

# Conference Report: “The Pleasant Bay Ecosystem: Past, Present and Future”

3/30/2023



*Supported by a Southeast New England Program (SNEP) Watershed Grant*



Organizers: Owen C. Nichols<sup>1\*</sup>, Sarah B. Griscom<sup>2</sup>, Carole Ridley<sup>3</sup>

1. Center for Coastal Studies
2. Pleasant Bay Community Boating
3. Pleasant Bay Alliance



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### **Suggested Citation**

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### **Abstract**

Following COVID-19 pandemic-related postponement from fall 2021, we held the mini-conference, “The Pleasant Bay Ecosystem: Past, Present and Future,” Saturday 3/26/2022 at the Chatham Community Center. Forty-six people attended the workshop which featured a keynote address, twelve oral presentations, two panel discussions, and a poster session. The mini-conference was followed by a closing social at Pleasant Bay Community Boating, including a campus tour and viewing of the solar-powered research vessel R/V *Friend of Pleasant Bay*. Attendees highlighted the value of monitoring more than single ecosystem components, noting the need to examine the relationships between components and how those change over time, especially in the context of multiple stressors like climate change and nutrient pollution, and to measure success of our efforts to repair damage caused by anthropogenic impacts as well via habitat restoration and conservation. Participants noted the importance of community involvement and citizen science, and the need to foster collaboration around the Bay in both science and education. The workshop provided a foundation upon which to develop a long-term, interdisciplinary monitoring program as an essential component of a holistic, ecosystem-level approach to conservation, research, education and management as we maintain our relationship with this dynamic ecosystem in a changing climate.

### **Background**

Pleasant Bay (Cape Cod, Massachusetts) is part of the Nauset Beach/Monomoy Island - barrier spit - barrier island system. The Bay is surrounded by approximately 42.9 miles of coastline, and its watershed includes the towns of Orleans, Chatham, Harwich and Brewster. A highly valued regional resource, it was designated by the state and recognized by the surrounding towns as an Area of Critical Environmental Concern (ACEC) in 1988. This valuable ecosystem, a collection of both living and nonliving components, is at risk from development within its watershed and from human activities within the Bay. Its location at the eastern extent of the SNEP region places it in a transition zone between the waters of southern New England and the

Gulf of Maine, and as such, it is an ideal location for monitoring the effects of climate change as ocean temperatures warm, weather patterns change, and species distributions shift.

In 1998, the Towns of Orleans, Chatham and Harwich adopted the Pleasant Bay Resource Management Plan (PBRMP) and formed the regional Pleasant Bay Alliance (PBA) to implement the plan (Brewster joined the Alliance in 2007). The PBRMP is designed to provide analysis and action steps for coordinated local, regional and state management and permitting activities in the Bay and its watershed. The PBA periodically updates the plan (most recently in 2018) and submits it to the four towns and the Commonwealth for approval. Challenges faced by natural resource managers include understanding how the 2007 formation of a second inlet in the Bay's dynamic barrier beach system is affecting its resources and coastline, and how to reduce the current anthropogenic watershed nitrogen load in the Bay by 36%, and all future load by 100%, in order to comply with state regulations. The four towns' efforts to reduce nitrogen are being implemented under the Pleasant Bay Watershed Permit, which is the first watershed permit for nitrogen removal issued by Massachusetts Department of Environmental Protection. Watershed permit compliance is coordinated by the PBA.

Based on the plan's recommendations and in coordination with PBA the Center for Coastal Studies (CCS) conducted an environmental assessment of Pleasant Bay between 2014 and 2017. The comprehensive, interdisciplinary project was funded by a grant from the Friends of Pleasant Bay (FOPB), with additional support provided by the US National Park Service (NPS) Cape Cod National Seashore (CCNS). The goal of this assessment was to create an important dataset of baseline information by assessing the present status of the natural resources of Pleasant Bay that can be used to develop a long-term habitat monitoring program. In particular, the assessment:

- Developed high-resolution benthic habitat maps, integrating data collected through acoustic mapping of the Bay, seismic reflection profiling, sediment coring, bottom grab samples and videos to type sediment and identify the micro-invertebrates by sediment type.
- Determined the distribution and relative abundance of individual species of shellfish and finfish using a variety of capture methods.
- Described the seasonal distribution for gray and harbor seals in Pleasant Bay during 2014 and 2015 based on aerial surveys
- Provided additional information on the diet of gray and harbor seals in Pleasant Bay through scat content analysis
- Provided an initial representation of the interrelationships among the Bay's biological and physical features.

The CCS study and associated data comprise a critical baseline record of biological and physical characteristics of Pleasant Bay, in some cases replicating work that had not been

repeated for 50 years since a study by the Massachusetts Division of Marine Fisheries. This new baseline documented Pleasant Bay's role as spawning and nursery habitat for a variety of commercially, recreationally, and ecologically important marine animals. Despite the intrinsic value of baseline assessments, they remain a "snapshot" in time, with limited utility for elucidating the causes of decadal scale ecosystem change.

There are also a host of other organizations conducting research on various physical and biological components of the Bay's ecosystem. The PBA coordinates a water-quality monitoring program that has generated a 20+-year time series of environmental data. Town, state, and Federal (e.g., NPS/CCNS) natural resource management is supported by a variety of species- or habitat-specific data collection efforts by agencies and partner organizations that occur on various spatial and temporal scales in Pleasant Bay. The PBA also sponsors annual tide monitoring, implemented by CCS. The work of the PBA to update the PBRMP and produce a coastal resource guide has provided a relatively comprehensive inventory of data. However, the potential to fully leverage the work of other researchers and practitioners to coordinate data collection or combine datasets for analysis at an ecosystem level was unrealized due in large part to a lack of peer-to-peer interaction. While the PBA and other groups have convened topical workshops on fisheries resources or other issues, the last regional scientific meeting focused on Pleasant Bay as an ecosystem was held in 2006. Since then, many studies have been completed, and the priorities of the PBRMP and other resource management efforts have evolved. A regional workshop or "mini-conference" presented a significant opportunity to gather researchers and practitioners from. Multiple organizations to share and compile a comprehensive inventory of research conducted to date in a collegial and collaborative setting.

## **Workshop**

Following COVID-19 pandemic-related postponement from fall 2021, we held the mini-conference, "The Pleasant Bay Ecosystem: Past, Present and Future," Saturday 3/26/2022 at the Chatham Community Center. Forty-six people attended the workshop which featured a keynote address, twelve oral presentations, two panel discussions, and a poster session (agenda attached). Following introductory remarks and background from the organizers, the keynote speaker provided a historical retrospective of human interactions with Pleasant Bay, from exploration and exploitation to conservation. The first two oral presentation sessions focused on research on the Bay's physical environment and benthic habitats, which was followed by a panel discussion of the role of science in support of natural resource management of the Bay. The second session included presentations on water quality, shellfish populations, and fisheries habitat before transitioning to a focus on climate change resilience, habitat restoration, and community science and education. A second panel discussion explored the pathway to future ecosystem-level monitoring. The mini-conference was followed by a closing social at Pleasant Bay Community Boating, including a campus tour and viewing of the solar-powered research vessel R/V *Friend of Pleasant Bay*.

Throughout the day, a number of common themes emerged during presentations and panel discussions, including the value of long-term data sets (and the need for more, as opposed to

“snapshots”) to understand the synergistic effects of multiple stressors leading to change and degradation of the Bay’s habitats. Participants highlighted the value of collaboration and integrating both new and existing data sets. Interannual variability in natural and anthropogenic processes confounds analyses of long-term change, as do differences in lengths and resolution of existing time series, which create challenges for trend analysis and comparisons across habitats using existing data. A number of gaps were identified in existing data (e.g. the lack of phytoplankton sampling), but several overlapping or parallel data collection efforts were identified, such as municipal and federal water quality monitoring efforts in adjacent parts of the Bay. The latter exercise highlighted the value of communication and collaboration, and the need to get out of the ‘silos’ that can be created based on agency science or management objectives. Participants identified the need for organizational structure and centralized databases, both to inventory existing data as well as to support future integrated ecosystem monitoring, with standardized metrics and indicators. Discussion focused on the need for larger-scale, multi-disciplinary monitoring to support coastal resilience and habitat restoration in a climate change context. Attendees highlighted the value of monitoring more than single ecosystem components, noting the need to examine the relationships between components and how those change over time, especially in the context of multiple stressors like climate change and nutrient pollution, and to measure success of our efforts to repair damage caused by anthropogenic impacts as well via habitat restoration and conservation.

Discussion also focused on the value of science communication, including to elected officials, for decision-making across town and park boundaries, as well as procurement of funding for research. A need was identified for consistent and effective messaging to address the need (and funding challenges) for monitoring. Participants noted the importance of community involvement and citizen science, and the need to foster collaboration around the Bay in both science and education. Finally, for many attendees, this workshop was their first meeting of its kind since the beginning of the COVID-19 pandemic, and they shared hearty enthusiasm for the return to in-person events. A full video recording of the meeting, courtesy of the Town of Chatham, is available at: <https://www.youtube.com/watch?v=dJvMlhGAX0E>

## **Conclusions and Next Steps**

The enhanced understanding of the present level of knowledge and identification of priorities for future work will allow us to develop a long-term, interdisciplinary monitoring program that ties together and builds upon work by the numerous stakeholders and practitioners in the Pleasant Bay watershed. While the threats human activities pose to the Bay’s ecosystems are evolving, several habitat preservation and restoration efforts are underway. For example, the four watershed towns are investing millions of dollars implementing sewerage and other measures to reduce watershed nitrogen load and achieve threshold loads consistent with a healthy estuary. In 2016, a significant habitat restoration project was implemented, connecting the waterways of Pleasant Bay and Muddy Creek for the first time in over 100 years, and beginning the tidal restoration process to restore 55 acres of wetlands. Restoration work is also planned for Sipson Island, a partially developed and newly conserved 24-acre island in the center of the Bay, and Frost Fish Creek, another tidally-restricted system. While there are individual environmental

analyses associated with these various projects, concerted efforts to examine their collective effects on the larger Pleasant Bay watershed at an ecosystem level need to be expanded. In this landscape of climate change and habitat recovery/restoration, the need for research coordination and long-term monitoring at an ecosystem scale is readily apparent.

Following the workshop, the Pleasant Bay Alliance was awarded a Municipal Vulnerability Preparedness (MVP) Action Grant to develop a Pleasant Bay Climate Adaptation Action Plan. The project responds to multiple top resilience threats and priority resilience actions identified in each of the four towns' MVP plans. Project partners include: Center for Coastal Studies, Wright-Pierce, Barnstable County Cooperative Extension, and Cape Cod National Seashore. The Pleasant Bay Climate Adaptation Action Plan will (1) use the best available science and research tools to assess climate threats to barrier beach, salt marsh, eelgrass meadows, shoreline intertidal resources, public access points, and stormwater and wastewater management infrastructure in Pleasant Bay; (2) identify adaptation solutions that maximize use of nature-based approaches to enhance the resilience of those resources and assets and (3) engage stakeholders in the four surrounding communities, including climate vulnerable populations, in understanding climate threats and developing a Climate Adaptation Action Plan prioritizing resilience strategies and actions.

Some of the conversations begun at the March 2022 workshop have continued as part of the Pleasant Bay Climate Adaptation Action Plan process. Findings from the workshop have been shared via presentations to local organizations including the Friends of Pleasant Bay and town committees such as the Orleans Shellfish and Waterways Committee. Research questions discussed during the workshop, e.g., exploring the causes of poor quahog survival in the Bay, have begun to be explored by community partners. Building on the momentum established by the workshop to **continue conversations and develop new collaborations** will greatly enhance the capacity to understand the Bay at an ecosystem level. The workshop identified many **partnership opportunities for research and education** among private, municipal, state and federal organizations.

This workshop builds on the recommendations of the CCS assessment and the PBRMP updates that a comprehensive, ecosystem-level long-term monitoring program be developed for Pleasant Bay. To quote Nate Sears, Natural Resources Manager of the town of Orleans regarding the CCS assessment of Pleasant Bay, "I don't want to wait another 30 years, and I don't want your snapshots!" Future sampling and monitoring will further unlock links between seasons, habitats and abundances and will allow us to connect them to the influences of human actions affecting Pleasant Bay. As the habitat changes, inlets shift, sea levels rise and temperatures warm, both the species composition of Pleasant Bay communities and the distribution of habitats will change. Therefore, and in order to trace and mitigate any impacts caused by human action, it is necessary to develop a robust monitoring plan as the basis for strong ecosystem-based management. **Long-term monitoring is an essential component of a holistic, ecosystem-level approach to conservation, research, education and management as we maintain our relationship with this dynamic ecosystem in a changing climate.**

## **Resources**

Hughes, P.E. and A. Mittermayr, eds. 2018. Interdisciplinary Multi-scale Marine Ecosystem Assessment: Pleasant Bay, Cape Cod, Massachusetts. Final Report to the Friends of Pleasant Bay. August 2018. <https://coastalstudies.org/interdisciplinary/>

Pleasant Bay Alliance: <https://pleasantbay.org/>

Pleasant Bay Alliance. 2020. Pleasant Bay resource management plan: 2018 update (revised 2020). <https://pleasantbay.org/wp-content/uploads/RMP-2018-REv-2020-final.pdf>

## **Acknowledgements**

Ali Hogue and volunteers from PBCB assisted with conference and meeting-related tasks, service members from AmeriCorps Cape Cod assisted with conference execution, and Town of Chatham staff provided facilities and A/V support and a video recording of the conference. The idea for this workshop was in part inspired by Herb Heidt and Mon Cochran (FOPB) who suggested the idea of sharing the results of CCS research in the Bay with the local scientific community and the public, and more recently Bob Granger and others on the FOPB ad hoc science committee, asking important questions while working to define priorities for future funding. This workshop and the project, “Ecosystem Research in the Pleasant Bay Watershed: The State of the Science and the Future of Monitoring,” was supported by a Southeast New England Program (SNEP) Watershed Grant. SNEP Watershed Grants are funded by the U.S. Environmental Protection Agency (EPA) through a collaboration with Restore America’s Estuaries (RAE).

**Mini-conference, “The Pleasant Bay Ecosystem: Past, Present and Future,” Saturday 3/26/22, Chatham Community Center**

*\*\*\*\*Coffee and light refreshments will be provided, please bring a lunch and reusable water bottles/coffee mugs!*

| Time              | Event                           | Speaker/Panelist(s)   | Presentation/Panel Title  |
|-------------------|---------------------------------|---|---|
| 8:30 AM           | Coffee and Registration         |   |   |
| 9:00-9:15 AM      | Introductory Remarks            | Sarah Griscom, Owen Nichols, Carole Ridley  |   |
| 9:15-9:30 AM      | Keynote Presentation            | Alan McClennen  | Sutcliff's Inlet to a Friend of Pleasant Bay--How Has Our Bay Changed Over the Last 400 Years?  |
| 9:30-9:45 AM      | Oral Presentation Session 1     | Mark Borrelli   | Understanding Sediment Transport on the Outer Beach and its Implications for the Future of Pleasant Bay's Barrier Beaches             |
| 9:45-10:00 AM     |                                 | Graham Giese  | Long Term Tidal Studies in Pleasant Bay and Adjacent Areas  |
| 10:00-10:15 AM    |                                 | Greg Berman   | Living Shoreline Suitability Analysis for Pleasant Bay  |
| 10:15-10:30 AM    | Coffee Break and Poster Session | Coffee/Light Refreshments Provided  |   |
| 10:30-10:45 AM    | Oral Presentation Session 2     | Holly Plaisted  | Predicting Seagrass Vulnerability to Environmental Conditions Under Changing Temperature Regimes in Pleasant Bay                      |
| 10:45-11:00 AM    |                                 | Agnes Mittermayr  | Getting to the Bottom of it - the Sediments and Benthic Invertebrates of Pleasant Bay   |
| 11:00-11:15 AM    |                                 | Sophia Fox  | Towards Understanding Relationships Among Ecosystem Components: a Submerged Habitat Study in Pleasant Bay, Cape Cod National Seashore |
| 11:15 AM-12:00 PM | Panel Discussion 1              | Bob Duncanson, Chris Miller, Heinz Proft, Geoff Sanders (moderator: Charlie Sumner) | Science to Support Natural Resource Management in Pleasant Bay  |
| 12:00-1:00 PM     | Lunch and Poster viewing        | Bring a bag lunch!  |   |



|              |                                 |  |   |
|--------------|---------------------------------|--|---|
| 1:00-1:15 PM | Oral Presentation Session 3     | Bob Duncanson  | Pleasant Bay Water Quality  |
| 1:15-1:30 PM |                                 | Josh Reitsma   | Ups and Downs in Almost Two Decades of Oyster and Quahog Seed Growth and Survival Data from Pleasant Bay                |
| 1:30-1:45 PM |                                 | Owen Nichols   | Fisheries Habitat Research in Pleasant Bay  |
| 1:45-2:00 PM | Coffee Break and Poster Session | Coffee/Light Refreshments Provided   |   |
| 2:00-2:15 PM | Oral Presentation Session 4     | Carole Ridley  | Climate Resilience in Pleasant Bay: A System-wide Approach  |
| 2:15-2:30 PM |                                 | Bob Duncanson  | Pleasant Bay Habitat Restoration – Muddy Creek Bridge Project   |
| 2:30-2:45 PM |                                 | Sarah Griscom  | Marine Science for All: Building Affordable, Accessible and Timely Community Programs at Pleasant Bay Community Boating |
| 2:45-3:30 PM | Panel Discussion 2              | Rachel Hutchinson, Ted Keon, Agnes Mittermayr, Carole Ridley (moderator: Pat Hughes) | The Future of Ecosystem-Level Monitoring in Pleasant Bay  |
| 3:30-3:45 PM | Closing Remarks                 | Owen Nichols   |   |

The mini-conference will conclude with an informal closing social held on the Pleasant Bay Community Boating (PBCB) campus, featuring a campus tour, including a look at the solar-powered R/V *Friend of Pleasant Bay*. The “*Friend*” is a unique, cutting-edge research vessel and educational platform that was designed with future monitoring of the Pleasant Bay ecosystem in mind. Light refreshments will be served - the PBCB campus is at 2287 Route 28, Harwich, MA 02645.

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Organizers:

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Sarah Griscom and Ali Hogue (Pleasant Bay Community Boating)

Carole Ridley (Pleasant Bay Alliance)