

Evaluation of Package Plants on North Carolina's Coast

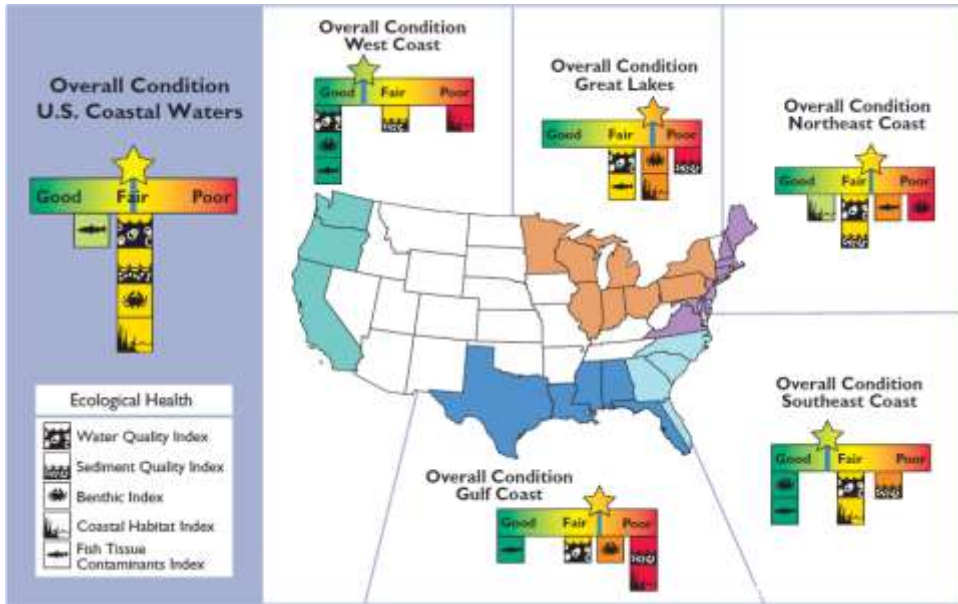
Eban Bean, Ph.D., P.E.
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Sensitive Coastal Estuaries



Wastewater Treatment

Municipal WWTP

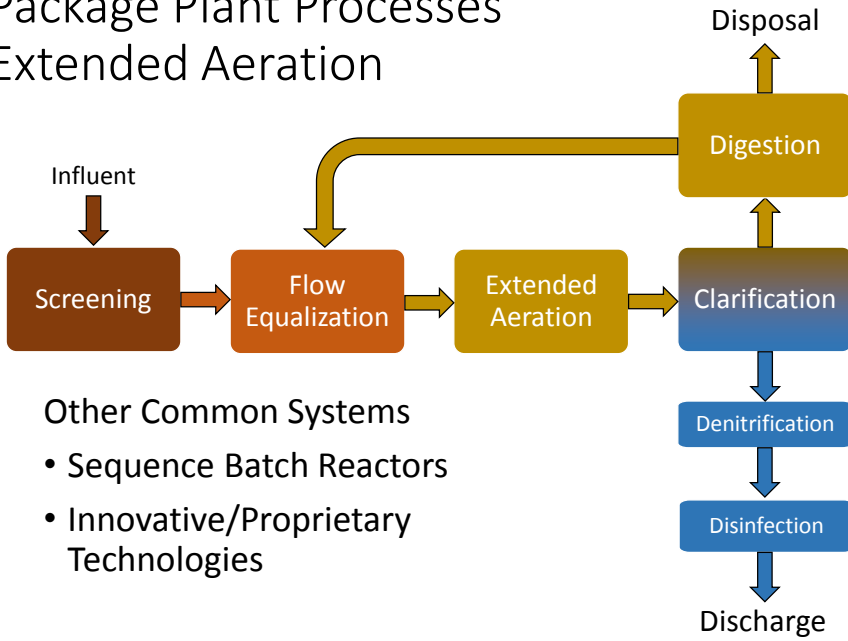
On-site Wastewater Treatment (Septic)



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Package Plant Processes Extended Aeration



Other Common Systems

- Sequence Batch Reactors
- Innovative/Proprietary Technologies



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Risks to Coastal Waters

- Uncertain Treatment
- Coarse Sands
- Shallow Water Tables
- Nutrient Sensitive Waters



Objective: Characterize water quality treatment performance of Package Treatment Plants in Coastal NC



Study Sites



Plant Characteristics

Site	Treatment Type	Disinfection	Discharge	Permit Agency	Permitted Discharge (GPD)
EA-1	Extended Aeration	Chlorine	Surface	NCDENR*	101,460
EA-2	Extended Aeration	None	Subsurface	CCHD#	160,000
EA-3	Extended Aeration	UV	Surface	NCDENR	65,000
ADV-1	Advantex	UV	Subsurface	CCHD	12,000
ADV-2	Advantex	UV	Subsurface	CCHD	17,340
SBR-1	Sequence Batch Reactor	Chlorine	Subsurface	CCHD	6,000
SBR-2	Sequence Batch Reactor	Chlorine	Surface	NCDENR	30,500

* North Carolina Department of Environment and Natural Resources

Carteret County Health Department



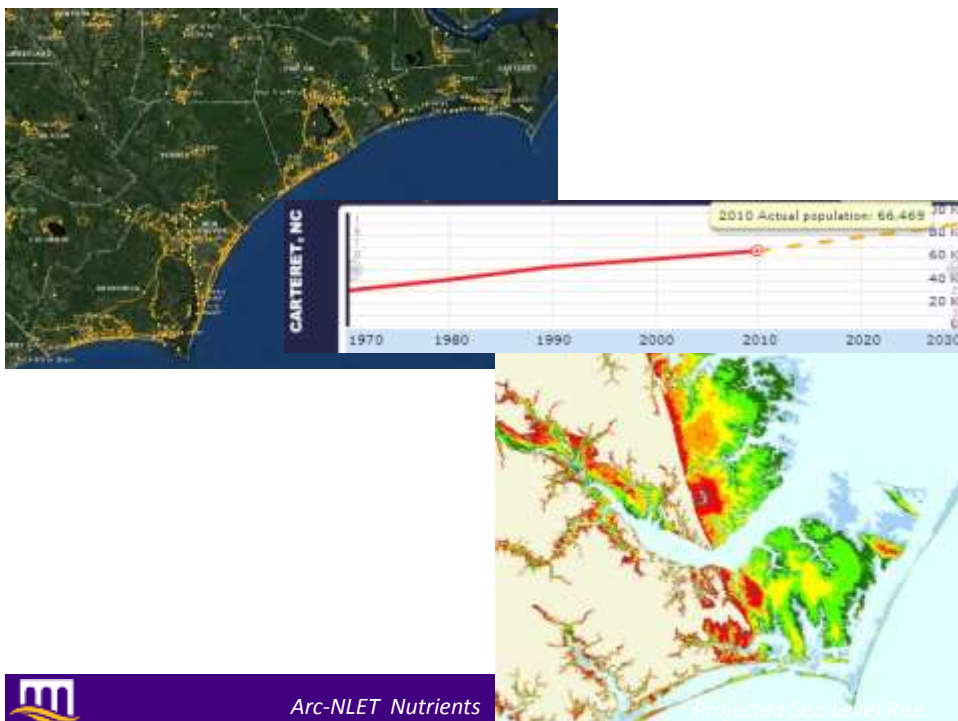
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Data Collection

- Monthly Sample Collection
 - Feb '14 – Jan '15
- Influent & Effluent
- Field Measurements (Temp, pH, & Cond.) Oakton PC-10
- Nutrients
 - Nitrogen and Phosphorus Species
 - Dissolved and Particulate
- TOC, Cl
- Pathogens (E. Coli, Total Coliform, & Enterococci)

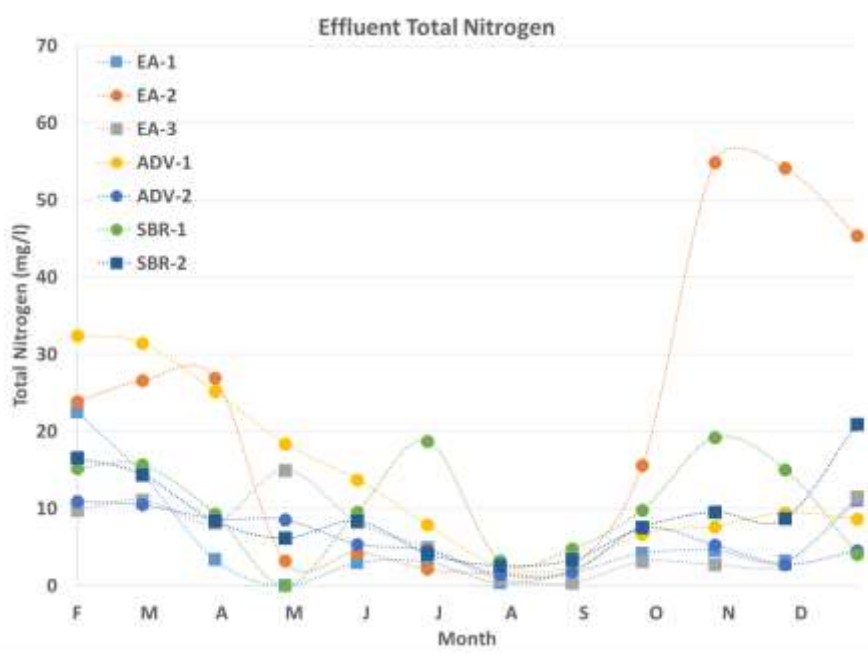


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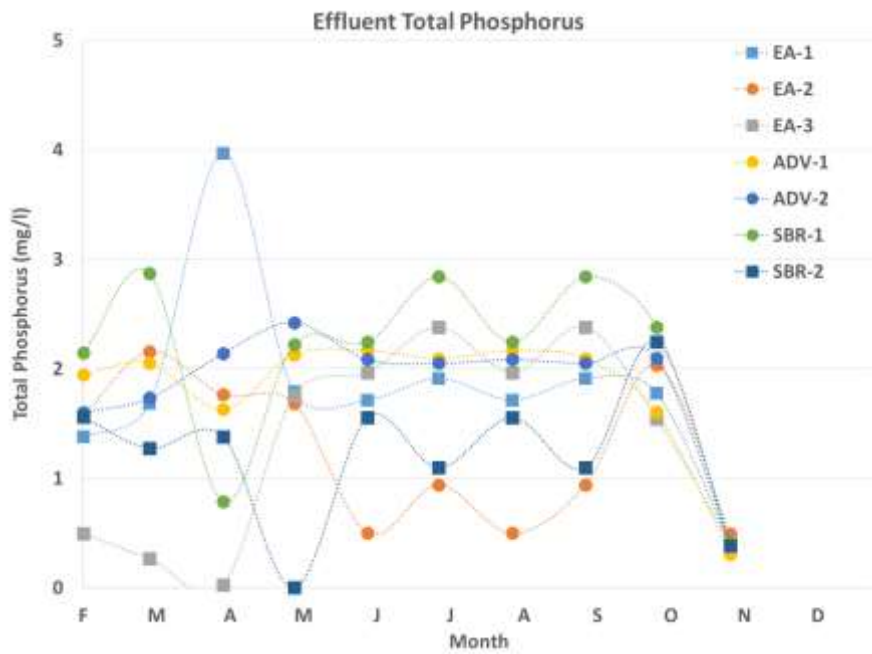


Arc-NLET Nutrients

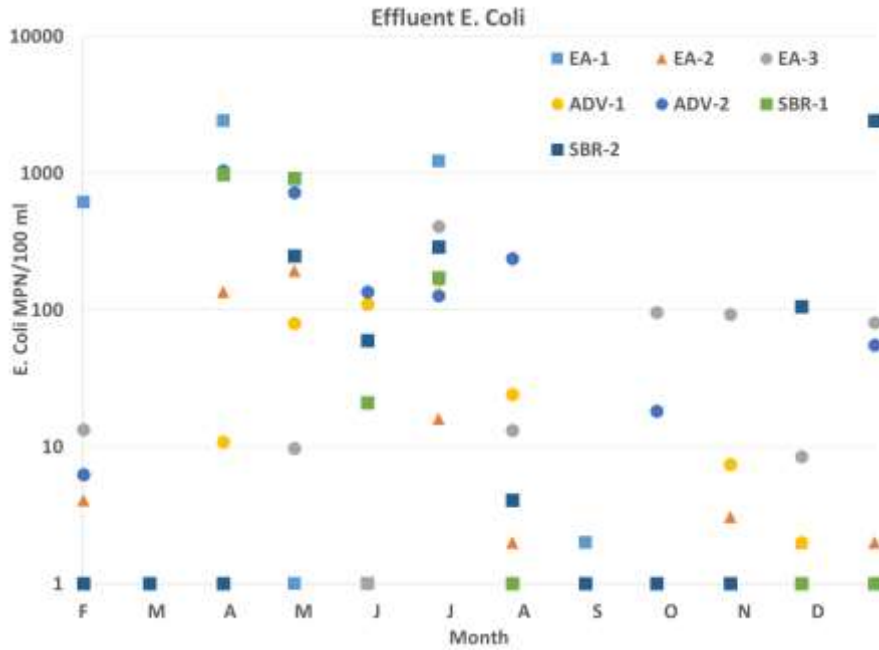
Projected Sea Level Rise



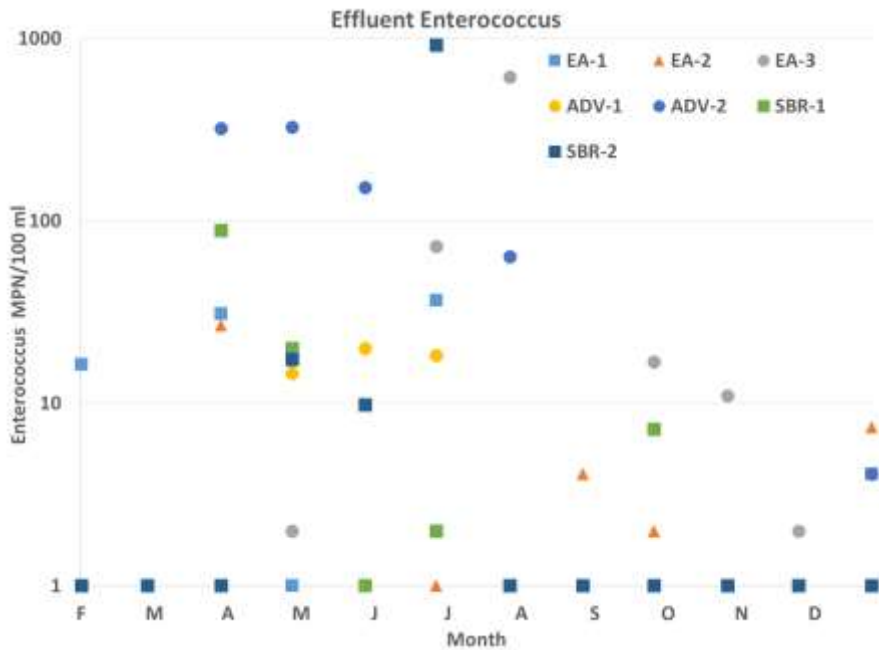
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Effluent Summary

- TN
 - Generally below 10 mg/L
 - Primarily as NO₃-N
 - All systems over 10 mg/L at least once
 - Most Effective during Summer/Tourist Season
- TP
 - Consistently < 2.5 mg/l
 - Mostly as PO₄
 - No clear Seasonal Variation
- Pathogens
 - Least effective during Summer/Tourist Season
 - UV better during Summer; Chlorine better during Winter



Next Steps

- Finish Data Collection
- Determine Loadings and Removal Efficiencies
- Statistical Analysis
 - Time
 - System/Treatment Type
- Groundwater Impacts



Acknowledgements

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Questions?

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