

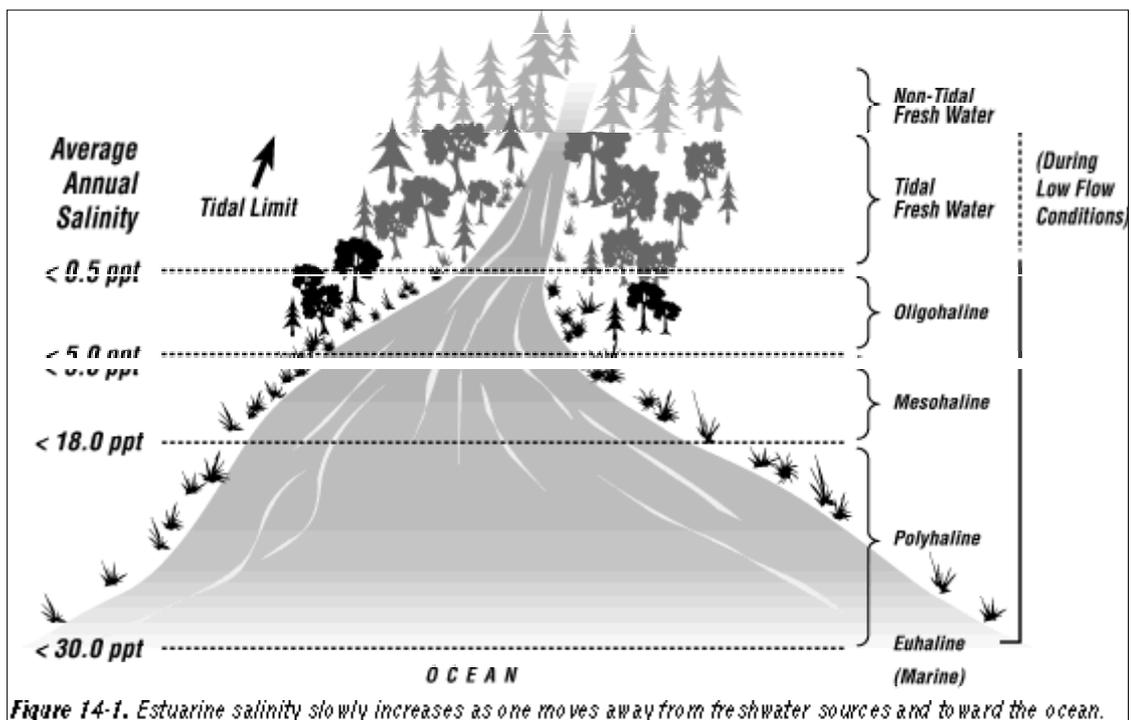
Salinity Measurements - Estuaries

Overview

Because of its importance to estuarine ecosystems, salinity (the amount of dissolved salts in water) is commonly measured in water quality monitoring programs.

About Salinity

Salinity is simply a measure of the amount of salts dissolved in water. An estuary usually exhibits a gradual change in salinity throughout its length, as fresh water entering the estuary from tributaries mixes with seawater moving in from the ocean (Figure 14-1). Salinity is usually expressed in parts per thousand (ppt) or O/00.



The fresh water from rivers has a salinity of 0.5 ppt or less. Within the estuary, salinity levels are referred to as oligohaline (0.5–5.0 ppt), mesohaline (5.0–18.0 ppt), or polyhaline (18.0–30.0 ppt). Near the connection with the open sea, estuarine waters may be euhaline, where salinity levels are the same as the ocean at more than 30.0 ppt.

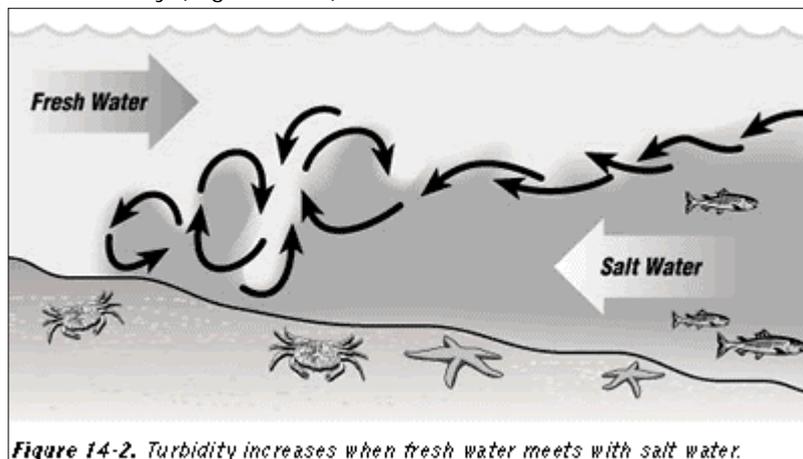
Generally, salinity increases with water depth unless the estuarine water column is well mixed vertically. Salinity, along with water temperature, is the primary factor in determining the stratification of an estuary. When fresh and salt water meet, the two do not readily mix. Warm, fresh water is less dense than cold, salty water and will overlie the wedge of seawater pushing in from the ocean. Storms, tides, and wind, however, can eliminate the layering caused by salinity and temperature differences by thoroughly mixing the two masses of water. The shape of the estuary and the volume of river flow also influence this two-layer circulation.

This text has been taken from the EPA's National Estuaries Monitoring Programme – see documentation etc at the website: <http://www.epa.gov/owow/estuaries/>

Role of Salinity in the Estuarine Ecosystem

Salinity levels control, to a large degree, the types of plants and animals that can live in different zones of the estuary. Freshwater species may be restricted to the upper reaches of the estuary, while marine species inhabit the estuarine mouth. Some species tolerate only intermediate levels of salinity while broadly adapted species can acclimate to any salinity ranging from fresh water to seawater. Drastic changes in salinity, such as those due to drought or storms, can greatly alter the numbers and types of animals and plants in the estuary.

Another role played by saline water in an estuary involves flocculation of particles. Flocculation is the process of particles aggregating into larger clumps. The particles that enter an estuary dissolved in the fresh water of rivers collide with the salt water, and may flocculate or clump together and increase turbidity (Figure 14-2).



Sampling Considerations

Salinity will fluctuate with movement of the tides, due to dilution by precipitation, and mixing of the water by wind. There are also seasonal differences in salinity.

Season and Weather

Environmental conditions vary with the seasons, and salinity levels can reflect those variations. During wet weather periods, more fresh water enters the estuary, so salinity is lower at these times. On the other hand, dry weather periods mean less fresh water entering the estuary, so higher salinity levels may be found. Another way the seasons influence an estuary's salinity involves the mixing of fresh water and salt water. Seasonal storms help mix estuarine waters and serve to decrease the vertical temperature gradients in the estuary.

Choosing a Sampling Method

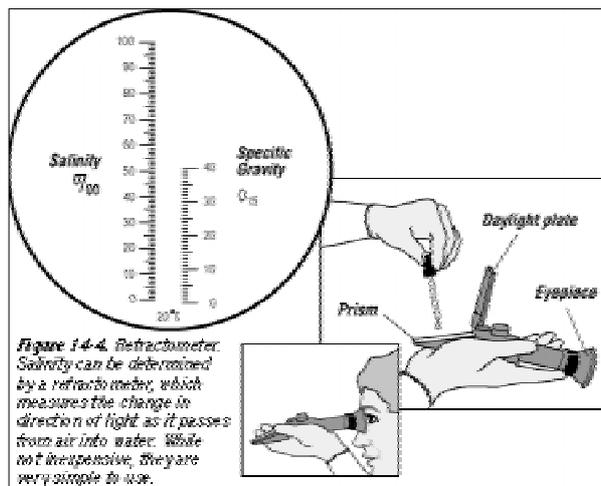
Salinity can be measured either by physical or chemical methods. Physical methods use conductivity, density, or refractivity. The physical methods are quicker and more convenient than the chemical methods. The chemical methods determine chlorinity (the chloride concentration), which is closely related to salinity.

Refractivity

Refractometers (Figure 14-4) are used to measure substances dissolved in water, using the principle of light refraction through liquids. The more dissolved solids in water, the slower light travels through it. Refractometers measure the change in the direction of light as it passes from air into water. Salinity and temperature both affect the index.

Refractometers use a scale to quantify the effect that dissolved solids in water have on light. Using a refractometer is simple. It works with ambient light, and no batteries are required.

Measuring salinity with a refractometer



- Lift the lid that protects the refractometer's specially angled lens.
- Place a few drops of your sample liquid on the angled lens, and close the lid.
- Peer through the eyepiece. Results appear along a scale within the eyepiece. Most refractometers display specific gravity and parts per thousand (ppt).
- Record the measurement on your data sheet.
- Rinse the lens with a few drops of distilled water, and pat dry, being very careful to not scratch the lens' surface.