

Buchanan*, C., R. V. Lacouture, H. G. Marshall, M. Olson, and J. Johnson. 2005. Phytoplankton reference communities for Chesapeake Bay and its tidal tributaries. *Estuaries* 28(1):138-159.

ABSTRACT: Phytoplankton reference communities for Chesapeake Bay were quantified from least-impaired water quality conditions using commonly measured parameters and indicators derived from measured parameters. A binning approach was developed to classify water quality. Least-impaired conditions had relatively high water column transparency and low concentrations of dissolved inorganic nitrogen and orthophosphate. Reference communities in all seasons and salinity zones are characterized by consistently low values of chlorophyll *a* and pheophytin coupled with relatively stable proportions of the phytoplankton taxonomic groups and low biomasses of key bloom-forming species. Chlorophyll cell content was lower and less variable and average cell size and seasonal picophytoplankton biomass tended to be greater in the mesohaline and polyhaline reference communities as compared to the impaired communities. Biomass concentrations of the nano-micro phytoplankton size fractions (2–200 μm) in 12 of the 16 season-specific and salinity-specific reference communities were the same or higher than those in impaired habitat conditions, suggesting that nutrient reductions will not decrease the quantity of edible phytoplankton food available to large consumers. High (bloom) and low (bust) biomass events within the impaired phytoplankton communities showed strikingly different chlorophyll cell content and turnover rates. Freshwater flow had little effect on phytoplankton responses to water quality condition in most of the estuary. Improved water column transparency, or clarity, through the reduction of suspended sediments will be particularly important in attaining the reference communities. Significant nitrogen load reductions are also required.