

Role of Inlets

Inlets are channels connecting outer waters to interior lagoons or bays. Inlets are subjected to two competing forces. The rising and falling tides in the ocean cause water to flow into the bay (flood currents) and out of the bay (ebb currents). The volume of water entering an inlet during flood (inward) flow or leaving during ebb (seaward) flow is termed the "tidal prism", an important characteristic of the inlet bay system. Through refraction, waves tend to transport sand toward inlets and to cause closure. The tidal currents through the inlets scour excess sand from the channel maintaining it open. To understand how these two competing forces interact, consider the simple system discussed below. If an inlet were excavated wider than equilibrium, the scouring velocities would decrease, sand would enter the channel and deposit thereby decreasing the cross-sectional area with a corresponding increase in tidal currents which would decrease the tendency for sand deposition. Conversely, if sand were placed in an inlet in equilibrium conditions, thereby decreasing the flow area, the velocities would increase, scouring out the excess and returning the area to equilibrium. Thus the inlet cross-sectional area tends to be self-equilibrating. O'Brien (1931) found the surprisingly simple relationship shown in Figure 10 between the equilibrium cross-section of an inlet and the total volumetric flow of water passing through an inlet during flood or ebb flow. The dashed line in Figure 10 represents a peak velocity through the inlet of 1 m/s. Thus it appears that in a sandy material, under equilibrium conditions, the inlet adjusts itself such that the peak velocities in and out of the inlet are on the order of 1 m/s. As described previously, any change in cross-sectional area to alter this velocity will induce velocity changes to reestablish the equilibrium area.

With the above discussion of the flow in and out of inlets and the related scour of excess sediments, it is not surprising to find extensive sand deposits bayward and seaward of the inlet channel. These deposits are termed flood and ebb tidal shoals signifying the currents causing their transport to these locations. These shoals are extremely important to the inlet stability; their roles will be reviewed below.

The flood tidal shoals represent deposits that are relatively static and grow to substantial volumes and, due to the usually moderate wave climate inside