

SJR Technical Working Group

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SJR DO Depletion Modeling Progress Update

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**E n v i r o n m e n t a l
E n g i n e e r s & S c i e n t i s t s**

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Modeling Approach

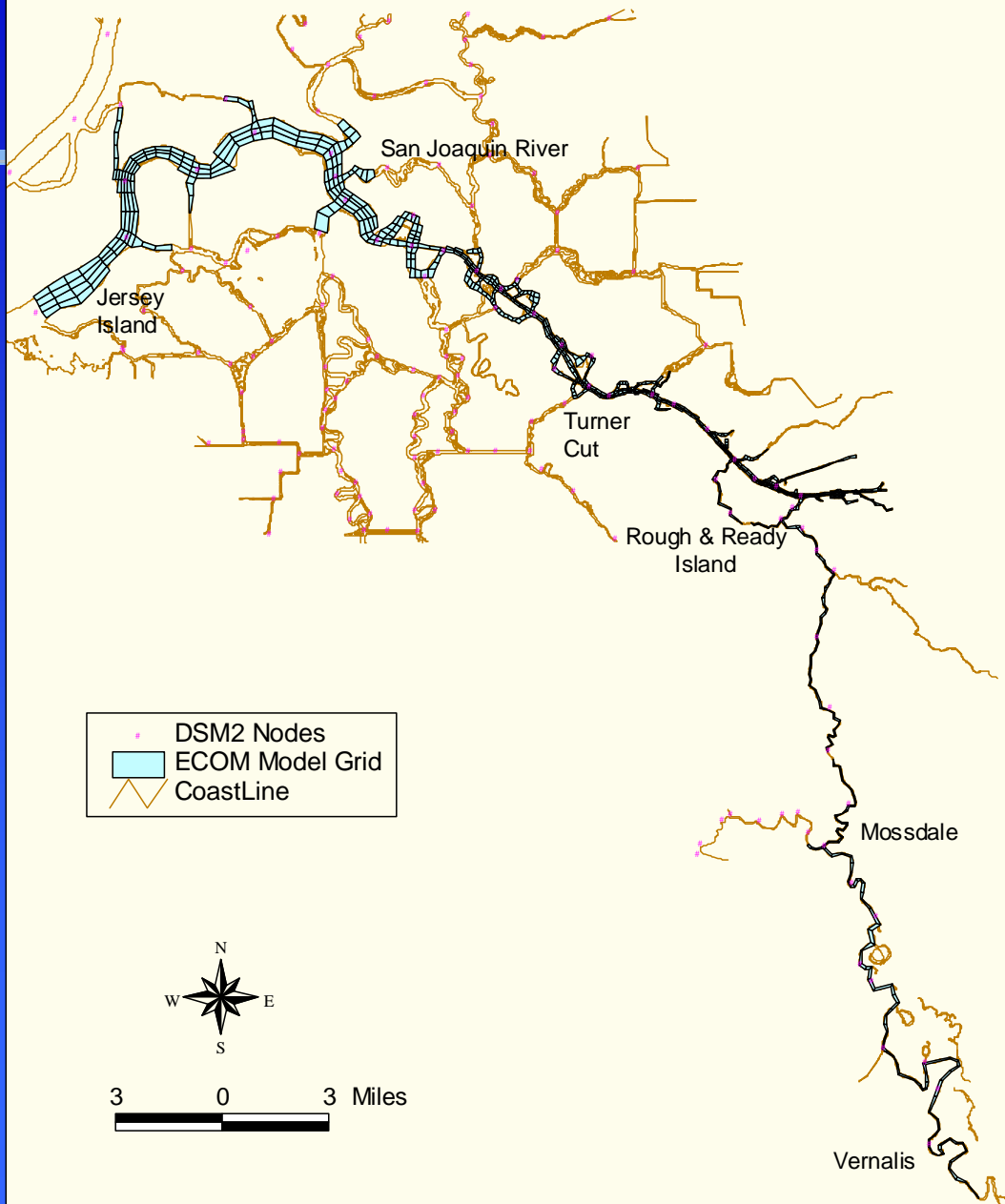
- **Data compilation & review (Data Atlas)**
 - ◆ **Started compiling data, atlas format – Russ Brown**
- **DSM2-delta modeling (develops BC)**
 - ◆ **Started developing BC interface**
- **DWSC modeling (ECOMSED/RCA)**
 - ◆ **Draft model grid developed**
- **Upstream SJR modeling (DSM2-sjr)**
- **Adaptive/Corrective Management**

HydroQual Project Status

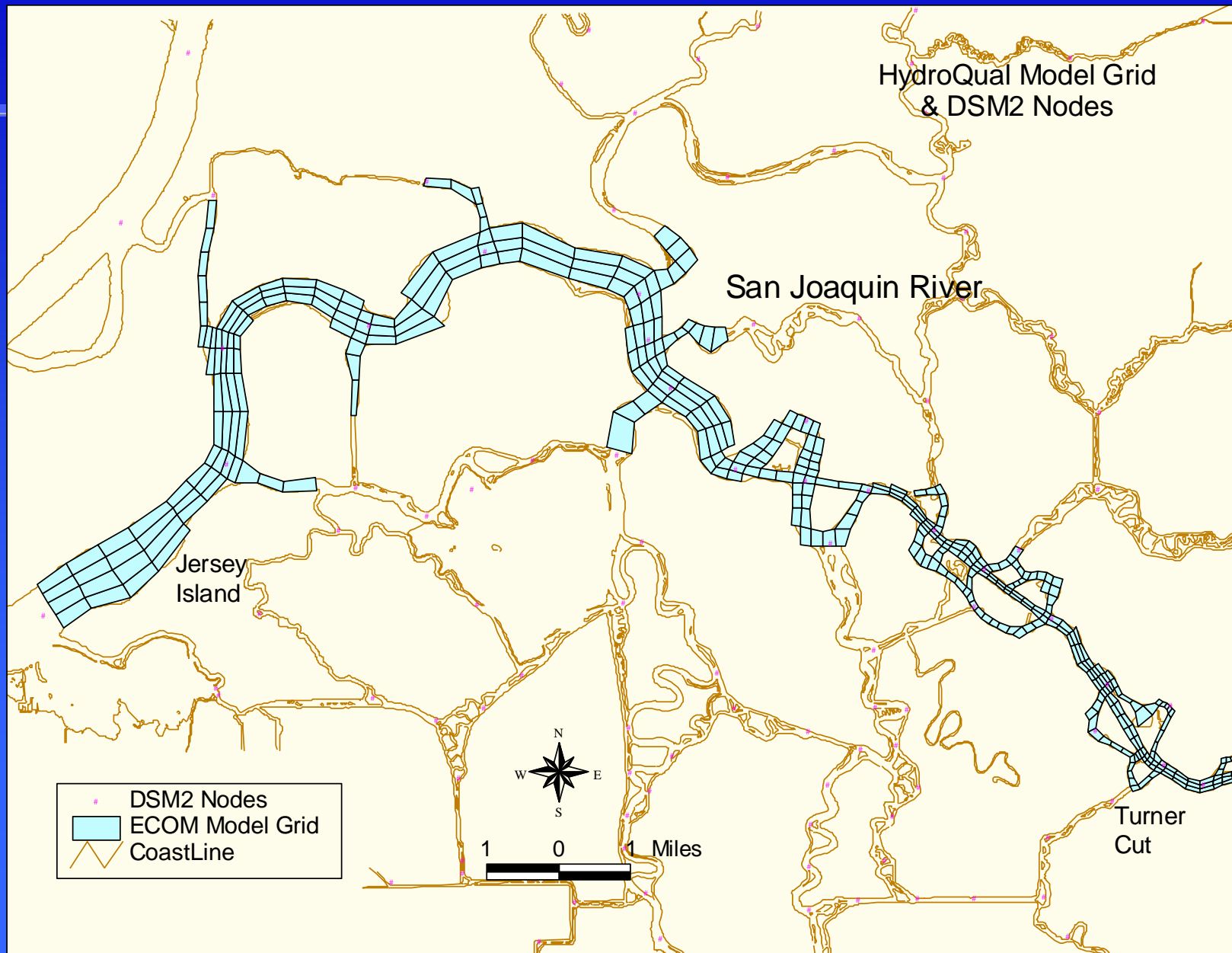
- **Reviewing reports/data from the DWSC and in upstream SJR**
- **Generated a draft model grid for the hydrodynamic & water quality modeling**
- **Started linking DSM2 model output to hydrodynamic model for BC**

Preliminary Model Grid (Entire Study Area)

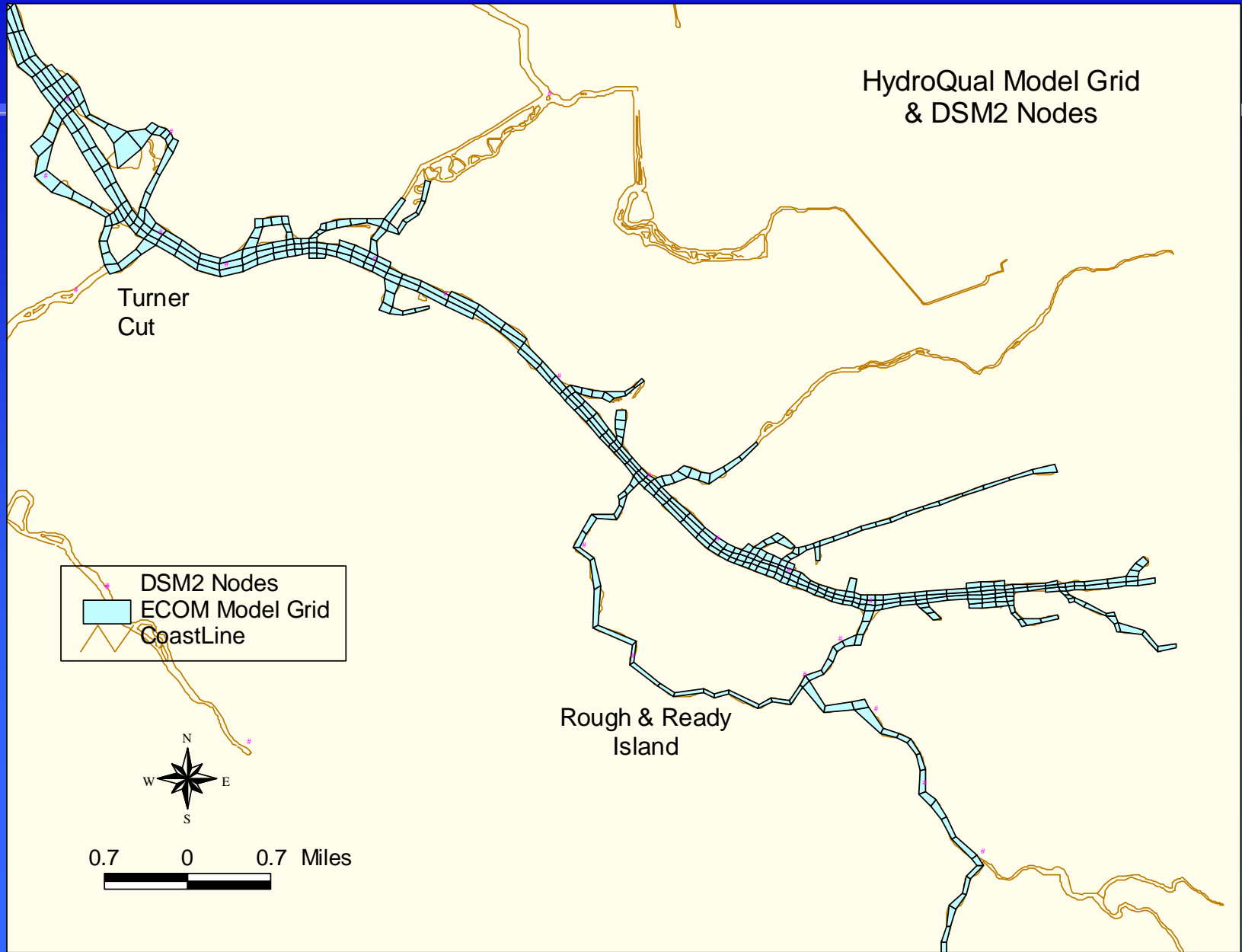
HydroQual Model Grid & DSM2 Nodes



Jersey Island to Turner Cut



Turner Cut to DWSC



DWSC to Vernalis

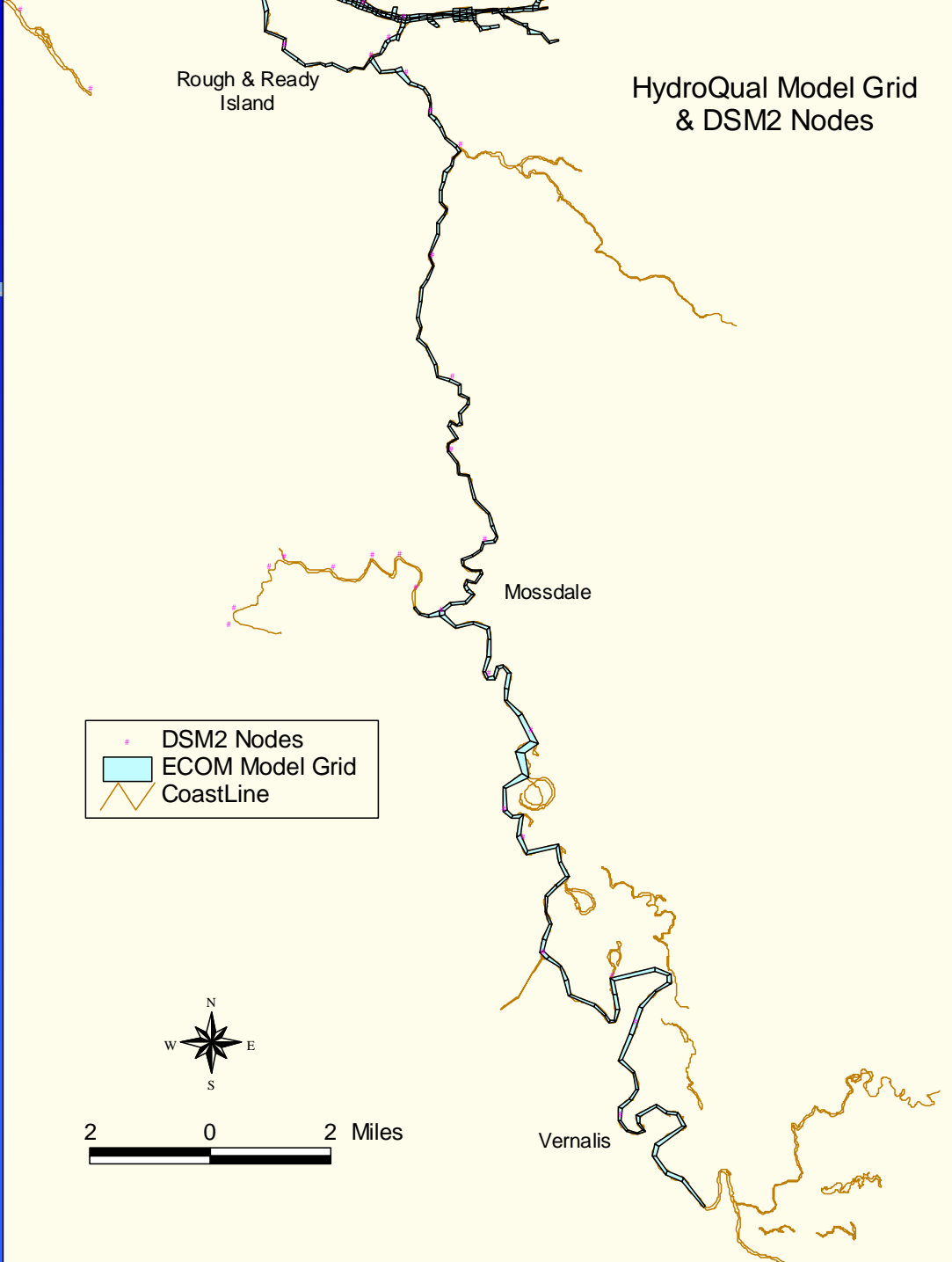
Rough & Ready Island

HydroQual Model Grid & DSM2 Nodes

Mossdale

Vernalis

◆ DSM2 Nodes
■ ECOM Model Grid
— CoastLine



Eutrophication Modeling Framework

(Yellow Text Denotes Sediment Flux Model)



Solar Radiation as Reduced by
Cloud Cover and Water Column
Light Attenuation

Atmospheric
Reaeration

Mineralization

PON
&
DON

DIN
(NH_4 & $\text{NO}_2 + \text{NO}_3$)

Nitrification

POP
&
DOP

DIP
(PO_4)

PHYTOPLANKTON
(Chl-a)

Photosynthesis

Oxidation

DISSOLVED
OXYGEN

POC & DOC
(BOD)

Settling

Settling

DISSOLVED
SILICA
(SiO_2)

Nutrient Uptake
and Recycle

Settling

Sediment
Oxygen
Demand
(SOD)

Settling

Nutrient Fluxes
(NH_4 , $\text{NO}_2 + \text{NO}_3$, PO_4)

Respiration

Sediment Diagenesis
of Organic Matter

Production of H_2S , CH_4 , NH_4 , PO_4 , Si

SEDIMENT



SOD & Nutrient Fluxes

- **Sediment oxygen demand (SOD)**
- **Sediment nutrient fluxes**
 - ◆ **NH_3 – typically from sediment into water**
 - ◆ **PO_4 – varies depending on water DO level**
 - ◆ **NO_3 – typically from water into sediment**
 - ◆ **N_2 – typically from sediment into water**
- **Measured rates will be used to calibrate the sediment flux submodel**

Eutrophication: Nutrients

- **Nitrogen**



- ◆ K_M – mineralization rate of OrgN to NH_3
- ◆ K_{nitr} – nitrification rate of NH_3 to NO_2+NO_3
- ◆ K_{denitr} – denitr. rate of NO_2+NO_3 to N_2 gas

- **Phosphorus**



- ◆ K_M – mineralization rate of OrgP to PO_4

Carbon (BOD), Reaeration

- **Carbon** *Carbon (BOD)* 🕒 K_d ☀️ O_2 consumption
 - ◆ K_d – carbon (BOD) oxidation rate
- **Reaeration** K_a 🌊 $\frac{K_L}{H}$
 - ◆ K_L – oxygen transfer coefficient (L/T)
 - ◆ Wind & velocity dependent
- All rates are temperature dependent

Algal Kinetics

- **Algal growth is a function of:**
 - ◆ **Temperature**
 - ◆ **Available light**
 - ◆ **Available nutrients (NH_3 , NO_2+NO_3 & PO_4)**
 - ◆ **Algae produce oxygen during photosynthesis**
- **Algal mortality occurs due to:**
 - ◆ **Respiration**
 - ◆ **Zooplankton grazing**
 - ◆ **Algae consume oxygen during respiration**
- **Algal death also recycles nutrients & OrgC**

Algal Kinetics (cont.)

- **Algal growth & respiration rates**
 - ◆ **Can be estimated from light & dark bottle studies, literature, previous modeling studies, literature**
- **Zooplankton grazing rate**
 - ◆ **Estimate from zooplankton levels, model calibration**
- **Is information available on algal species?**

Water Quality Model Inputs

- **Solar radiation / photoperiod**
 - ◆ **Measurements**
- **Secchi depth / light extinction**
 - ◆ **Measurements**
- **Settling rates for algae, part. N/P/C**
 - ◆ **Literature, measurements, calibration**
- **N/C, P/C, C/Chla ratios for algal kinetics**
 - ◆ **Literature, measurements, calibration**
- **Reaction rates**
 - ◆ **Literature, measurements, calibration**

Questions & Answers

