Sediment Transport and Deposition

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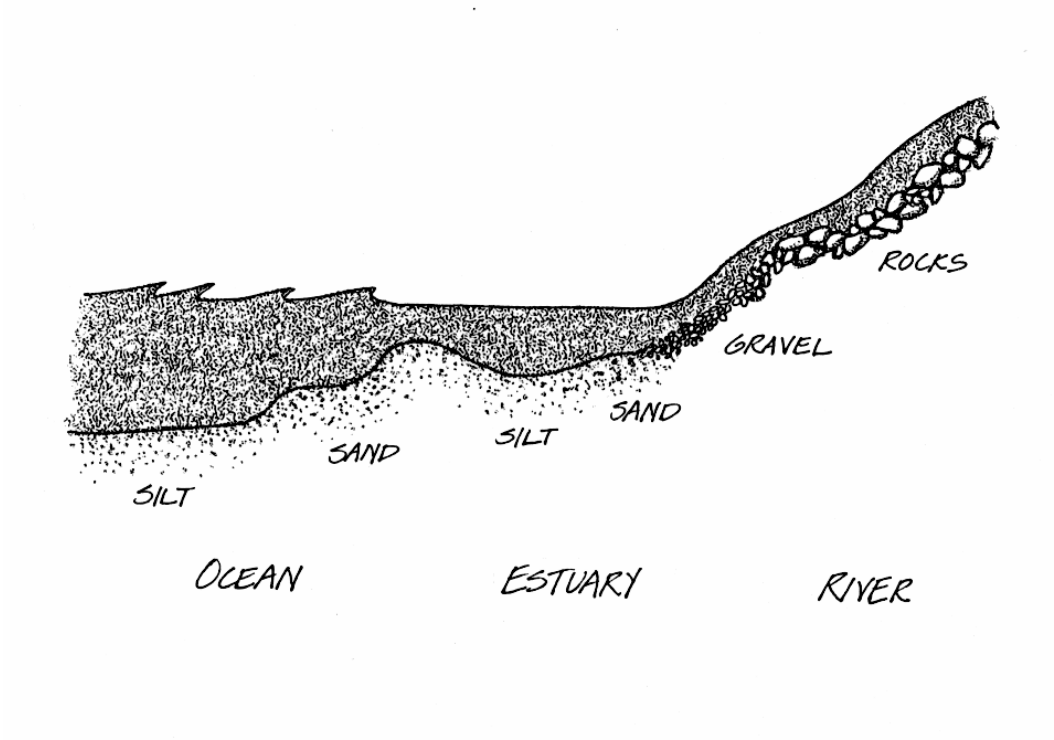

Sediments entering and settling in the estuary are both terrestrial and oceanic in origin. As rivers and creeks flow seaward, they carry with them sediments from the land. Flood tides bring in sands from the sea. Runoff from rains and snowmelt carry sediments into nearby streams. Removal of vegetation--as from agricultural, logging, and construction operations--promotes erosion and increases the sediment loads of rivers and creeks.

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Sediments ranging in size from small rocks and coarse gravel to silt and clay particles as fine as talcum powder enter the water where currents carry them downstream. The faster the current, the greater the size of sediment particles a stream can move.

As a river or creek moves from the mountains or inland areas toward the ocean, its course broadens and velocity gradually slackens. During this process, smaller and smaller particles of sediment drop out and settle toward the bottom, so that the larger rocks and coarser gravel are found farther upstream and finer sediments downstream, creating what is known as a sediment gradient.

In the slower currents of a river's lower reaches, only the finest sediments will remain suspended in the water. In the tidewater portion of the river, fine sediments begin settling out and are deposited in several ways. In

some cases, flood tides are of sufficient size and force as to overcome river currents and stop or even reverse the course of the river for some distance upstream, allowing even finer particles to rain out.

Another phenomenon affecting the way sediments are deposited in the estuary is a process called flocculation, which causes the tiny particles to clump together, become heavier, and settle to the bottom.

While in fresh water, these particles--kept in suspension by their molecular motion--carry negative charges and tend to repulse one another. In the estuary, however, where the fresh water meets and mingles with ionically charged salt water, negative charges are neutralized, and the particles become attractive. As they collide, they tend to coalesce or stick together, forming larger aggregates or clumps of sediments called flocs, which then settle out of the destabilized suspension.

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The process of flocculation depends on salinity levels. Consequently, it can change along the course of the estuary. It might vary from tide to tide and season to season, or according to the amount of runoff or size of storm surge.

Incoming tides and storm surges bring ocean sands into the estuary and keep the bottom of the lower estuary sandy. The sediment gradient from the mouth to the head of the estuary, then, ranges from coarse to extremely fine. That's why tidal flats in the lower portions of Coos Bay are sandy and relatively firm, while upbay flats are muddy and soft.

Sediments are deposited wherever currents are slowed. On the bend of a stream, for example, sediments will settle and create shallows along the inside of the curve, because the current is slower there. Currents are also slowed as they flow over plants and algal mats, causing nutrient-bearing sediments to sink to the bottom where they nourish the vegetation.

Left alone, an estuary can build its own tidal flats and marshlands and deliver nutrients to countless organisms.