

Using a box model to estimate the hydraulic residence time of the Bagaduce River estuary

Hydraulic residence time is one way to determine if an estuary flushes at a fast enough time to support a healthy ecosystem. This is an important hydrographic characteristic to determine, especially when determining if an estuary can support future aquaculture hatcheries. A two-layer box model was developed in MATLAB in order to determine if the hydraulic residence time of the Bagaduce River, Maine is fast enough to support *Crassostrea virginica* shellfish hatcheries. Input data from the summer of 2017, such as salinity measurements, freshwater inputs, and volume of the estuary, were used to build the model. The mean pulse residence time at the head of the river and at the mouth of the river was estimated at 10.51 days and 9.99 days, respectively. It was concluded that the Bagaduce River has a fast enough residence time to promote an healthy estuary to support aquaculture, however, more studies will needed to be conducted on phytoplankton biomass and nutrient density in order to determine if the Bagaduce River estuary could support *C. virginica* shellfish hatcheries.

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