Twitter Analytics for Florida Red Tide Impact Assessment.

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Photo Credit: South Florida Water Management District

Red tide results from an algal bloom of the dinoflagellate Karenia brevis. It is toxic to fish, wildlife and humans.

Photo Credit: Dale White

While not the longest duration red tide event on record, the severity and extent of Florida 2018 red tide brought national attention to the impacted Florida Gulf Coast communities.

the first major red tide since ubiquitous social media

Casey Key, Florida, before (June 2018) and during (August 2018) red tide. Credit: Cody Johnson, Source: NOAA NCCOS

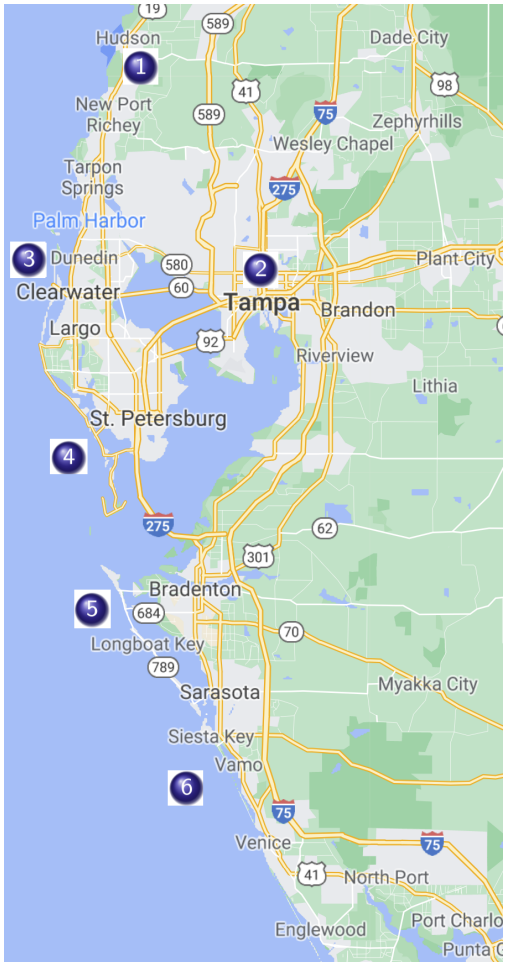
Residents and visitors turned to social media platforms like Twitter, Facebook, Instagram to both

- **receive information, and**
- **communicate their own sentiments and experiences.**

Local Twitter dynamics were used to retrospectively measure the 2018 Florida red tide event impacts, for the purposes of potentially quicker assessment and better response to future events.

Focused on 6 Metro Areas surrounding **Tampa Bay** on FL Gulf Coast:

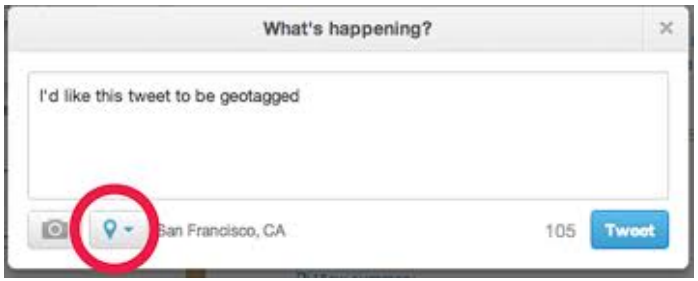
1. **Pasco county**
2. **Tampa/Hillsborough county**
3. **Clearwater metro**
4. **St Petersburg metro**
5. **Manatee county**
6. **Sarasota county**



Twitter Data Mining.

To make sure tweets came from 6 metro areas **surrounding Tampa Bay**, we used

1. Tweets **explicitly geo-tagged** in the area:



Found a total of $\approx$ **1,200** such **explicitly geo-tagged** tweets with explicit mention of "red tide".

Twitter Data Mining.

To make sure tweets came from 6 metro areas **surrounding Tampa Bay**, we used

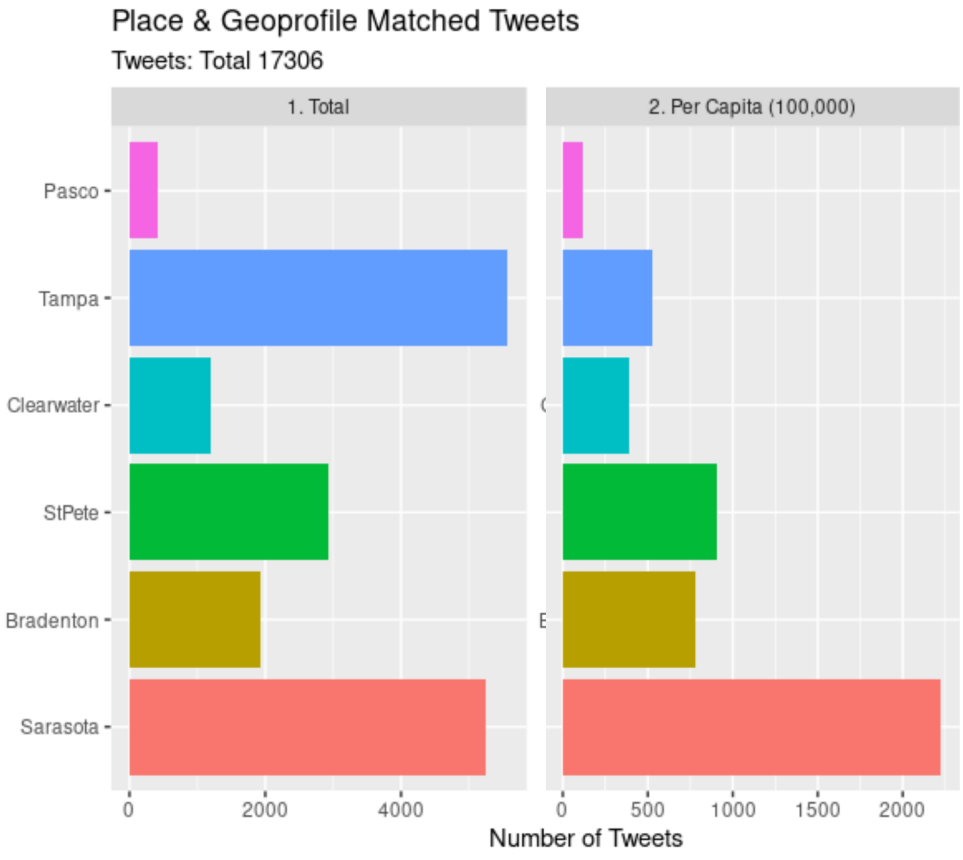
2. Tweets from users whose **geoprofile location** was in the area:

Found a total of $\approx$ **16,000** geoprofile-matched tweets that had an explicit mention of "red tide".

Overall, there were **17,306 relevant unique geo-matched tweets**, including

- original posts,
- replies and
- retweets.

Tweet Counts by Metro Area: Totals vs Per-Capita.



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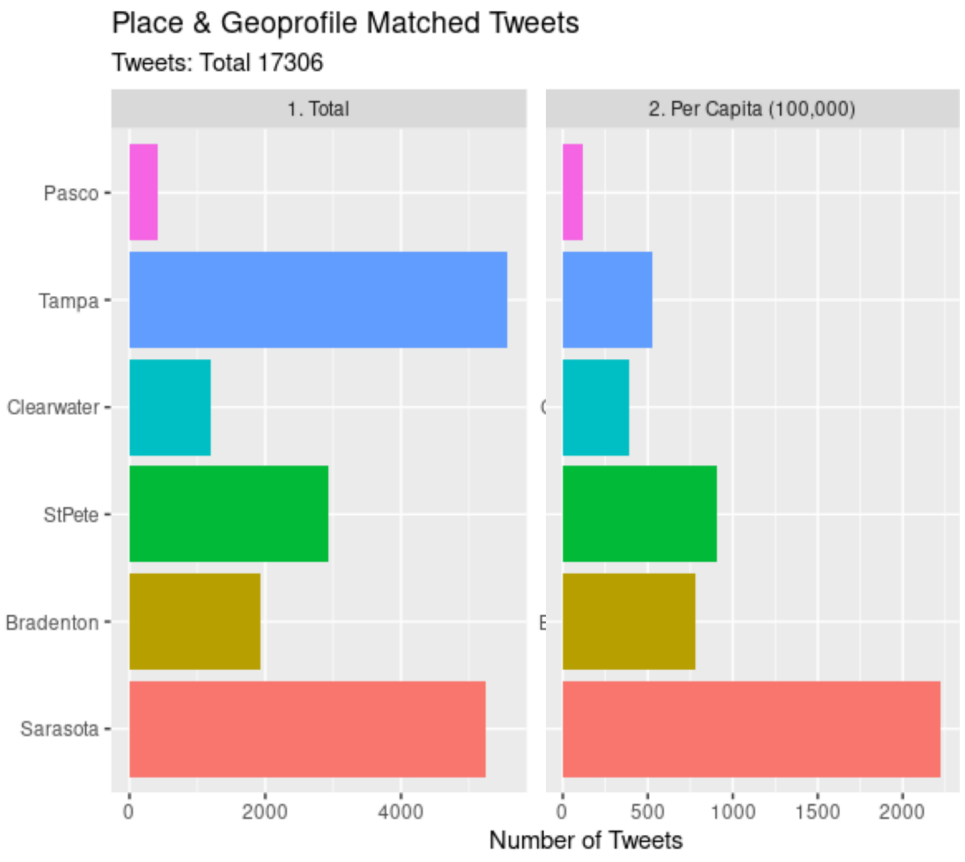

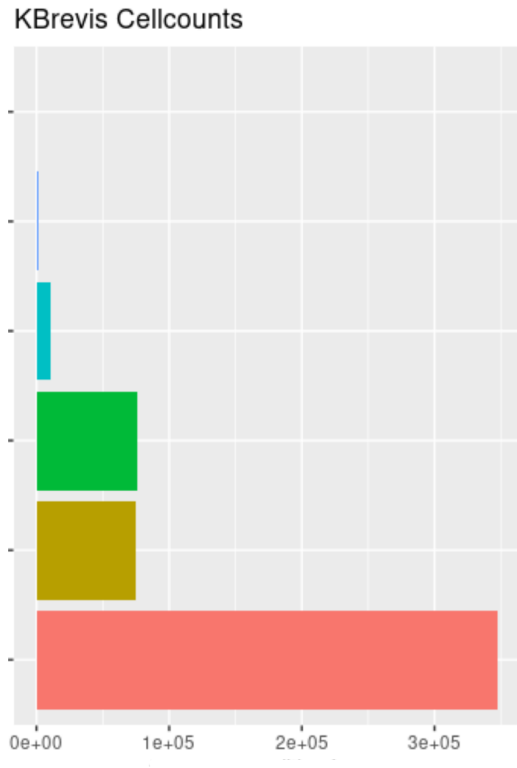

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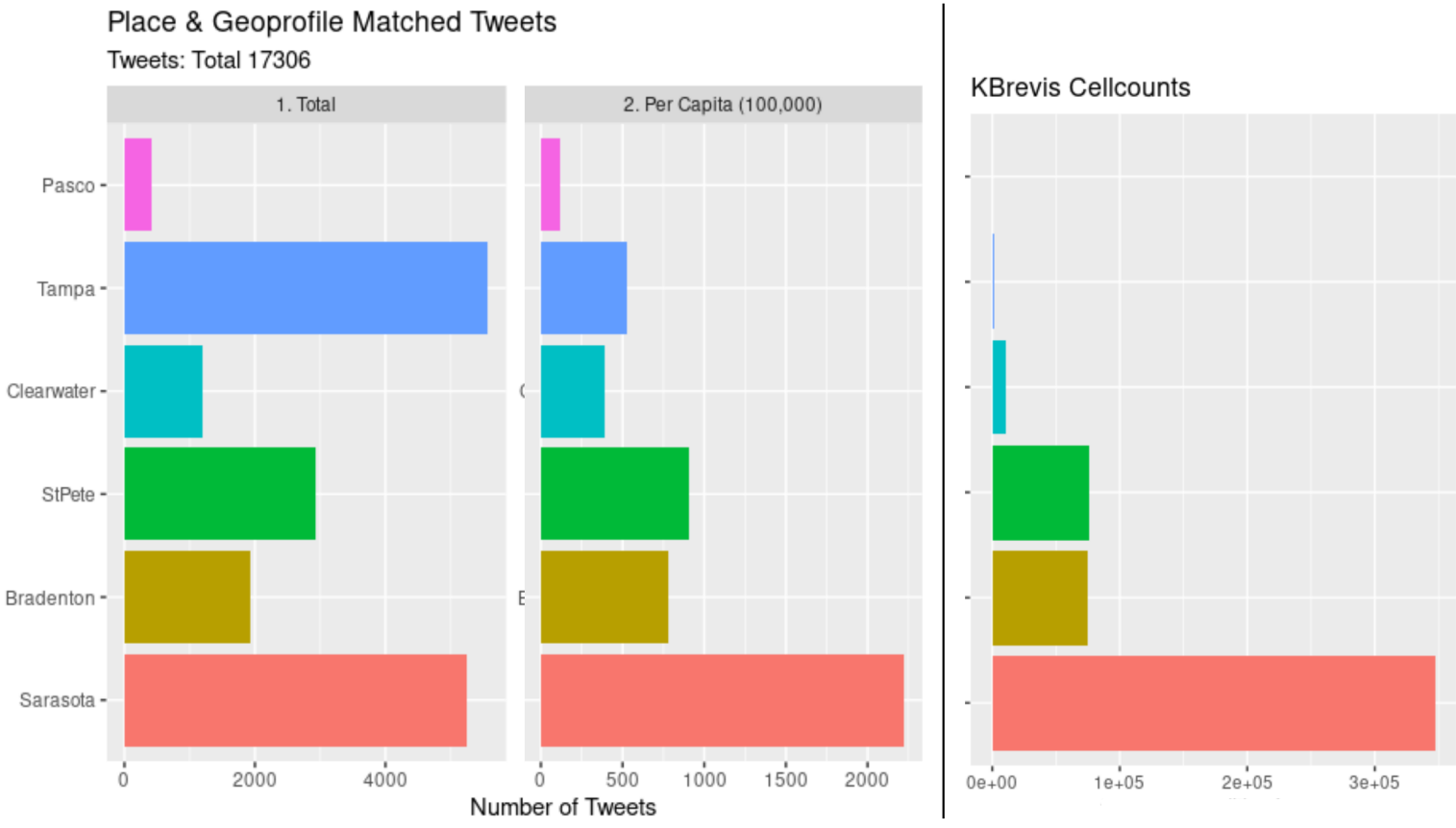
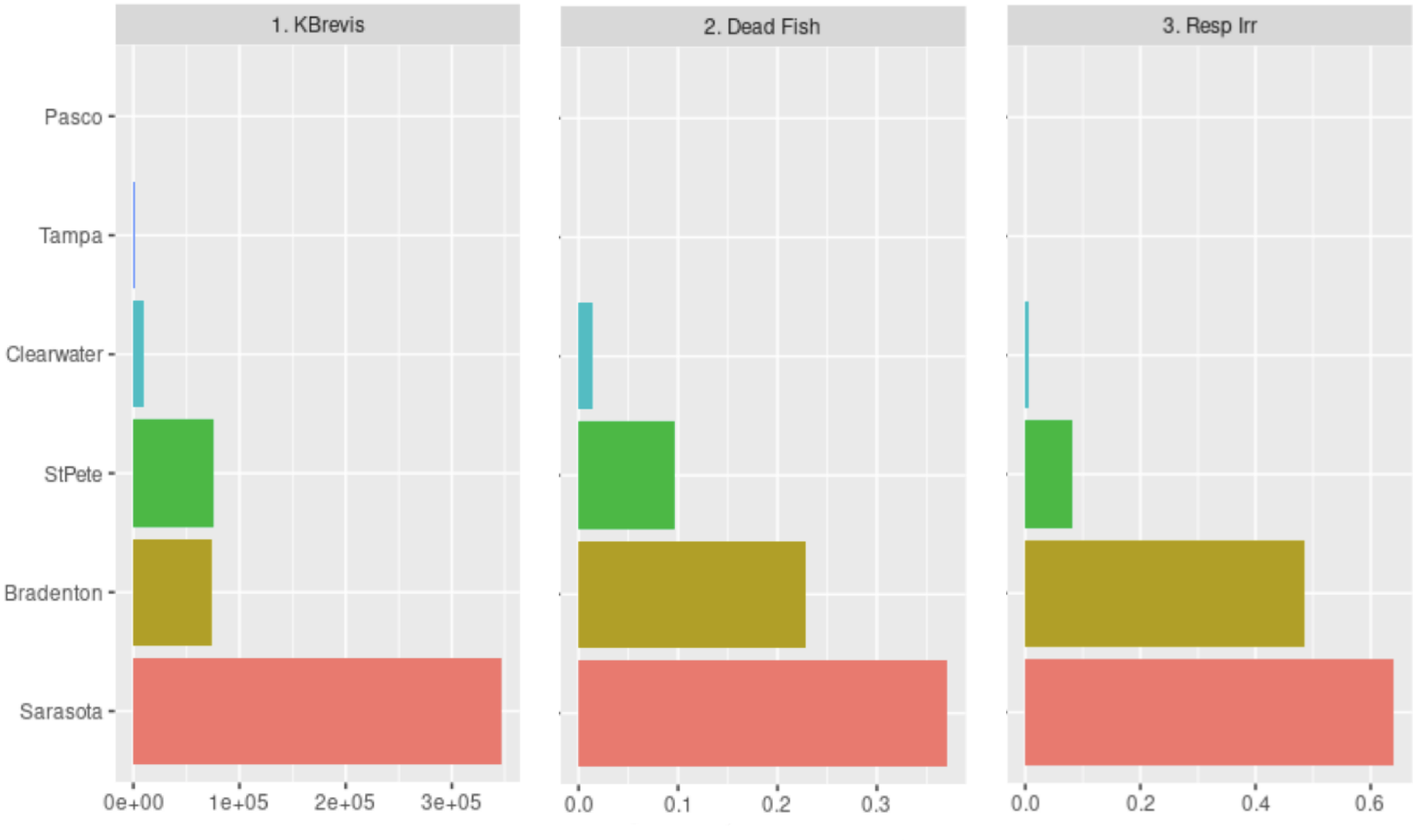


- Tampa's twitter activity is in large part due to much larger # of users.
- This effect is **alleviated** when doing **per-capita** tweet counts.

Actual Red Tide Conditions by Metro: Cumulative Averages.



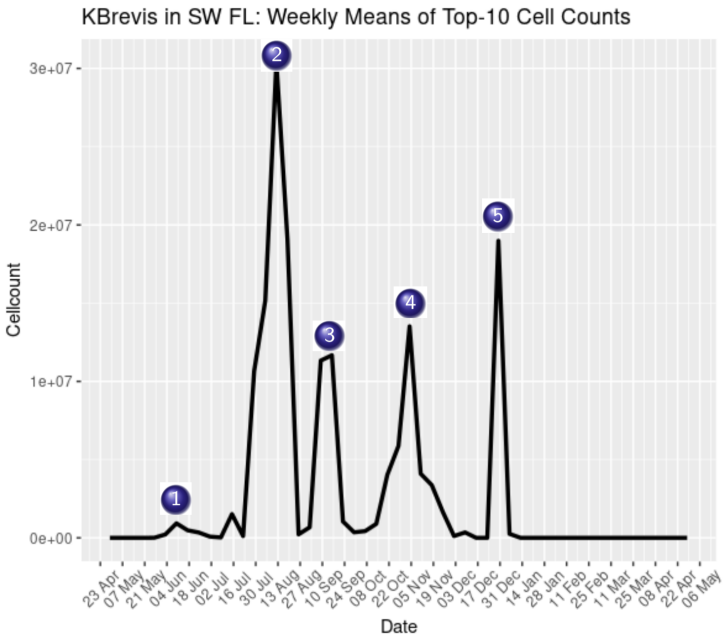
Average
Cell Counts

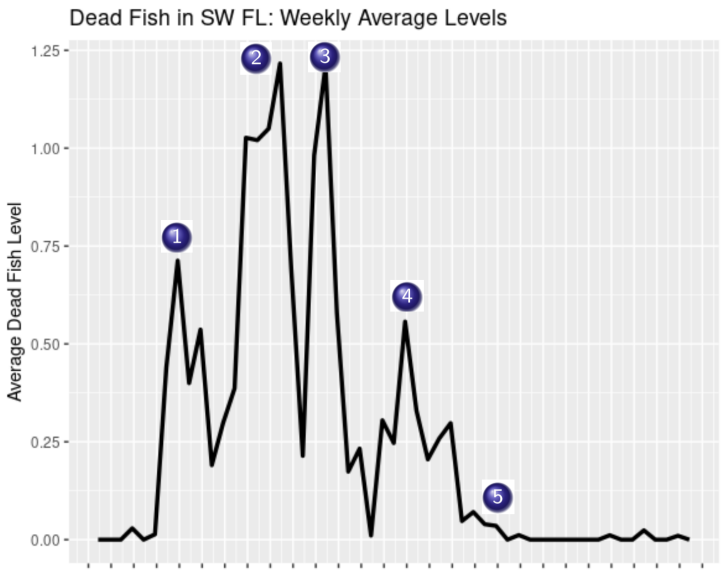
Average
Condition Index
(0 - None,
1 - Some,
2 - Heavy)

Average
Condition Index
(0 - None,
1 - Slight,
2 - Moderate,
3 - Intense)

Data sources: *Wildlife Commission (Kbrevis)*, and
Mote Marine Laboratory (beach conditions)

Actual Red Tide Conditions Over Time (Weekly).



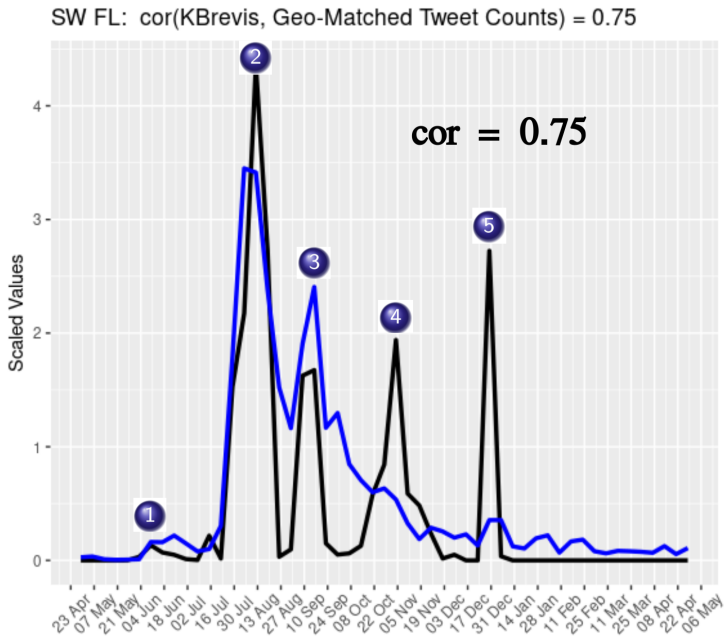


Five waves of red tide detected from the plots:

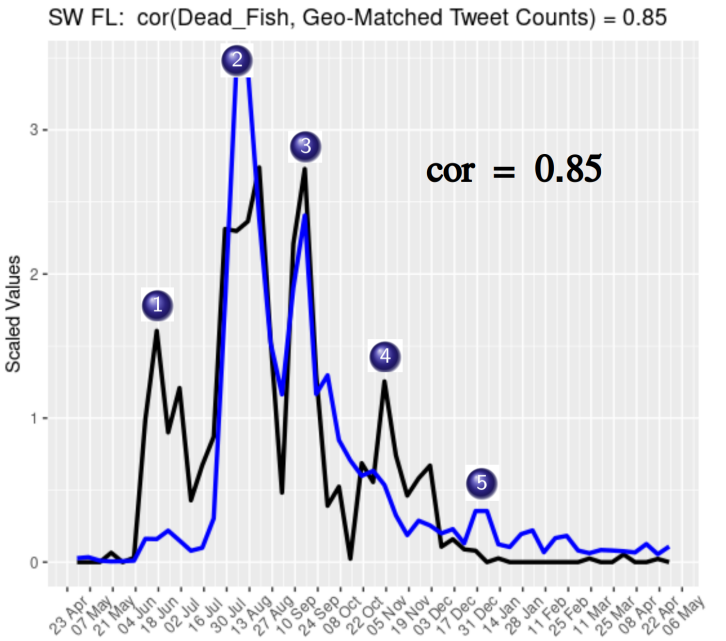
1. June
2. Late July - Early August
3. Mid-September,
4. Late October - Early November,
5. Early January

Data sources:
Florida Fish and Wildlife Commission
and
Mote Marine Laboratory.

Tweet Counts versus Red Tide Conditions: Overall.

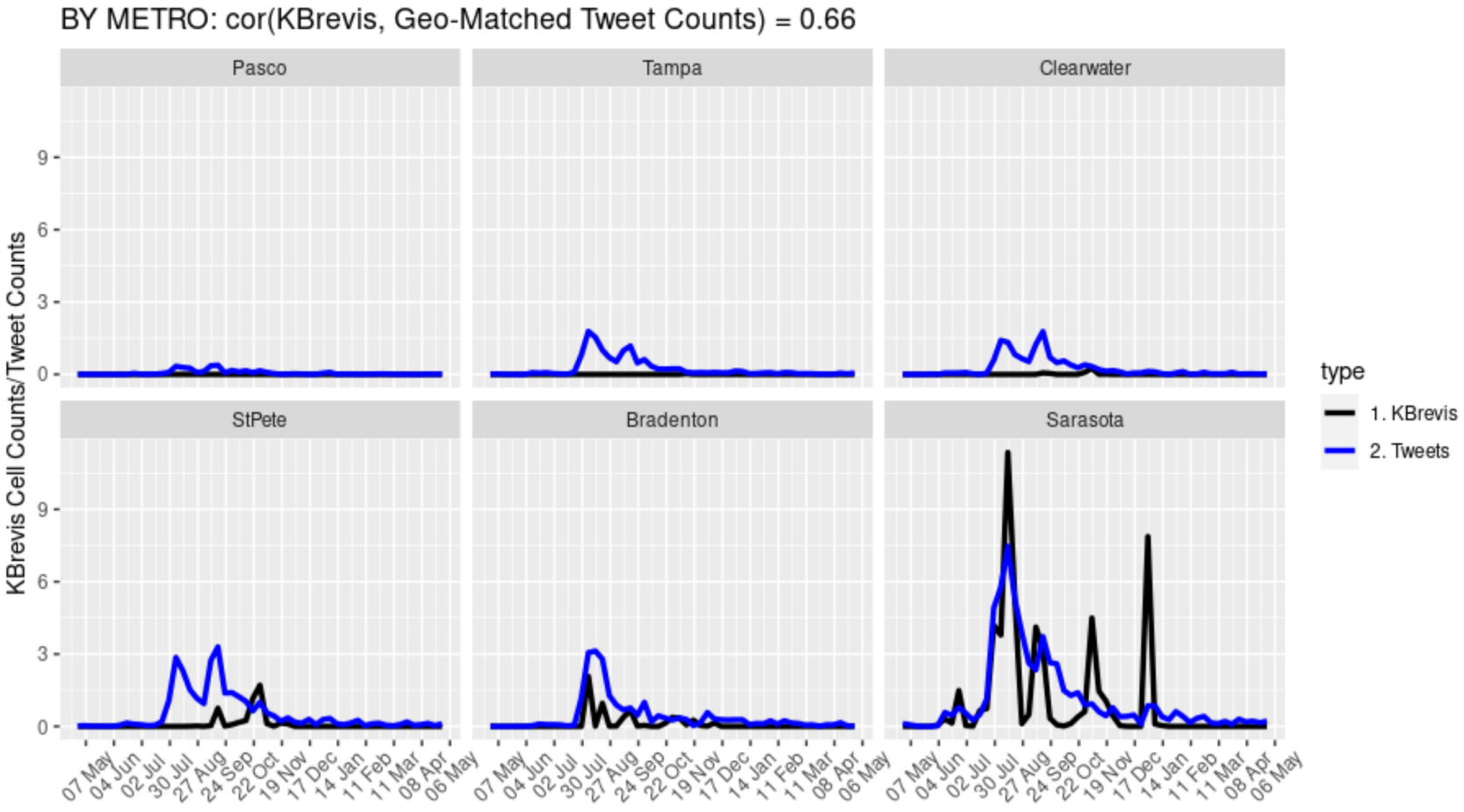


Total weekly tweets
versus
red tide cell counts
(correlation = **0.75**)



Total weekly tweets
versus
dead fish level
(correlation = **0.85**)

Tweet Counts versus Red Tide Conditions: By Metro.

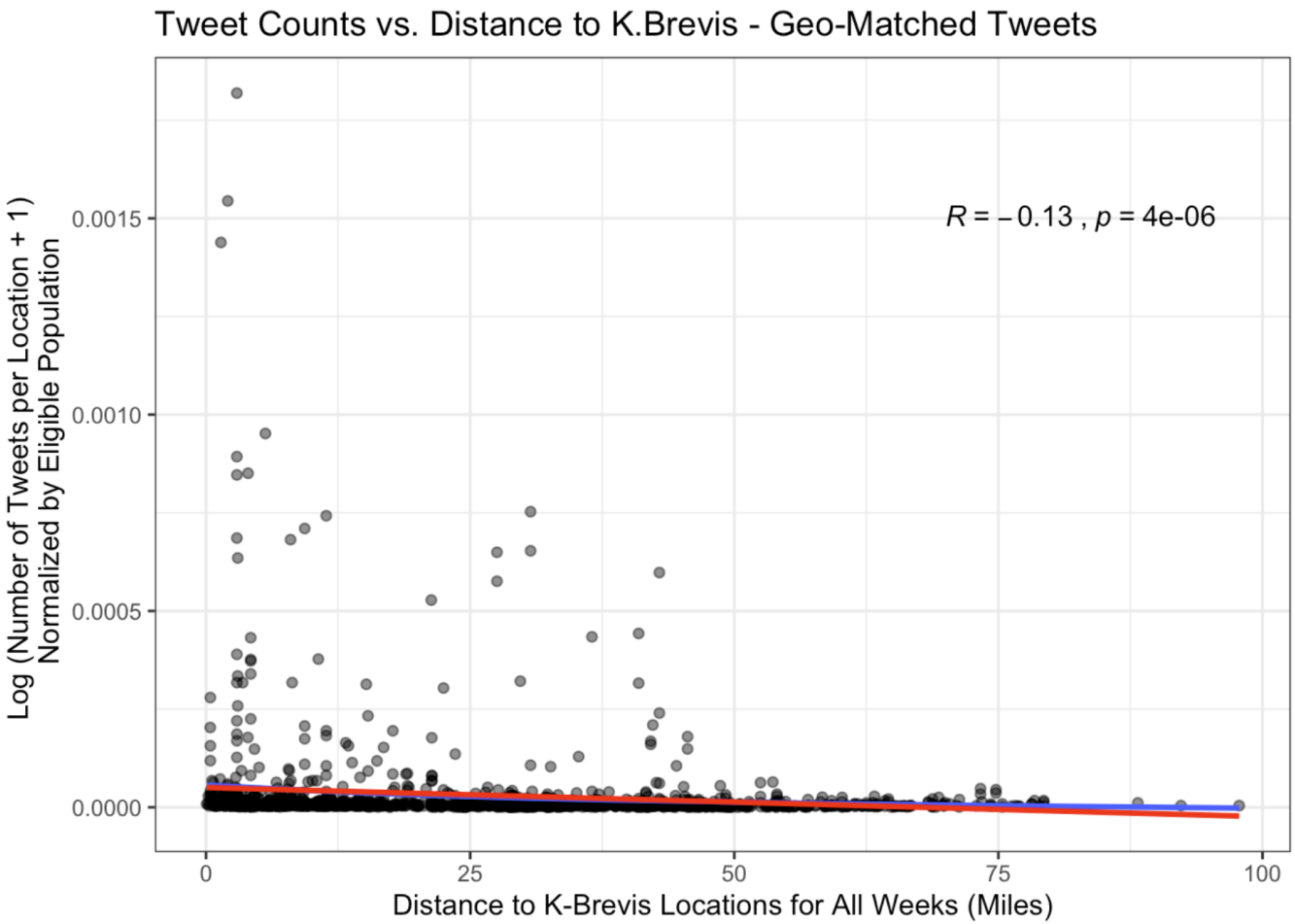


Distance From Red Tide vs Twitter Activity: Correlation.

Farther from red tide (distance ⇑)

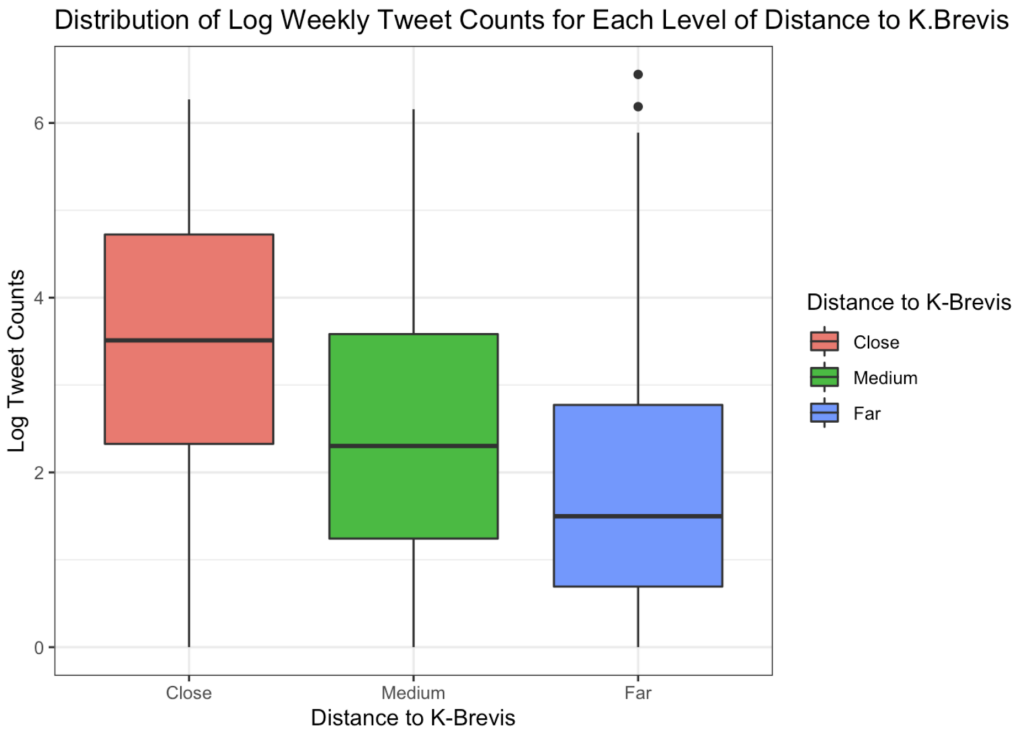
⇓

less tweets posted (tweet counts ⇓)



Distance From Red Tide vs Twitter Activity: Close vs Far.

Analysis of variance for red tide **tweet counts** based on if tweet location is at **Close/Medium/Far** distance from impacted area:



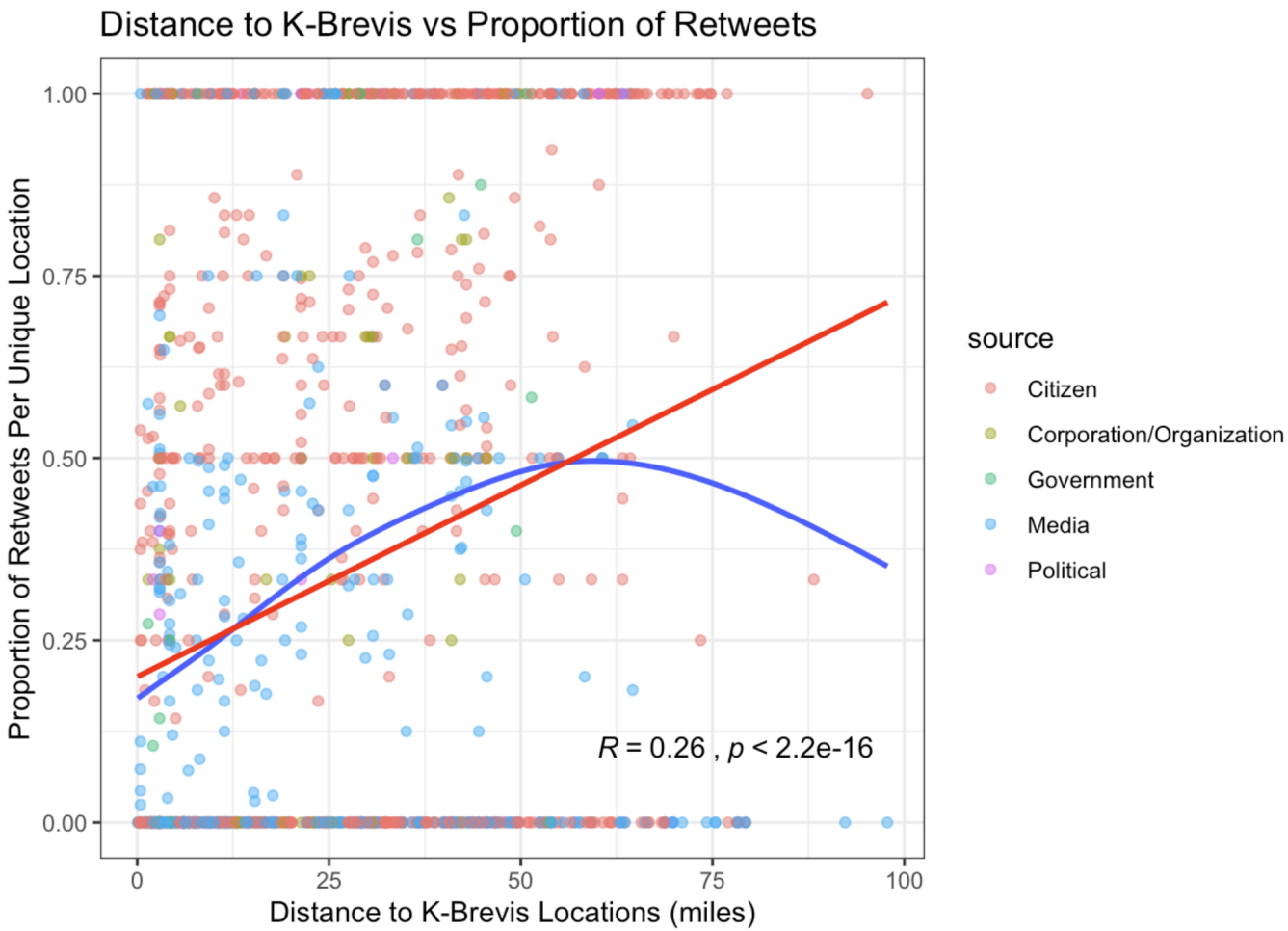
- p-value of $2.37 \times 5 \times 10^{-07}$, R^2 of 0.11
- 95% CI for {Medium - Close} $\in (-1.43, -0.38)$
  95% CI for {Far - Close} $\in (-2.01, -0.96)$

Distance From Red Tide vs % of Retweets.

Farther from red tide (distance $\Uparrow$)

$\Downarrow$

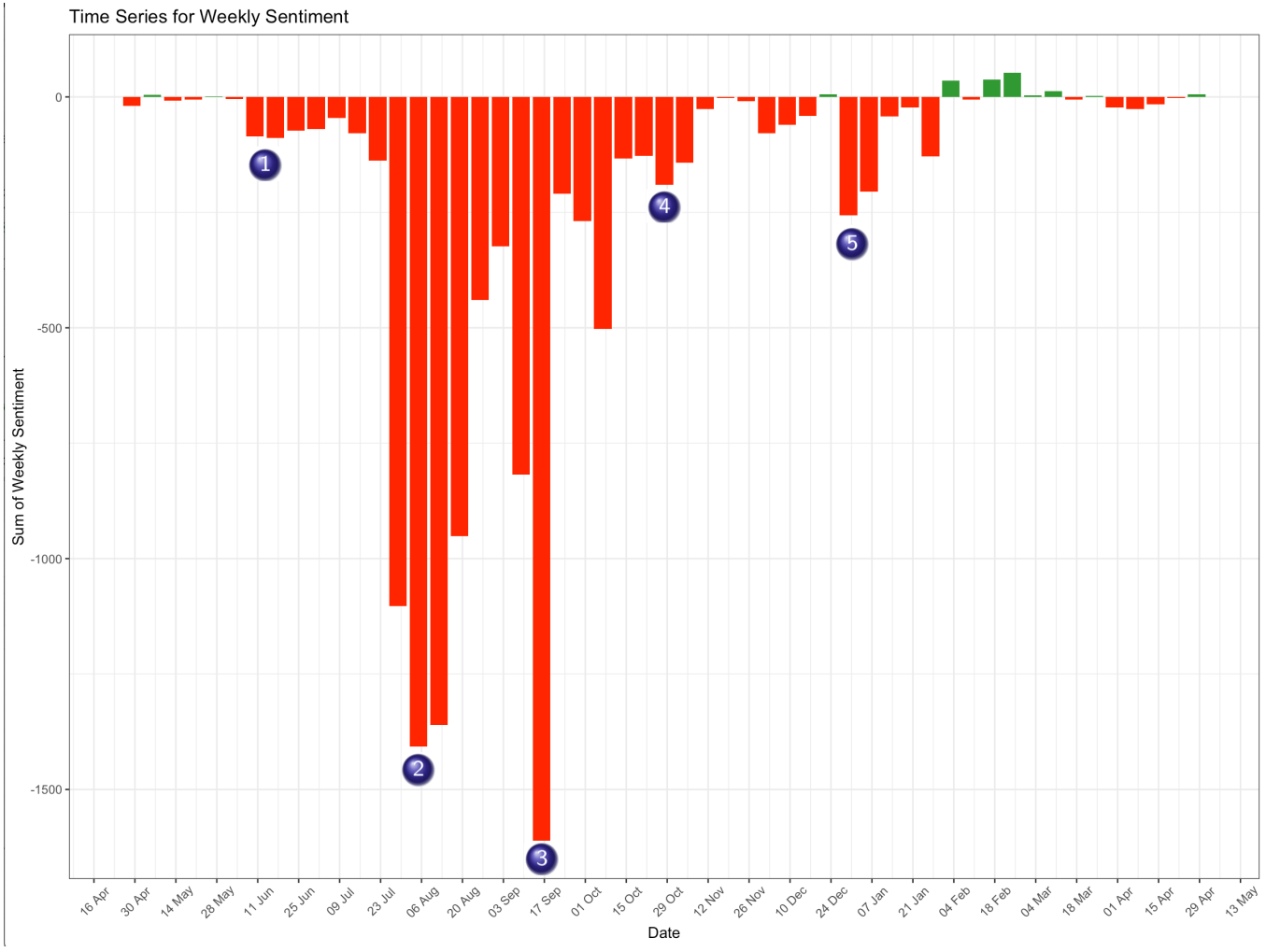
higher % of retweets (% retweets $\Uparrow$).



Sentiment Analysis of Tweets.

Each tweet was assigned a numeric score based on **direction** (+/-), and **strength** of **emotion** expressed in the tweet.

Weekly total sentiments:



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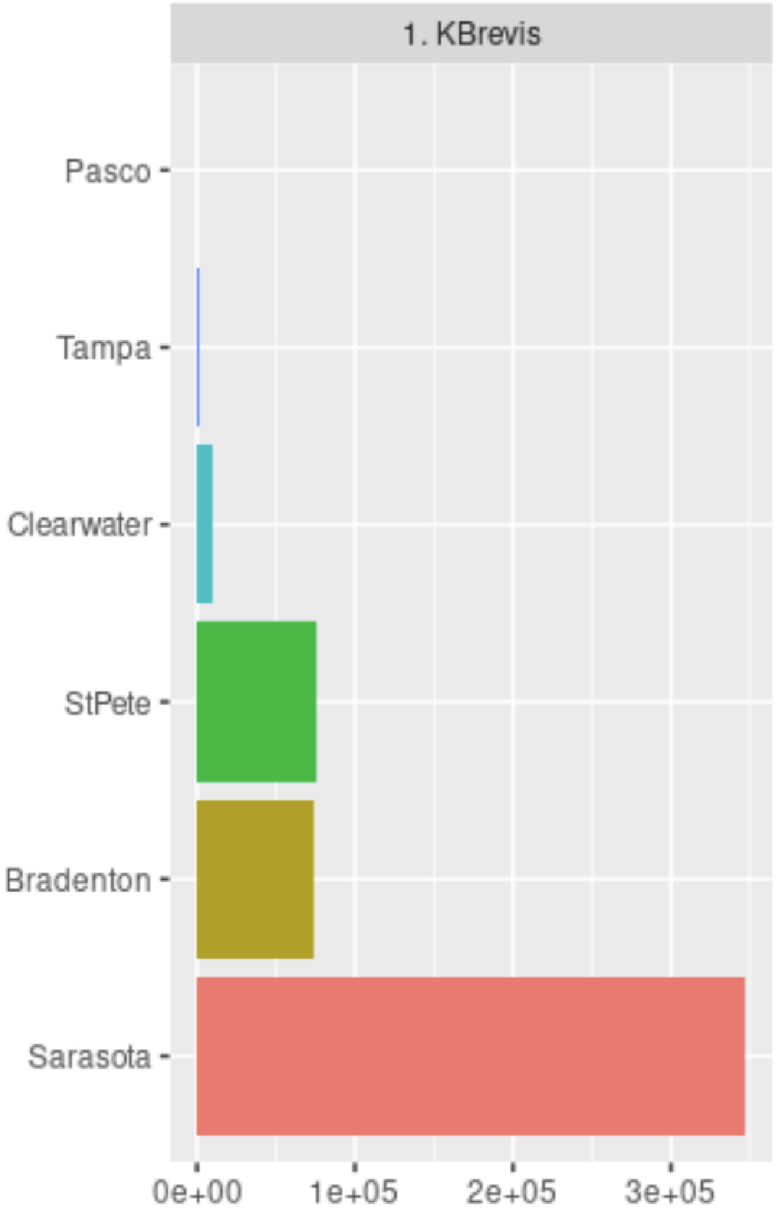

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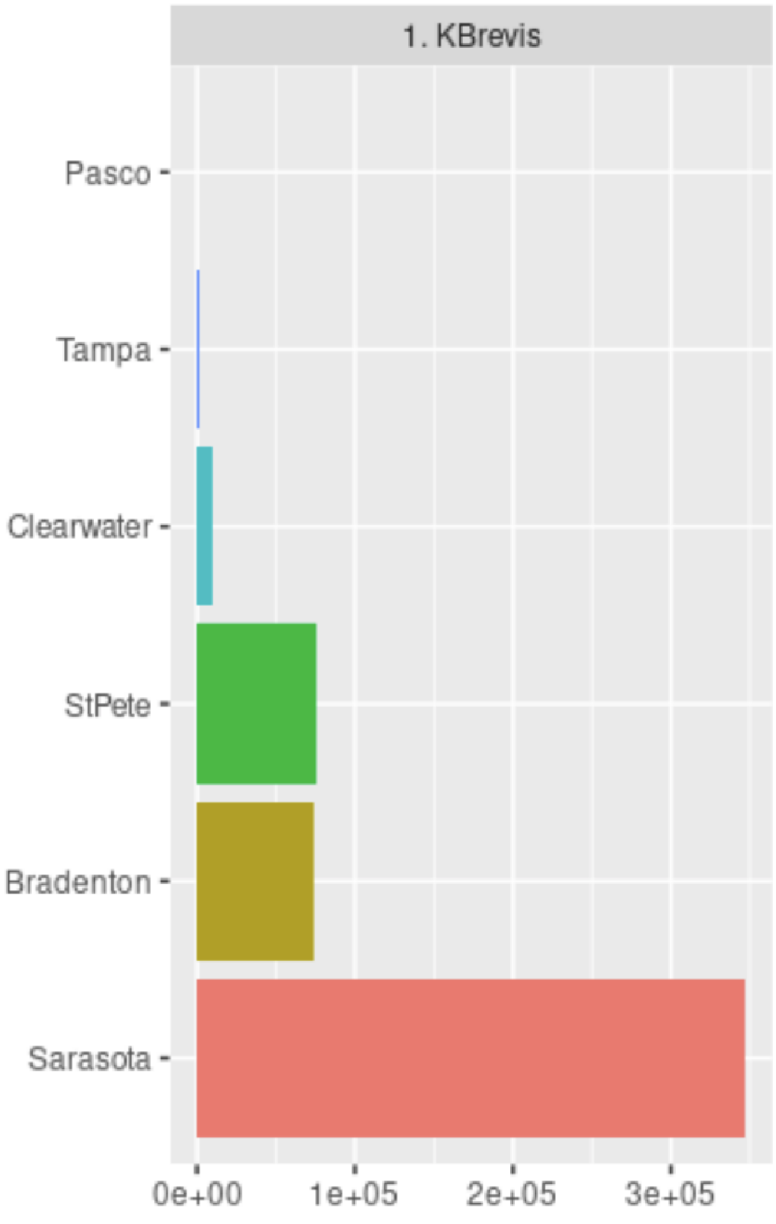
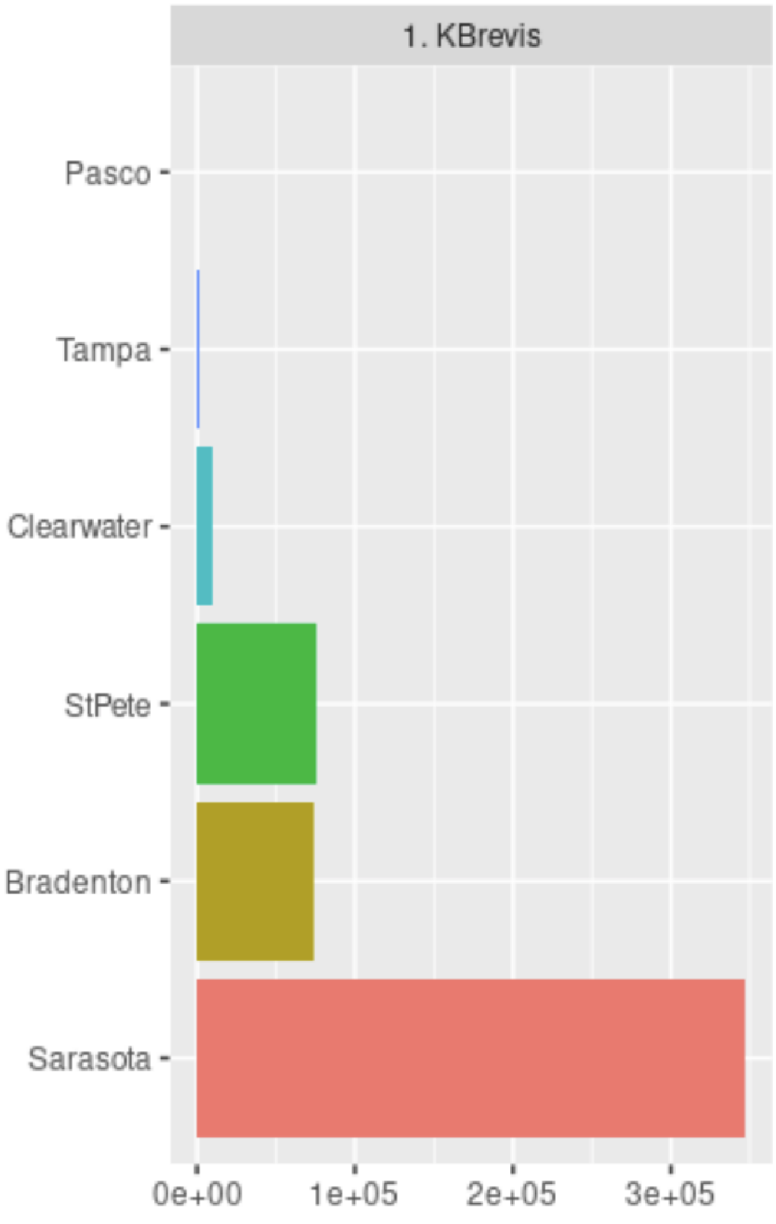


Pasco

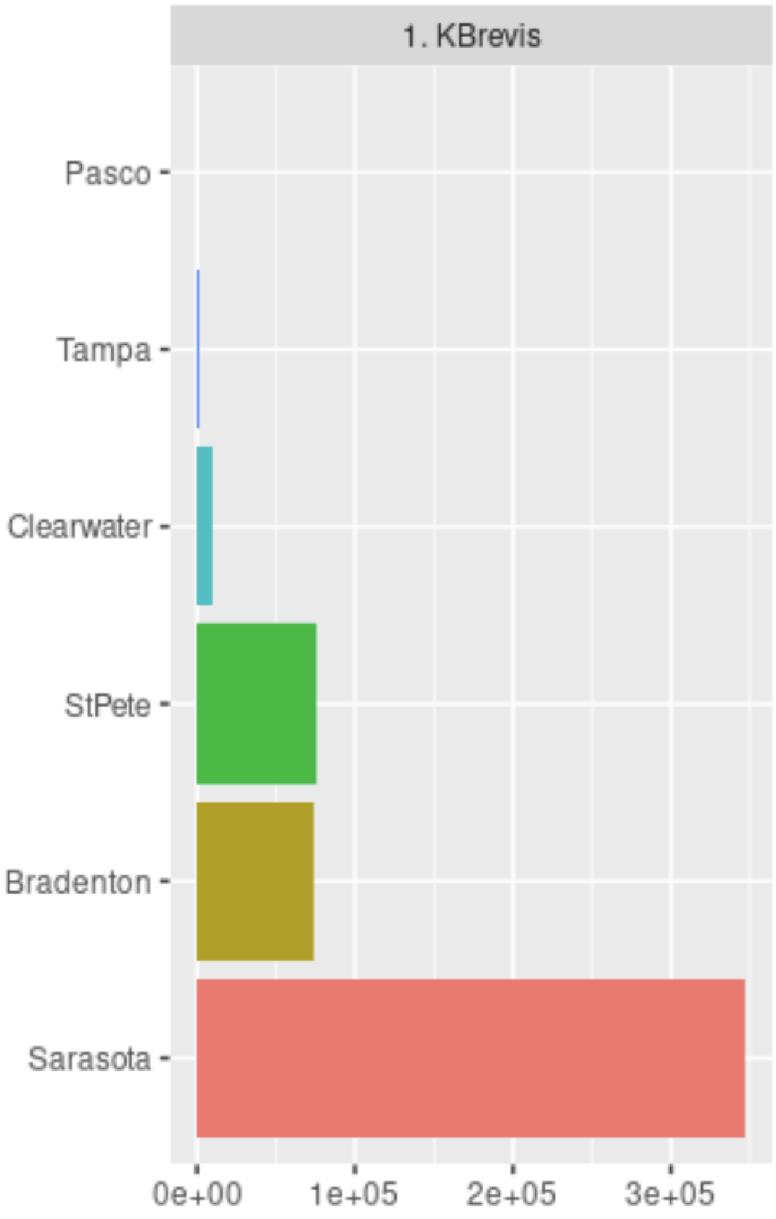
Sentiment Analysis of Tweets.



Pasco

StPete

Sentiment Analysis of Tweets.



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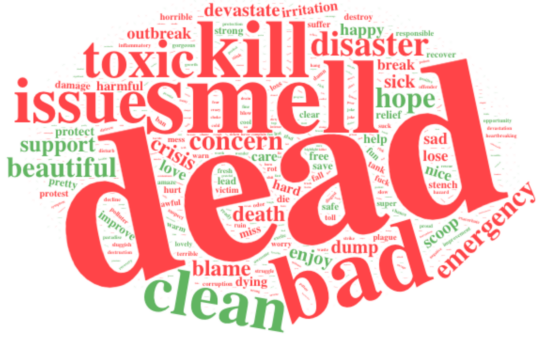
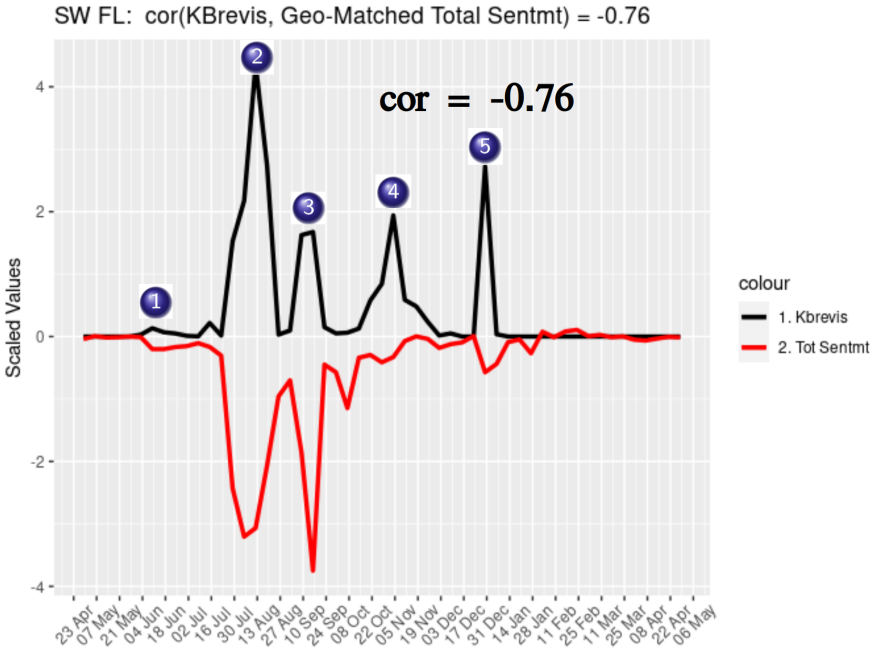
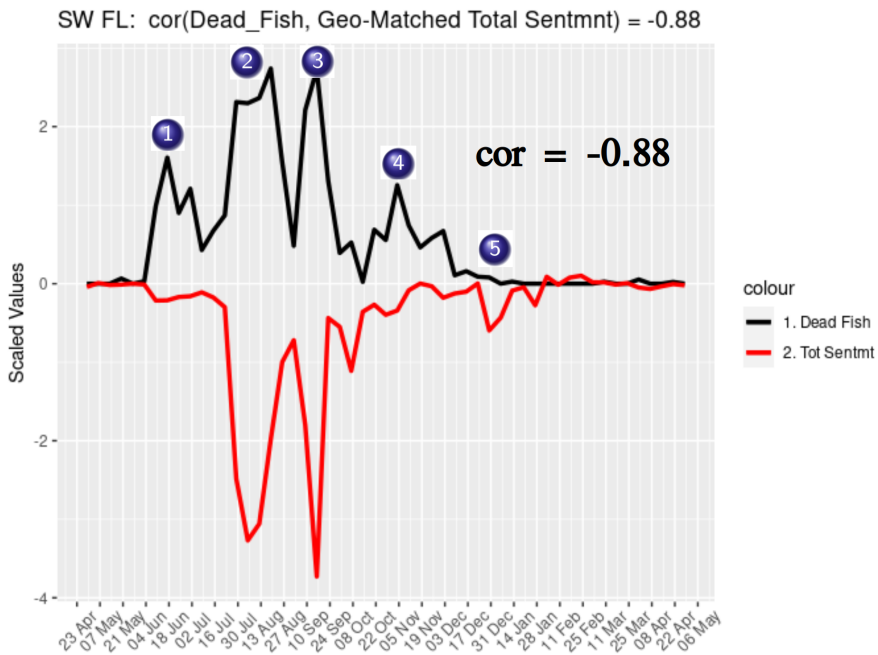
Sarasota



Tweet Sentiments versus Red Tide Conditions: Overall.



Total weekly sentiment
versus
red tide cell counts
(correlation = **-0.76**)



Total weekly sentiment
versus
dead fish level
(correlation = **-0.88**)

Conclusions and Future Work.

- Our analysis of over 17,000 **geo-matched** tweets from Florida's west coast during the 2018 red tide event showed very strong localized correlations between red tide conditions and public response in terms of the number and sentiment of tweets, along with % of retweets.
- **Twitter** showed to be a reliable indicator of community awareness and actual red tide impact.
- We are conducting further analysis into different Twitter user groups (e.g. Citizens, Media, Government,etc) to characterize social influencers and identify strategies for improved public communication. Moreover, we plan on utilizing tweets matched to a particular location via explicit mention of that local area in the **tweet content** for an even better local impact assessment.

THANK YOU!

Sponsors and Partners

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