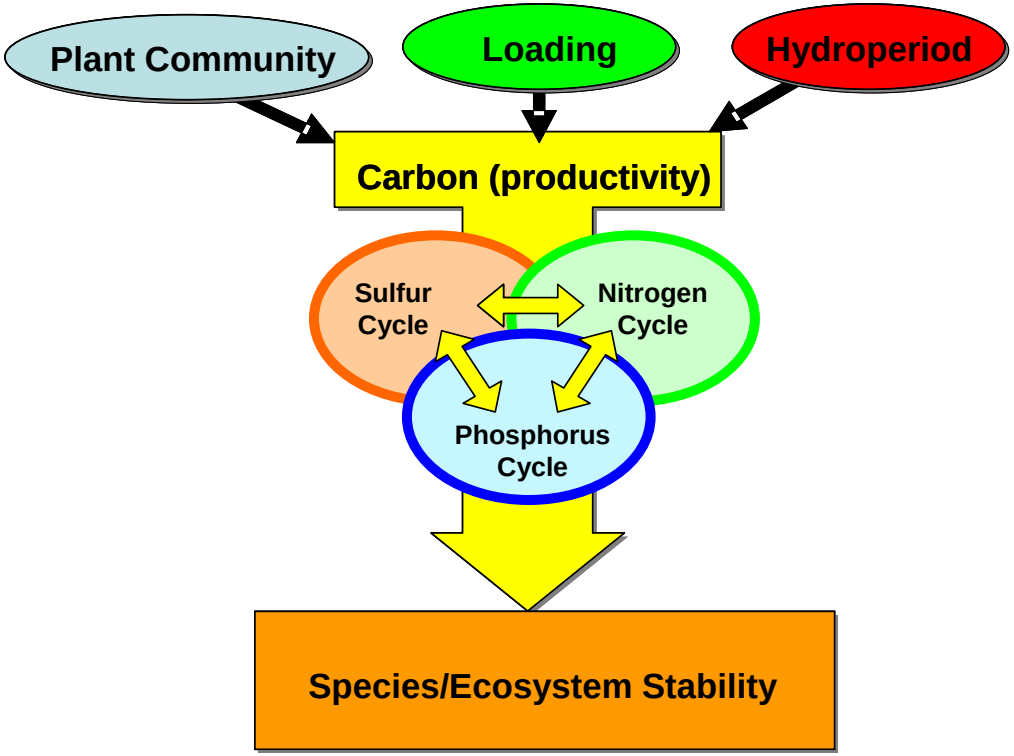
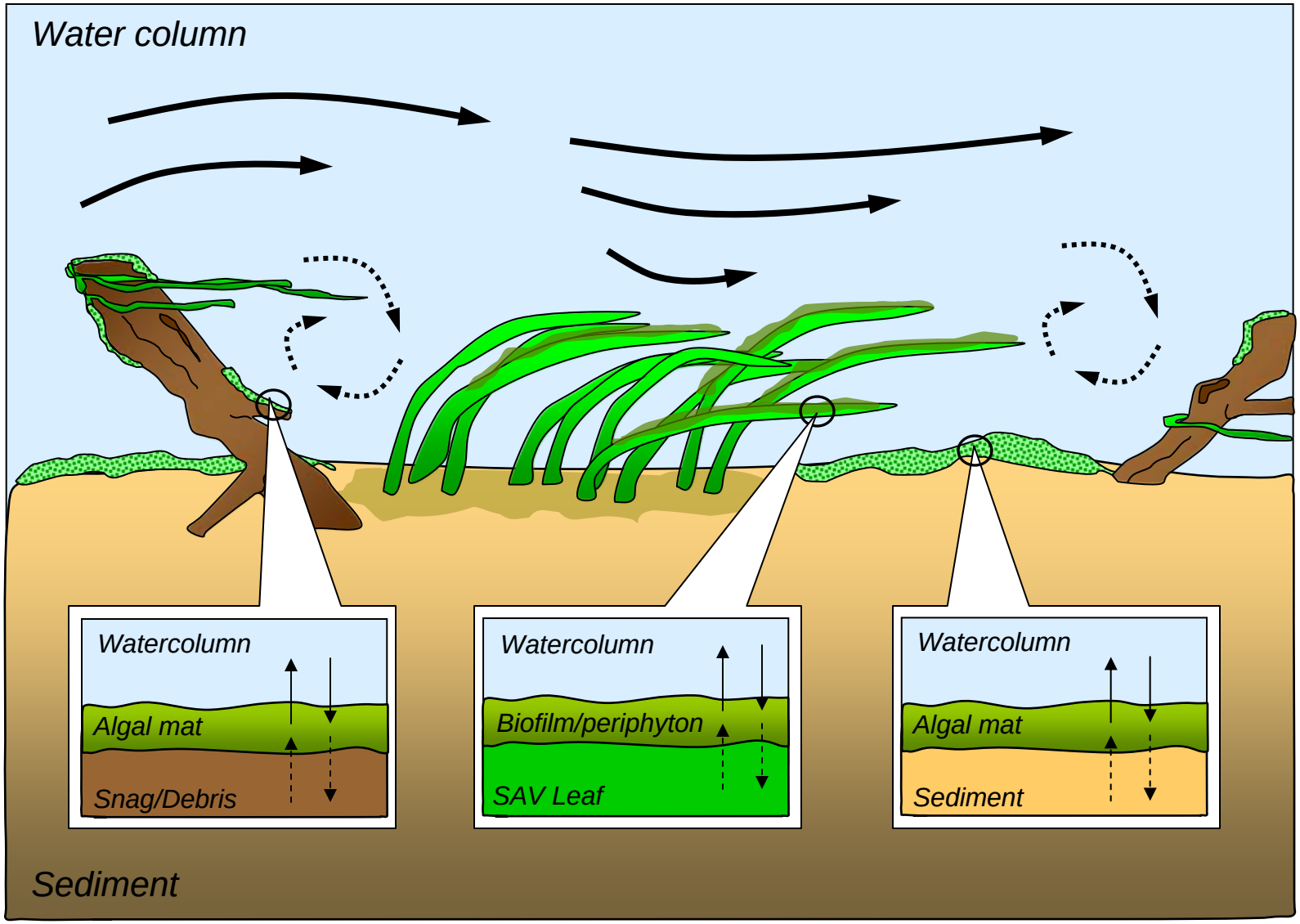
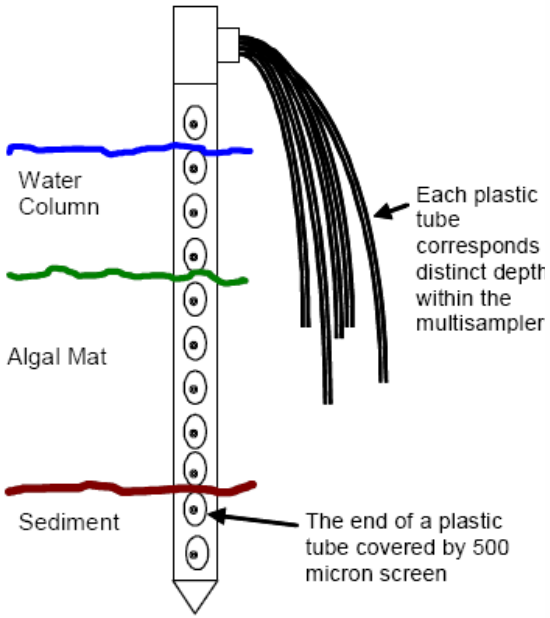
Chapter 3: Biogeochemical Processes and Implications for Nutrient Cycling

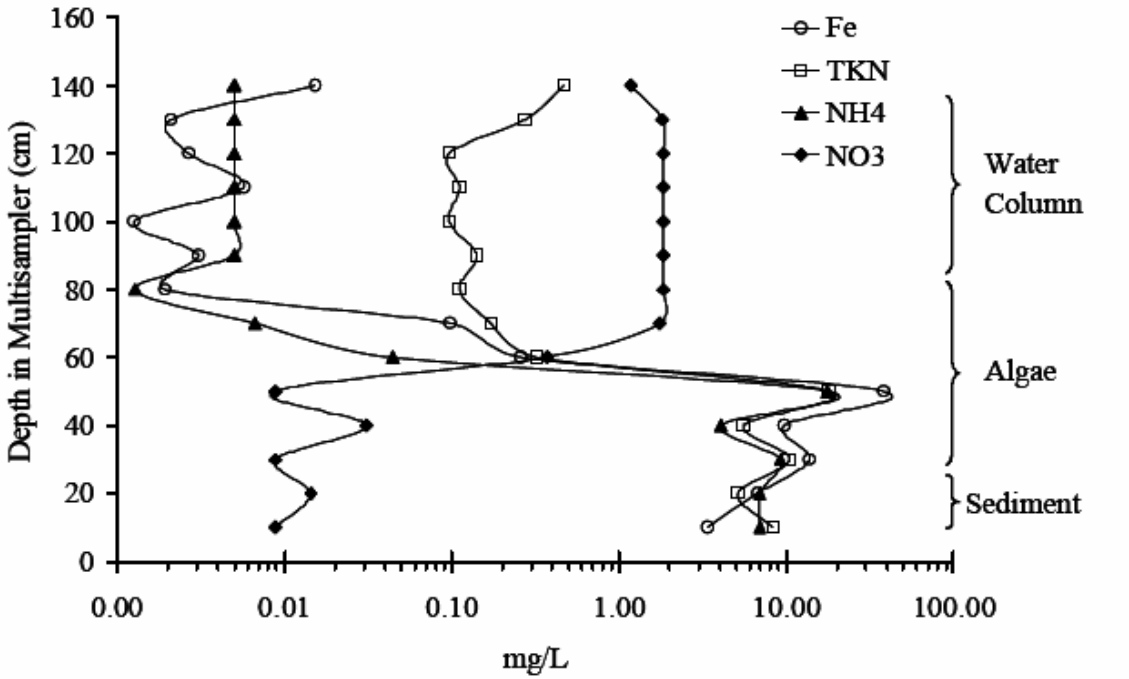


Biogeochemical Hotspots



Benthic Fluxes

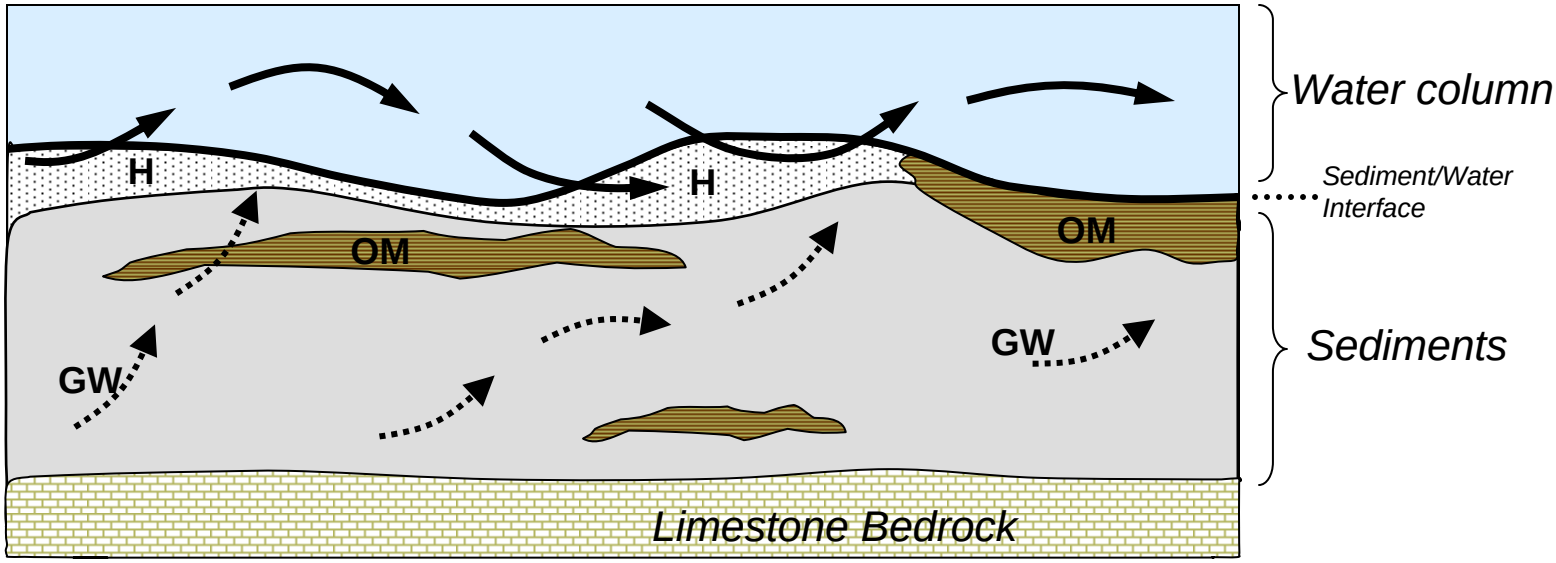




(Stevenson et al., 2007)

Sediment Processes

(hyporheic exchange)

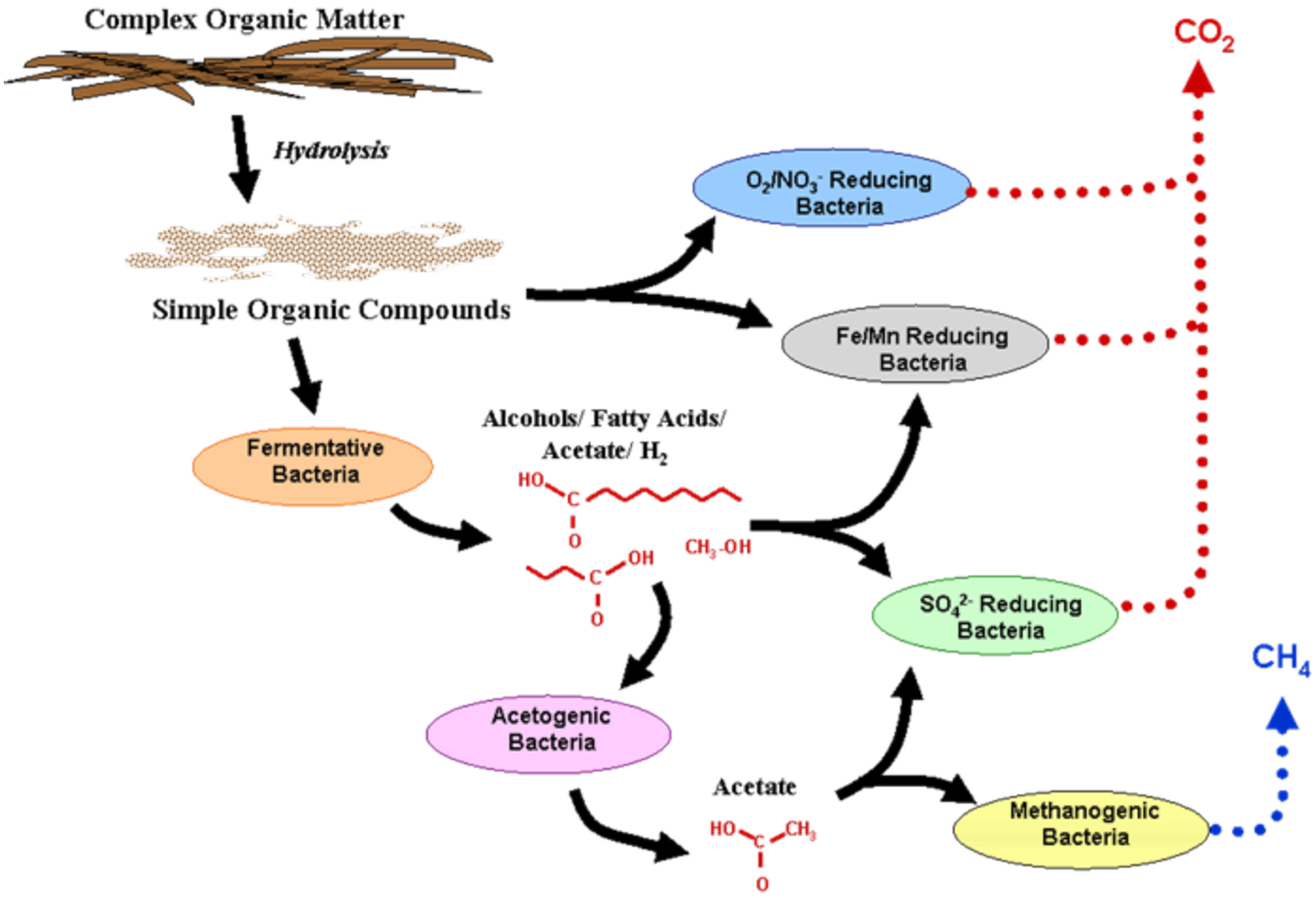


Sediment Composition:
Chassahowitzka River

Horizon	Depth cm	TP mg/kg	TN g/kg	OC g/kg	OC:TN Molar	OC:TP Molar	TN:TP Molar
Near Boil							
A	9	98	1	9	18	246	13
AC1	34	54	0	6	14	281	20
AC2	55	67	1	8	17	289	17
CA	66	66	0	1	14	50	4
Riverside							
O_e	7	1014	17	209	15	531	36
A1	27	2481	10	131	16	136	9
A2	49	520	5	104	26	518	20
A3	64	152	4	85	23	1443	62
A4	82	51	0	5	20	235	12

(Saunders, T. 2007. Dissertation. University of Florida)

Sediment Composition:
Organic Matter Sources



Downstream Trends:
Wekiva

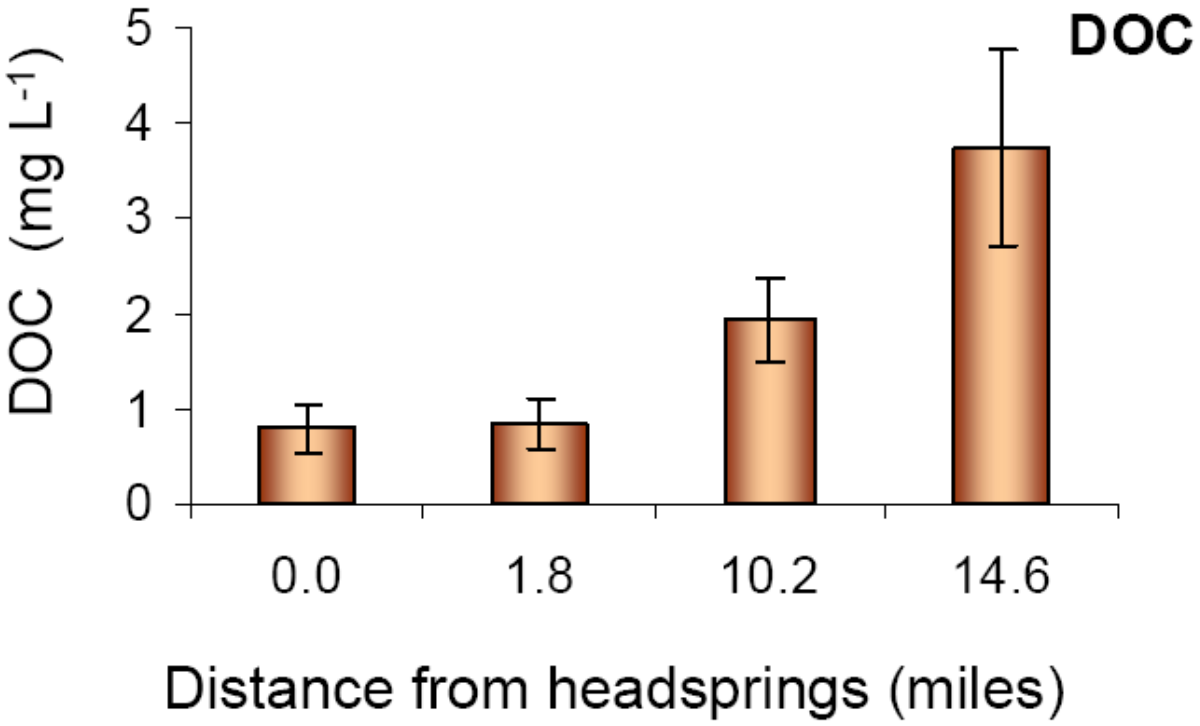
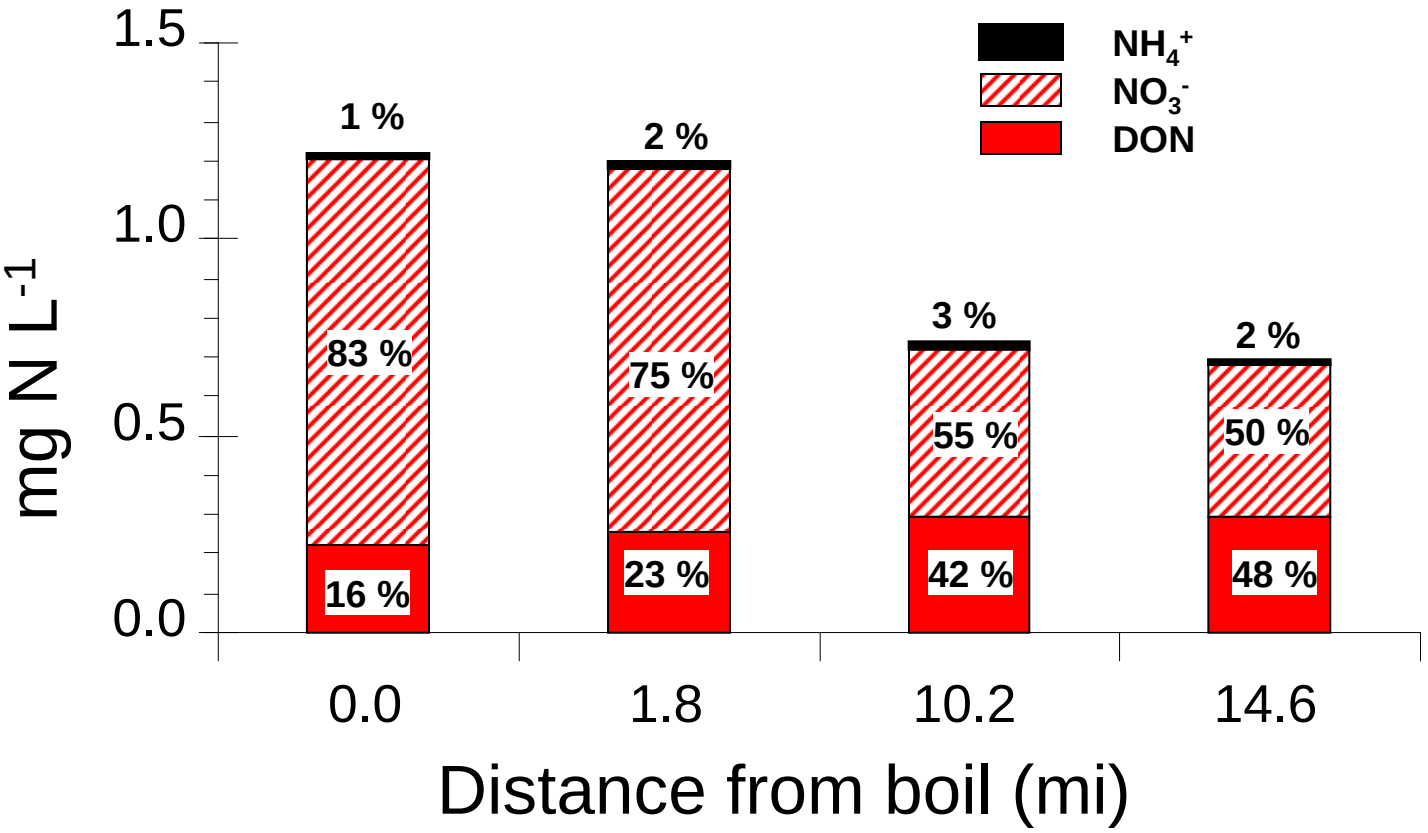


Figure 9 Dissolved organic carbon concentrations in Wekiwa Springs at 4 sampling locations situated at increasing distance from the headsprings.

(from Inglett et al., 2007)

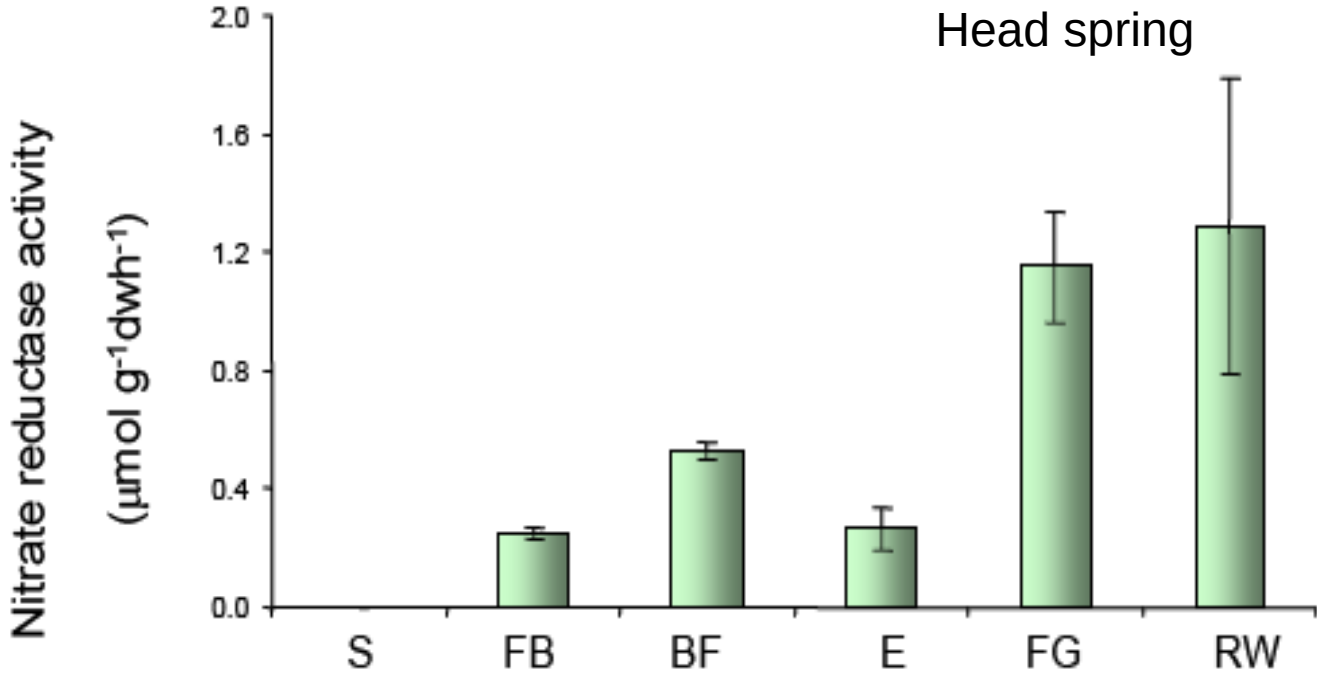
Downstream Trends:

Wekiva



(from Inglett et al., 2007)

Nitrate Assimilation:
Wekiva



(from Inglett et al., 2007)

Denitrification:
Wekiva

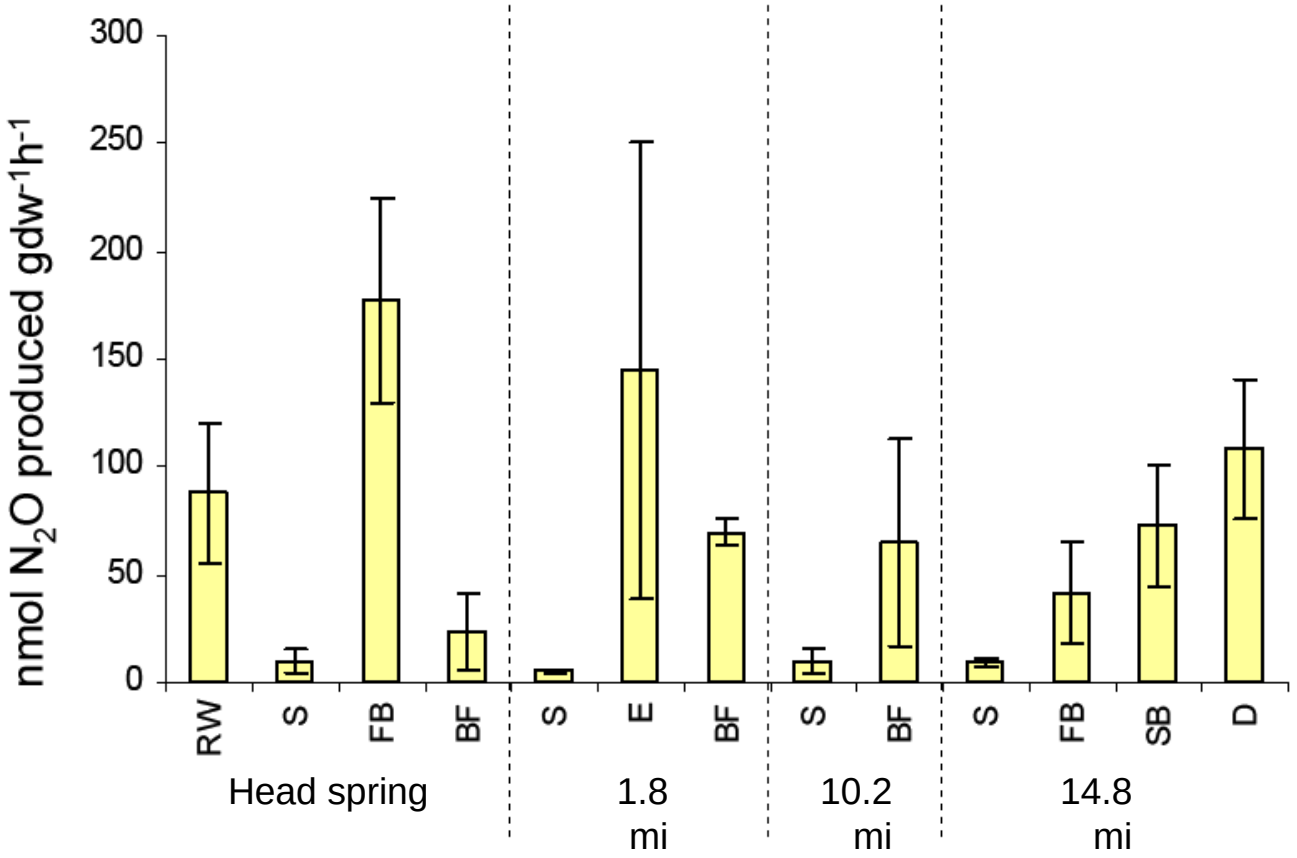
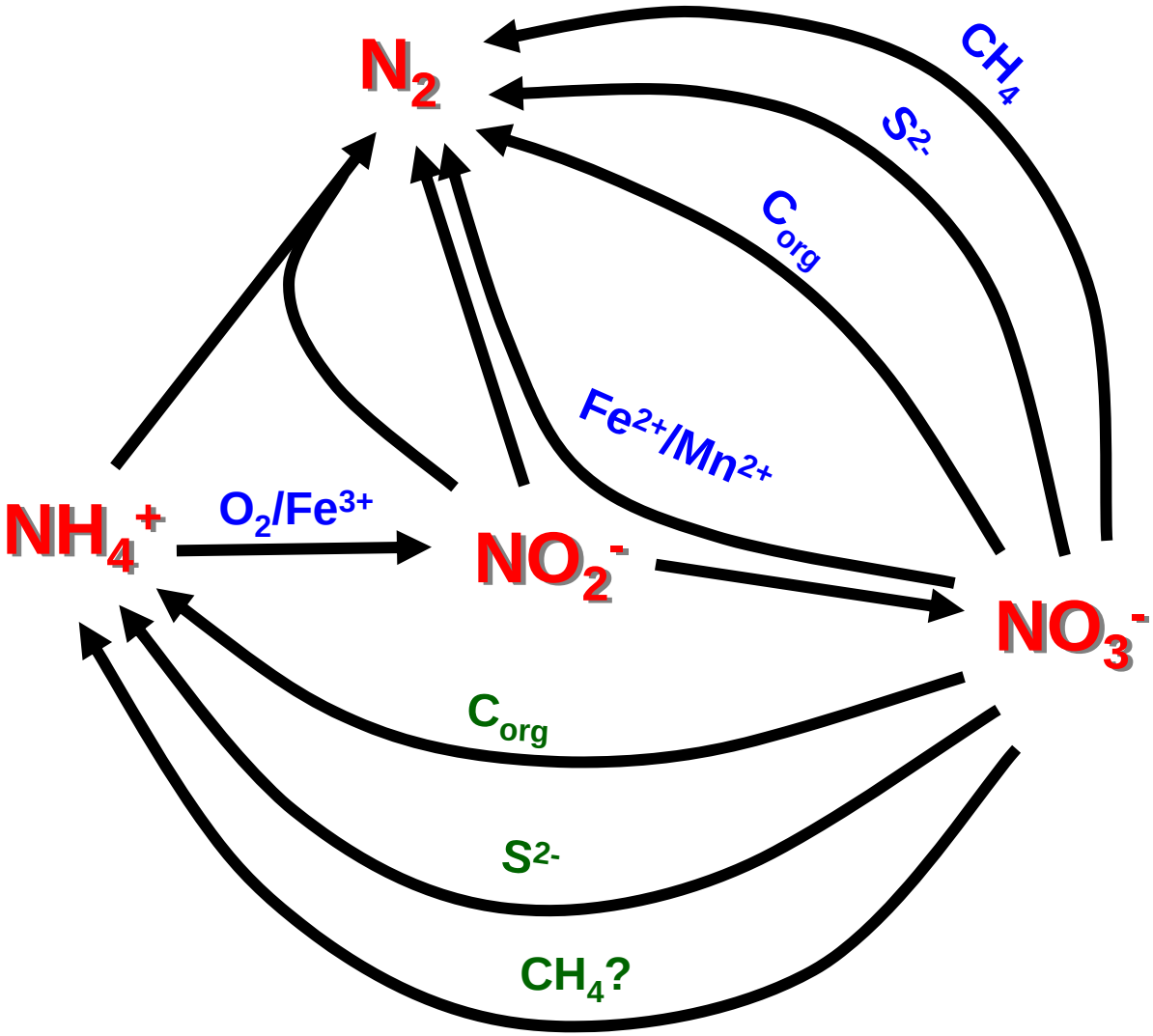


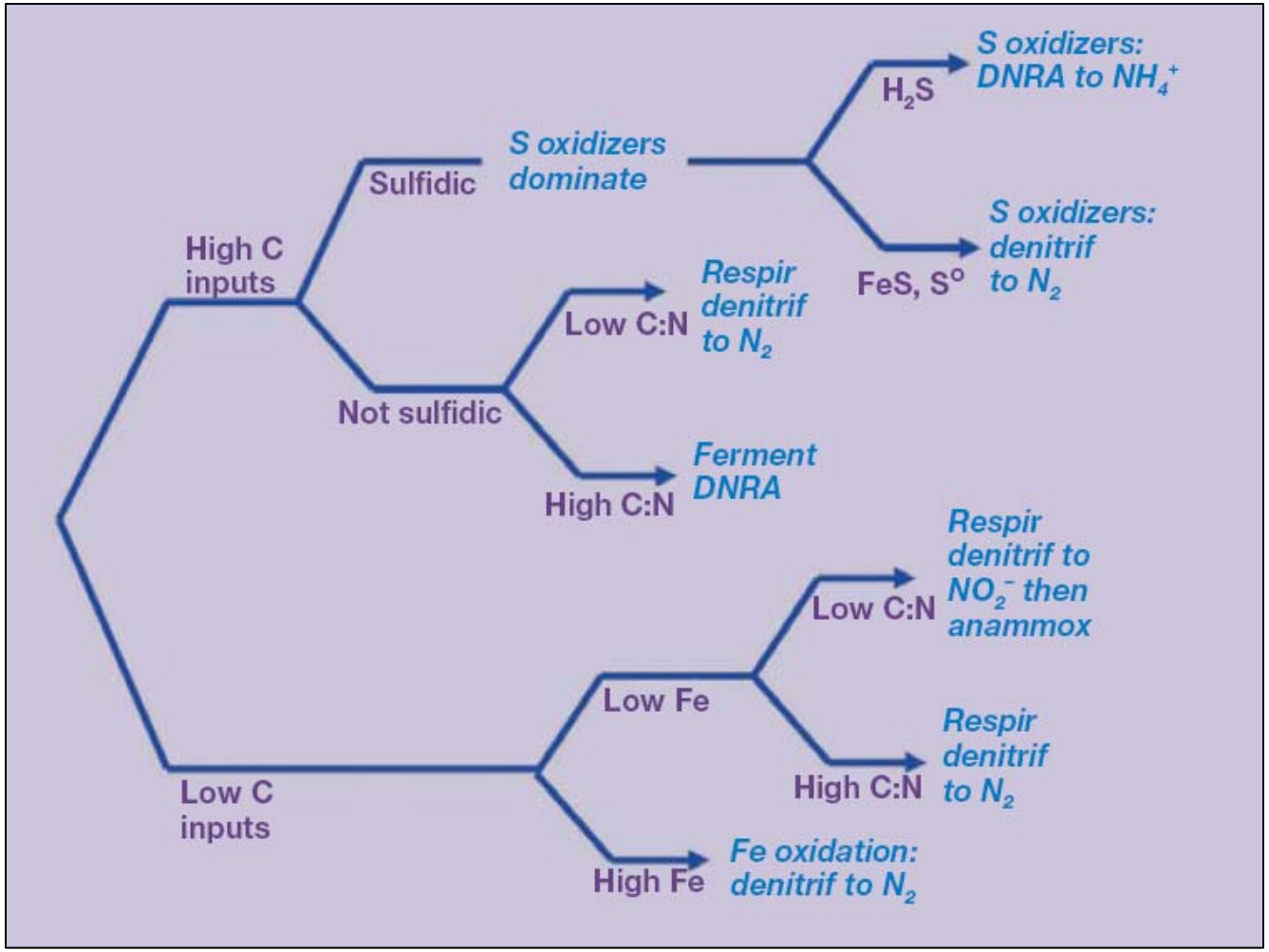
Figure 14. Denitrifying potential in sediments, and algal biofilms collected from various substrata. S, sediment; FB, filamentous benthic algae; BF, Brown filamentous algae; E, epiphytic biofilms; RW, Biofilms attached to rock wall; D, detrital material; SB, algal biofilm on submerged bark.

(from Inglett et al., 2007)

Fates of NO_3^-



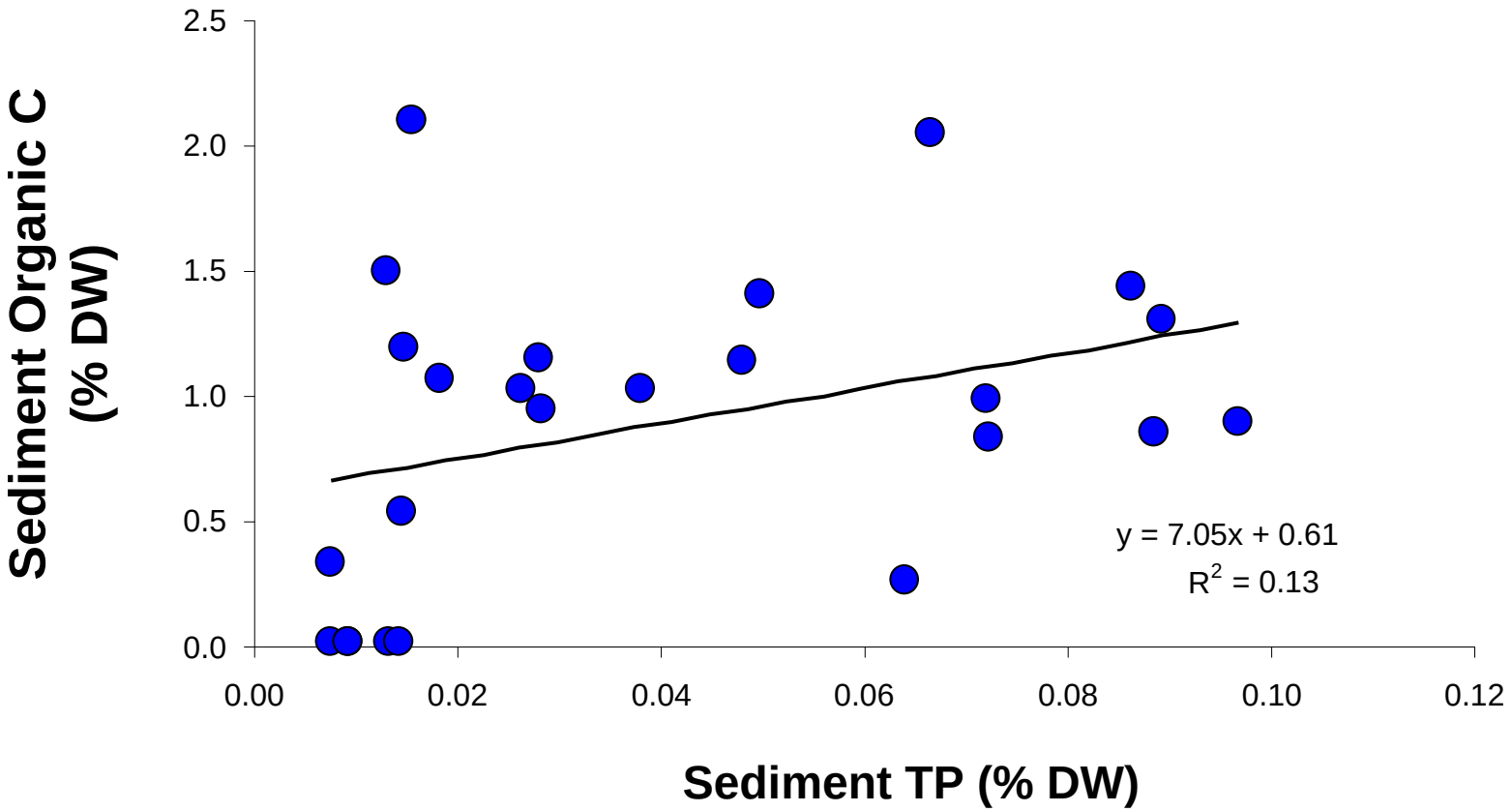
Fates of NO_3^-



(From Burgin and Hamilton, 2007)

Sediment P Storage

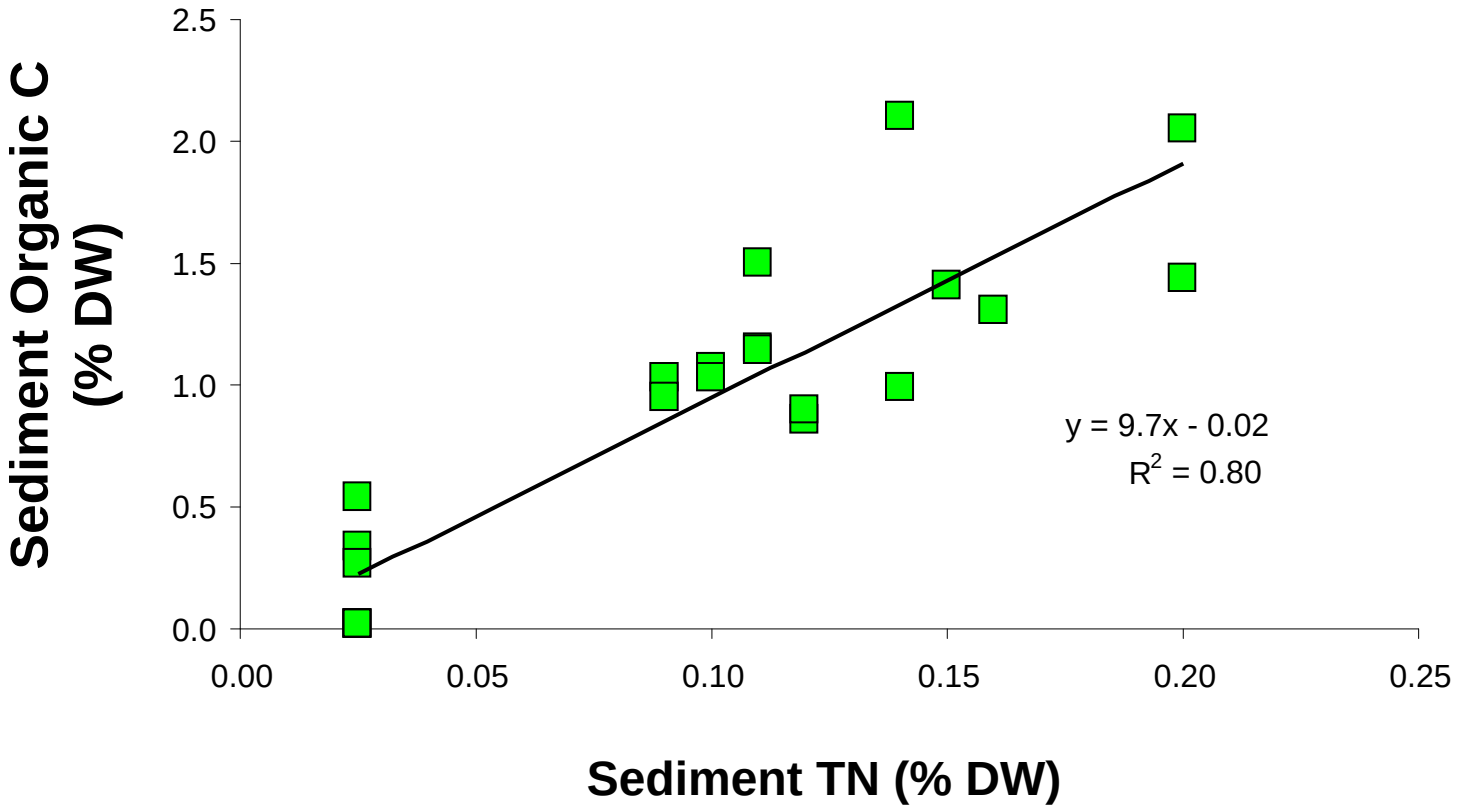
(Wekiva, Rock Springs, Juniper, Alexander)



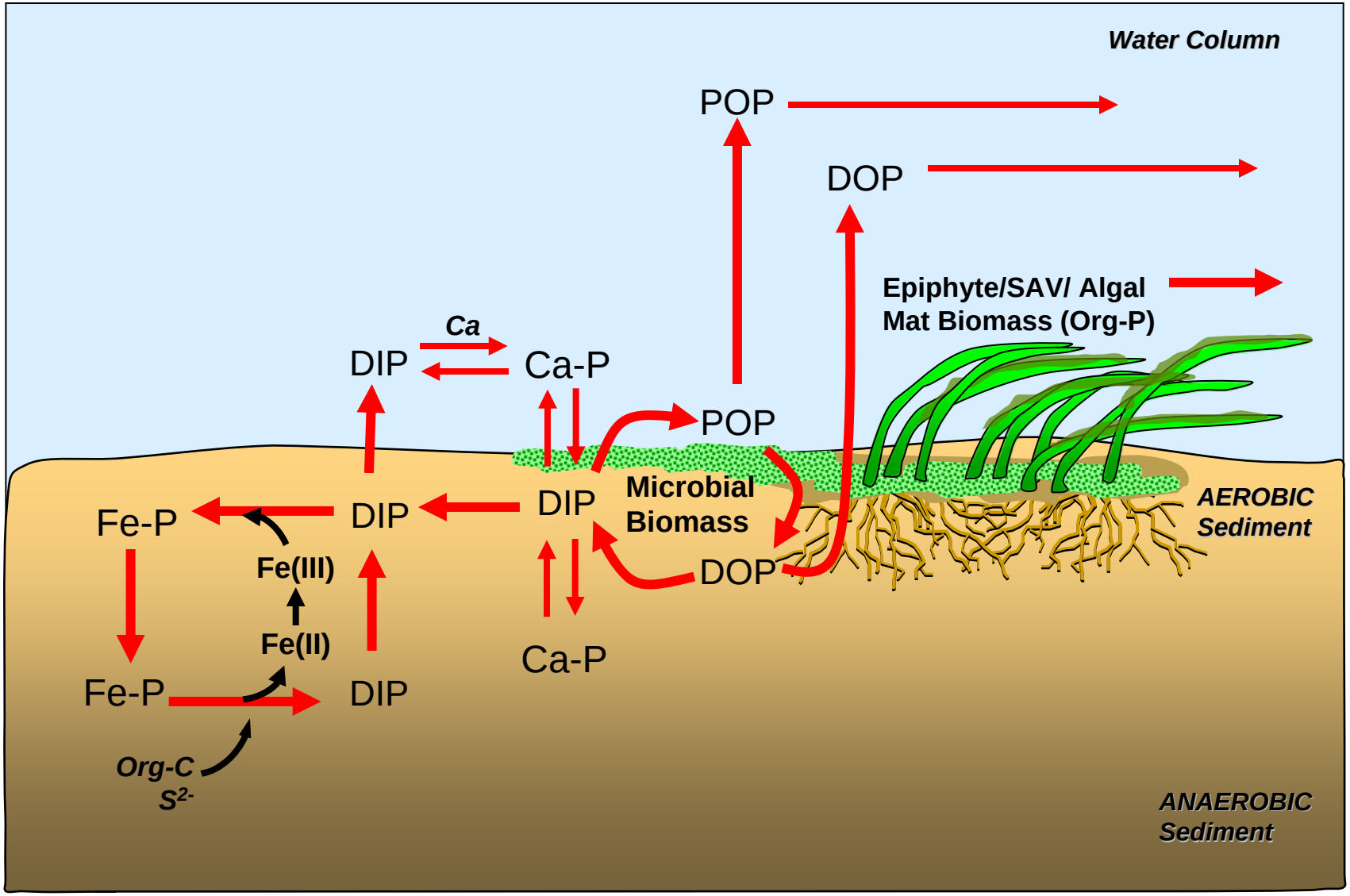
(based on data from: Wetland Solutions, Inc., 2005)

Sediment N Storage

(Wekiva, Rock Springs, Juniper, Alexander)



(based on data from: Wetland Solutions, Inc., 2005)


Water Column
POP
DOP
Epiphyte/SAV/ Algal
Mat Biomass (Org-P)
Ca
DIP
Ca-P
POP
Microbial
Biomass
DIP
DIP
Fe-P
Fe(III)
Fe(II)
DOP
AEROBIC
Sediment
Ca-P
Fe-P
DIP
Org-C
S2-
ANAEROBIC
Sediment

Research Needs

General

- Data collection
  - More than physicochemical parameters
  - Spatial/temporal patterns
  - Different spring types
- Sediment characterization

Nitrogen

- Assimilation vs. denitrification
- Alternate pathways?

Research Needs

Phosphorus

- Role in limitation (coupling to N)
- Sediment storages/release

Sulfur

- Sulfate reduction/Sulfide toxicity
- Coupling to Fe/P….N

Indicators of Change

- Nutrient ratios
  - Response threshhold
- Enzyme activities
  - Nutrient limitation
  - Process rates
- Stable Isotopic ratios
  - Sources
  - C,N processes