

Ecosystem Research in the Pleasant Bay Watershed: The State of the Science and the Future of Monitoring

SNEP Watershed Grants Final Report



Prepared by the Center for Coastal Studies

1/31/2023

Executive Summary

Project Narrative

Project leader and CCS Interdisciplinary Research Coordinator Owen Nichols and Pleasant Bay Community Boating (PBCB) Science Director Dr. Sarah Griscom worked with Carole Ridley of the Pleasant Bay Alliance (PBA) to plan a workshop to advance local and peer-to-peer learning and develop the foundation for a long-term ecosystem-level monitoring program to support the restoration of clean water and a healthy coastal ecosystem in the Pleasant Bay watershed. Scientists and natural resource managers from several organizations in the region were contacted, and a workshop date was set for October 9, 2021 based on their input. A room at the Chatham Community Center was reserved, and a 'Save the Date' announcement was drafted for circulation. Following COVID-19 pandemic-related postponement from fall 2021, the mini-conference, "The Pleasant Bay Ecosystem: Past, Present and Future," was held 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*. A workshop report was drafted and subsequent community engagement was conducted to maintain momentum towards development of an ecosystem-level monitoring program.

Project Results

Background

Pleasant Bay (Cape Cod, Massachusetts; Figure 1) 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. 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. Every five years (most recently in 2018), the PBA updates the plan 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 amount of anthropogenic nitrogen in the Bay's watershed by 50% in order to comply with state regulations.

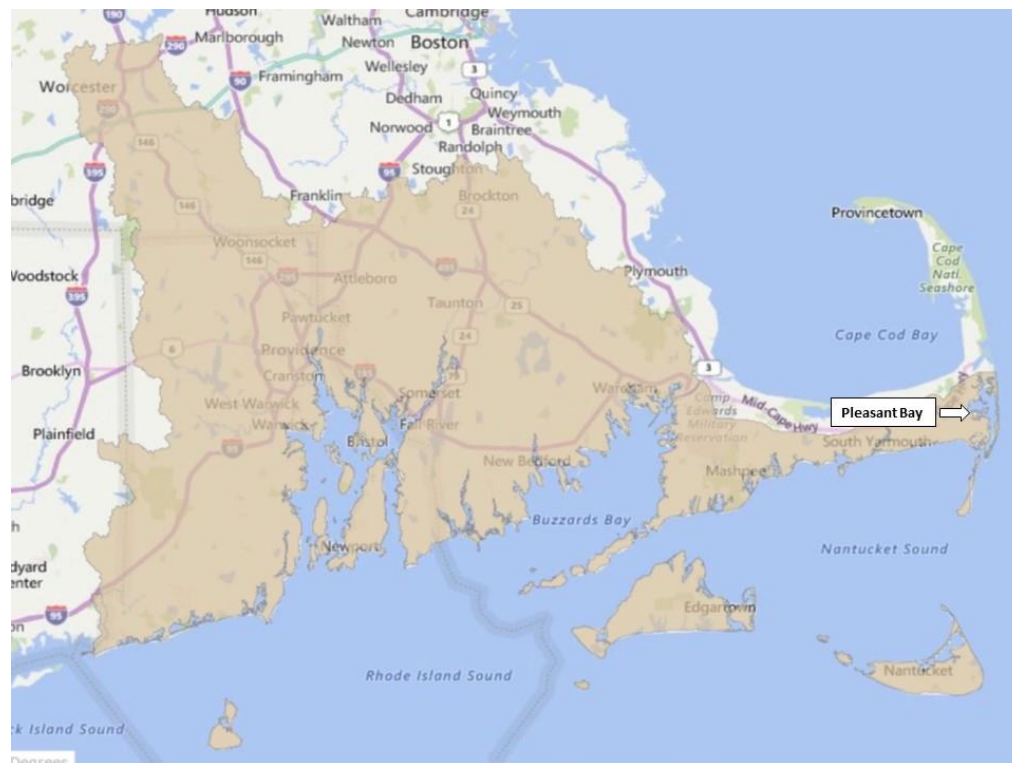


Figure 1. Pleasant Bay is located at the eastern extent of the SNEP region.

Based on the plan’s recommendations and in coordination with PBA the Center for Coastal Studies (CCS) to conduct 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 assessing the present status of the natural resources of Pleasant Bay that can be used to develop a long-term habitat monitoring program. 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 since a 50-year old 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. While the work of the PBA to update the PBRMP and produce a coastal resource guide has provided a relatively comprehensive inventory of data, there is rarely an effort to coordinate data collection or combine datasets for analysis at an ecosystem level, due in large part to a lack of peer-to-peer interaction among regional

researchers and practitioners. 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 changed. A regional workshop or “mini-conference” was needed to provide a comprehensive inventory of research conducted to date, and more importantly, create an environment that fosters collaboration.

Workshop/Mini-Conference

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. 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>

Challenges and Changes to Scope of Work

The COVID-19 pandemic and associated impacts on peer-to-peer engagement made this project especially challenging. The organizers were confronted with the challenge of holding an in-person event while managing uncertain risk to public health in a pandemic, causing the workshop to be postponed multiple times during the grant period. Formation of an in-person working group involving partners from nonprofits and municipal/federal agencies in a time of evolving schedules, working hours and locations, and workloads, proved an unsurmountable goal during the grant period. Based on input from workshop attendees and the broader community, rather than forming a working group, we focused on disseminating the results of the workshop and fostering new community partnerships, translating the workshop's findings directly into action (see below).

Next Steps and Recommendations

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, 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 environmental analyses associated with these various projects, there are no concerted efforts to examine their effects on the larger Pleasant Bay watershed at an ecosystem level. 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 Town of Chatham will administer the grant as the fiscal agent for the Alliance. The project responds to multiple top resilience threats and priority resilience actions identified in each of the four towns' MVP plans. Project partners include: CCS, 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 above Pleasant Bay Climate Adaptation Action Plan process. Research questions discussed during the workshop have begun to be explored by community partners, e.g., exploring the causes of poor quahog survival in the Bay via studies of green crab diet and predation behavior. Communication has been initiated between NPS scientists and conservation practitioners seeking to protect eelgrass while restoring island habitat. Natural resource managers in towns adjacent to the Pleasant Bay watershed have taken note of the workshop's findings and called for comparative studies; one citizen even proposed that the adjacent Nauset Marsh system be designated an ACEC. 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 update that a comprehensive, ecosystem-level long-term monitoring program be developed for Pleasant Bay. 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.

Volunteer and Community Involvement

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.

Outreach & Communications

A conference webpage was created leading up to the event and a media advisory was issued on 3/15/2022. A video recording of the conference is available on the Town of Chatham community YouTube channel, portions of which were broadcast on local cable television and shared on social media, across a wide demographic: <https://www.youtube.com/watch?v=dJvMlhGAX0E>

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. The final workshop report (draft attached) will be shared on the CCS website.

Budget Report

PI Owen Nichols worked 60 hours (\$41/hr) on Task 1 (workshop) planning and execution, which included coordination with project partners, multiple planning phone calls and meetings, soliciting panelists and presenters, compiling an agenda, as well as co-chairing and facilitating the workshop itself. PI Owen Nichols worked 42 hours (\$41/hr) on Task 3 (reporting), drafting a workshop report (attached), outreach (presentations of the workshop findings and recommendations to regional agencies), and engagement (facilitating follow-up among workshop attendees and regional organizations; see 2.A section, “Challenges and Changes to Scope of Work,” for explanation of the shift from Task 2 to an expanded Task 3). CCS charges 20% fringe on his salary. In general, the COVID-19 pandemic placed more workload on the project PI than was budgeted in order to complete this project. Project partner Pleasant Bay Community Boating (PBCB) assisted with workshop planning and execution, but did not host working group meetings; the reduced amount in the budget category “other” reflects this shift in emphasis from Task 2 to Task 3. The slightly reduced “supplies” expenditure reflects a cost savings relative to that estimated for coffee and refreshments for the mini-conference. An indirect cost rate of 25% was applied to the above costs and the balance of CCS’ 53.7% NICRA was provided as in-kind matching funds. Please see tables above. At the time the contract was signed, CCS had an unaudited indirect rate of 53.7%. In September 2022 the DoI issued a new NICRA for 31.6%, backdated to January 1, 2021, which reduced budgeted indirect match from \$2,801 to \$909. The match reported in this final report reflects that new rate. Additional in-kind match was provided by PBCB.

Table 1. Expenditures by federal cost category. Match source: in-kind.

Budget category	Total budgeted funds	Total budgeted match	Grant funds expended - this period	<i>Grant funds expended - cumulative</i>	Match funds expended this period	<i>Match funds expended - cumulative</i>
Personnel						
Nichols - 42 hrs @ \$41/hr	3,280		1,722.00	<i>4,182.00</i>		
Fringe - 20% of salary	656		344.40	<i>836.40</i>		
Travel						
Equipment						
Supplies	500		327.98	<i>327.98</i>		
Contractual						
Other	2,751	1,375	1,840.00	<i>1,840.00</i>	1,375.00	<i>1,375.00</i>
Total Direct	7,187	1,375	4,234.38	<i>7,186.38</i>	1,375.00	<i>1,375.00</i>
Indirect	1,797	2,801.00	1,058.60	<i>1,796.60</i>	61.58	<i>908.80</i>
Total	8,984	4,176	5,292.98	<i>8,982.98</i>	1,436.58	<i>2,283.80</i>

Table 2. Expenditures by task.

Budget Category	Budgeted Grant Funds	Expended Progress Period 1	Expended Progress Period 2	Expended Progress Period 3	Expended Progress Period 4	Expended Progress Period 5	Actual Expended to Date
Task 1 - Workshop				\$1,230	\$2,460		\$3,690
Task 2 - Working Group							
Task 3 - Reporting						\$5,293	\$5,293
Total				\$1,230	\$2,460	\$5,293	\$8,983

Acknowledgements

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).

SNEP Watershed Grants Final Report

0. Executive Summary

See front matter.

1. Cover Information

Date: 1/31/2023

Project Name: Ecosystem Research in the Pleasant Bay Watershed: The State of the Science and the Future of Monitoring

Contract Number: SNEPWG20-10-CCS

Grant and Reporting Period: October 1, 2020 – December 31, 2022

Grantee Organization: Center for Coastal Studies (CCS)

Report Contact Person/Project Leader: Owen C. Nichols; Interdisciplinary Research Coordinator

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Reporting Period: 10/1/2020 – 12/31/2022

Report Type: Final

2. Project Report Narrative

Project leader and CCS Interdisciplinary Research Coordinator Owen Nichols and Pleasant Bay Community Boating (PBCB) Science Director Dr. Sarah Griscom worked with Carole Ridley of the Pleasant Bay Alliance (PBA) to plan a workshop to advance local and peer-to-peer learning and develop the foundation for a long-term ecosystem-level monitoring program to support the restoration of clean water and a healthy coastal ecosystem in the Pleasant Bay watershed.

Scientists and natural resource managers from several organizations in the region were contacted, and a workshop date was set for October 9, 2021 based on their input. A room at the Chatham Community Center was reserved, and a ‘Save the Date’ announcement was drafted for circulation. Following COVID-19 pandemic-related postponement from fall 2021, the mini-conference, “The Pleasant Bay Ecosystem: Past, Present and Future,” was held 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. A workshop report was drafted and subsequent community engagement was conducted to maintain momentum towards development of an ecosystem-level monitoring program.

2.A. Project Results

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.

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Based on the plan's recommendations and in coordination with PBA the Center for Coastal Studies (CCS) to conduct 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 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 since a 50-year old 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.

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working group involving partners from nonprofits and municipal/federal agencies in a time of evolving schedules, working hours and locations, and workloads, proved an unsurmountable goal during the grant period. Based on input from workshop attendees and the broader community, rather than forming a working group, we focused on disseminating the results of the workshop and fostering new community partnerships, translating the workshop's findings directly into action (see below).

2.B. Next Steps and Recommendations

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, 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 environmental analyses associated with these various projects, there are no concerted efforts to examine their effects on the larger Pleasant Bay watershed at an ecosystem level. 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.

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Some of the conversations begun at the March 2022 workshop have continued as part of the above Pleasant Bay Climate Adaptation Action Plan process. Research questions discussed during the workshop have begun to be explored by community partners, e.g., exploring the causes of poor quahog survival in the Bay via studies of green crab diet and predation behavior. Communication has been initiated between NPS scientists and conservation practitioners seeking to protect eelgrass while restoring island habitat. Natural resource managers in towns adjacent to the Pleasant Bay watershed have taken note of the workshop's findings and called for comparative studies; one citizen even proposed that the adjacent Nauset Marsh system be

designated an ACEC. 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 update that a comprehensive, ecosystem-level long-term monitoring program be developed for Pleasant Bay. 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.

2.C. Compliance

No Quality Assurance Project Plan or permits were required for this project.

2.D. Project Partners

Project leader and CCS Interdisciplinary Research Coordinator Owen Nichols worked with Pleasant Bay Community Boating (PBCB) Science Director Dr. Sarah Griscom on conference planning, in coordination with Carole Ridley (PBA).

2.E. Volunteer and Community Involvement

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.

2.F. Outreach & Communications

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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. The final workshop report (draft attached) will be shared on the CCS website.

3. Project Budget Report

3.A. Summary Budget Tables

Table 1. Expenditures by federal cost category. Match source: in-kind.

Budget category	Total budgeted funds	Total budgeted match	Grant funds expended - this period	<i>Grant funds expended - cumulative</i>	Match funds expended this period	<i>Match funds expended - cumulative</i>
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Equipment						
Supplies	500		327.98	<i>327.98</i>		
Contractual						
Other	2,751	1,375	1,840.00	<i>1,840.00</i>	1,375.00	<i>1,375.00</i>
Total Direct	7,187	1,375	4,234.38	<i>7,186.38</i>	1,375.00	<i>1,375.00</i>
Indirect	1,797	2,801.00	1,058.60	<i>1,796.60</i>	61.58	<i>908.80</i>
Total	8,984	4,176	5,292.98	<i>8,982.98</i>	1,436.58	<i>2,283.80</i>

Table 2. Expenditures by task.

Budget Category	Budgeted Grant Funds	Expended Progress Period 1	Expended Progress Period 2	Expended Progress Period 3	Expended Progress Period 4	Expended Progress Period 5	Actual Expended to Date
Task 1 - Workshop				\$1,230	\$2,460		\$3,690
Task 2 - Working Group							
Task 3 - Reporting						\$5,293	\$5,293
Total				\$1,230	\$2,460	\$5,293	\$8,983

3.B. Budget Narrative

PI Owen Nichols worked 60 hours (\$41/hr) on Task 1 (workshop) planning and execution, which included coordination with project partners, multiple planning phone calls and meetings, soliciting panelists and presenters, compiling an agenda, as well as co-chairing and facilitating the workshop itself. PI Owen Nichols worked 42 hours (\$41/hr) on Task 3 (reporting), drafting a workshop report (attached), outreach (presentations of the workshop findings and recommendations to regional agencies), and engagement (facilitating follow-up among workshop attendees and regional organizations; see 2.A section, “Challenges and Changes to Scope of Work,” for explanation of the shift from Task 2 to an expanded Task 3). CCS charges 20% fringe on his salary. In general, the COVID-19 pandemic placed more workload on the project PI than was budgeted in order to complete this project. Project partner Pleasant Bay Community Boating (PBCB) assisted with workshop planning and execution, but did not host working group meetings; the reduced amount in the budget category “other” reflects this shift in emphasis from Task 2 to Task 3. The slightly reduced “supplies” expenditure reflects a cost savings relative to that estimated for coffee and refreshments for the mini-conference. An indirect cost rate of 25% was applied to the above costs and the balance of CCS’ 53.7% NICRA was provided as in-kind matching funds. Please see tables above. At the time the contract was signed, CCS had an unaudited indirect rate of 53.7%. In September 2022 the DoI issued a new NICRA for 31.6%, backdated to January 1, 2021, which reduced budgeted indirect match from \$2,801 to \$909. The match reported in this final report reflects that new rate. Additional in-kind match was provided by PBCB.

4. Supporting Materials

Conference report attached. A video recording of the conference is available on the Town of Chatham community YouTube channel: <https://www.youtube.com/watch?v=dJvMlhGAX0E>

5. Certification

The undersigned verifies that the descriptions of activities and expenditures in this final report are accurate to the best of my knowledge; and that the activities were conducted in agreement with the grant contract. I certify that the matching fund levels established in the grant contract and reported here have been met.

Grantee Signature:

A handwritten signature in black ink, appearing to read "Owen Nichols", written over a light gray rectangular background.

Job Title: Interdisciplinary Research Coordinator

Date: 1/31/2023

Organization: Center for Coastal Studies