An Analysis of Florida Water Quality, 2001 - 2017

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github.com/maps-apps-n

Introduction

This poster studies the existence of contaminants and salinization in Florida's water from the year 2001 to 2017. This research analyzes the measured contents of pollutants in water sources by location and identifies cluster areas of importance. Additionally, this analysis finds possible factors of importance in the causality of increases in units of pollutants per measurements.

Data and Methods

Water measurement data for the 67 counties of Florida was gathered from the National Water Quality Monitoring Council, which includes datasets from USGS National Weather Information Systems (NWIS) and the US EPA STORET repository. This includes data for estuaries, rivers, streams, wetlands, groundwater, wells, and variables such as salinity (ppt), barium (ug/l), and enterococcus (cfu/100 ml).
Figures 2 and 3 were created using the leaflet package for R. Cluster spots for coordinates were added using the markerClusterOptions() method.

The pie chart for water measurements in FL Central Atlantic Coast was created using Google Charts JavaScript API. Oil well data for the chart and Figure 3 were sourced from maps.fractracker.org.

Figure 1. Growth of Barium measurements in Brevard County, 2005 - 2013

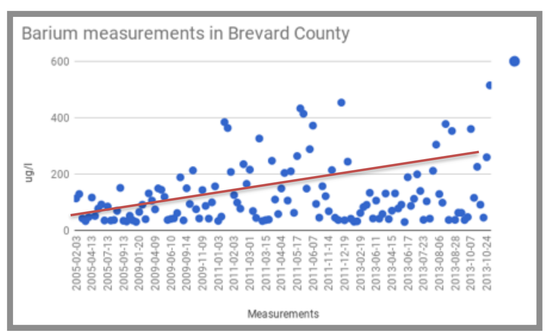


Figure 2. Measurements of Salinity above 30 ppt in Ft. Pierce area

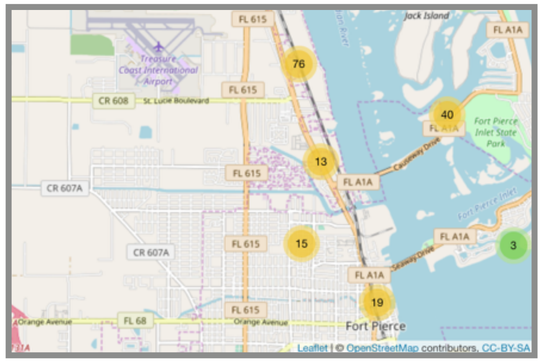
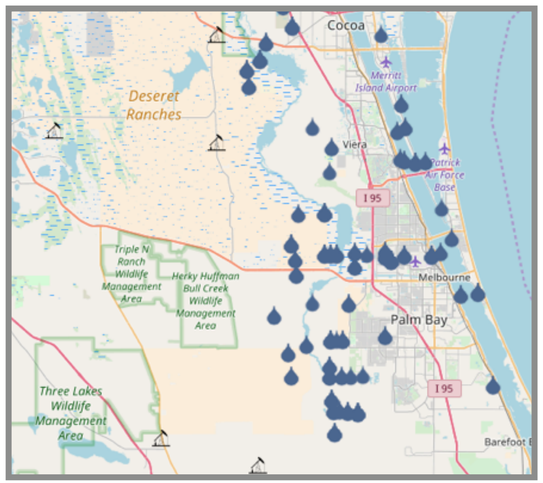
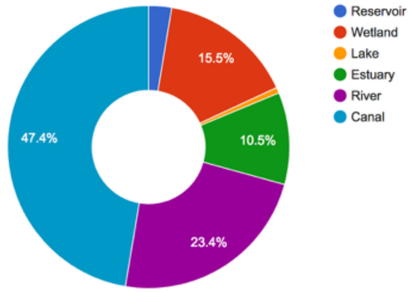


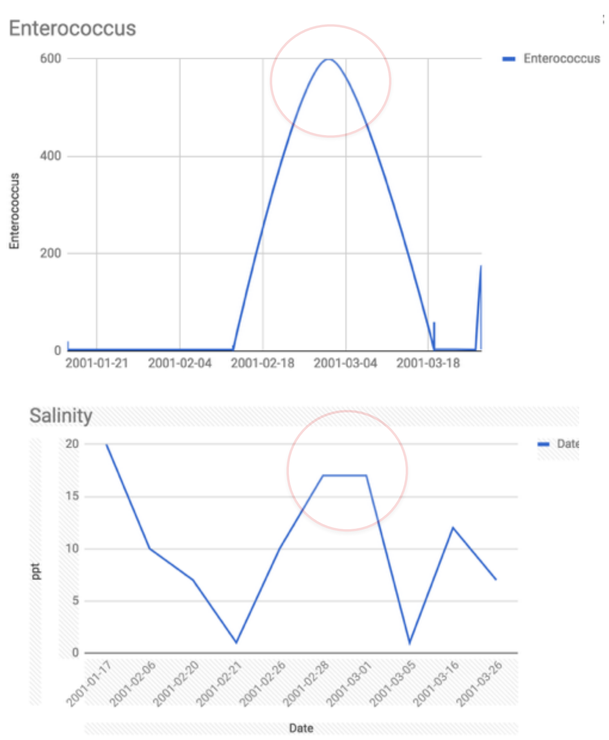
Figure 3. Measurements of barium in water and nearby oil wells



Water measurements of barium in FL Central Atlantic Coast by location type



Figures 5 and 6. Enterococcus vs Salinity in Gulf County



Results

The diversity of the state's geographies, industries, and infrastructure needs, reflect the issues in each county. Atlantic areas such as Ft. Pierce, St. Lucie county show an increase of salinity measurements above 30 ppt for inland water (1). In Atlantic-bordering Brevard County, there has seen a steady increase in barium in water from 2005 to 2013 (last year data was available), with a maximum measurement of 184.97 ug/l. Hydraulic fracturing has been identified as a possible source of release of this element due to quakes and unstable structure (2). Barium has been found in Florida's coast in an increasing pattern since the late 1980s (3). Furthermore, linear regressions of measurements and a variety of cancer and stomach disease incidence rates through time proved insignificant in this study, perhaps indicating that medical use of barium is not an important factor in the rise of ug/l in Brevard. The proximity of a handful of both, dry and functioning oil wells in the vicinity of measurement areas is depicted in Figure 3. Additionally, a cluster of enterococcus bacteria was found in Gulf County, coinciding with an increase in salinity.

Conclusion

This analysis has identified three clusters of concern in regards to external elements in inland water of the state: A significant and increasing amount of salinity, specially in southeastern Florida; a surge in barium in the Treasure Coast counties; an enterococcus cluster in the Gulf area due to high salinity.

References

1.NOAA (n.d.) Water Quality Parameters information Sheet. coast.noaa.gov/data/
2. Swackhamer, D. (2014) "Health Impact Assessment of Shale Gas Extraction", Roundtable on Environmental Health Sciences, Research, and Medicine; Institute of Medicine. National Academies Press.
3. Andreegg, D. et al (1997) "Barium chronologies from South Florida reef corals-environmental implications", NOVA Oceanography Faculty Proceedings, Presentations, Speeches, Lectures. 47.
4. Fraser, S. et al (2017) "Enterococcal infections", Medline.