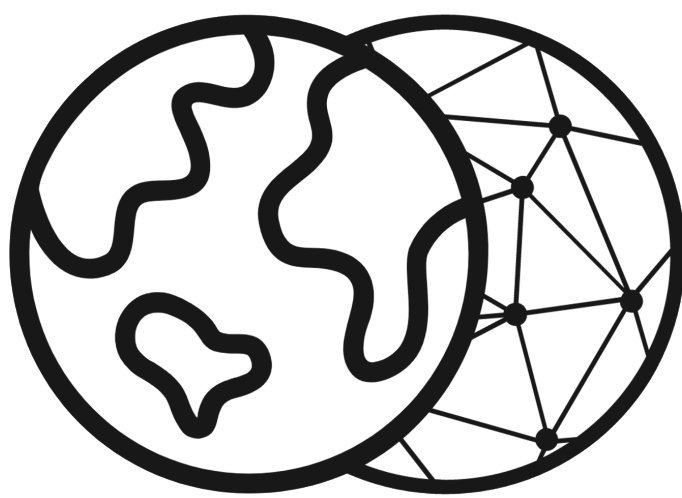


Reservoir operations for saltwater intrusion mitigation in the tidal Susquehanna River



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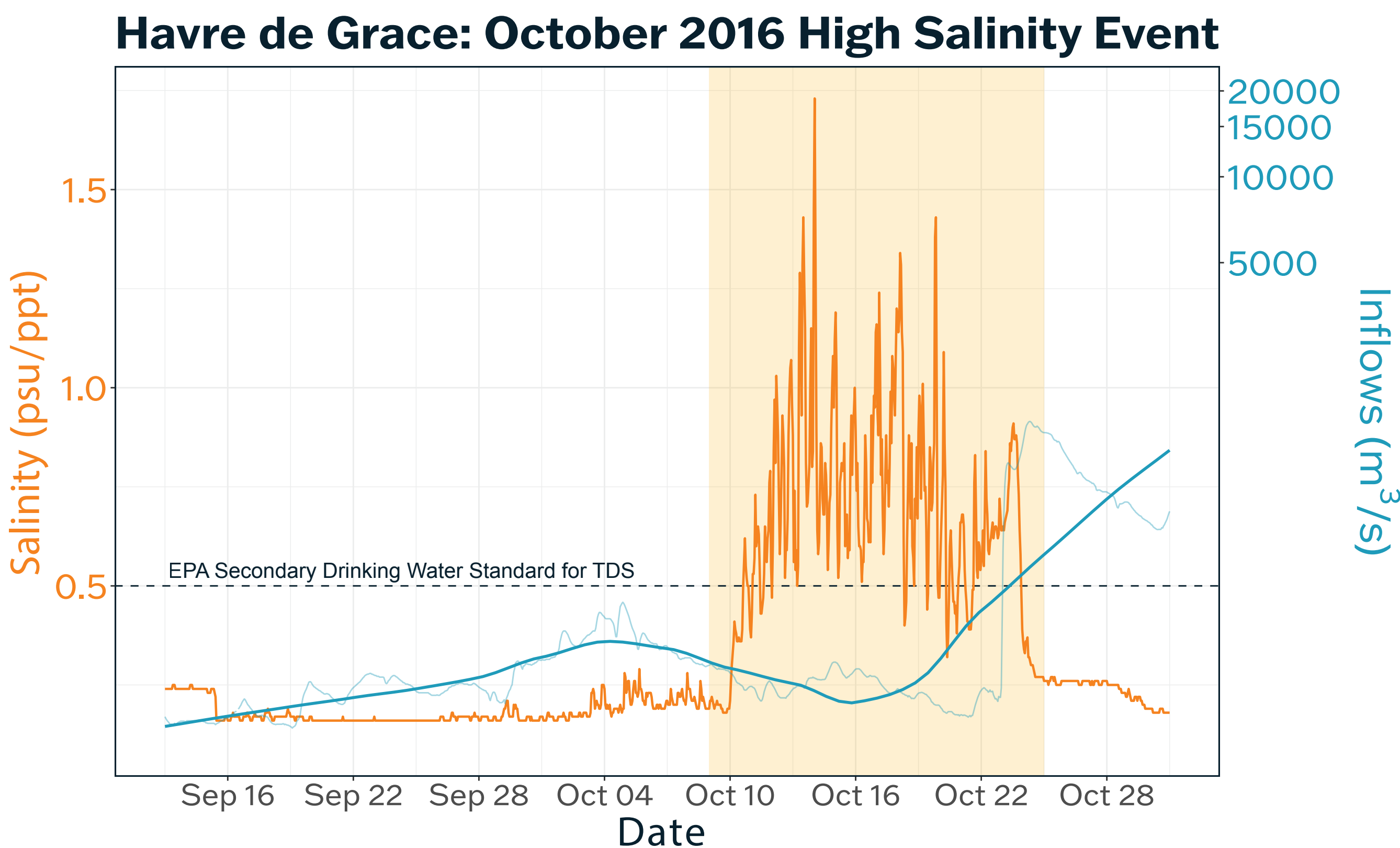
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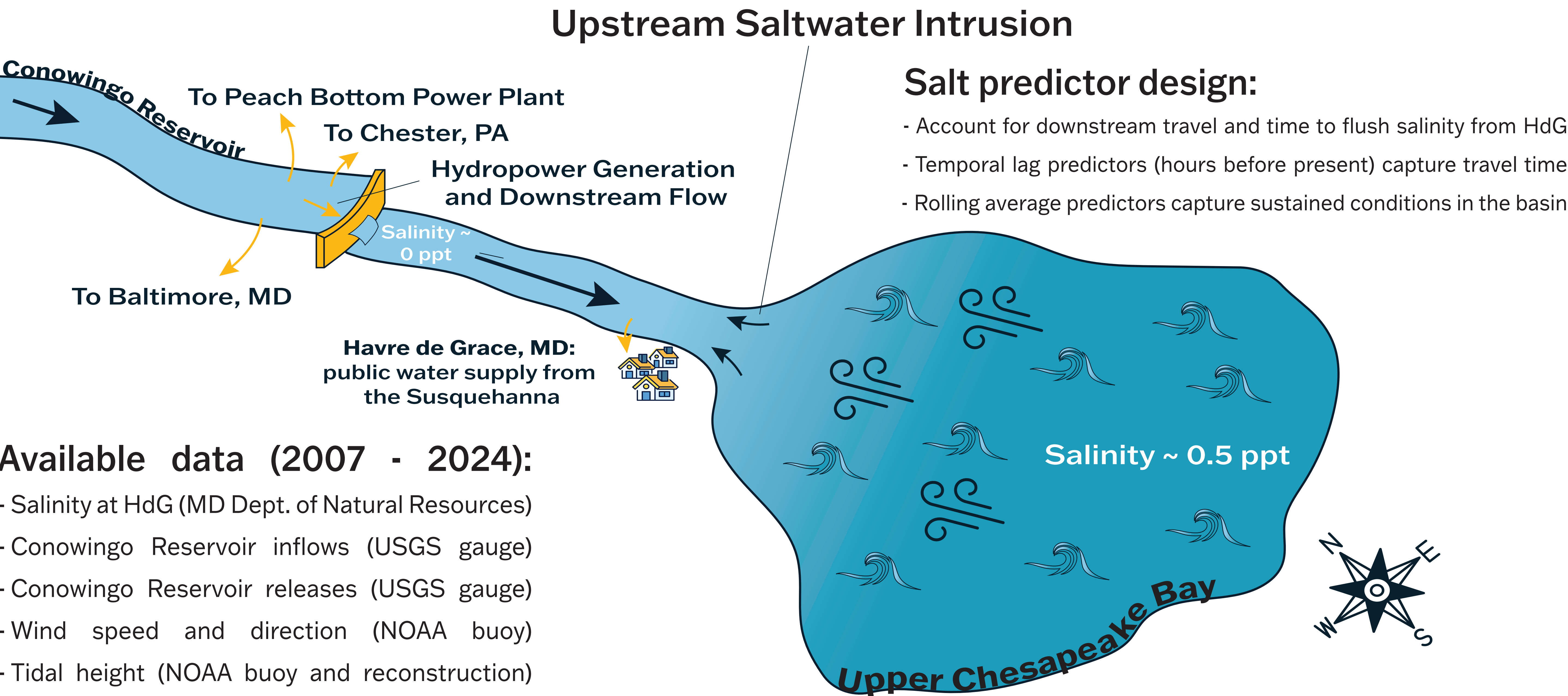
Saltwater intrusion degrades coastal surface waters

Havre de Grace, MD, at the outlet of the Susquehanna River, has experienced **elevated salt levels in drinking water** that are greater than the EPA Secondary Standard for Total Dissolved Solids (0.5 parts per thousand), indicating **insufficient freshwater flows to flush salt**.

1. What conditions cause saltwater intrusion?
2. Will saltwater intrusion become more likely under variable hydrological conditions due to climate change?
3. How can upstream Conowingo Reservoir operations be updated to mitigate saltwater intrusion while continuing to meet existing regional water demands?

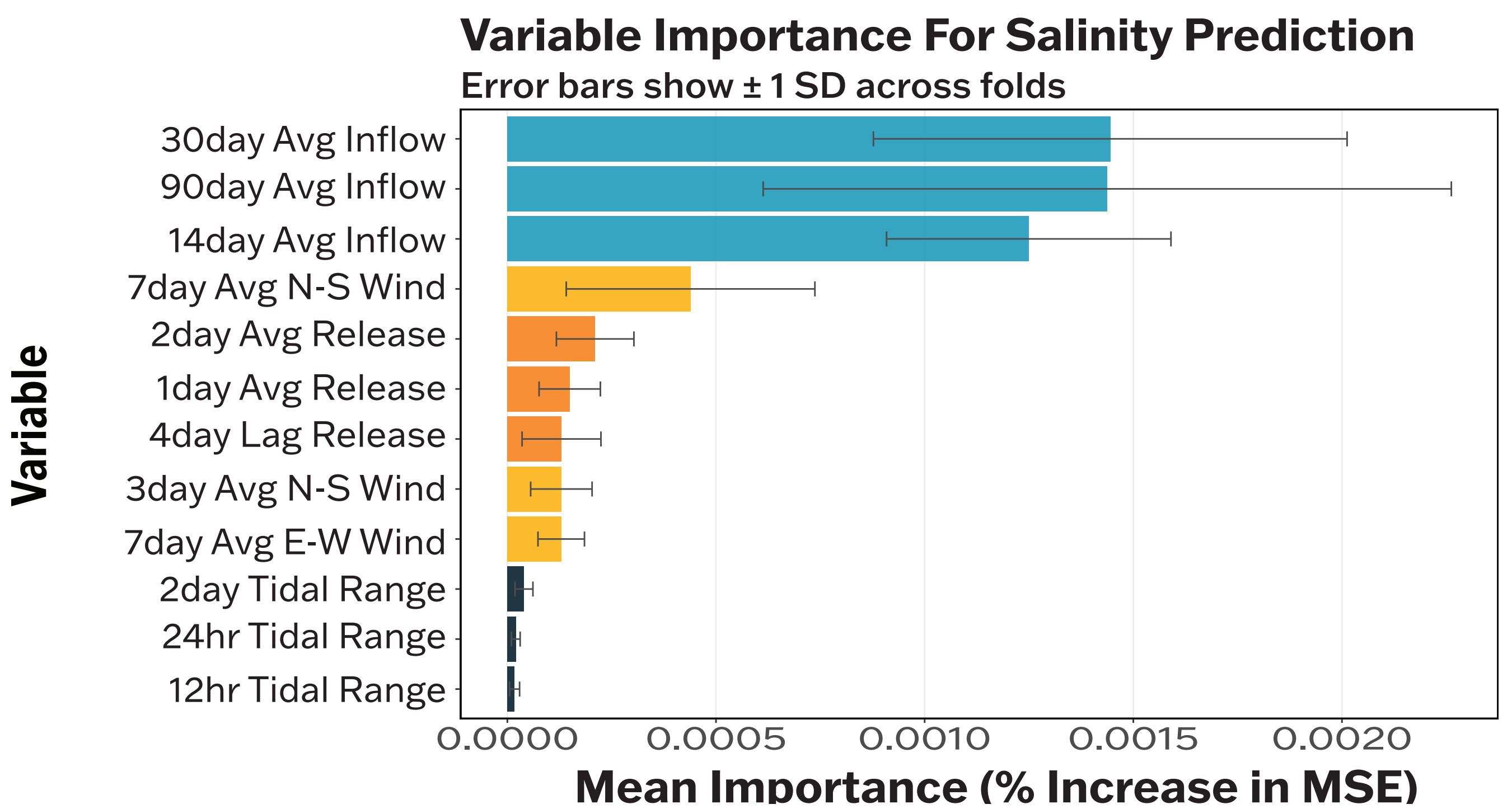


Salt intrusion is governed by freshwater releases, winds, and tidal motion



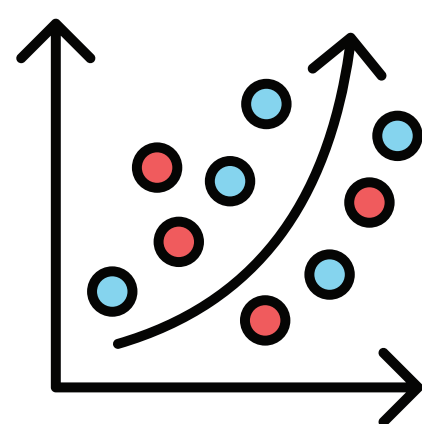
Screening and building statistical models for salt prediction

1. Random Forest to **identify top predictors in each variable group**
2. Use regularized linear models to further screen predictors, test linear predictions, and **inform more complex models that predict high salinity**
3. Build a **Generalized Additive Model (GAM)** that adds non-linear terms and variable interactions to **better capture the October 2016 event**

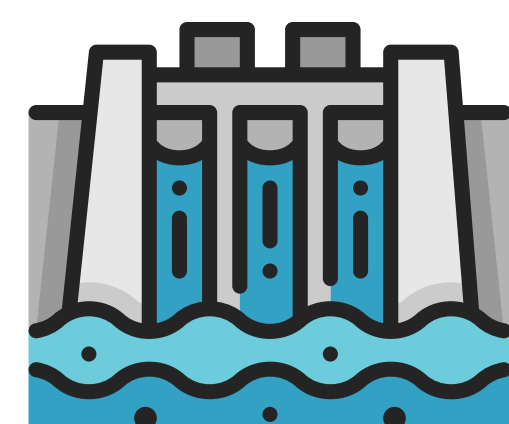


Expected outcomes and future work

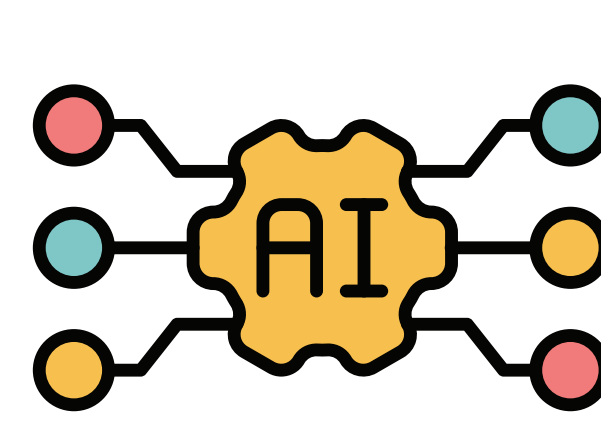
In **October 2016**, Havre de Grace experienced a significant salinity event that lasted two weeks. Initial efforts to model this event have suggested that **wind forcing over Chesapeake Bay is a more important predictor of salinity than tidal motion**.



Salinity Model



Conowingo Model



Reinforcement Learning

This work will **improve understanding of saltwater intrusion as an emerging hazard** and use reinforcement learning to expand the scope of reservoir management to prevent an emerging water quality concern.