Selective Pressure as a Resilient Approach for Algae Crop Protection

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Pronouns: he, him, his
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Barriers to Scale: Algae Crop Protection Workshop
Bioenergy Technologies Office (BETO)
U.S. Department of Energy

ILLINOIS

Guest Research Group
ENGINEERING FOR SUSTAINABILITY

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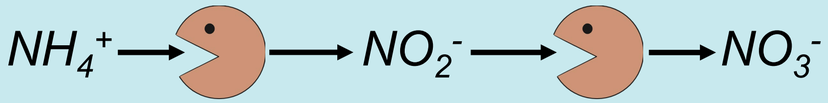
In environmental biotechnology, we design reactors and processes that create a competitive advantage for naturally occurring microorganisms with a particular function.

Target: **nitrification**

AOB
ammonia oxidizing bacteria

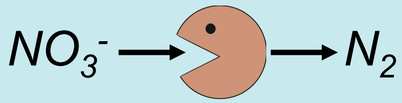
NOB
nitrite oxidizing bacteria



selective pressures: biomass age, dissolved oxygen, pH, temp

Target: **denitrification**

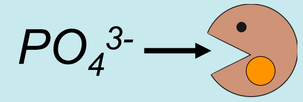
denitrifiers

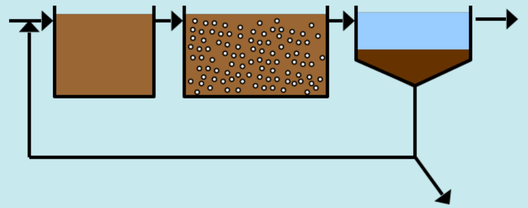


selective pressures: nitrate, dissolved oxygen

Target: **phosphorus accumulation**

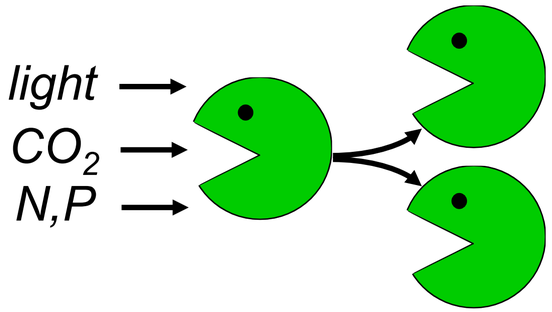
PAOs
polyphosphate-accumulating organisms

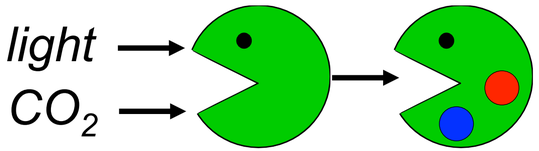


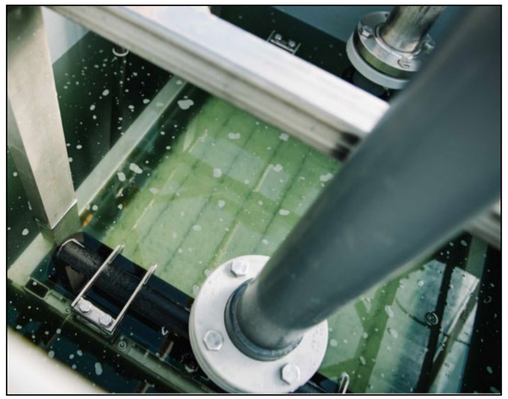


selective pressures: biomass age, VFAs, anaerobic-aerobic/anoxic cycling

Target: **photoautotrophic biomass production, carbon accumulation, etc.**



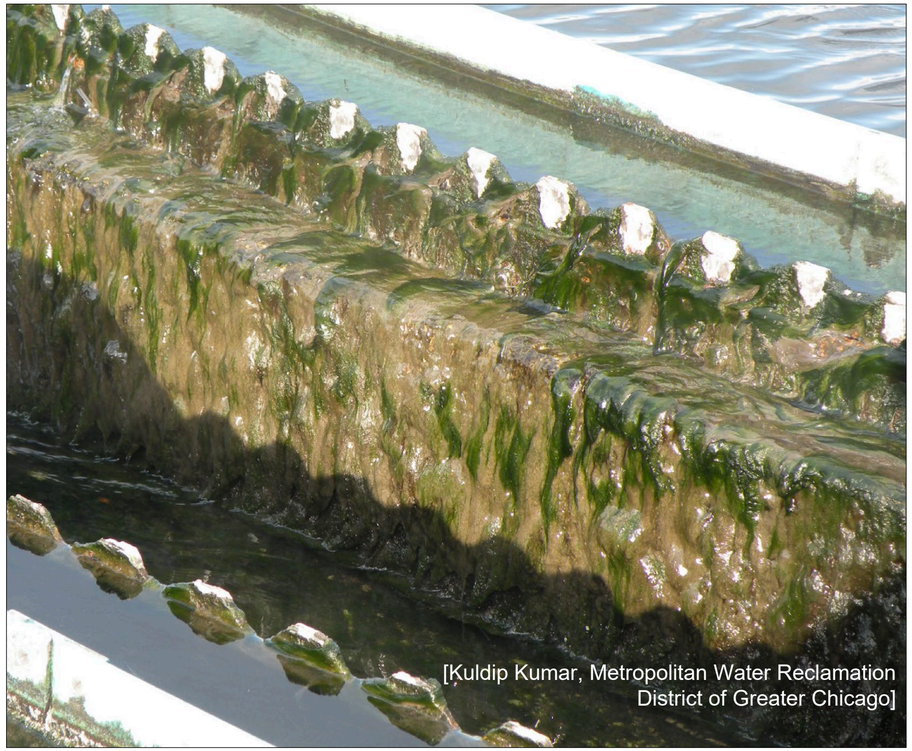


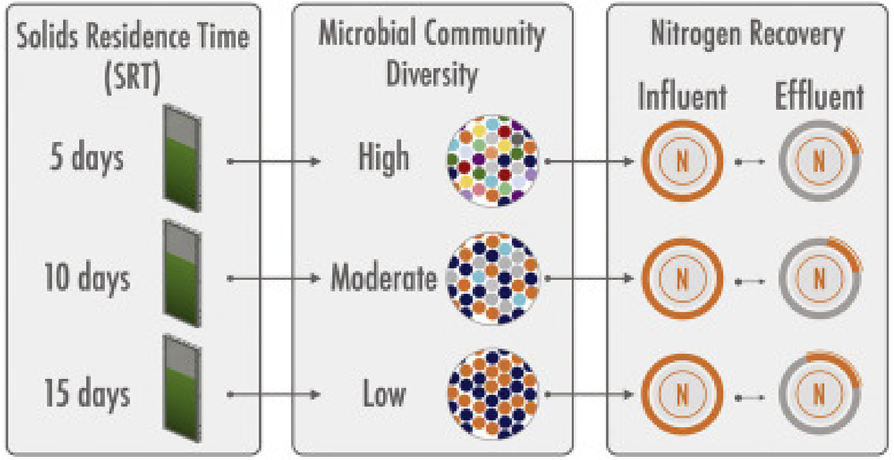


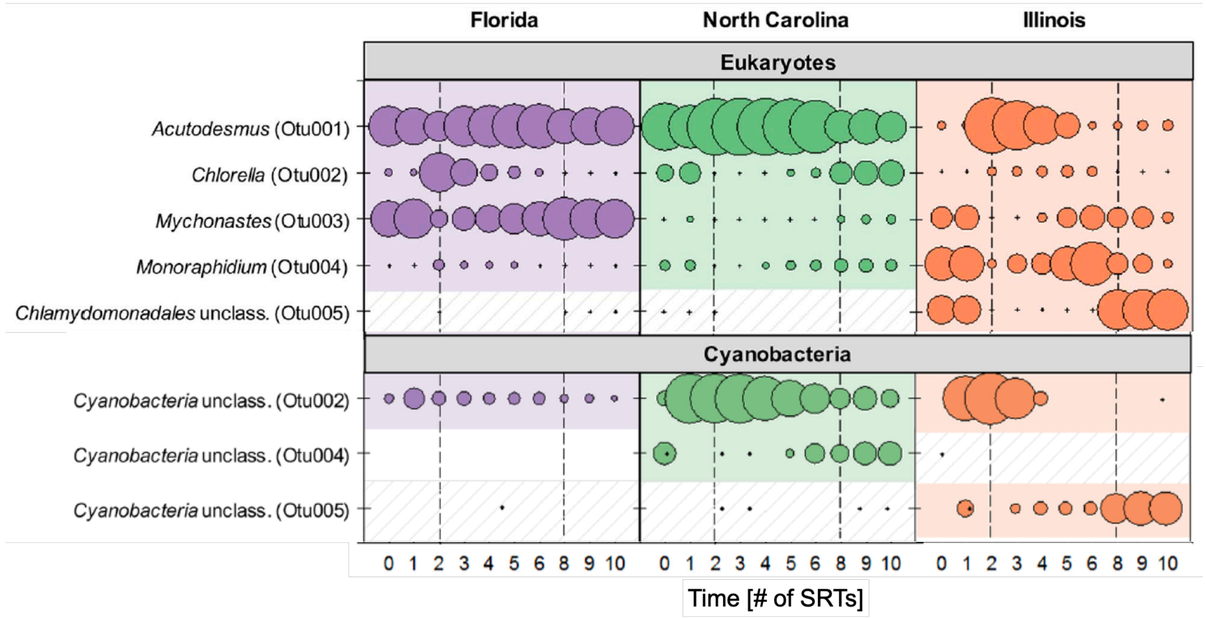
● stored carbohydrates ● stored lipids

selective pressures: biomass age, hydraulic retention time, single-pass time in reactors, dissolved oxygen, pH, temp

Mixed algal communities are common in places with consistent selective pressures. We focus on engineering more intensive processes for mixed communities.

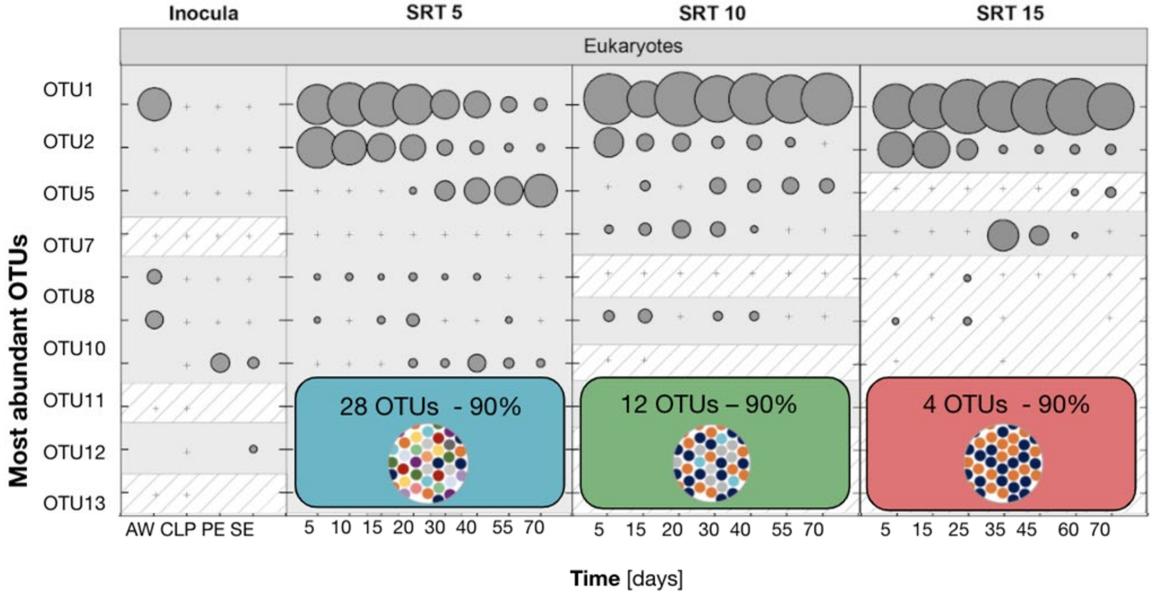






circle area represents mean relative 18S or 16S read abundance

[Fedders, A.C.; DeBellis, J.L.; Bradley, I.M.; Sevillano-Rivera, M.C.; Pinto, A.J.; Guest, J.S. Comparable nutrient uptake across diel cycles by three distinct phototrophic communities. *Environmental Science & Technology*. 2019, 53(1): 390-400.]



[Bradley, I.M.; Sevillano-Rivera, M.C.; Pinto, A.J.; Guest, J.S. Impact of solids residence time on community structure and nutrient dynamics of mixed phototrophic wastewater treatment systems. *Water Research*. 2019, 150: 271-282.]

Clearas Water Recovery applies selective pressures in intensive cultivation systems to achieve nutrient removal (and algae production) from wastewaters.


[Brian Richichi, Clearas Water Recovery]

CLEARAS
WATER RECOVERY