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6-1-1996

# INFLUENCE OF NONPOINT-SOURCE POLLUTION ON MICROBIAL ASPECTS OF WATER QUALITY IN NEW HAMPSHIRE'S COASTAL WATERSHEDS

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### Recommended Citation

Jones, Stephen H.; McDowell, William H.; and Langan, Richard, "INFLUENCE OF NONPOINT-SOURCE POLLUTION ON MICROBIAL ASPECTS OF WATER QUALITY IN NEW HAMPSHIRE'S COASTAL WATERSHEDS" (1996). *NH Water Resources Research Center Scholarship*. 100.

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## **INFLUENCE OF NONPOINT-SOURCE POLLUTION ON MICROBIAL ASPECTS OF WATER QUALITY IN NEW HAMPSHIRE'S COASTAL WATERSHEDS**

*Principal Investigators: Dr. Stephen H. Jones, Dr. William H. McDowell, Dr. Richard Langan, University of New Hampshire*

*Descriptors: Water quality management, bacteria, organic compounds, nutrients, contaminant transport, estuaries, pollutants, public health*

### *Research Objectives:*

The specific objectives of this research was as follows:

- Determine the seasonal occurrence and persistence of indicator and pathogenic bacteria in relation to nutrients, phytoplankton blooms, and DOC/dissolved organic nitrogen (DON) along a transect from the Oyster River to Great Bay at Furber Strait;
- Characterize differences in growth and survival responses of target bacteria in estuarine water from different sources (algal production, terrestrial NPS runoff, POTW, seasonal and spatial differences) that reflect ambient variability in DOC/DON, planktonic micro-flora and -fauna and nutrients;
- Relate laboratory results to observe environmental trends to explain mechanisms of microbial dynamics in the Great Bay Estuary.

### *Principal Findings and Significance:*

The temporal intensity of sampling was increased during August 1994, and in May and June 1995, to better understand the dynamics of water quality parameters at some of the sites relative to target bacterial numbers. The *V. parahaemolyticus* data showed differences from *V. vulnificus* data in a similar fashion to last year. *V. vulnificus* incidence was similar to that observed in 1993, which was much more frequent than in any of the three previous years. However, *V. vulnificus* concentrations were much higher throughout the study area in 1994. Numbers were especially high at a site just downstream from the Durham POTW, where DOC concentrations were also elevated. The most consistently positive (54%) site for *V. vulnificus* incidence in 1994 was the site farthest up the Oyster River, with incidence decreasing at the next downstream site (25%), to the mouth of the river (18%) and at Adams Point (16%).

Microcosm studies have yielded results that help to interpret field observations. The incubation temperature had major effects on the growth and survival responses of the different bacteria. The vibrios became non-culturable at 5°C, as expected, while fecal-borne bacteria maintained relatively high levels in estuarine water, even in the presence of other bacteria. At 20°C, the vibrios showed some growth responses in the estuarine water in pure cultures, less of a response in water with eukaryotes inhibited, and no growth and decreased survival in the presence of all microorganisms. *E. coli* exhibited no growth but better survival in all treatments in the more polluted, upstream estuarine water compared to the cleaner Adams Point water. Enterococci showed less differences between sites, but maintained higher numbers compared to *E. coli*.