Depending on the source of recharged water, many toxic constituents may flow with ground water and affect aquatic ecosystems. On Lower Cape Cod, domestic wastewater, which includes many compounds intended for household or medicinal use, is generally disposed of through onsite septic systems. These contaminants may affect both ground-water supplies and downgradient surface-water ecosystems (John Colman, U.S. Geological Survey, written commun., 2003), with potential chronic or acute effects to both individual species and entire ecosystems.

**Land Development and Ground-Water Flow**

Presently (2004), only Provincetown and portions of Truro are serviced by a large capacity, municipal water-supply system that withdraws water from the Pamet flow lens. Other portions of Lower Cape Cod obtain drinking water from shallow, private wells. As land development increases and wastewater continues to be returned to the aquifer through onsite septic systems, there is a growing concern that increased amounts of nonpoint-source contamination in the aquifer system may degrade the water supply. If the water supply is adversely affected, it may necessitate a shift from small-capacity, private wells to larger, more centralized municipal systems that can be managed more efficiently than the current water supply (Sobczak and Cambareri, 2002). Federal, State, and local officials responsible for managing and protecting water resources are concerned that such a shift may cause ecologically detrimental declines in the water table and in pond levels, and cause decreased ground-water discharge to streams and coastal areas, and increased risk of saltwater intrusion.

A pumping well can alter ground-water discharge to downgradient surface-water bodies by capturing water that would discharge to these bodies (figs. 10A, B); and if the pumping rate is great enough, by reversing the flow direction so that the surface-water bodies contribute water directly to the pumping well (fig. 10C). This pumping can cause declines in pond levels, increases in the depth to the water table beneath inland wetlands, reductions in streamflow, and reductions in ground-water discharge to the coast. These changes can reduce the water available to shoreline plants, decrease the flooding depth and duration of vernal pools, impede migratory fish passage, and alter the salinity of estuaries, all of which alter a diverse biotic community.

Saltwater intrusion is another potentially adverse effect of centralized large-capacity municipal pumping on the ground-water-flow system. Saltwater intrudes into freshwater when a pumped well removes enough fresh ground water to cause the interface between fresh and saltwater to move in from the coast or up from the underlying saline part of the aquifer (fig. 11).

**Salt-Marsh Diking and Tidal Restoration**

Ongoing efforts to restore tidal flow to Lower Cape Cod coastal marshes, restricted for the past 150 years for mosquito control, marsh drainage, and flood control, may affect the ground-water-flow system. Tide-control structures (fig. 12) were built at the Herring River in Wellfleet, the Pamet River and East Harbor (Pilgrim Lake) in Truro, and Hatches Harbor in Provincetown. These structures restrict tidal flow, reduce high-tide heights, impede low-tide drainage, and thereby degrade