



PROTECT

Puerto Rico Testsite for Exploring Contamination Threats

Temporal Assessment of Regulatory Water Quality Measurements in the Northern Karst Aquifer of Puerto Rico (PR): A Significant Outcome of the K.C. Donnelly Externship



Northeastern

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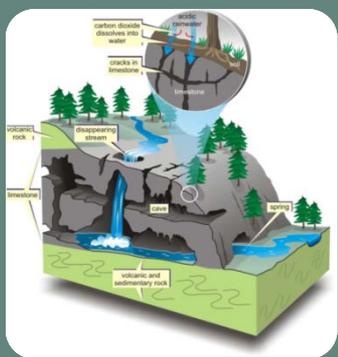
Outline

- Motivation and Background
 - North Coast (NC) Aquifer of Puerto Rico (PR)
 - Public Health
 - Adverse Reproductive Outcomes
- Objectives
 - PRoTECT
 - K.C. Donnelly
 - Technical
 - Broader Impacts
- Methods
- Results
- Major Outcomes
- Conclusions
- Acknowledgments

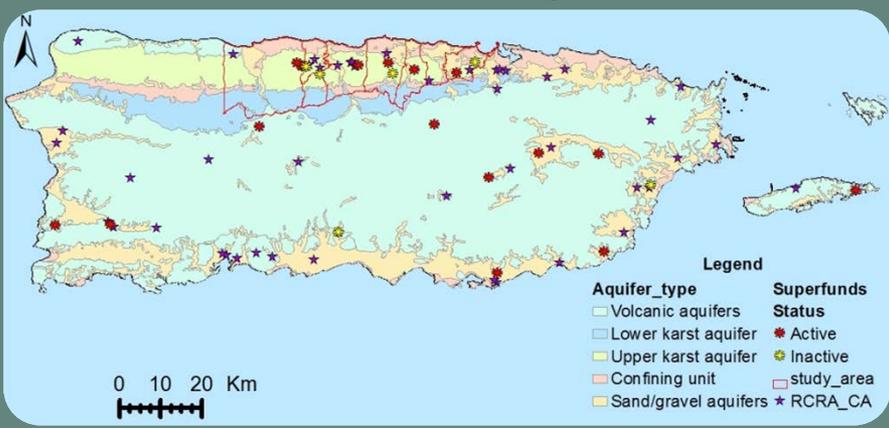


Background

- Karst region of northern PR
 - Highly productive
 - Highly vulnerable to contamination

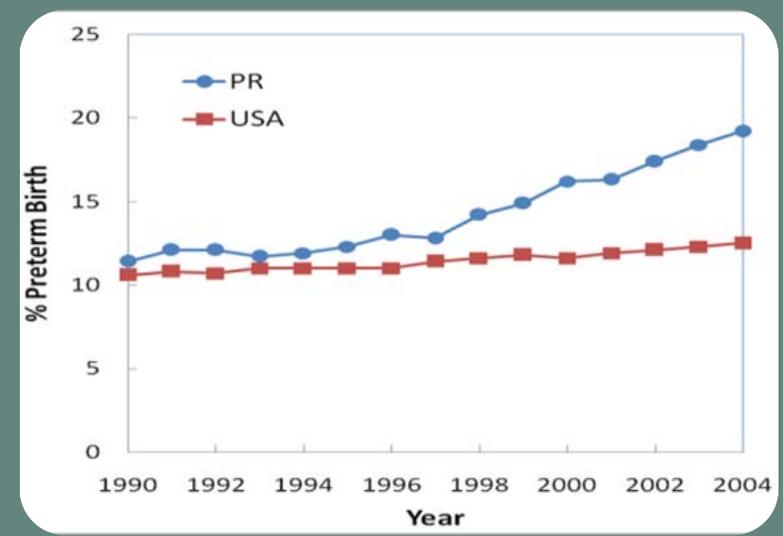


Karst Groundwater System. [1]



Puerto Rico Hydrogeology

- CVOCs and Phthalate contaminants
 - Identified as potential risk factors for preterm birth. [2], [3], [4]
- Public Health Concerns
 - Preterm Birth



Preterm Births in Puerto Rico and USA, 1990-2004. [5]

[1](VIU, 2006), [2](Meeker et al.,2009), [3](Meeker et al.,2012) and [4](Forand et al. 2012), [5](Cordero et al, 2010)

Objectives



- **PRoTECT**
 - Assessing potential relationships between contamination and preterm birth.
 - Developing new technology for discovery, transport characterization and green remediation of these contaminants.

- **K.C. Donnelly Externship**
 - Technical
 - Interpret water quality
 - Analyze the historical and spatial distribution of CVOCs and phthalate contaminants in the Northern Karst aquifer of PR.
 - Assess spatial and temporal changes in contamination trends within the study area.
 - Broader Impacts
 - Acquire translational and transdisciplinary opportunities and experiences.



Externship



- Puerto Rico Department of Health (PRDoH), potable water division
- Environmental Protection Agency (EPA), Caribbean Environmental Protection Division (CEPD)



PRDoH Mentors



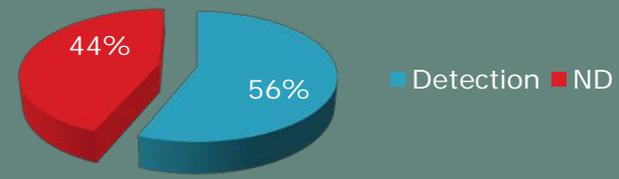
EPA CEPD Mentors



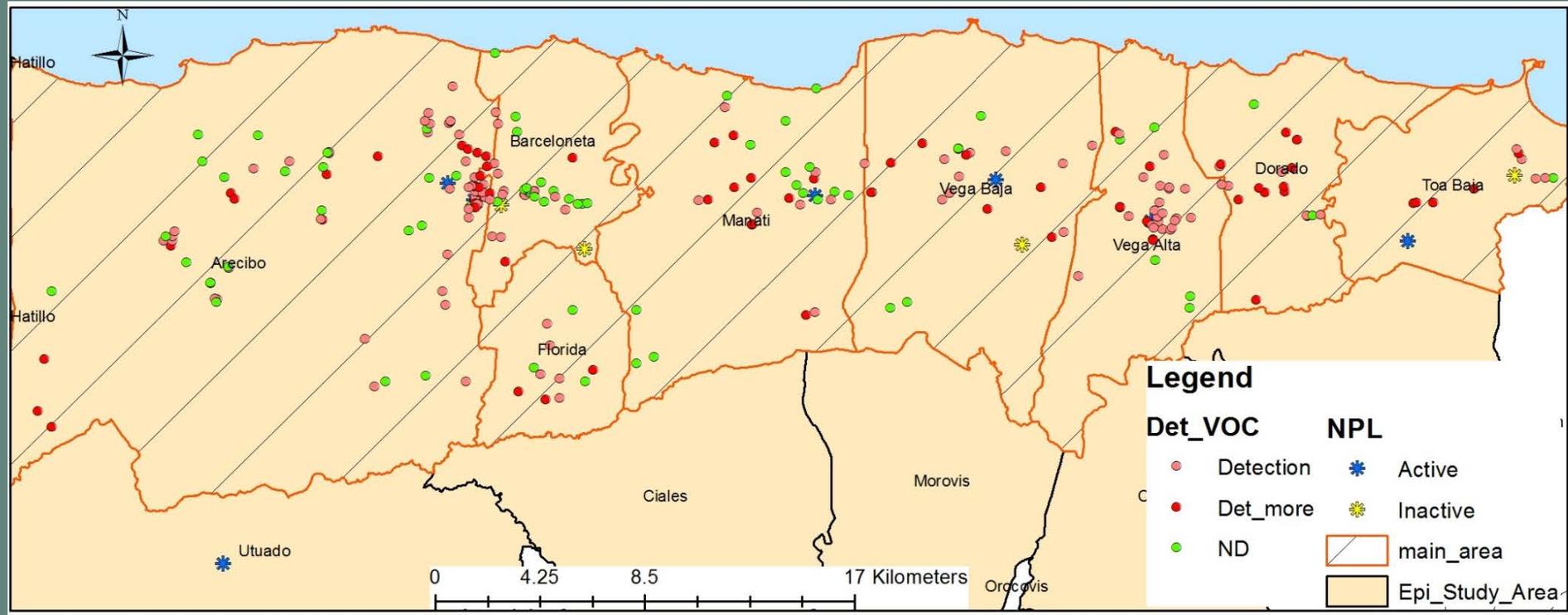
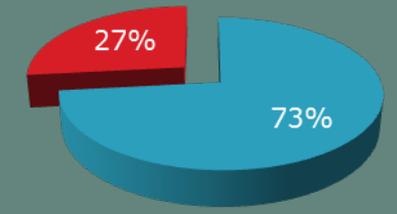
Data Results-CVOCs

- Number of data analyzed
 - 4,012 samples
 - 262 wells

CVOCs detections by Sample



CVOCs detections by Well





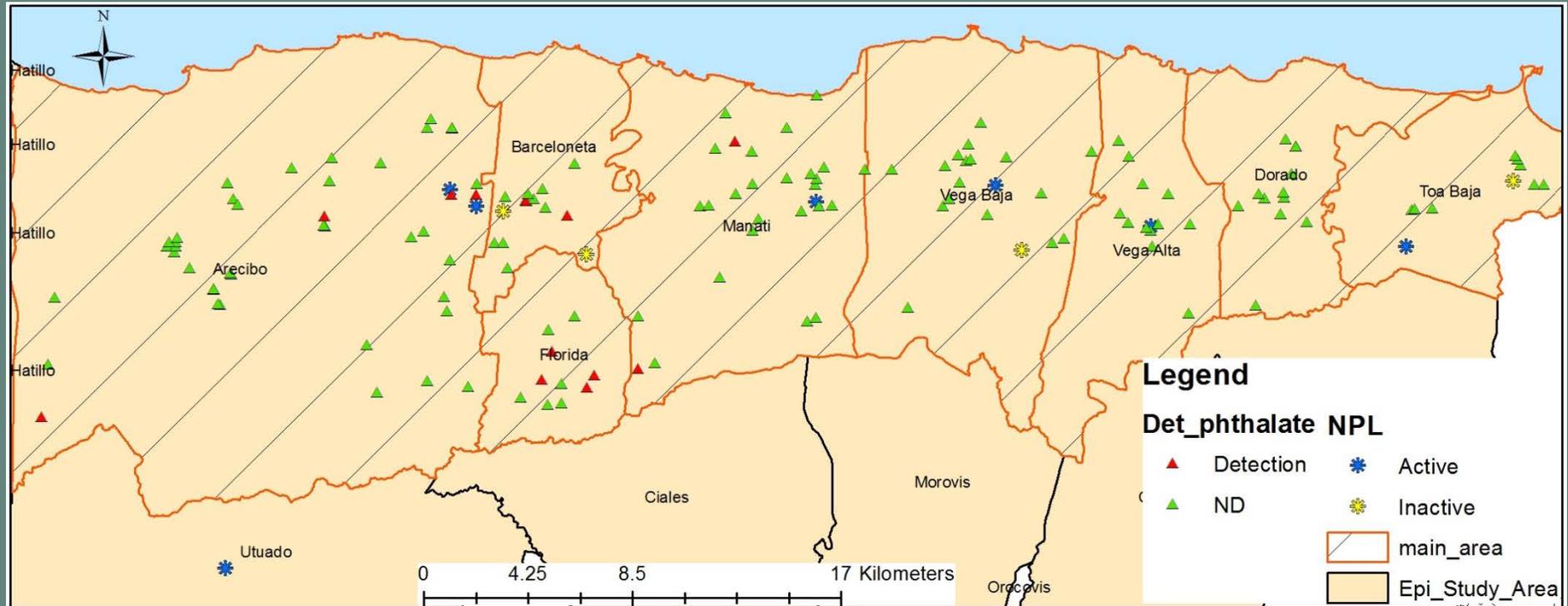
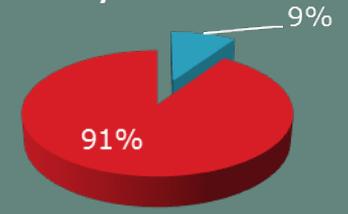
Data Results - Phthalate

- Number of data analyzed
 - 572 samples
 - 140 wells

Phthalate detections by Sample



Phthalate detections by Well





Externship Outcomes

• Technical

- Development of spatial and temporal distribution models for contaminants and potential exposure.
- Provide support data for exposure assessment of complex mixtures.
- Populate database for development of fate and transport models and risk assessment tools.
- Expand our ability to develop tools and technologies to assess risk and protect human health and the environment.

• Conclusions

- Extensive historical contamination of CVOCs and phthalates in the karst aquifer of northern PR.
- Long term storage and release of contaminants.
- Contaminated groundwater may be reaching water sources for human consumption and ecological integrity.
- Exposure to contamination may impact public health and be associated with adverse reproductive outcomes (e.g., High PTB).



Externship Outcomes

• **Transdisciplinary and Translational**

- Integrate of data from different regulatory agencies that focus on environment and public health.
- Translate technical and non-technical regulatory aspects into a single objective.
- Acquire knowledge of regulatory and policy aspects on:
 - QA/QC
 - Assessment of risk exposure
- Develop skills to communicate with a multi-sectorial population.
- Built strong networking capabilities.
- Develop practical understanding of the technical barriers and needs faced by regulatory agencies.
- Provide technical assessment and capabilities to the agencies.

• **Conclusions**

- Externship met the objectives, beyond expectations.
- The externship serves as a model for data integration and assessment across institutions.

Acknowledgments

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