

Challenges Facing the Cape Cod Aquifer Installment 2: Water Quantity

As was pointed out in Installment one on Upper Cape Cod Aquifer, the Sagamore Lens includes a number of separate watersheds in which we choose the Waquoit Bay watershed as a case study. The geological history of Cape Cod and its relationship to Hydrology has been the subject of studies by the US Geological Survey who work with the Cape Cod Commission and Town Drinking Water & Wastewater Districts to convert this scientific information (monitoring and research) into policy and guidance at the grassroots level. The attached references can provide examples on these scientific studies on how the Cape Cod Aquifer inland groundwater operates and projected effects along the coast of future changes in the water table as a result of Relative Sea Level Rise and climate change (the latter is covered separately in installment 5). The Pitch Pine/Scrub oak forests and training areas at Camp Edwards play a critical role in recharge of the Sagamore Lens Aquifer and future drinking water supplies emanating from the Upper Cape Water Supply Reserve. The Upper Cape Water Supply Reserve is the location of two current town public water wells for Falmouth and Sandwich and the answer for future water supply needs of Upper Cape towns. The EPA Study of Multipurpose Machine Gun Range is focused on maintaining toxic chemical free groundwater at the UCWSR (which was established by state legislation to ensure military training at Camp Edwards was consistent with protection of the groundwater and state-listed species on the northern 15,000 acres at Joint Base Cape Cod).

Recently the Town of Falmouth implemented regulations restricting watering of gardens/yards and irrigation due to the recent drought. This practice is implemented by most Cape Cod Towns during the summer when we have droughts combined with increased water use from tourists and second homeowners plus more irrigation from public/private drinking water wells. Since the height of the water table can be seen in over 1000 freshwater ponds and streams on Cape Cod, 150 monitoring wells underground record water table height which is incorporated into models developed by the US Geological Survey to aid the 17 Water Districts on Cape Cod to impose water use restrictions. Over the last 30 years, the average water withdrawal rate on Cape Cod is 10 billion gallons per year with the summer withdrawal being 54 million gallons per day compared to 25 mgd during the rest of the year.

Since the rainfall minus evapotranspiration from vegetation controls the recharge rate of the Sagamore Lens, climate change can lead to more extreme droughts and increased coastal flooding from severe weather events (hurricanes and Northeasters). Along the coast Relative Sea Level Rise (RSLR) increases the height of the saline portion of the aquifer which increases water heights inland in the freshwater portion of the aquifer. The water table height can vary up to 8 feet. RSLR is the result of our land on Cape Cod sinking and ocean water rising as a result of salinity and temperature effects from the wider ocean ecosystem. The depth of the water table also influences septic systems location and efficiency to address black and grey water from homes. The USGS has

conducted studies of the potential effects of 2, 4 and 6 feet increases in RSLR. Jeff Williams and his USGS colleagues have published reports of coastal geology and RSLR.

Since most of our public drinking water wells are located inland, RSLR doesn't affect the balance of groundwater flow and drinking water extractions. Severe, dry summers can affect the water balance via lowering groundwater levels and decreasing flows in streams. Unlike places like Savannah, Ga. which has large industrial withdrawals, we don't face saltwater intrusion challenges in our coastal aquifer. Climate change (increased water temperature and ocean acidity) combined with "Nitrogen" enrichment in Waquoit Bay influences water quality and leads to losses of wildlife habitat. Similar effects occur in Ashumet Pond where "Phosphorus loading" is a problem. This topic (nutrient effects) will be discussed in the next installment in this series.

The Hyannis Ponds Complex in Barnstable faces some drinking water extraction challenges. The Upper Cape Water Supply Zone at Camp Edwards offers an opportunity for increasing our drinking water supply and balancing wastewater discharges from ocean outfalls into Nantucket Sound. Having an ocean outfall in Nantucket Sound is part of the Town of Falmouth CWMP for treated sewage effluent from a new or expanded wastewater treatment plan to replace "N loading" from septic systems and is also part of the Town of Barnstable proposal to take over and expand the WWTP at JBCC to serve the Upper Cape Towns. The Upper Cape Drinking Water Supply balance from the UCWSR is based upon: (Precipitation & ocean recharge) - (Evapotranspiration - groundwater withdrawals for drinking water, agriculture; watering of lawns & ocean outfalls for treated sewage). Given the increased number of WWTP being developed under the CWMPs, the ocean outfall discharges of freshwater into NS will become a significant loss rate for recharge of town public water supply wells during periods of drought. Thus summer water use restrictions plus development of the Mashpee Commons will have to be balanced with new water supply sources from the UCWSR. Tom Cambareri has proposed a Cape Cod Water Resources Center to address some of these potential future water supply challenges.

References:

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2. USGS Science for Stewardship Fact Sheet for Cape Cod Groundwater Resources

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3. Jeff Williams Papers PDF on RSLR:

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