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ABSTRACT: A Phytoplankton Index of Biotic Integrity (P-IBI) was developed from data collected during eighteen years (1985-2002) of the Chesapeake Bay Water Quality Monitoring Program. Dissolved inorganic nitrogen, orthophosphate and Secchi depth were used to characterize phytoplankton habitat conditions. Low DIN and PO₄ concentrations and high Secchi depths characterized least-impaired conditions. Thirty-eight phytoplankton metrics were tested for their ability to discriminate between impaired and least-impaired habitat conditions. Twelve discriminatory metrics were chosen, and different combinations of these twelve metrics were scored and used to create phytoplankton community indexes for spring and summer in the four salinity regimes in Chesapeake Bay. The scoring criteria for each metric were based on the distribution of the metric's values in least-impaired conditions relative to the distribution in impaired conditions. An independent data set and jack knife validation procedure were used to examine P-IBI performance. The P-IBI correctly classified 70.0% - 84.4% of the impaired and least-impaired samples, grouped by season and salinity, in the calibration data set. The P-IBI is a management tool to assess phytoplankton community status relative to estuarine nutrient and light conditions.