

April 26, 2019

Nutrients $\frac{dR}{dt} = \underbrace{S_R}_{\text{nutrient inflow}} - \underbrace{\alpha_1 R P_1}_{\text{nutrient uptake}} - \underbrace{\alpha_2 R P_2}_{\text{nutrient uptake}} \quad (1)$

Pro analog $\frac{dP_1}{dt} = \underbrace{\alpha_1 R P_1}_{\text{nutrient uptake}} + \underbrace{\phi_1 P_1 \text{DOC}}_{\text{DOC uptake}} - \underbrace{\gamma_1 P_1 \text{ROS}}_{\text{ROS damage}} - \underbrace{\delta P_1}_{\text{dilution}} \quad (2)$

Syn analog $\frac{dP_2}{dt} = \underbrace{\alpha_2 R P_2}_{\text{nutrient uptake}} + \underbrace{\phi_2 P_2 \text{DOC}}_{\text{DOC uptake}} - \underbrace{\gamma_2 P_2 \text{ROS}}_{\text{ROS damage}} - \underbrace{\delta P_2}_{\text{dilution}} \quad (3)$

Heterotroph $\frac{dH_1}{dt} = \underbrace{\alpha_3 R H_1}_{\text{nutrient uptake}} + \underbrace{\phi_3 H_1 \text{DOC}}_{\text{DOC uptake}} - \underbrace{\gamma_3 H_1 \text{ROS}}_{\text{ROS damage}} - \underbrace{\delta H_1}_{\text{dilution}} \quad (4)$

Organic C $\frac{d\text{DOC}}{dt} = \underbrace{\kappa_1 P_1 + \kappa_2 P_2 + \kappa_3 H_1}_{\text{DOC production}} - \underbrace{(\phi_1 P_1 + \phi_2 P_2 + \phi_3 H_1) \text{DOC}}_{\text{DOC consumption}} - \underbrace{\delta \text{DOC}}_{\text{dilution}} \quad (5)$

Reactive oxygen $\frac{d\text{ROS}}{dt} = \underbrace{S_{\text{ROS}}}_{\text{ROS production}} - \underbrace{(\lambda_1 P_1 + \lambda_2 P_2 + \lambda_3 H_1) \text{ROS}}_{\text{ROS detoxification}} - \underbrace{\delta \text{ROS}}_{\text{dilution}} \quad (6)$