Coastal salinization vulnerability through coupled groundwater-surface water interactions

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MOTIVATION

The problem of saltwater intrusion along coasts has been widely recognized for its importance with regard to water resource management and planning. The drivers of salinization—such as sea level, storms and tides, precipitation and recharge, hydrologic connectivity, and water use—vary in space, time, frequency, and duration. Field studies and hydrologic models can begin to quantify the impact of these hydrologic processes in the future. But without considering the variability and interactions between multiple saltwater intrusion pathways, these studies may grossly mischaracterize the problem. The importance of a holistic approach to assessing these various processes is recognized but difficult to model and quantify. Here we consider coupled groundwater-surface water interactions along the coast to assess the relative importance of salinization drivers.

QUESTIONS

How do feedbacks between surface and subsurface water systems alter the pattern of salinization?

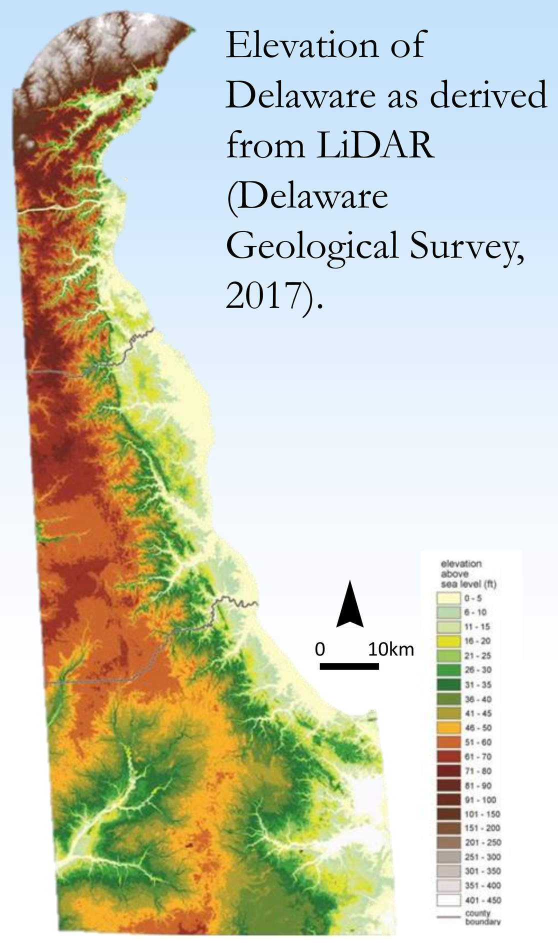
What is the affect of reduced freshwater flow in coastal aquifers and streams?

What are the relative effects of human activities and climate change to nearshore salinization?

What are the main drivers of salinization along the Delaware coast and how will those drivers change in the future?

FUTURE GOALS

We plan to review and consolidate previous work on each of these coastal divers of salinization. Using Delaware as a case study, we will consider the relative impact of surface and subsurface salinization, as well as the feedbacks between the systems. This region is especially vulnerable to the effects of sea level rise, with rates approximately twice the global mean. Delaware's flat topography, low mean elevation, and significant development and agriculture along the coast may also exacerbate the changes in near-coast hydrology over the next century. By identifying trends in climate patterns, stream discharge, groundwater level, and pumping rates, we hope to model risks for future water managers.



Elevation of Delaware as derived from LiDAR (Delaware Geological Survey, 2017).