Using our Competitive Advantage to Fund Wastewater Infrastructure – Kristy Senatori

The Cape Cod and Islands Water Protection Fund has served as a primary driver of long overdue progress on wastewater management and water quality improvement. The certainty of a 25% subsidy from the Fund has led to unprecedented advancements of water quality projects in a region that has grappled with strategies to address impacts from septic systems on coastal water quality for decades.

The influx of seasonal visitors on Cape Cod and the Islands has a direct impact on the scale of infrastructure that must be developed. The Fund has a dedicated source of revenue – a 2.75% tax on traditional lodging and short-term rentals. It is overseen by a Management Board with equal representation from each member community, which is responsible for equitable distribution of the funds. The Cape Cod Commission provides administrative and technical support to the Management Board, working closely with the Massachusetts Clean Water Trust, which maintains the Fund. As the Fund is directly connected to the Massachusetts Clean Water State Revolving Fund loan program, projects financed through that program are automatically eligible for subsidy absent any further application or review processes.

The Fund is a model for local, state, and regional collaboration and development of a new and innovative revenue and funding mechanism with a clear nexus between the source of funds, environmental degradation, and the economic burden of maximizing infrastructure to accommodate seasonal variation. The result is much needed funding for projects critical to the long-term viability of the environment and economy on Cape Cod.

Developing a Data-Driven Strategy for Cape Cod's Freshwater Ponds - Erin Perry

Cape Cod's 890 freshwater ponds and lakes cover nearly 11,000 acres. They possess unique ecological, aesthetic, and recreational values and provide significant ecosystem services. They are critical to the region's economy, drawing both seasonal visitors and year-round residents. Freshwater ponds are part of the region's interconnected fresh and marine water resources and are important for filtering nutrients and pollutants before discharging waters to coastal estuaries.

Ponds are vulnerable to contaminants from the precipitation and groundwater recharging them. Pond health is declining due to impacts from development, stormwater, and wastewater, including excessive inputs of nutrients leading to eutrophication and algal blooms. Increasing temperatures and more intense storms associated with climate change exacerbate these challenges.

To better understand the factors contributing to pond degradation, develop solutions, and inspire action, the Cape Cod Commission launched the Freshwater Initiative. The Commission and its partners are collecting and analyzing available data to characterize Cape Cod's freshwater ponds and their role in the region, assess their overall health, and identify regional trends in water quality. These data include over 20 years of pond water quality data from

approximately 200 ponds from multiple monitoring programs, including the newly developed Cape Cod Regional Pond Monitoring Program, GIS analyses of pond characteristics and potential stressors, and satellite remote sensing of pond water clarity.

Coupled with an economic analysis to better understand the role of ponds in the economy, the Commission is enabling local and regional stakeholders to make informed decisions about the future of freshwater resources on Cape Cod.

Examination of wetland restoration and creation as a nutrient interception strategy within watersheds of US estuaries – Scott Alford

Freshwater inflow drives environmental conditions and subsequently ecological function of estuaries. The quantity, quality, and timing of freshwater inputs are derived from the interaction of climatic drivers occurring over a mosaic of different land uses within watersheds feeding estuaries. Broad-scale loss of wetlands has removed landscape buffers to sources of nonpoint source pollution, such as nutrient-laden agricultural runoff, making downstream connected waters more susceptible to eutrophication and decreasing watershed resiliency. Due to growing recognition of the role of wetlands in maintaining downstream water quality, there is an increasing emphasis on identification of potential wetland area (PWA) for targeted wetland creation or restoration as a means to buffer nutrient pollution within watersheds and improve water quality. We developed a dataset of delineated basins of 413,211 km2 of individual existing wetlands and 201,129 km2 of PWA on current croplands across the conterminous United States. We use basin characteristics (e.g., land use) to examine the potential benefit of converting PWA to wetlands on nutrient interception across landscapes feeding estuaries. Wetland creation has the highest potential nutrient reduction to estuaries along the Texas coast, within the Upper Mississippi River Basin, and the San Francisco Bay Delta Watershed due to relatively high concentrations of both PWA and agricultural land use. PWA within these regions primarily fall on current agricultural land, making federal incentive programs a viable strategy for wetland creation and water quality improvement. This dataset provides critical insights for the prioritization of wetland areas to meet national water quality goals.

Modeling static and dynamic fish habitat to support environmental flows and habitat restoration – Mike Wessel

Tidal tributary habitats are being challenged by increased stress from coastal development, increased demand for potable water supply, sea level rise and other effects of climate change. Natural resource managers need tools to evaluate the potential negative effects of anthropogenic stressors on natural resource values and plan restoration activities where they are most beneficial to protect intrinsic ecosystem services, particularly in the face of sea level rise. A healthy and robust fish community is a recognized critical ecosystem service and a key ecological indicator in southwest Florida that is routinely considered as one metric in evaluating the potential effects of water management activities. Habitat favorability models were developed to estimate static (i.e., shoreline) and dynamic (i.e., salinity) habitat preferences and

their interactions as a function of freshwater inflows and season for fishes utilizing Florida tidal tributaries to support natural resource management decisions. Results demonstrate that many important fish taxa have both static and dynamic habitat preferences within tidal tributaries. In particular, shorelines with emergent vegetation, which are being disproportionately lost in southwest Florida, are preferential habitats for several estuarine dependent taxa. Many taxa displayed significant salinity preferences that affected favorability both within and among habitat types, sometimes differentially. The ability to quantify both static and dynamic habitat effects on fish species occurrence has provided a tool managers can use to inform environmental management of instream flows and identify optimal restoration strategies to maximize potential for success of individual and multivariate taxa groups in the face of development and climate change.

The Water Atlas: A Forward-Looking Interactive Estuaries and Habitat Report Card - Sarina Weiss

A regional resiliency issue that is shared across coastal watersheds is the need to restore freshwater flows and levels within remaining natural areas to recharge aquifers and convey to tributaries and estuaries which are becoming saltier with sea level rise. On top of this, there are significant challenges to reverse damage from development and balance limited water resources between people and natural ecosystems.

In Southwest Florida, regional collaboration has resulted in the creation of watershed management plans with the goal to 'get the water right', identifying what needs to happen to maintain water supply and storage, flood protection, water quality and water-dependent resources in the face of existing degradation and depletion, climate change factors, and continued regional growth. Due to the large scale, complexity, and cost of implementing the plans, most are need a multi-partner and phased funding approach so restoration projects can collectively yield greater cost-benefits. This presentation will focus on larger principles from these projects that could be applied across landscapes; discussing outcomes and lessons learned for effective coordination between water management and permitting agencies, researchers and others such as land conservation organizations. To increase adaptive capacity of existing ecosystems, project partners utilized funding from the Bipartisan Infrastructure Act to integrate all available climate data into modeling tools, this resulted in the creation of forward-looking plans with projects that will increase freshwater flows and water storage capacity as well as address other needs that will be exacerbated by climate impacts in forward-looking regional research and restoration.