A Harmful Algal Bloom (HAB) is a high concentration of microscopic algae which has a negative impact on the environment. Harmful algal bloom species have had an increasing ecological impact on the Chesapeake Bay Watershed where they disrupt water chemistry, kill fish and cause human illness. In Virginia, scientists from Virginia Institute of Marine Science and Old Dominion University monitor HABs and their effect on water quality; however, these groups lack a method to monitor HABs in real time. This limits the ability to document associated water quality conditions and predict future blooms. Band reflectance values from Landsat 8 Surface Reflectance data (USGS Earth Explorer) and MODIS Chlorophyll imagery (NOAA CoastWatch) were cross calibrated to create a regression model that calculated concentrations of chlorophyll. Calculations were verified with in situ measurements from the Virginia Estuarine and Coastal Observing System. Imagery produced with the Chlorophyll-A calculation model will allow VIMS and ODU scientists to assess the timing, magnitude, duration and frequency of HABs in Virginia’s Chesapeake watershed and to predict the environmental and water quality conditions that favor bloom development.