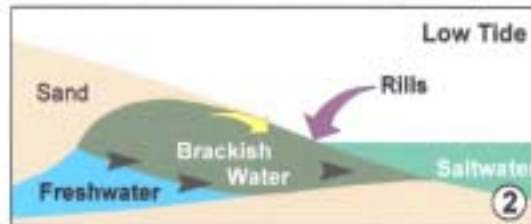


## Beach Rills Reveal Groundwater Movement



Cape Cod is composed of highly permeable sand. When it rains, freshwater is quickly absorbed into the ground where it enters the groundwater and flows to the sea. The flow is very slow because it is restricted to the tiny spaces that exist between sand grains. In spite of its snail's pace, this flow is visible in many places along the coast, although at this point what we see is often a brackish combination of groundwater mixed with saltwater.

At the shore, when tides are high, saltwater flows slowly into the sand (1). There, it mixes with groundwater that has arrived from the opposite direction. When the tide goes down and sea level drops, the pressure pushing saltwater into the beach decreases. Because the level drops faster than water can leave the sand, the height of brackish water in the beach ends up higher than the water in the bay (2). Drawn by gravity and pushed by the pressure of flowing groundwater, it flows back toward the sea. This subterranean flow carries loose sand grains with it, creating small depressions, called rills, that appear as tiny channels in the beach (3, 4, 5, and 6). Look carefully and you can see gentle trickles of water flowing through the rills to the sea.

Beach rills are more frequently observed in winter because of the higher occurrence of low pressure systems and the low tides that accompany them. Rills are also easily seen when there is ice and winter tides expose the dark, muddy area at the base of the beach (7 and 8). Warmed by the sun, the area is often ice free, unlike the areas on either side (5). As rills make their way down the beach face and stretch out across the open area, they are readily seen by those willing to carefully make their way across the ice to observe them.

