Invasion of the Laurentian Great Lakes by dreissenid mussels in the late 1980’s led many researchers to propose direct, detrimental impacts on lower trophic levels that could ultimately reduce commercially and recreationally important fish species. Combination of the mussels’ high consumptive capacity and their abundance in the benthos of Lake Erie’s western basin led to the prediction that the existing mussel population could filter the entire water column up to 18.8 times per day. Rates this high would decimate phytoplankton standing stocks and could diminish higher trophic level production. However, lake-wide plankton data over the last decade show a pattern of increasing phytoplankton biomass and no decline in crustacean zooplankton. Over the same time period, the frequencies of harmful algal blooms (HABs) and central basin hypoxia have increased. We hypothesize that dreissenids affect ecosystem processes at different spatial and temporal scales from other forcing functions, creating non-linearities within these processes. For example, phytoplankton reproduction occurs on time scales of days but watershed phosphorus loading occurs on time scales of months or years. Internal phosphorus loading through dreissenid excretion operates on similar time scales as phytoplankton growth and may compensate for any phytoplankton loss due to dreissenid consumption and facilitate growth of HABs by excreting at low nitrogen:phosphorus ratios. We provide evidence for non-linear impacts in addition to qualitative examination of how dreissenid mussels impact Lake Erie system stability.