your property. Trees absorb carbon dioxide, the most prevalent greenhouse gas. The 40 million to 50 million acres of lawn in the U.S. are almost as much as acreage as all of the country’s national parks combined. And in 2018, Americans used nearly 3 billion gallons of gasoline running lawn and garden equipment. If you have no lawn, support local land trusts in their efforts to protect forests and marshes.

When you replace your vehicle, investigate purchase of an electric or hybrid model. Rebates and tax incentives can make the price competitive. Electric cars are less expensive to maintain that those running on fossil fuels.

Produce your own electricity. Solar loans now make solar panels increasingly affordable, and the cost of electricity from the grid will continue to increase.

Talk with others about what you do to reduce your carbon footprint. Good ideas are contagious.

Support political candidates who promise to pursue policies that reduce release of greenhouse gases. Policy changes can have a major impact on global warming.
Go for a Walk at Paw Wah Point

Written by Todd Kelley

Perhaps now more than ever so many of us long to return to reliable cultural norms that are rooted in balance with the natural world and each other. With spring comes an instinctual eagerness to refresh our sense of well-being remembering this. When you are out and about around Pleasant Bay consider reconnecting more deeply to that which is sacred and intangible about community and culture. Consider visiting a small sliver of land called Paw Wah Point which has much to offer if we have the stillness in our hearts to patiently perceive it.

Paw Wahs are Indigenous medicine people who have special knowledge that they alone hold and carry. They are sole members of a sacred society within Indigenous communities. Acknowledging long standing local oral tradition about Paw Wah Pond, the Town of Orleans placed a historic marker there, but it was washed out many years ago. It told of an old fable that if you offer a pinch of tobacco (gratitude) you will be “given good fishing.” So go for a short walk and look out across Paw Wah Pond and Little Pleasant Bay to ponder with an admiring smile of gratitude, our own good fortune to have such a place to visit.

Below is the book and title of the story that members could connect to:


In Memoriam

Jane Curtis
Dana Eldridge
Vince Leheny
Hugh S. Pershing, M.D.
Frederick L. Rhodes
James Stetson