



## 2018 SPEAKER ABSTRACTS

### **THOMAS (Tom) C. CAMBARERI**

**Title:** The Occurrence of Poly and Per Fluoro Alkyl Substances (PFAS) in Cape Cod Groundwater

**Summary:** The occurrence of PFAS is the subject of recent discovery, and growing response for assessment and risk reduction throughout the globe. The EPA conducted a National Listening Tour in the Fall of 2018 to formulate needed policy and regulatory direction. This presentation will focus on the occurrence of PFAS in groundwater at several sites on Cape Cod. The presentation will provide a brief introduction of the PFAS compounds, their discovery, the status and findings of groundwater and surface water assessments and risk reduction efforts. The challenges to assess and cleanup PFAS sites will be discussed.

### **JENNIFER CLINTON**

**Title:** Protect, Accommodate, or Retreat? Integrating Adaptation Strategies and Ecosystem Services into the Cape Cod Coastal Planner

**Summary:** The Cape Cod Commission and several partner agencies were awarded a 3-year NOAA grant in 2015 to develop a decision support tool around climate change adaptation for Cape Cod. The Resilient Cape Cod project investigated the environmental and socio-economic effects of **coastal resiliency strategies in three phases:**

- Data Collection and Development of the Adaptation Strategies Database
- Public Engagement and Socio-Economic Analysis
- Design and Development of the Decision-Support Tool

Jennifer Clinton, Special Projects Coordinator at the Commission, and April Wobst, Restoration Ecologist at the Association to Preserve Cape Cod, will highlight the adaptation strategies research, present the latest version of the Cape Cod Coastal Planner, and discuss its role in enhancing conversations about adaptation in Cape Cod communities.

Link to Resilient Cape Cod Project <http://www.capecodcommission.org/index.php?id=631>

### **MARC DRAINVILLE**

**Title:** Strategies for removing contaminants of emerging concern at municipal wastewater treatment facilities

**Summary:** Marc's presentation will focus on technologies that can be considered when CEC removal is desired or required. He will also review a few case studies with regard to CEC removal.

### **BRIAN DUDLEY, MICHAEL, GIGGEY, CAROLE RIDLEY**

**Title:** Hatching a Watershed Permit: A Pleasant (Bay) Experience

**Summary:** In August 2018, MassDEP issued a first-of-its-kind Massachusetts watershed permit. This presentation describes what the permit is, how it came to be and why this is a blueprint for the future of watershed planning and permitting.

### **ASHLEY FISHER**

**Title:** Water Quality Improvement from Quahog Fishery Restoration and Oyster Aquaculture in the Waquoit Bay System

**Speakers:** Richard York and Ashley Fisher

**Summary:** The Town of Mashpee MA Comprehensive Watershed Nitrogen Management Plan (CWNMP) to restore water quality in the estuaries by reducing nitrogen calls for shellfish aquaculture/fishery restoration and new sewers/wastewater treatment infrastructure. Nitrogen reductions required to meet the total maximum daily maximum load of nitrogen limits (TMDL-N) and total nitrogen (TN) concentrations to restore water quality are based on the Massachusetts Estuaries Project (MEP) reports. In the Great River, Little River, Hamblin Pond and Jehu Pond area (DMF SC-16) of the Waquoit Bay estuarine system, the annual reduction required is 5.76 metric tons of nitrogen (MT N). The CWNMP estimates that annual fishery harvest of an additional 19.2 million quahog clams at an average live weight of 60 grams (littlenecks) would remove 5.76 MT N based on measurements of the nitrogen content of quahogs in the area (N content = 0.5 % live weight). From 2014 to 2016, the Town planted a total of 9.9 million quahog seed in the SC-16 area (including only 0.5 million in Jehu Pond). Very small seed (2 mm) hatchery produced seed was grown in upwellers and trays to larger sizes (15 to 25 mm) for increased survival before planting in the fall. Trapping invasive green crabs reduced predation. An oyster aquaculture farm in Hamblin Pond had 0.5 million oyster seed in 2017 that contributed a small fraction of the nitrogen reduction. In 2017, summer water quality monitoring data showed improvement with total nitrogen concentration reduced by 35% of the amount needed to meet the target (0.38 mg/L TN) in Great River, Little River and Hamblin Pond compared to 2016. In other areas, total nitrogen increased and water quality was worse in 2017 (TN >2X higher in mid Moonakis River) as the nitrogen load increased from ground water flow and runoff. There was twice as much rainfall in 2017 compared to 2016.

### **DR. JIM HANEY**

**Title:** Utilizing the ecology of cyanobacteria to address problems of cyanotoxins in lakes

**Summary:** This presentation will provide an overview of cyanobacteria ecology, freshwater vs. marine, nutrient requirements and food web considerations. It will also address health and environmental problems associated with toxic cyanobacteria and new methods and approaches being utilized to monitor toxic cyanobacteria and engage citizens in the process.

### **GEORGE HEUFELDER**

**Title:** An Overview of Onsite Septic System Performance and Update on Research on Promising New Approaches

**Summary:** This presentation will provide an overview of different types of onsite septic systems being tested at the Massachusetts Alternative Septic System Test Center (MASSTC), a division of the Barnstable County Department of Health and Environment, and results of their performance as it relates to nitrogen removal.

### **SHANNON HULST JARBEAU**

**Title:** Mapping Stormtide Pathways on Cape Cod Bay: A New Flood Mapping and Preparedness Project

**Summary:** Barnstable County and the Center for Coastal Studies have partnered to bring stormtide pathway mapping to Cape Cod Bay. This advanced flood mapping will provide useful information for planning, emergency response, and flood safety.

### **LEALDON LANGELY**

**Title:** Update on Regulations for Land Subject to Coastal Storm Flowage and Thoughts on Resiliency Planning

## **ELISE LEDUC**

**Title:** Innovative use of SLAMM to project wetland changes due to tidal restoration to guide adaptive management decisions for the Herring River Estuary

**Summary:** The Herring River Estuary is a 1000+ acre system located on outer Cape Cod. It has been physically separated from Wellfleet Harbor for over a century by a compound dike system, which has dramatically reduced its tidal range and water circulation, and resulted in significant degradation of the ecological functions and values of the marsh. The Herring River Restoration Committee has developed a comprehensive adaptive management strategy to restore this system. As part of that strategy, a targeted ecological modeling effort was undertaken to improve the understanding of how wetland types and vegetation within the system will respond and change to the alterations in tidal regime planned as part of the restoration. Although the Sea Level Affecting Marshes Model (SLAMM) was originally designed to simulate the dominant processes involved with wetland conversions due to sea-level rise, because water level is the driving factor within SLAMM, by specifying the tidal range resulting from various tide gate openings this model could be used in a unique approach to evaluate how the vegetation will respond to changes in water level due to altering man-made structures, rather than the water level increases projected to occur through sea-level rise. Such simulations were completed for 17 different adaptive management gate opening scenarios. Results from these analyses provide restoration managers with the change in total acres of each wetland type, as well as raster-based map outputs to visualize and evaluate site-specific changes for each gate opening scenario. These data will also feed directly into a broader 38-measurement endpoint decision tool to guide adaptive management decisions, which calls for predictions such as habitat areas and viewscapes. Additionally, these results can assist managers in choosing gate openings that produce desirable equilibrium habitat conditions, identifying gate opening scenarios that may require secondary management actions, and eliminating gate opening alternatives that are too small to affect any meaningful change.

## **MARGOT MANSFIELD**

**Title:** MVP Program: Empowering Communities to Address Climate Resilience From Planning to Implementation

**Summary:** Learn about the Commonwealth's Municipal Vulnerability Preparedness (MVP) Program and how Cape Cod communities are engaging in climate resilience. This presentation will cover an overview of the MVP Program, the status of Cape communities engaged in planning and implementation grants, and how communities are incorporating nature-based solutions into the planning process and beyond.

## **ALYSON McCANN**

**Title:** Sources, Transport, Exposure and Effects of Poly- and Perfluoroalkyl Substances: A Program Update Focusing on Cape Cod Efforts

**Summary:** Funded in 2017 by the National Institute of Environmental Health Sciences Superfund Research Program, STEEP is a partnership of the University of Rhode Island; Harvard T.H. Chan School of Public Health, Department of Environmental Health; and Silent Spring Institute. STEEP consists of research and its translation for a variety of audiences, graduate training, and community engagement that is focused on Cape Cod. This presentation will include an overview of the STEEP Program; the class of chemicals known as PFASs including sources, exposure, and their potential health effects; what is known about PFAS contamination in Cape Cod drinking water; and STEEP's efforts to test for PFASs in private drinking water wells on Cape Cod.

## **SEAN McNALLY**

**Title:** The Massachusetts Shellfish Initiative (MSI): Developing A State-Wide Plan For Maximizing Economic, Environmental, and Social Benefits of Shellfish Resources in Massachusetts

**Summary:** The MSI is an iterative and collaborative process that was started and is currently led by the Cape Cod Commercial Fishermen's Alliance, Massachusetts Aquaculture Association, and The Nature Conservancy. In 2017 the project partners identified issues, concerns, interests, and commonalities, across various shellfish resource users to confirm broad support for the concept. Since then the initiative has successfully recruited 18 shellfish community leaders and managers who represent the Commonwealth of Massachusetts Environmental Secretariat, state agencies, elected and appointed municipal representatives, fisheries and aquaculture trade associations, and members of the Massachusetts Legislature to serve as the initiative's task force. The project has also identified over 30 potential shellfish stakeholders to serve on three sub-committees whose work will lead to the formulation of the initiative's recommendations associated with coastal community interests, resource development and strategic plan developed by the task force. The initiative's primary goal is to work to balance growing and competing demands for shellfish resources, including the development of new regulations, and various recommendations of strategies and tactics (built from the industry) that can be implemented to make progress towards creating resilient shellfish resources and environments across the state. The partners have studied other states' shellfish initiatives and are implementing the most effective pieces of each state's process in order to provide goals and guidance for how the state and towns should balance growing and competing demands for shellfish resources.

## **SEAN O'BRIEN**

**Title:** *Panelist*

**Summary:** Lessons Learned during the 2018 Winter Storm Season. From a coastal flooding event in January to four events in March we will discuss sheltering, power restoration and flood mapping

## **MAGGIE PAYNE**

**Title:** Coastal Zone Soil Survey

**Summary:** The USDA Natural Resources Conservation Service (NRCS) is the lead agency in National Cooperative Soil Survey (NCSS); a group responsible for mapping the soils of the United States. Soil survey maps consist of a 3D dataset that gives properties of soil and geology from the soil surface to a depth of approximately 2 meters (6 feet). Recently, the Coastal Zone Soil Survey initiative has been undertaken by the NCSS in an effort to create a seamless dataset of soils information that encompasses inland soils, marsh and coastal soils, and shallow subaqueous soils to an approximate water depth of 5 meters (15 feet). The goal of a Coastal Zone Soil Survey is to ensure that coastal soil data provided is consistently mapped and represented to better enable users to make spatial assessments of coastal and near-shore assessment and planning activities including blue carbon assessment, shellfish habitat, eelgrass restoration, shoreline erosion risk.

## **JOSHUA REITSMA**

**Title:** Dynamics in Using Shellfish Harvest for Nitrogen Mitigation

**Summary:** This presentation will recap some of the data collected on nitrogen content in harvestable shellfish and potential sources of variation. Also to be touched upon, markets for harvested shellfish are often assumed but when scaling projects to rapidly increase harvest is infrastructure and end disposition being considered adequately.

### **DR. DANIEL ROGERS**

**Title:** Working towards an ecosystem level understanding of how different oyster aquaculture practices alter nitrogen cycling.

**Summary:** Shellfish have been suggested as a potential and/or partial remedy to the coastal nutrient pollution. Oysters, and filter feeders in general, may increase the transfer of particulate carbon and nitrogen from the water column to the sediments where nitrogen may be removed through microbial processes. Here we quantify the removal of nitrogen from the sediments underlying oyster aquaculture systems and begin to describe how nitrogen moves through the ecosystem.

### **BRIDGER RUYLE**

**Title:** Geochemistry of PFAs from historical fire-training activity in surface and groundwater on Cape Cod

**Summary:** Poly- and perfluoroalkyl substances (PFASs) are a class of more than 4,000 compounds manufactured for use in firefighting applications (aqueous film forming foam: AFFF) and other industrial and commercial applications. Human health effect associated with PFAS exposure include immunosuppression, obesity, and cancer. Concentrations of perfluoroalkyl acids (PFAAs) above health advisories have been measured at several locations on Cape Cod. Many PFASs are not known to degrade significantly under environmental conditions, but little is known about the biogeochemical processes that affect PFAS persistence and transformation along groundwater/surface water pathways from contaminated sources to discharge areas. This presentation will describe recent work as a part of the STEEP Superfund Research Center on a well characterized groundwater watershed impacted by AFFF in Mashpee. A former fire-training area served as a continuous source decades after the last AFFF application. The mobility and persistence of perfluoroalkyl acids (PFAAs) and precursor compounds have resulted in a groundwater plume that is kilometers long and discharge of PFASs into lakes, rivers, and the ocean. Surface to groundwater exchange results in a substantial decrease in PFAA precursors and is thought to influence the PFAS composition reaching the ocean. These findings help fill critical knowledge gaps in assessing human health risk associated with exposure to PFASs from AFFF-contaminated sites.

### **CHRISTOPHER SCHILLACI**

**Title:** Management Considerations for Shellfish Aquaculture and Propagation Activities in Massachusetts

**Summary:** The Massachusetts Division of Marine Fisheries (DMF) is responsible for coordinating the environmental review and operational permitting of private shellfish aquaculture and municipal propagation activities in the Commonwealth. DMF works in partnership with coastal municipalities, NGOs, the private industry, and our state and federal partners to ensure private aquaculture and public propagation activities are conducted in a manner that does not result in substantial harm to the environment, protects public health, and limits conflict with other marine user groups. Herein, we will discuss the licensing and permitting requirements for shellfish aquaculture and propagation projects in Massachusetts, and important management considerations when undertaking shellfish planting activities. In addition, we will discuss steps the State is taking to encourage sustainable growth in shellfish aquaculture and propagation activities in the Commonwealth, while continuing to ensure adverse effects on the environment and public trust are minimized.

## **SCOTT SOARES**

**Title:** The Massachusetts Shellfish Initiative (MSI): Developing A State-Wide Plan For Maximizing Economic, Environmental, and Social Benefits of Shellfish Resources in Massachusetts

**Summary:** The MSI is an iterative and collaborative process that was started and is currently led by the Cape Cod Commercial Fishermen's Alliance, Massachusetts Aquaculture Association, and The Nature Conservancy. In 2017 the project partners identified issues, concerns, interests, and commonalities, across various shellfish resource users to confirm broad support for the concept. Since then the initiative has successfully recruited 18 shellfish community leaders and managers who represent the Commonwealth of Massachusetts Environmental Secretariat, state agencies, elected and appointed municipal representatives, fisheries and aquaculture trade associations, and members of the Massachusetts Legislature to serve as the initiative's task force. The project has also identified over 30 potential shellfish stakeholders to serve on three sub-committees whose work will lead to the formulation of the initiative's recommendations associated with coastal community interests, resource development and strategic plan developed by the task force. The initiative's primary goal is to work to balance growing and competing demands for shellfish resources, including the development of new regulations, and various recommendations of strategies and tactics (built from the industry) that can be implemented to make progress towards creating resilient shellfish resources and environments across the state. The partners have studied other states' shellfish initiatives and are implementing the most effective pieces of each state's process in order to provide goals and guidance for how the state and towns should balance growing and competing demands for shellfish resources.

## **MAUREEN THOMAS**

**Title:** West Falmouth Harbor Nitrogen-Reducing Septic System Demonstration Project

**Summary:** In 2014, the Buzzards Bay Coalition and the Town of Falmouth collaborated on an EPA Southeast New England Coastal Watershed Restoration Program grant to fund the West Falmouth Harbor Shoreline Septic Remediation Project that upgraded 20 nearshore septic systems and cesspools to nitrogen-reducing septic systems aimed at helping to restore nitrogen-impaired West Falmouth Harbor. The success of the project led to an ongoing second phase funded by the Cape Cod Water Protection Collaborative to upgrade 10 more septic systems to denitrification systems. This presentation will include information on the West Falmouth Harbor project design, implementation, costs, results, and lessons learned.

## **MEGAN TYRRELL**

**Title:** Update on NERRS Thin Layer Placement Experiment & NERRS Salt Marsh Crab Results

**Summary:** Eight National Estuarine Research Reserves are currently experimenting with sediment addition, aka thin layer placement, to investigate its efficacy for curtailing marsh vegetation and elevation loss in the face of sea level rise. This project is truly on an experimental scale, the plots are 70 cm squared and in most participating NERRS, the sediments were placed in spring 2017. Based on a literature review conducted by the project team, we expect most plants will recover about two years after sediment addition. I will present the project objectives, experimental design and preliminary results for Waquoit Bay NERR including changes in: salt marsh vegetation, elevation and abundance of crab burrows. In addition to the thin layer project, 15 NERRS conducted a large scale crab burrow count and pitfall trap survey in summer of 2017. This data is currently being prepared for publication, but preliminary results for the 15 sites indicate that marsh elevation, distance to creek and soil compressibility are significant predictors of crab distribution within a marsh. These factors also influenced the cover of salt marsh plants, but not in a consistent manner between the 15 Reserves. Our surveys spanned the entire elevation gradient of marsh vegetation and our results contrast with several smaller scale studies where specific components of the marsh ecosystem (e.g. creek banks) were targeted. We conclude that while we failed to detect a significantly negative influence of crabs on marsh vegetation across these 15 Reserves, the negative effects of crabs on marshes is likely to be exacerbated by sea level rise. Eighty percent of the

individual crabs captured are from species that burrow into marsh peat while only 8% of them directly consume marsh vegetation. When only the East Coast Reserves were included in analyses, there was a negative relationship between latitude and burrow density; well as for latitude and species richness. For both the thin layer experiment as well as the crab surveys, the patterns at Waquoit Bay are similar to those of our closest Reserve, Narragansett Bay, which is also microtidal and experiencing loss of marsh integrity as measured common marsh metrics of vegetation cover and elevation change.

### **MICHELLE WEST**

**Title:** Improving Water Quality in the Three Bays through Stormwater Management

**Speakers:** April Wobst (APCC) and Michelle West (Horsley Witten Group)

**Summary:** The Association to Preserve Cape Cod is partnering with the town of Barnstable Department of Public Works, the Barnstable Clean Water Coalition, the Horsley Witten Group and the Barnstable Land Trust on a five-year \$1.2 million project to improve water quality in the Three Bays watershed through better stormwater management. The Three Bays watershed like many coastal estuaries on Cape Cod suffers from the impacts of nutrient and bacteria contamination. High levels of nitrogen result in algal blooms and fish kills and bacteria contamination from pet and wildlife waste causes regular shellfish and beach closures. Stormwater runoff and fertilizers are two important contributors to this problem. This project is addressing this problem through design and installation of green infrastructure stormwater systems, which incorporate the use of plants and soil media to remove nitrogen, bacteria and other pollutants before they wash into the bays. The first two of these low impact design treatment systems are currently under construction.

### **APRIL WOBST**

**Title:** Improving Water Quality in the Three Bays through Stormwater Management

**Speakers:** April Wobst (APCC) and Michelle West (Horsley Witten Group)

**Summary:** The Association to Preserve Cape Cod is partnering with the town of Barnstable Department of Public Works, the Barnstable Clean Water Coalition, the Horsley Witten Group and the Barnstable Land Trust on a five-year \$1.2 million project to improve water quality in the Three Bays watershed through better stormwater management. The Three Bays watershed like many coastal estuaries on Cape Cod suffers from the impacts of nutrient and bacteria contamination. High levels of nitrogen result in algal blooms and fish kills and bacteria contamination from pet and wildlife waste causes regular shellfish and beach closures. Stormwater runoff and fertilizers are two important contributors to this problem. This project is addressing this problem through design and installation of green infrastructure stormwater systems, which incorporate the use of plants and soil media to remove nitrogen, bacteria and other pollutants before they wash into the bays. The first two of these low impact design treatment systems are currently under construction.

### **RICHARD YORK**

**Title:** Water Quality Improvement from Quahog Fishery Restoration and Oyster Aquaculture in the Waquoit Bay System

**Speakers:** Richard York and Ashely Fisher

**Summary:** The Town of Mashpee MA Comprehensive Watershed Nitrogen Management Plan (CWNMP) to restore water quality in the estuaries by reducing nitrogen calls for shellfish aquaculture/fishery restoration and new sewers/wastewater treatment infrastructure. Nitrogen reductions required to meet the total maximum daily maximum load of nitrogen limits (TMDL-N) and total nitrogen (TN) concentrations to restore water quality are based on the Massachusetts Estuaries Project (MEP) reports. In the Great River, Little River, Hamblin Pond and Jehu Pond area (DMF SC-16) of the Waquoit Bay estuarine system, the annual reduction required is 5.76 metric tons of nitrogen (MT N). The CWNMP estimates that annual fishery harvest of an additional 19.2 million quahog clams at an average live weight of 60 grams (littlenecks) would remove 5.76 MT N based on measurements of the nitrogen content of quahogs in the area (N content = 0.5 % live weight). From 2014 to 2016, the Town planted at

total of 9.9 million quahog seed in the SC-16 area (including only 0.5 million in Jehu Pond). Very small seed (2 mm) hatchery produced seed was grown in upwellers and trays to larger sizes (15 to 25 mm) for increased survival before planting in the fall. Trapping invasive green crabs reduced predation. An oyster aquaculture farm in Hamblin Pond had 0.5 million oyster seed in 2017 that contributed a small fraction of the nitrogen reduction. In 2017, summer water quality monitoring data showed improvement with total nitrogen concentration reduced by 35% of the amount needed to meet the target (0.38 mg/L TN) in Great River, Little River and Hamblin Pond compared to 2016. In other areas, total nitrogen increased and water quality was worse in 2017 (TN >2X higher in mid Moonakis River) as the nitrogen load increased from ground water flow and runoff. There was twice as much rainfall in 2017 compared to 2016.