



## Streamflow

### Background

Cape Cod National Seashore is underlain by four freshwater flow lenses - the Nauset, Chequessett, Pamet and Pilgrim flow lenses, which receive recharge through precipitation. These four flow lenses compose the Lower Cape Cod groundwater flow system and are the only source of drinking water for the communities in and around the Seashore. Each lens not only provides the primary source of water for kettle ponds, streams and marshes but help to maintain the biological diversity and productivity of each of these ecosystems (Masterson, 2004). All four lenses are separated from each other by surface water discharge areas keeping them hydraulically independent of one another (Fig 1).

Beginning in 2000, a long-term hydrologic monitoring program was established in order to better understand the effects of sea level rise, climate change and urbanization on the hydrologic system of the Seashore and on the aquatic and estuarine ecosystems that depend upon that system (McCobb and Weiskel, 2003). The monitoring program proposed a network of 1) groundwater level monitoring wells, 2) pond level monitoring sites in permanent and seasonal wetlands and 3) streamflow monitoring sites located in both non-tidal and tidally influenced streams.

### Why should we measure streamflow at Cape Cod National Seashore?

Streamflow helps inform the following questions: 1) to see if rising sea levels will result in higher streamflows, 2) to document the effects of restricted tidal flow in streams and the effects of tidal restoration on this tidal flow, 3) to document the effect of increased groundwater pumping and, 4) to provide data for future modeling of the hydrologic system on Cape Cod.

### Long-Term Monitoring

The streamflow portion of the Cape Cod National Seashore Hydrologic Monitoring Protocol has been re-evaluated and we are currently monitoring 5 non-tidal streamflow sites weekly and 4 tidal sites bi-weekly (Fig. 1a). We are collecting the data at this frequency to develop a stream discharge rating curve. The intent of the rating

curve is to provide an estimate of stream discharge in relation to the groundwater level and flow of each system. Along with weekly measurements of streamflow (using a USGS standard pygmy meter and wading rod setup) (Fig. 1b), we are collecting continuous stream stage measurements with water level loggers at 1 hour intervals.



Figure 1: a) on left a map of all current streamflow sites and b) on right AmeriCorps Cape Cod member Jenny Burkhardt measuring streamflow of the Herring River at the Old Kings Highway site.

### Status and Trends

Site selection will be re-evaluated after two years of data collection at each of the eight locations to determine which sites will best answer our streamflow questions and inform us of better management practices. Figure 2 illustrates data collection at two of our non-tidally influenced streamflow sites on the Herring River and Figure 3 illustrates our only two tidally influenced sites on the Pamet River. Results from streamflow data collection will answer questions about impacts of sea level rise, tidal restoration and other anthropogenic impacts.

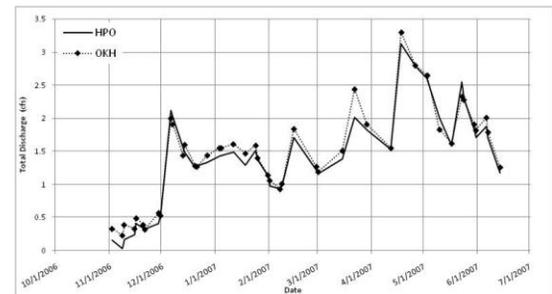


Figure 2. Stream discharge from the headwaters of the Herring River at Old Kings Highway and Herring Pond Output in 2006-2007.

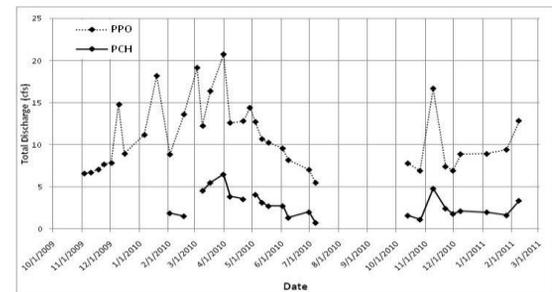


Figure 3. Stream discharge and height of Low Tide at Pamet Corn Hill showing the tidal influence.

### Management Applications

Continued land development, population growth and sea level rise have created concerns regarding the quantity of fresh ground water discharging to ponds, streams and coastal areas. Understanding how groundwater flow affects freshwater estuarine ecosystems of the Cape Cod National Seashore is vital to managing and protecting these natural resources. Groundwater is a vital resource because it is the only source of drinking water and the primary source of freshwater that discharges into the kettle ponds, streams and estuaries on Lower Cape Cod. It is also a key element in maintaining diverse habitat structures throughout Cape Cod National Seashore.

### More Information

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