

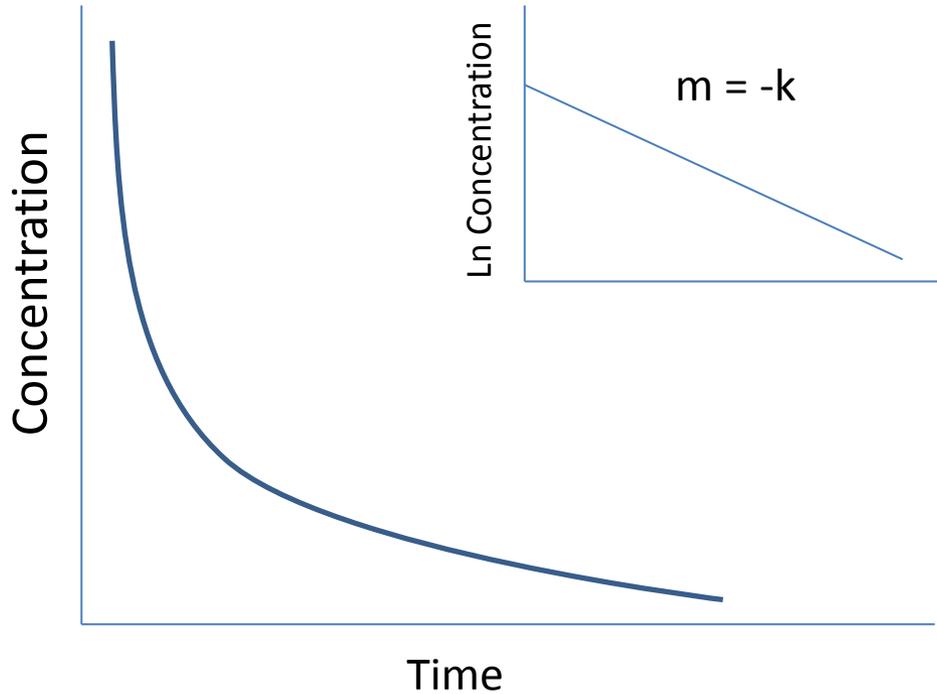
Mesocosm Experiments

Experimental Design



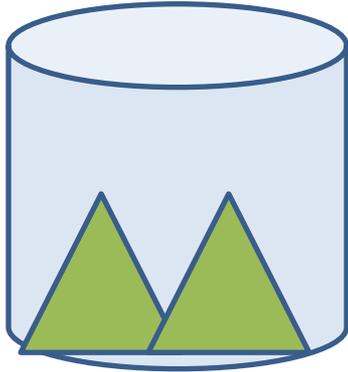
- Addition of nitrate and phosphorous
- Treatments
 - SAV removal (clear phase)
 - With and without mats (green phase)
- 6 hours in duration
 - 15 minute sample interval (first 2 hours)
 - 30 minute interval (last 4 hours)
- Sondes for several days (DO, pH, temperature and cond)
- Nighttime experiments (green period, open water only)
- Repeated for tailrace ~1 week following discharge

Theoretical Underpinning



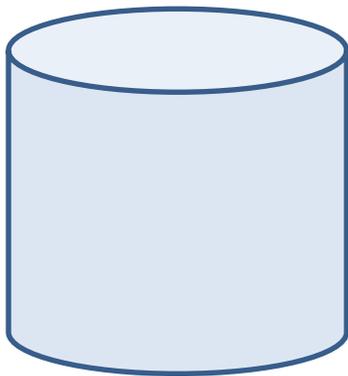
$$N_t = N_0 e^{-kt}$$

Background Conditions: Nutrients



Control

	Mean (mg/l)	CV
Nitrate	0.0496	47.5%
SRP	0.0095	28.5%

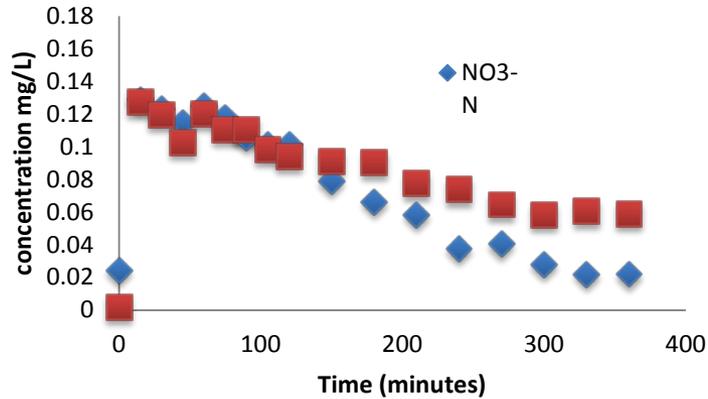


Treatment

	Mean (mg/l)	CV
Nitrate	0.0500	71.6%
SRP	0.0156	10.0%

Experimental Additions

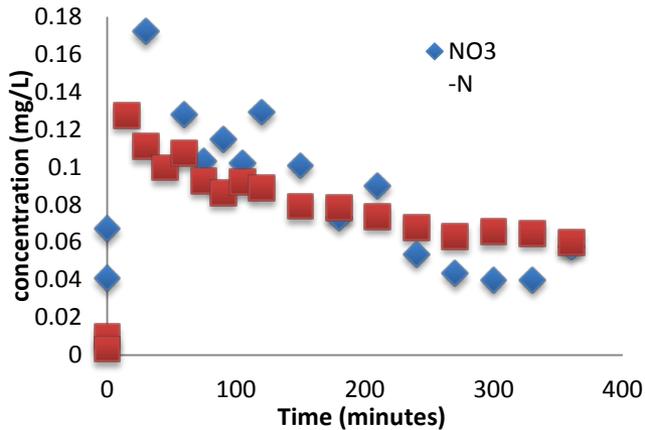
+SAVA



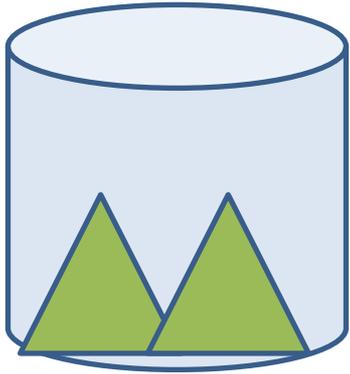
○ Increases were successful

○ A little higher than planned

-SAVB



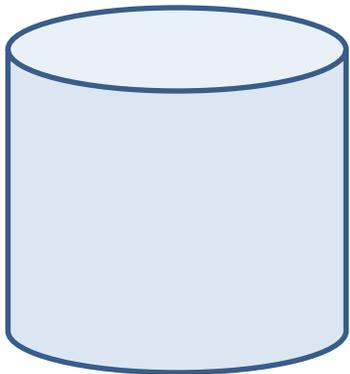
Results: Model Assumptions



Control

SRP
 $r^2 = 0.79$ to 0.96

NO3
 $r^2 = 0.86$ to 0.89

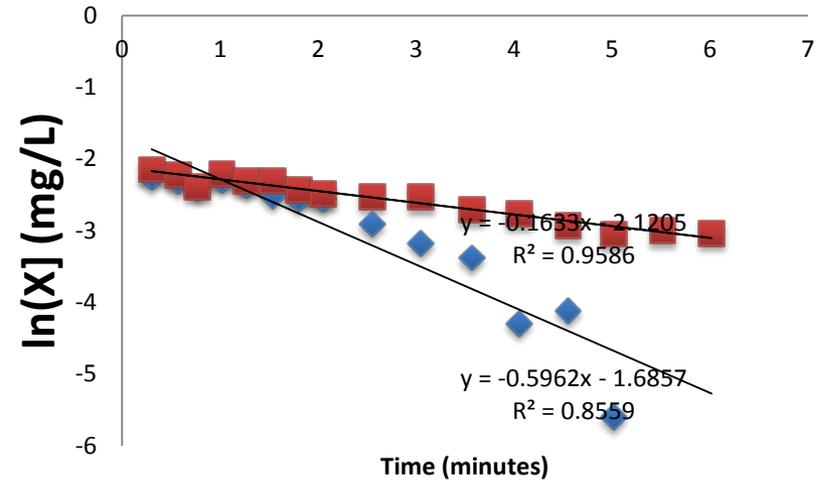


Treatment

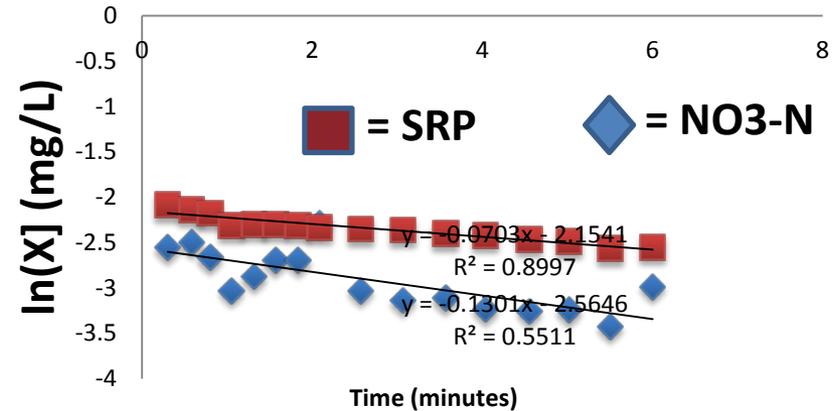
SRP
 $r^2 = 0.90$ to 0.94

NO3
 $r^2 = 0.32$ to 0.62

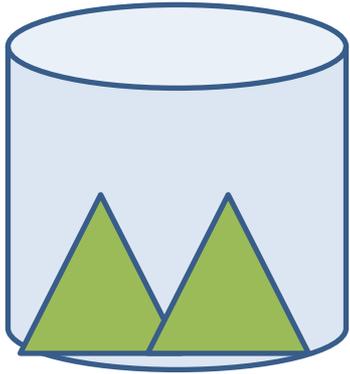
+SAVA



-SAVE



Results: Mean Rates [(mg [Nut] up/mg [nut])/min]



Control

SRP Rate

0.14

k = -0.12 to -0.16

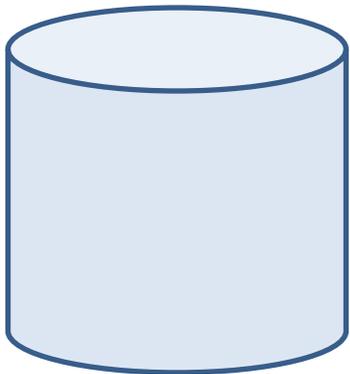
NO3 Rate

0.72

k = -0.60 to -0.92

N Rate: P Rate

5.4



Treatment

SRP Rate

0.05

k = -0.04 to -0.07

NO3 Rate

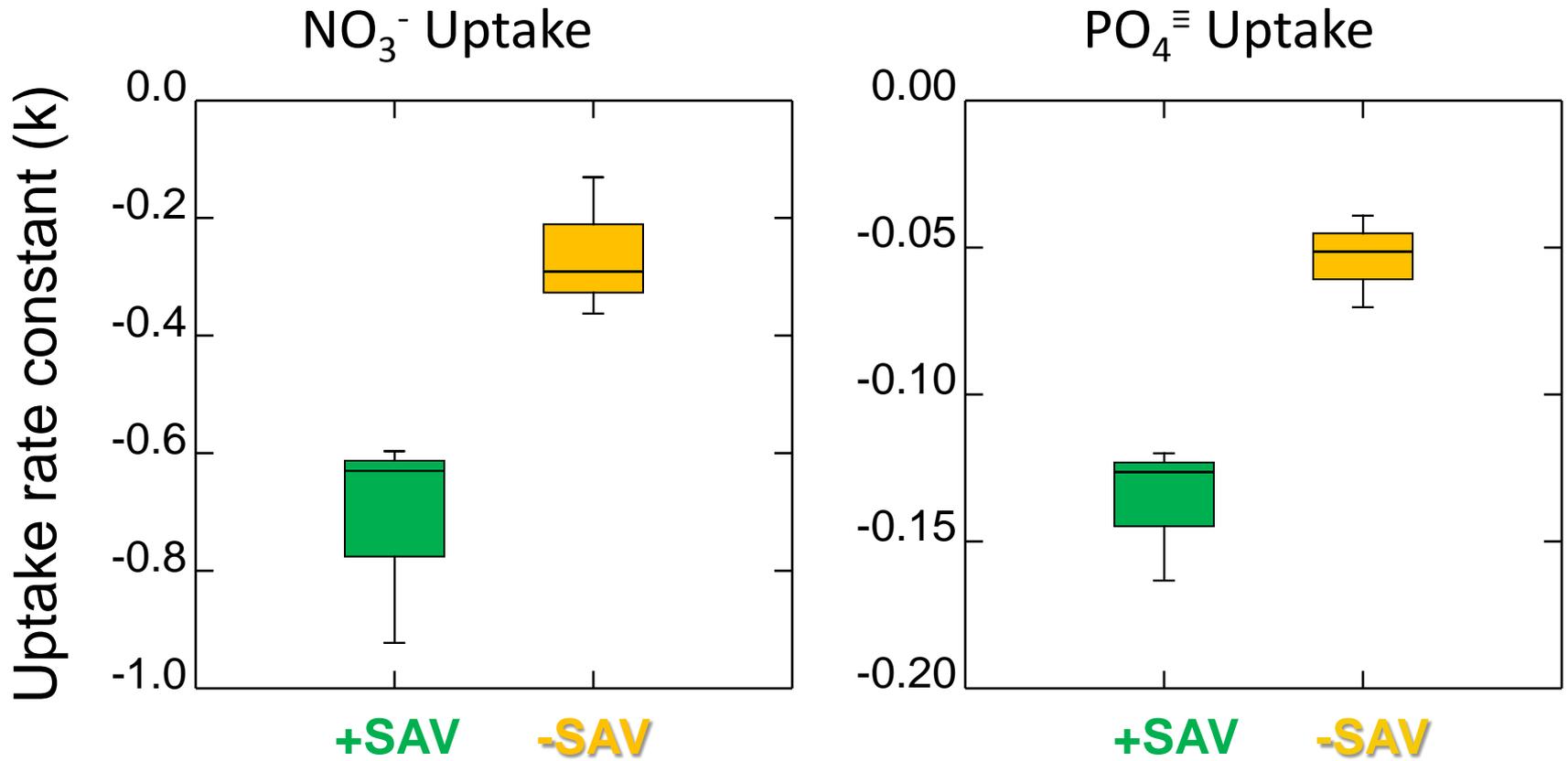
0.26

k = -0.13 to -0.36

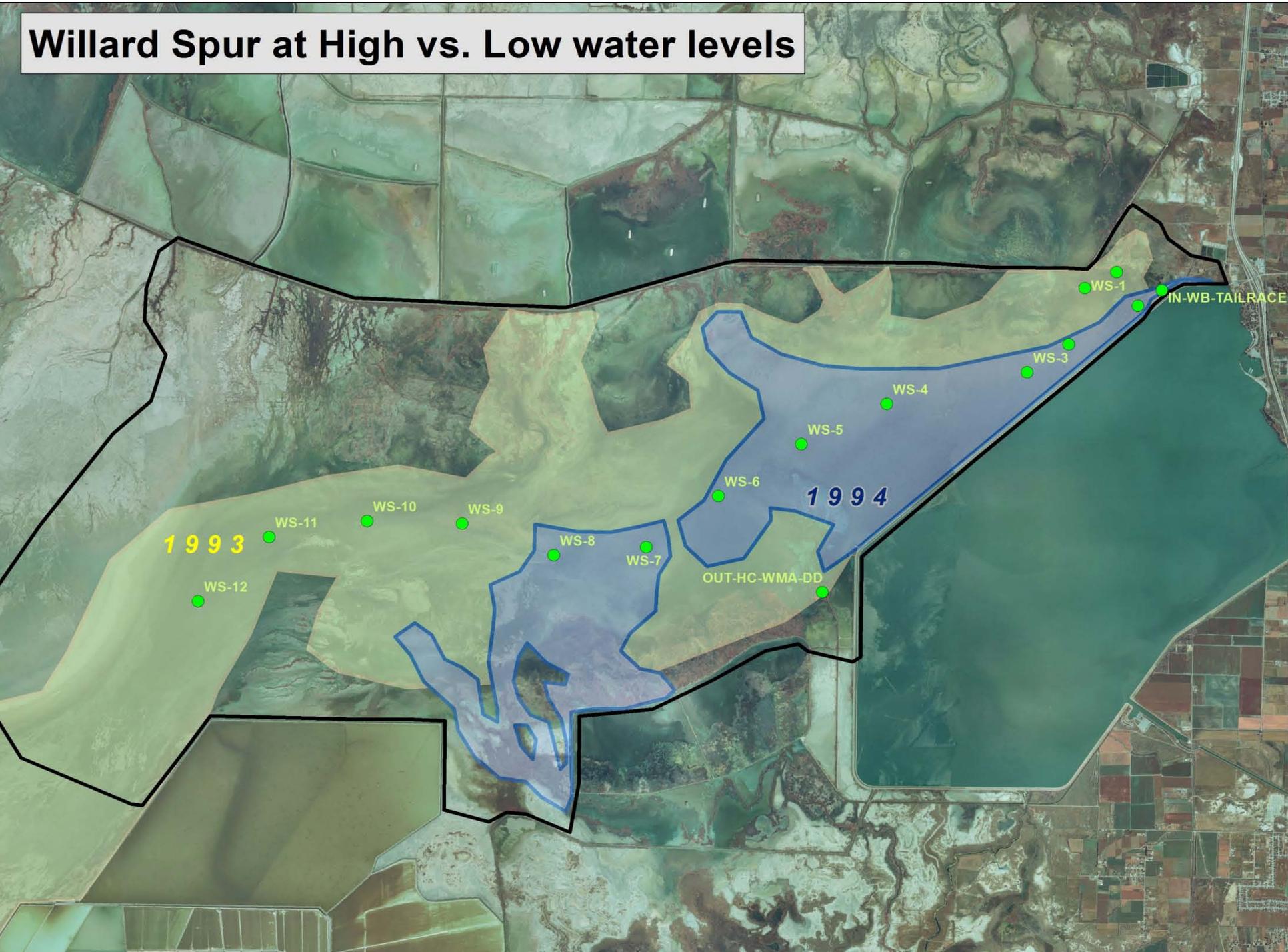
N Rate: P Rate

5.6

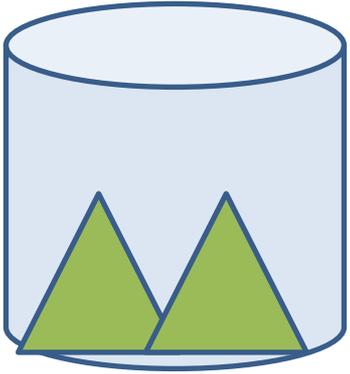
Uptake



Willard Spur at High vs. Low water levels



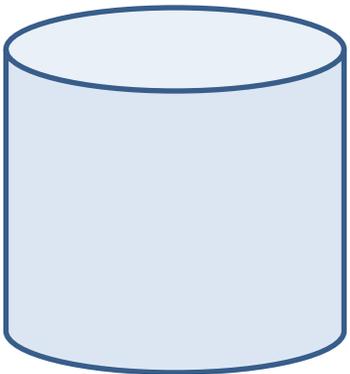
Gross Uptake: Willard Spur



Control

SRP = ~4,500-15,000 lbs/day

NO₃ = ~123,000-428,000 lbs/day

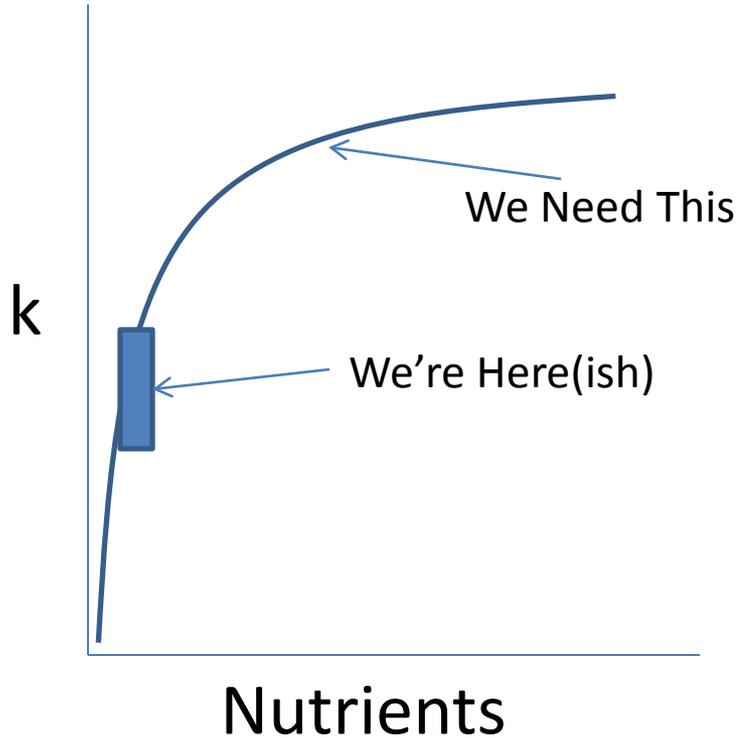


Treatment

SRP = ~2,800-9,900 lbs/day

NO₃ = ~45,000-157,000 lbs/day

Caveats and Next Steps



- **K estimates were based on daytime uptake at one concentration**
 - anchor based on clear and green conditions
 - scale with CPP and CR to extrapolate or model k-max
- **Biological retention is temporary**
 - important differences between algae and macrophytes
- **Need to compare with load estimates**