

## **Monitoring the Annapolis River estuary's salt wedge dynamics**

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The Annapolis estuary has undergone profound transformations since European settlers arrived in the early 1600s, including the dyking of salt marshes, the establishment of a tidal barrier, and the construction of a tidal generating station. These interventions have triggered substantial alterations in tidal patterns, impacting the ecological balance of the estuary.

The construction of a tidal generating station in 1960 brought significant transformations to the Annapolis estuary, altering its hydrological dynamics. Prior to the dam's construction, the estuary exhibited even mixing and extended tidal influence upstream. Following the dam's completion, the river transformed into a two-layered salt-wedge estuary, characterized by a layer of freshwater overlaying saltwater. The stability of this stratification is influenced by dynamic factors such as river discharge, tidal forces, and weather events.

Historical data from the 1970s revealed periods of exceptionally low oxygen saturation in the salt layer of the Annapolis River, posing potential ecological risks. Additionally, between 2004 and 2006, surveys detected severe oxygen depletion in the lower estuary, with oxygen-depleted water extending over 20 kilometers. Dissolved oxygen levels consistently fell within the range of 2 to 5 mg/L, significantly below established water quality standards.

From 2021 to 2023, bi-weekly monitoring was conducted at eleven established sites, with a focus on tracking seasonal fluctuations in the salt wedge and assessing their impact on the quality of fish habitats located above the causeway. This effort has yielded insights into the evolving dynamics of the estuary and the need to safeguard its aquatic ecosystems and habitats.

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