Incorporating Climate Change Scenarios and Interactive Stressors into a Seagrass Model for Florida Bay

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Introduction

Everglades Restoration is predicted to increase freshwater inflow to the northern estuaries of Florida Bay and ameliorate seagrass stress. In contrast, climate change will amplify stressors such as temperature, sea level rise, and hypersalinity. To explore how seagrasses respond to individual and combined climate stressors, we adapted a well-established seagrass ecosystem model (SEACOM) currently being used for management in Florida Bay. A hypoxia component was added to the model to simulate internal oxygen dynamics driven by climate stressors shown to drive seagrasss mortality. Further, sensitivity analyses were run to evaluate the effects of optimal and climate-change induced conditions on the dominant habitat-forming tropical species in Florida Bay, *Thalassia testudinum.*

Hypoxia Conceptual Model Integration into SEACOM Model

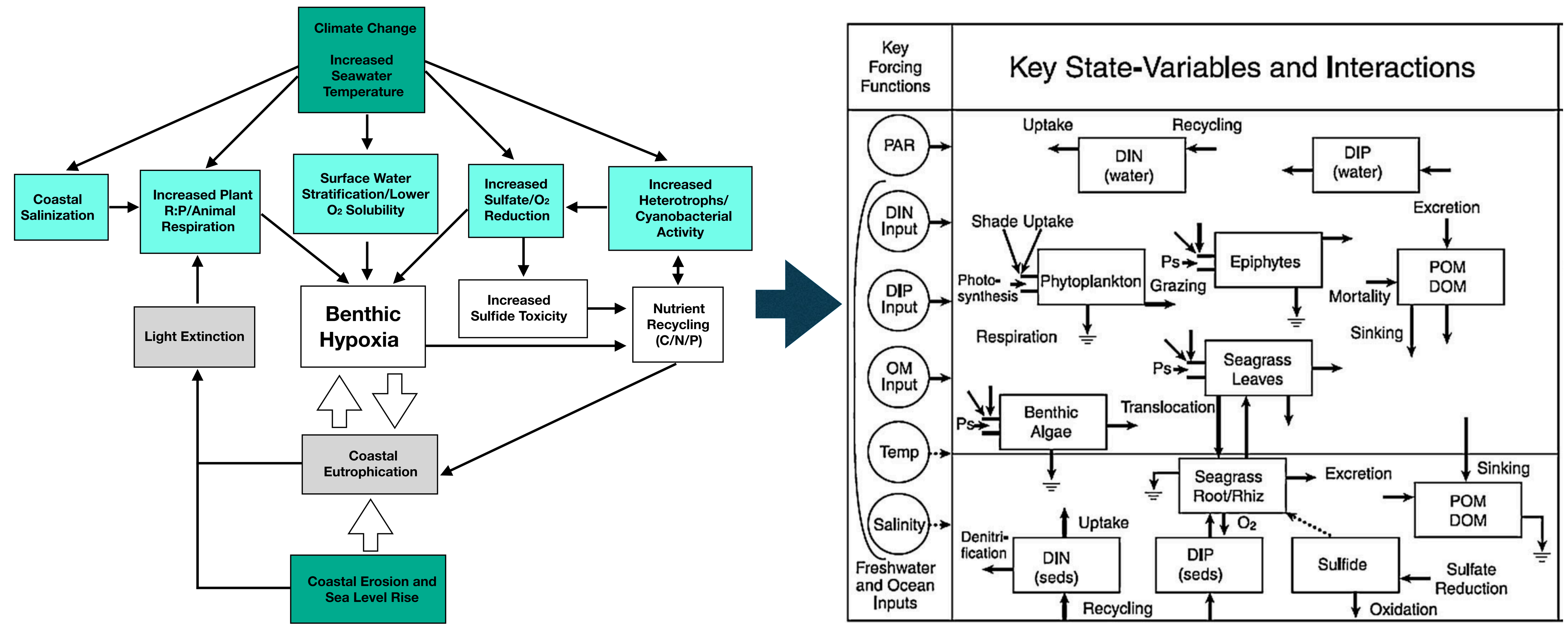
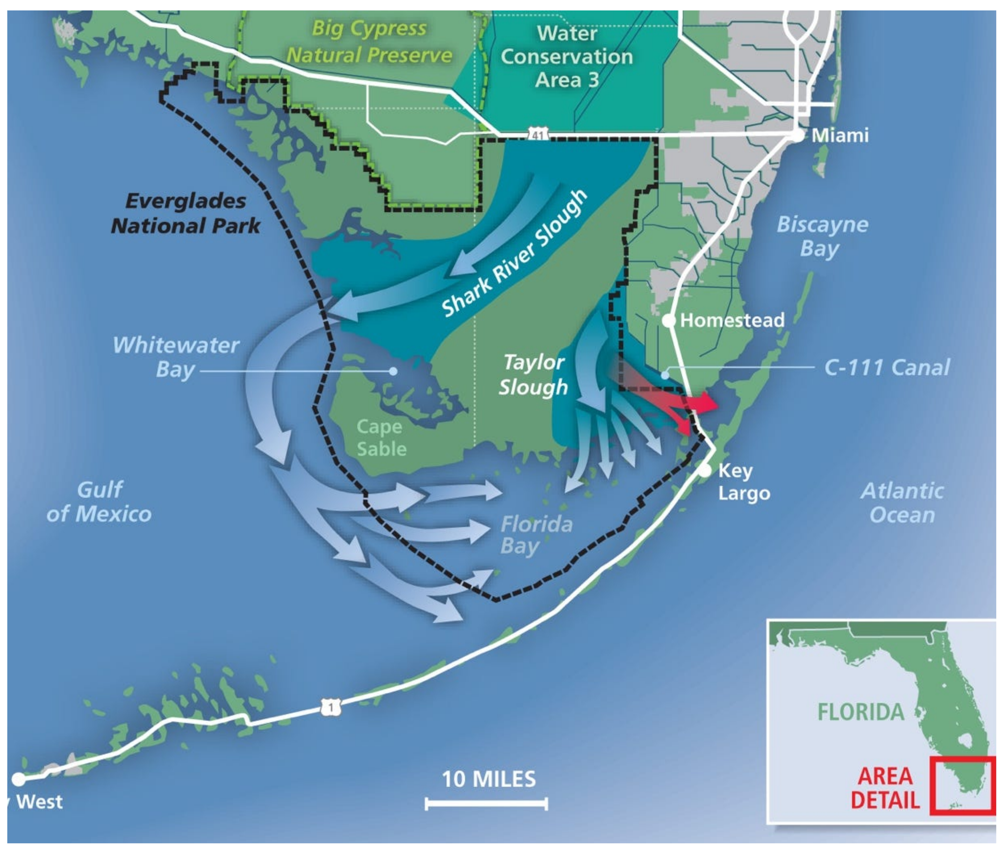


Figure 1: Hypoxia conceptual model being incorporated into the Seagrass Ecological Assessment and Community Organization Model (SEACOM), used for management in Florida Bay to establish climate stressors on seagrass growth and mortality and run various climate scenarios.

Florida Bay



Location of Florida Bay at the southern peninsula of Florida. Seagrass stressors are influenced by freshwater flow from the Everglades, tidal input from the Gulf of Mexico, evaporation, and high temperature in the subtropical Florida climate.
Image Source: Everglades Foundation

Water Column Oxygen Dynamics Module

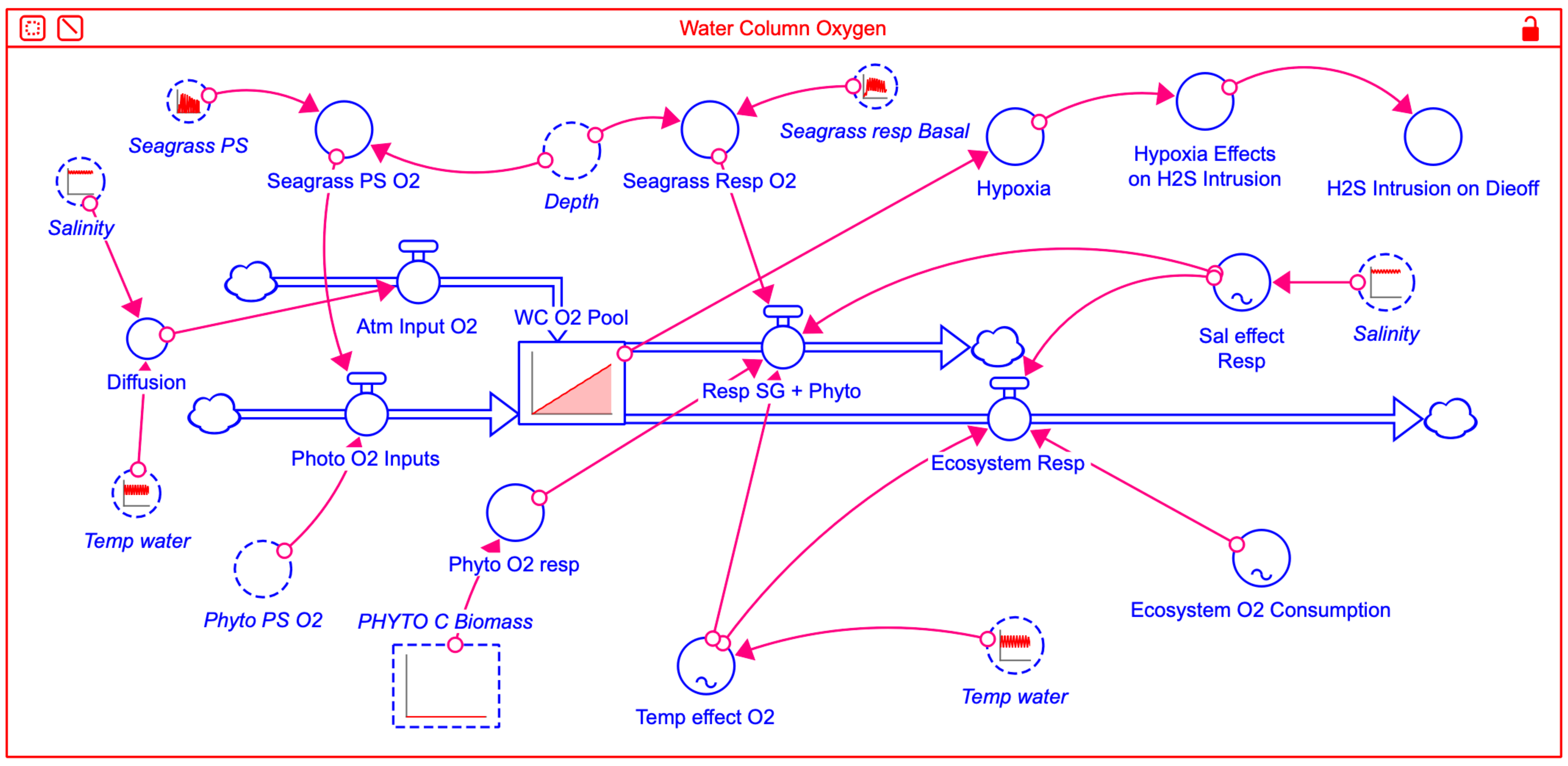


Figure 2: Water column oxygen module being developed to integrate into SEACOM. Oxygen inputs from seagrass, phytoplankton, and atmosphere are balanced by system respiration affected by temperature and salinity. Water column hypoxia effects are linked to seagrass sulfide intrusion, growth, and mortality (Stella Architect).

Climate Change Seagrass Stressor Scenarios

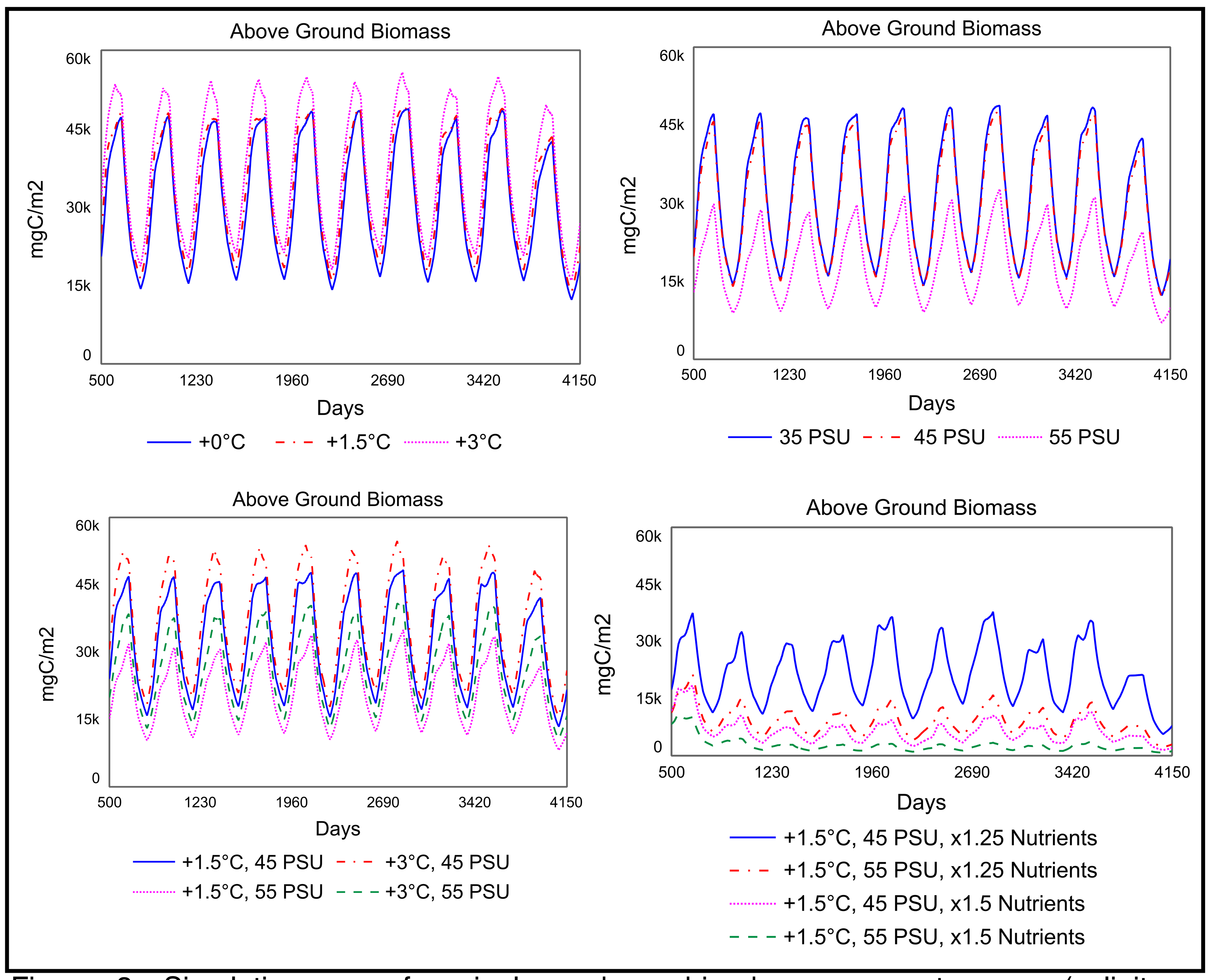


Figure 3: Simulations run for single and combined seagrass stressors (salinity x temperature x nutrients) under optimal conditions and temperature climate IPCC 8.5 worst-case scenario (2060, 2100), hypersaline conditions, and nutrient pulses leading to phytoplankton blooms to examine effects on *Thalassia testudinum* above ground biomass.

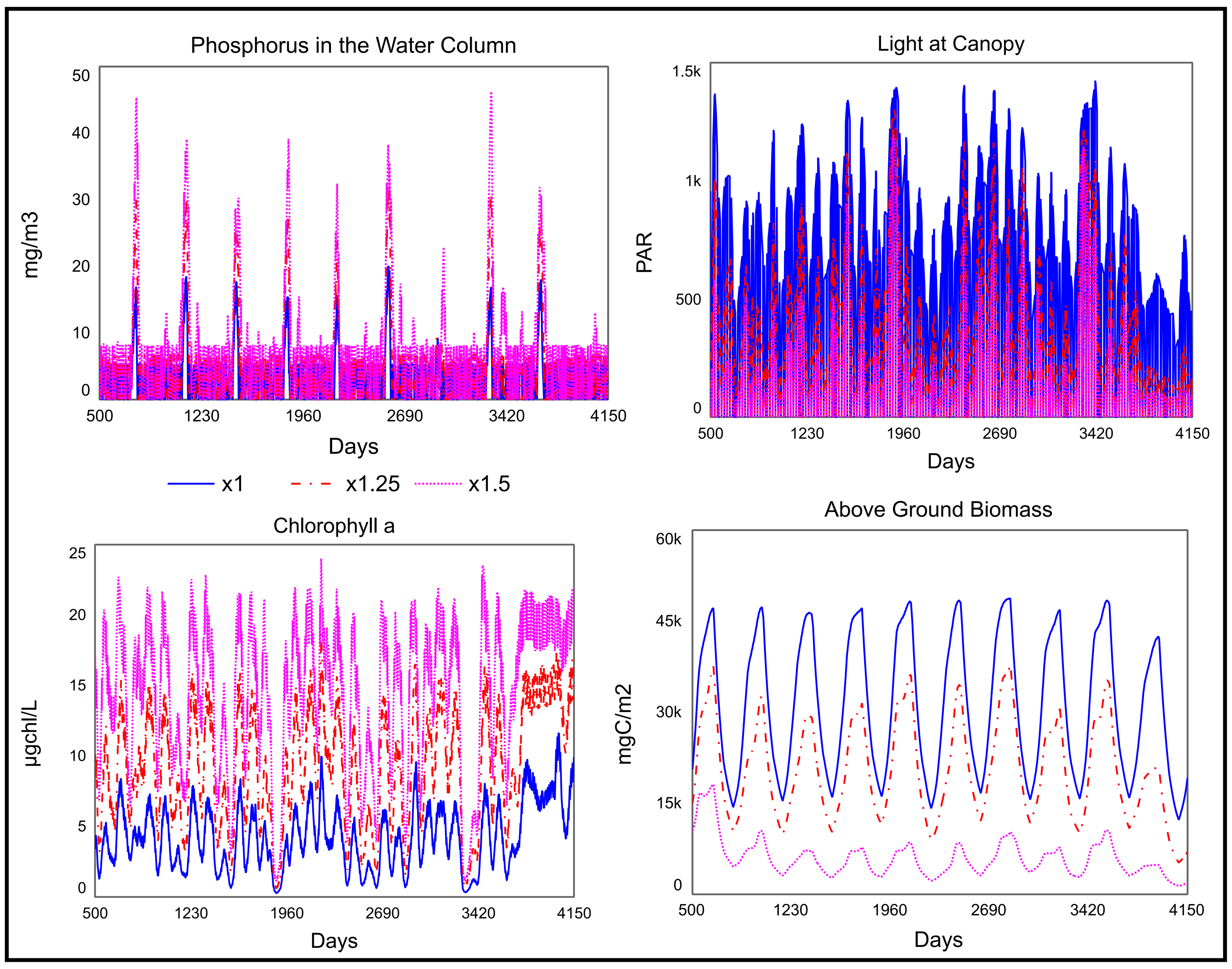


Figure 4: Simulations run for increased phosphorus in the water column and the projected impacts on light, chlorophyll concentration, and *Thalassia testudinum* above ground biomass.