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TRANSPORT AND FATE OF MICROBIAL CONTAMINANTS AND SUSPENDED SEDIMENTS IN THE GREAT BAY: EFFECTS ON WATER QUALITY AND MANAGEMENT IMPLICATIONS

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Descriptors: Water quality management; bacteria; suspended sediments; shellfish; eelgrass beds; contaminant transport; estuarine modeling; pollutants.

Problem and Research Objectives:

The purpose of this study was to assess how reduction of microbial contaminants occurs in Great Bay. The proposed research was designed to identify natural mechanisms within Great Bay that could be exploited to actively remove microbial contaminants from the estuarine water by eelgrass and oyster beds. Such information would be extremely useful for regulators/managers to better understand the fate of microbial contaminants and suspended solids in estuaries. An understanding of the m mechanisms functioning in the estuary that reduce pollutant levels in the water can be exploited by implementing these mechanisms in critical areas as best management practices to better eliminate pollution problems. Determination of the magnitude of microbial contaminant removal by shellfish and eelgrass beds allows for evaluation of the relative appropriateness of exploiting these two habitats to purify water within the estuary. Obviously, the practical value of demonstrating removal of indicator bacteria is that pathogens will probably also be removed, thus mitigating the potential threat to public health of people that consume shellfish or that are exposed to estuarine water. Success in these activities would potentially lead to opening previously closed shellfish grounds and expanding other recreational uses of the estuary. The research should also give valuable information on the relationship between suspended microorganisms and sediments in estuaries. The research makes a substantial contribution to the scientific literature regarding the role of these biological features as filters of estuarine water in tidally-dominated estuaries.

Principal Findings and Significance:

The routine surveys of water quality showed microbial contaminant concentrations to be temporally and spatially variable. As previously observed, levels of indicators were strongly seasonal. During the initial period of the project in the summer of 1991, concentrations of microbial indicators were typically present at Furber Strait and Mid Bay at very low concentrations, often <10, and sometimes <1, enterococci, fecal coliforms and Escherichia coli per 100 ml. At Chapman's Landing, levels were higher than at Furber Strait and Mid Bay, but they were still lower than observed for other times of year. Levels at all 3 sites increased in October and remained high, relative to summer samples, through early January, and then again in the spring of 1992. Levels began to decrease again in late spring/early summer of 1992.

The stage of the tide was also a significant influence on microbial levels. At Furber Strait, levels of indicators were typically higher at high tide than at low tide, while the opposite was true at Chapman's Landing. The trend at Furber Strait is consistent with previous findings at Furber Strait over the previous three years, and confirms the observation that water leaving Great Bay at Furber Strait typically has lower levels of microbial contaminants than water entering the Bay at high tide. The trend at Chapman's Landing is expected, as the water at low tide should reflect the greatest influence of contaminated freshwater. The only significant deviations from the concentrations of fecal-borne

microorganisms being higher at low tide occurred during the days following Hurricane Bob, in which case levels were much higher than normal at both tides.