

## Chapter 3.3

# Trends in Freshwater Benthic Macroinvertebrate Communities in Maryland's Coastal Bays

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### Abstract

Current freshwater benthic macroinvertebrate community conditions help determine long-term water quality and habitat trends in Newport and St Martin watersheds. Samples from two of the St Martin streams (Bishopville Prong and South Branch) indicated a strong improvement in water quality from the very poor to fair range. Both sites showed an improvement in taxa number, as well as in biotic and diversity indices and South Branch showed an improvement in Percent EPT (Ephemeroptera, Plecoptera, Trichoptera). The third stream in the St Martin watershed, Birch Branch, has not been sampled since 2001 due to inadequate substrate to sample. During the six years it was sampled there was no significant trend in the fair water quality. Streams in the Newport watershed showed slight improvements in diversity index and taxa number yet the biotic index showed decline over the past decade. Bottle Branch showed a slight improvement in percent EPT; however, the water quality is still in the poor/fair range. The Trappe Creek station showed a moderate improvement in water quality from the poor to the fair range with both the taxa number and diversity index values improving. Overall the conditions are improving but still remain fairly degraded in the Coastal Bays watersheds.

### Introduction

Streams carry nutrients, sediments, and pollution from the landscape and groundwater to the bays. Thus, the ecological integrity of streams is critical to maintaining the ecological quality of the Coastal Bays. The benthic community is particularly useful for assessment because the aquatic animals are, over a period of time, exposed to the range of physical and chemical stressors present in a stream. To report overall stream health, researchers use the diversity and abundance of benthic organisms. Benthic community structure and abundance, as well as water quality, are monitored at four sites in the St. Martin River and Trappe Creek to determine population trends related to eutrophication.

### Data Sets

Freshwater benthic macroinvertebrate data were collected by Maryland Department of Natural Resources (DNR) annually since 1978 as part of Maryland's core water quality monitoring program (Friedman, 1996). Core site trend data were collected and analyzed at each site as a measure of water and habitat quality. This contrasts with Maryland biological stream survey data (Chapter 3.2), which utilized multiple parameters to assess the health of the entire stream. Data were collected at two non-tidal stations (Birch Branch, South Branch) and three tidal freshwater stations (Bottle Branch, Bishopville Prong, Trappe Creek) to determine long-term water quality trends. Three of these stations were tributaries to the St. Martin River. They were on Birch Branch (BIH0009), Bishopville Prong (BSH0030), and South Branch (SBR0022; also known as Church

Branch) (Figure 3.3.1). One of the stations was on the headwaters of Trappe Creek (TRC0059) and the other was on a tributary to Trappe Creek named Bottle Branch (BOB0001) (Figure 3.3.1).

**Management Objective:** Improving trends for stream health

**Indicator:** Community trend analysis (see below)

### **Analyses**

Four benthic macroinvertebrate community measures were calculated: taxa number, Shannon-Weiner Diversity index, Modified Hilsenhoff biotic index, and percent Ephemeroptera, Plecoptera, Trichoptera (%EPT) and analyzed using non-parametric statistics (Friedman, 1996).

### **Results**

St. Martin River – Benthic macroinvertebrate communities indicated a strong improvement in water quality from the very poor to fair range at the Bishopville Prong (BSH0030) and the South Branch (SBR0022) stations (Figure 3.3.2). Both sites showed an improvement in taxa number, biotic and diversity indices with South Branch also showing an improvement in %EPT. The benthic community indicated no significant trend in fair water quality at Birch Branch (BIH0009) (Figure 3.3.2).

Newport Bay – Bottle Branch showed a slight improvement in the %EPT with the values improving from the very poor to the poor range and the water quality at this site is still in the poor/fair range. Trappe Creek station showed a moderate improvement in water quality from the poor to the fair range with both the taxa number and diversity index values improving.

The benthic macroinvertebrate community at Bottle Branch (BOB0001) showed a slight improvement with an improving trend in %EPT. At the Trappe Creek (TRC0059) station both taxa numbers and diversity index values showed improvement.

Both sites showed a decline in the Hilsenhoff biotic index

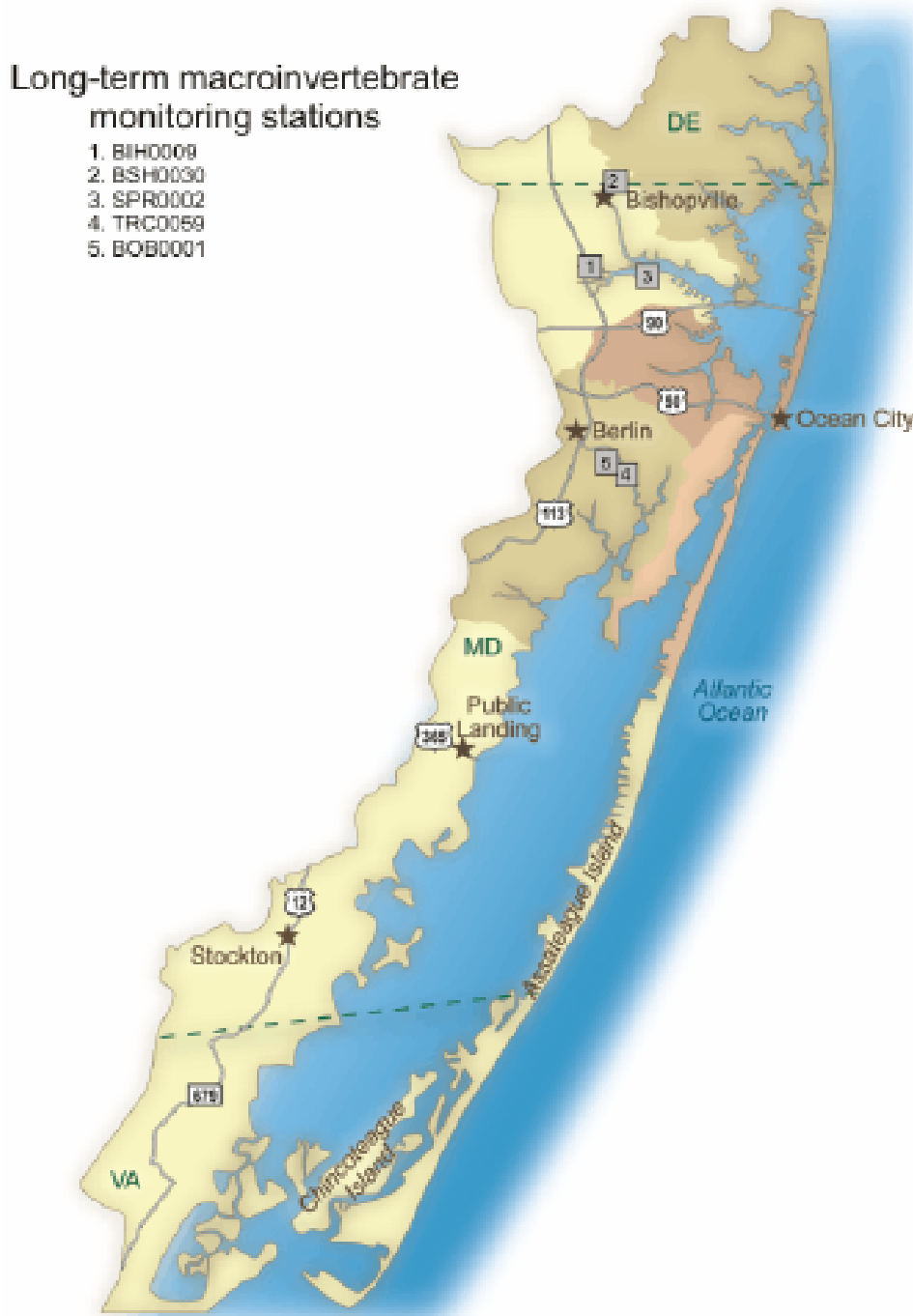
### **Summary**

Samples from the streams in the St. Martin watershed indicated a strong improvement in water quality from the very poor to fair range at the Bishopville Prong and the South Branch stations. Both sites showed an improvement in taxa number, as well as in biotic and diversity indices and South Branch showed an improvement in %EPT. Streams in the Newport watershed show mixed results with small improvements in up to three of the indicators but declines in the biotic index.

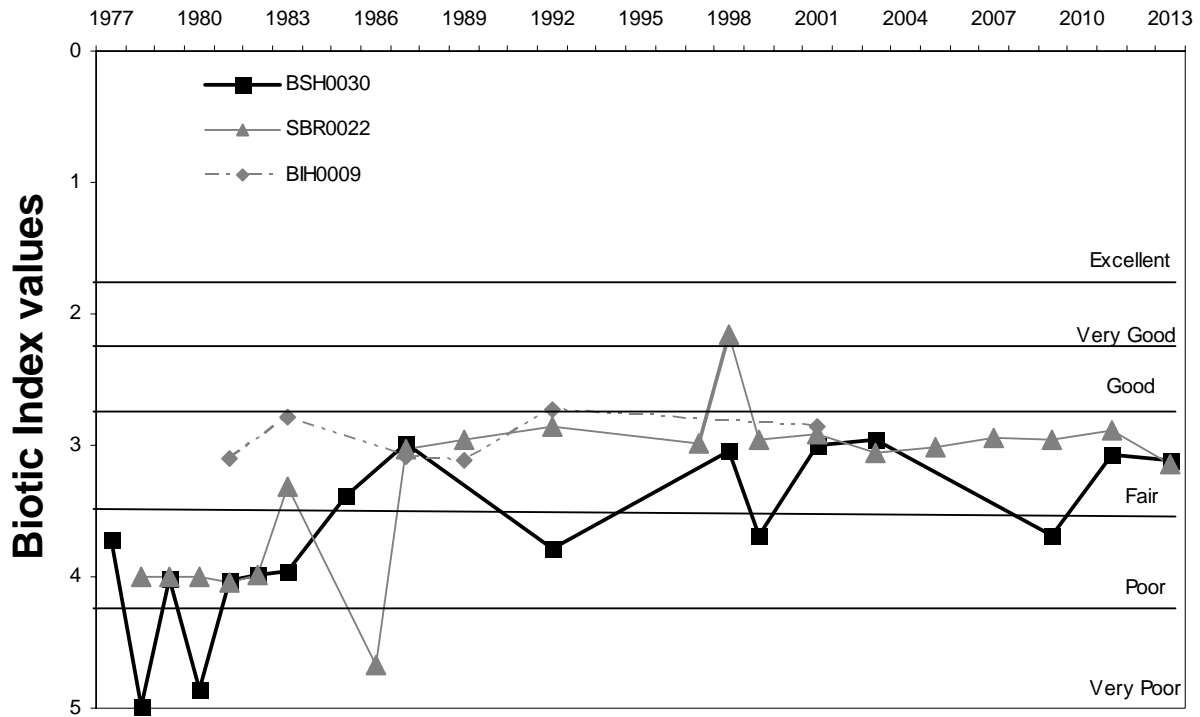
### **References**

Friedman, E. 2009. Benthic macroinvertebrate communities at Maryland's Core/Trend Monitoring Stations: Water Quality Status and Trends CBWP-MANTA-MN-09-1. Maryland Department of Natural Resources, Annapolis, MD.

**Figure 3.3.1** Locations of long-term macroinvertebrate monitoring stations in the Coastal Bays.



**Figure 3.3.2** Trends in freshwater macroinvertebrate community over time in three tributaries of the St. Martin River. Cut-off points and ranking categories were developed through an amalgamation of four commonly used diversity indices (see text). The biotic index score shown here is the modified Hilsenhoff biotic index. Birch Branch and South Branch are both non-tidal stations.



**Figure 3.3.3** Trends in freshwater macroinvertebrate community over time in two tributaries of Newport Bay. Cut-off points and ranking categories were developed through an amalgamation of four commonly used diversity indices (see text). The biotic index score shown here is the modified Hilsenhoff biotic index.

