Friends of Herring River

A Primer on Herring River's Water Quality Problems

Under natural conditions the Herring River salt marshes produced massive amounts of organic matter, most of which was stored in peat several meters thick. Some of this organic matter was decomposed by bacteria and other microbes, slowly in winter, but more intensively in summer with a consequent drain on dissolved oxygen in surface waters. However, twice each day seven to ten foot tides brought oxygen-saturated seawater into the marsh. This countered the decomposers' drain on dissolved oxygen to sustain a thriving community of dependent aquatic animals.

Meanwhile in the waterlogged peat, oxygen was depleted but bacterial decomposition did not stop. It continued using oxidizing agents other than oxygen, particularly sulfate, the third most abundant dissolved constituent in seawater. This process yielded sulfides as waste products, including hydrogen sulfide, with the familiar rotten-egg odor of anaerobic sediments. However, these sulfides were made innocuous either by binding to iron in the sediment or by re-oxidizing to sulfate as marsh water leached into oxygenated tidal creeks.

Abundant wildlife, especially waterfowl, naturally shed enteric bacteria into their marshland habitats. These bacteria are now lumped with water-quality indicators of human pollution, and can therefore force the closure of shellfish beds. It is likely that, before the diking of the river, unfettered tidal flushing diluted these bacteria and any associated pathogenic organisms, down to safe levels.

Since diking and drainage of the Herring River in 1909, well oxygenated Cape Cod Bay water has been almost entirely blocked from entering the river; however, organic-matter-rich sediments continue to consume dissolved oxygen, especially during the warm summer months. As a result, the river and its aquatic animals, including fish, mollusks, and other invertebrates, are stressed throughout July, August and September, and their abundance and diversity are far below that of the original estuary and even the waters of Wellfleet Bay just seaward of the dike. Summertime fish kills have been common.

At the same time, diking and drainage of the river's marsh peat has profoundly altered the normal cycling of sulfur. Peat drainage causes iron-sulfide minerals to oxidize and release sulfuric acid into receiving waters. Consequently, surface waters throughout most of the original thriving marshlands are acidic and devoid of fish; experimentally transplanted shellfish dissolve in the Herring River main stream.

Fecal coliform bacteria have caused the closure of shellfish beds in the mouth of the river since the mid-1980s, when the state intensified its monitoring. Dampened tidal flushing and lowered salinity have allowed coliform bacteria to live longer and accumulate in the sediments and surface water above the Herring River Dike.

With tidal restoration oxygen-rich seawater will again sustain aquatic life in the river as twice-daily tides flood and ebb through tidal creeks. Drained peat will again become saturated with water, re-establishing anaerobic conditions, and reversing the chemical change that led to sulfide release as sulfuric acid. Both restored aeration and restored water chemistry will favor the return of a rich and abundant native fauna. Fecal coliform bacteria will be stressed by restored salinity and diluted by restored tides, and should decrease greatly in concentration; this will likely allow the reopening of shellfish beds both above and below Chequesset Neck Road.