YSI Blue-Green Algae (BGA) Sensors
Spatial Water Quality Mapping of the Potomac River Estuary

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Basic Concept

Multiple stressors can limit growth of submerged aquatic vegetation (SAV) but poor water quality is a major limitation in many estuaries. Our goal is to evaluate where opportunities exist to restore seagrass in the Potomac River (Maryland), based on water quality conditions that meet SAV habitat needs.

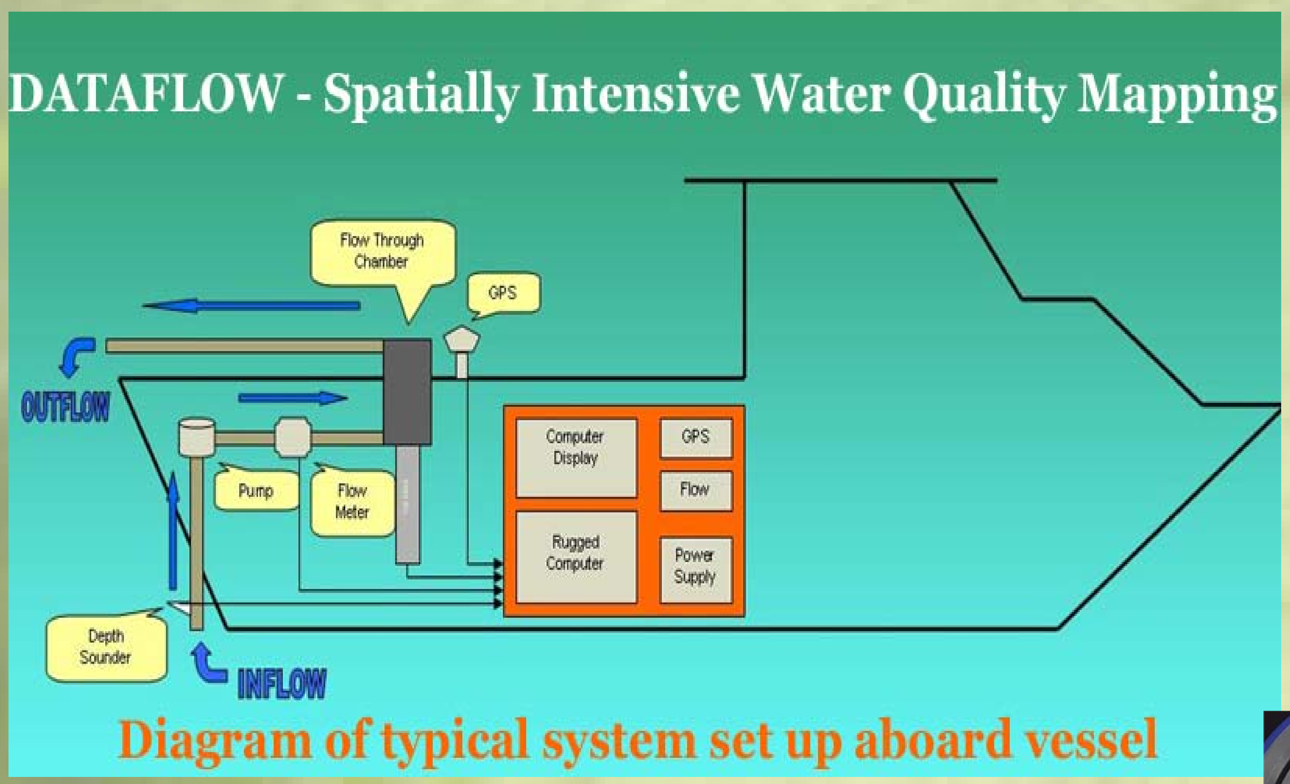
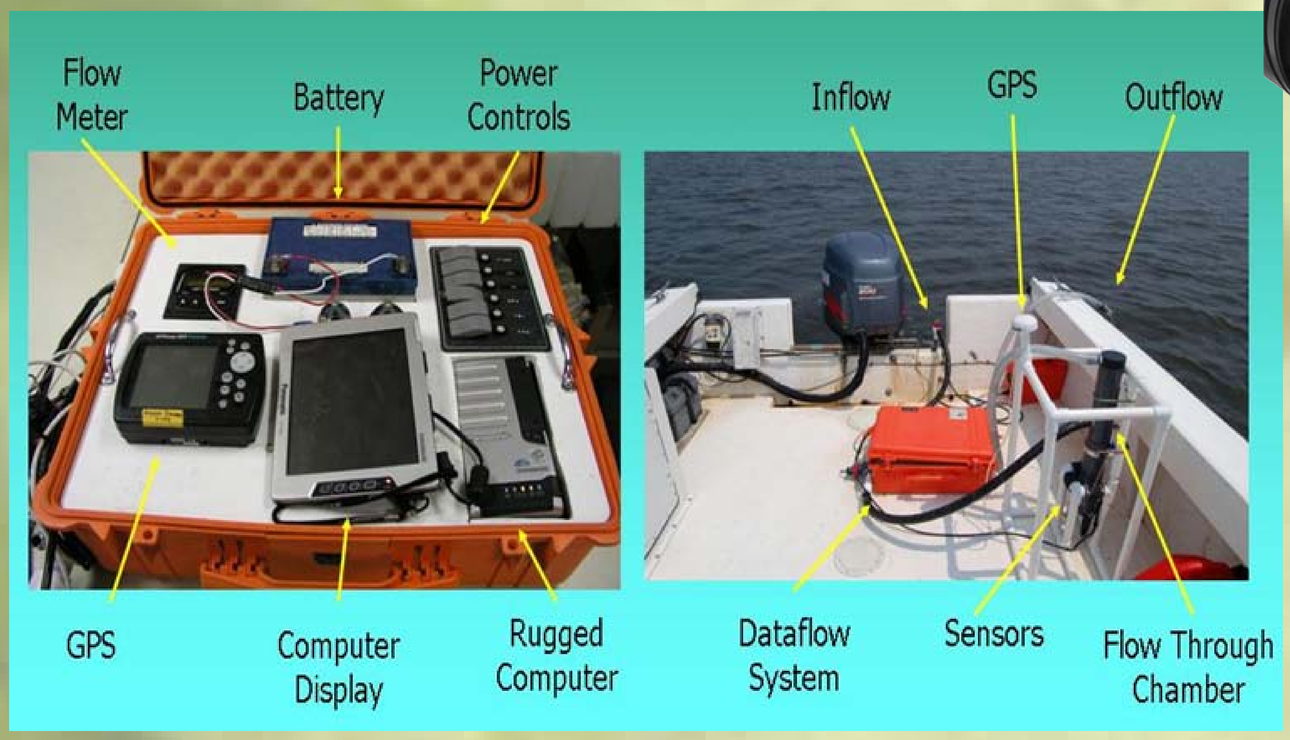


Diagram of typical system set up aboard vessel

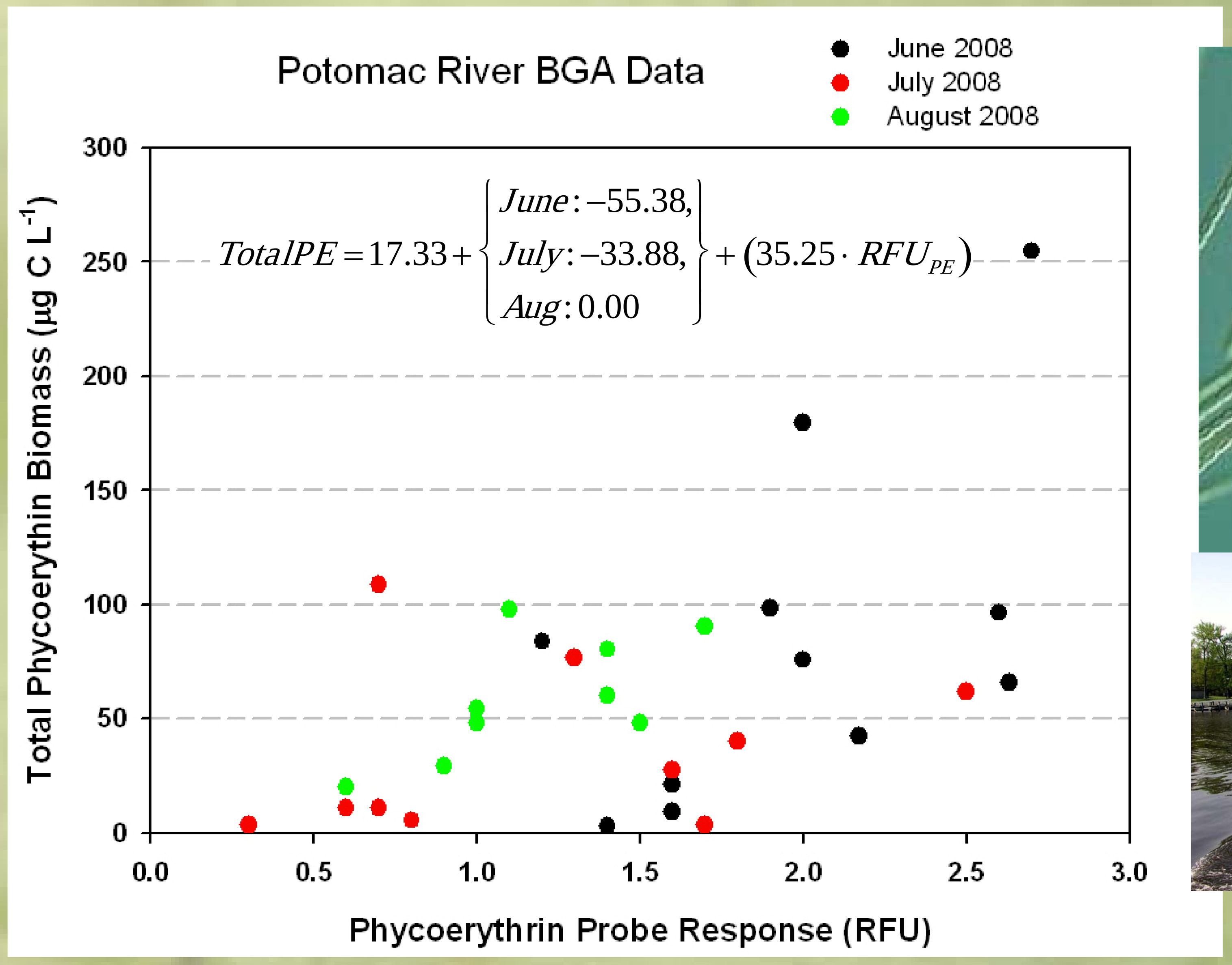


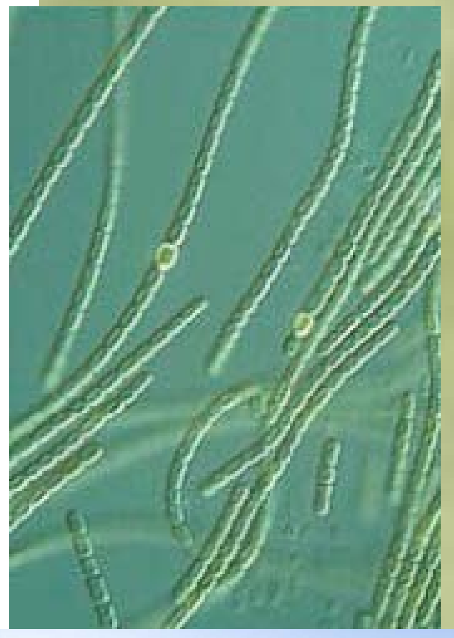
We collected monthly data on water quality in the Potomac River estuary using a vessel-based multi-parameter water quality sampling system linked to GPS positioning (DATAFLOW). Output is combined with supplemental data, models, and GIS modeling to create detailed spatial maps of water quality parameters and screened for acceptable habitat conditions.

In 2008 we integrated Yellow Spring Instruments (YSI) blue-green algae (BGA) sensors into our system to evaluate their use for detecting cyanobacteria in areas of the Potomac River that are seasonally plagued with blooms of *Microcystis aeruginosa*. We compared interpolated results of traditional chlorophyll sensors with the BGA data and examined the relationship between sensor data and enumerated phytoplankton samples.

Converting Flourometry to Biomass

Cell counts for each sample were converted to corresponding algal biomass using conversion factors (Morgan State's Phytoplankton Monitoring Program). A stepwise linear regression was applied to each fluorometer reading. Results of the regressions show a significant relationship between month-specific biomass of phycoerythrin containing organisms (PE) and probe fluorescence (RFU) in the upper Potomac River Estuary (R^2 = 0.84, p >> 0.01).





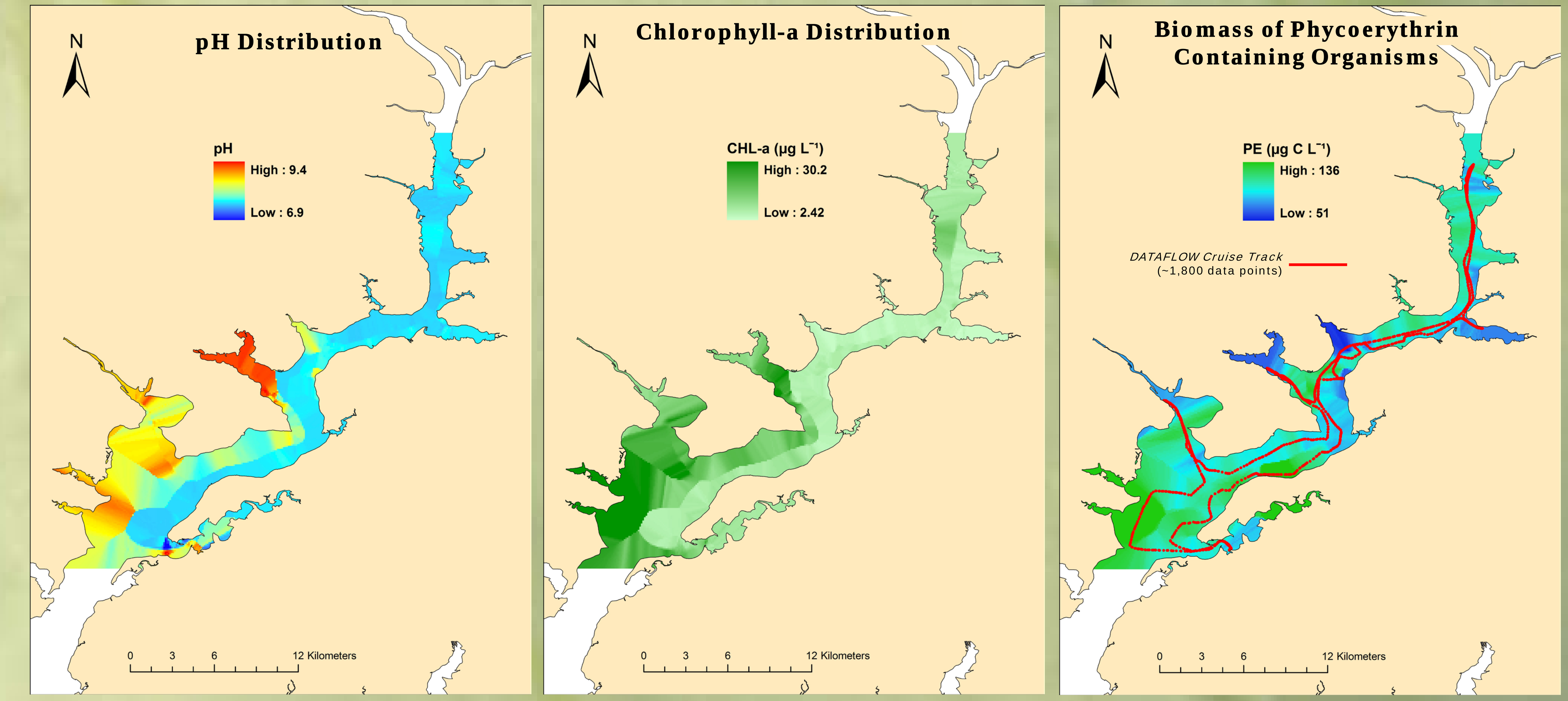
Gunston Cove, Potomac River

Results

Spatially intensive sampling provides an opportunity to understand fine-scale variability within the estuary, potential causes of water quality impairment, and the representativeness of the sparse sampling network used to assess compliance with water quality regulations.

- •Spatially intensive monitoring detects fine-scale (~50 m) patchiness in water quality
- •Phycoerythrin sensor showed significant relationship with abundance of phycoerythrin containing cells (e.g. cryptophytes)
- •Phycocyanin sensor did not show significant relationship with abundance of blue-green algae
- •Observed phycocyanin containing organisms were mainly colony forming (e.g. *Merismopedia*, *Microcystis*, *Spirulina*, *Oscillatoria*)
- •Spatial pattern of BGA distribution was mirrored in Chl-a and pH
- •Elevated pH (>9.0) enhances phosphorus release from sediments reinforcing further algal growth

August 2008 Tidal Fresh Potomac River
DATAFLOW and BGA Output Interpolations of pH, CHL-a and PE



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