

South Contaminant Sources and Solutions

LAUREN PADRON

PI: DR. JENNIFER REHAGE & DR. ROLANDO SANTOS

MENTOR: NICHOLAS CASTILLO & DR. RYAN JAMES



FIU

Institute of
Environment



Introduction

S.FL is moving towards

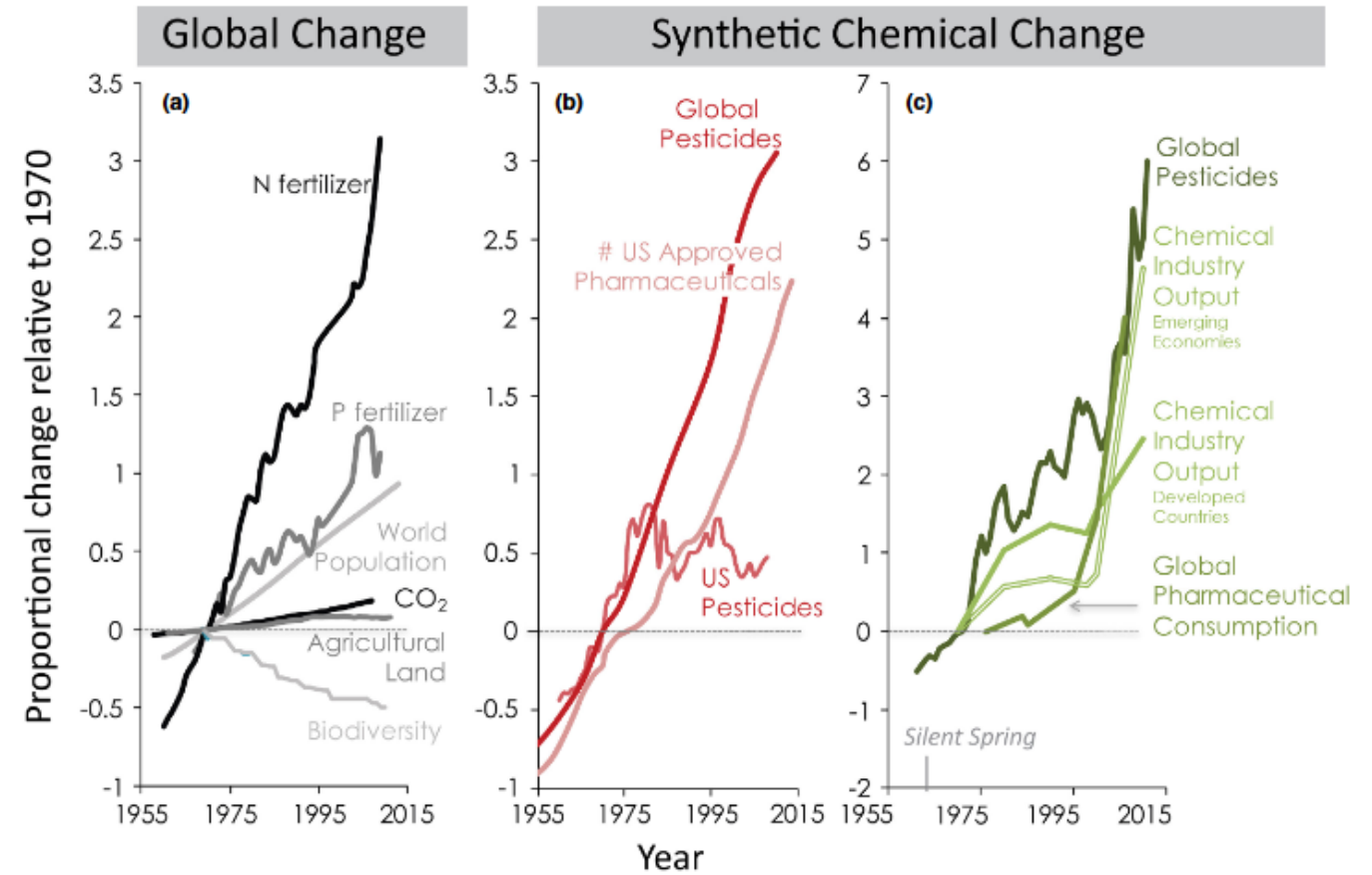
- ↑ re-use
- ↑ well injection
- ↑ CECs
 - Bioaccumulate
 - Active at very low doses
 - Disrupt functions

Finding solutions requires knowing:

Current infrastructure

Where the CECs are coming from

- Risk Assessment
 - Exposure Risk
- = Applicable Solutions



Bernhardt, et al., 2017.

Risk Assessment

Based on literary review:

- Level of treatment
- Use in each county

Source	(MO) Florida Keys	(MD) Miami Dade	
1. Septic systems	Yellow	Red	?
2. Failing sewer systems	Yellow	Yellow	0.5
3. Ocean Outfalls	Green	Yellow	1
4. Deep well injection	Grey	Grey	2
5. Shallow well injection	Orange	Green	3
6. Reclaimed water	Yellow	Yellow	4
7. Treatment Plants	Orange	Orange	5

Story Map



South Florida Water Contaminants

Current Wastewater Infrastructure & State-of-the-Art Solutions

July 26, 2022

[Introduction](#)

[Disposal](#)

[Risk Assessment](#)

[Solutions](#)

[Terms](#)

[References](#)

[Acknowledgements](#)

Large Scale Solution

There is no singular solution to CECs

Advanced Method	\$	Efficiency	Energy	By-product	Integration	Avg +/-		Score
O3	3	5	4	3	3	1.6	2	-0.4
UV+H2O2	3	1	2	1	3	1.0	1.4	-0.4
RO	5	5	5	2	2	1.4	2.4	-1
Combination Method	"	"	"	"	"	Avg		"
Stabilization pond	1	2	1	2	4	1.2	0.8	0.4
Activated Carbon (GAC) ⁶	3	2	2 – in use 4 – re-use	0 – water 2 – reuse	3	1	1	0 -0.8
Constructed Wetland	1	2	1	2	5	1.4	0.8	0.6

Future Work

9 solutions

Scaled (sm, m, lg)

& Evaluated by:

- Cost
- Efficiency
- Human aspects
 - Socioeconomic
 - Engineering Design

Scale	Small (3 cases)	Medium (3)	Large (3)
Cost	Small	Medium	Large
Efficiency	PFAS & PFOS	POPs	Nanoplastics
Gold Standard	Water Use & Water Reuse	Energy Use & Energy Creation	SocioEconomic Engineering Design

10th solution

Exceptionality

+ Heat density maps!!!

Acknowledgements



- ❖ Dr. Jennifer Rehage & Nicholas Castillo
- ❖ Dr. Rolando Santos & Dr. Ryan James
- ❖ Dr. Beth Simmons & Brad Schonhoff
- ❖ FCE LTER Network
- ❖ NSF (Grant No. HRD-1852123)