# How Estuaries Work: A Guide to Water Dynamics

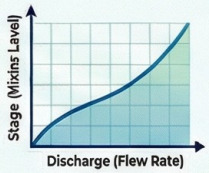
Estuaries are dynamic zones where freshwater from rivers meets and mixes with saltwater from the ocean. Understanding the volume and timing of these two water sources is critical for managing salinity, sediment transport, and the overall health of the ecosystem.

### Measuring Freshwater Inflow

**Freshwater inflow is a primary driver of estuarine conditions.**

It controls salinity, stratification, and the delivery of nutrients and poilutants.

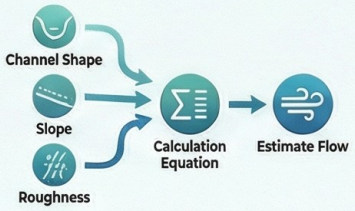
#### In Gauged Streams




**Stage-Discharge Curve**

A Stage-Discharge Curve provides continuous flow date. This curve relates the measured water level (stage) to the flow rate (discharge).

#### In Ungauged Streams




**Manning's Equation estimates flow.**

This formula calculates discharge based on channel shape, siope, and roughness.

### Understanding Tidal Exchange & Estuary Type

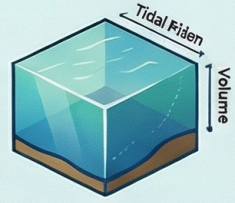
**Tides create a cyclical flow of saltwater.**

**Ebb Tides**

Ebb tides flow out to sea.

**Flood Tides**

...flood S'mam quamifies the volume of inoaming into the estuary.

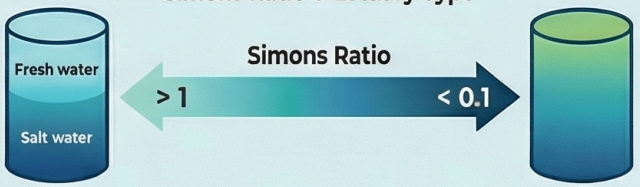



**Tidal Prism Volume**

It represents the total volume of weter entering the estuary during one flood tide.

**The Simons Ratio classifies estuaries by mixing type.** It compares the volume of freshwater inflow to the tidal prism.

#### Simons Ratio & Estuary Type




**Stratified** — **Fully Mixed**