Climate Change and Cape Cod:
Impacts on Water Resources and Planning Implications

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Current observations of our changing climate and projections of future change suggest that water resources will be significantly affected in some locales. A changing climate implies changes to the amount and timing of precipitation and changes to temperature, affecting growing season and evaporation. All of these factors produce changes to both aquatic ecosystems and pose potent threats to human water supplies. To understand the threats to Cape Cod, it is necessary to understand the expected changes to climate and how they interface with the hydrology of the Cape.

Cape Cod is fortunate to have a substantial aquifer system from which to draw water. This aquifer consists of highly permeable sands and gravels and is supplied by precipitation. The volume of water used for human consumption is small relative to the annual flow through the aquifer. The water table aquifer fluctuates annually with high, precipitation-fed levels in spring, declining though the summer as a result of evapotranspiration effects and other uses. Cape Cod's aquifer would be affected if there were a decrease in recharge to the aquifer or a decrease in aquifer storage volume.

Historical records over the last century and future climate projections suggest that Cape Cod will experience more precipitation with the precipitation changes highest in winter and smallest in fall. Temperatures are expected to increase by one to two degrees Centigrade during 21st century with temperature increases distributed across all seasons. More precipitation suggests more recharge to the aquifer, however, this may be counterbalanced by a longer growing season and higher temperatures leading to more interception of recharge water by evapotranspiration. Precipitation falling in high intensity events may also reduce recharge even with more total precipitation. Long term droughts are also possible. Overall, there may be more fluctuation in the elevation of the water table. This may lead to higher fluctuations in pond elevations and streamflow and degradation of water quality at the salt-water transition zone interface.

Changes to aquifer storage are also possible under a changing climate. At present, the volume of the Cape Cod aquifer is maintained by a balance between salt-water intrusion and water table elevations above sea level. Climate forecasts include a rise in sea level elevations. Depending on local geologic and hydrologic conditions this may produce a substantial reduction in aquifer thickness and volume as the 21st century progresses.

Conclusions

- -Cape Cod aquifer is a valuable water resource
- -Future periods of extended drought may produce saltwater intrusion

-Maximizing groundwater recharge is beneficial
-Sea level rise may cause reduction in thickness of freshwater lens increasing risk of upconing of saltwater.
-Detailed local studies needed for careful pumping of groundwater
-Storm drainage design must accommodate potential for more intense storm events.

References:

USGS Circular 1262,Ground Water in Freshwater-Saltwater Environments of the Atlantic Coast, by Paul M. Barlow, 2003.

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