Tampa Bay Groups with Few Financial Resources Lack Benefits from Natural & Artificial Wetlands

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Introduction and Study Area

The Tampa Bay Watershed (TBW) is comprised of over 15% wetlands and about 3% Artificial Water Features (AWFs, e.g., stormwater detention ponds, reservoirs). Both surface water features perform surface water storage functions, but wetlands are associated with other beneficial functions such as water quality enhancement, temperature modulation, wildlife viewing, and opportunities for recreation. AWFs are likely to perform these functions to a lesser degree and are often associated with algal blooms. Surface water features are unevenly distributed across the TBW, indicating different neighborhoods have different levels of access to the benefits and risks provided (Rains et al., 2023).

Artificial Water Features

Image credits: Rains et al. 2023

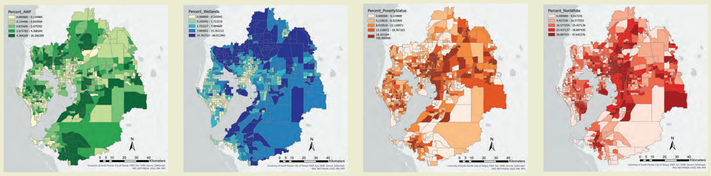
Wetlands

Image Credits: K. Rains

Minority populations within the TBW have historically been disproportionately exposed to environmental hazards (Chakraborty, 2009; Dorsey, 2009), but the distribution of wetlands and AWFs relative to these neighborhoods in the TBW has not previously been investigated.

Characteristics of the TBW by Census Tract

% AWF | % Wetlands | % Poverty | % Racial Minority



Research Question: How are natural wetlands and artificial water features distributed amongst different socioeconomic groups in the Tampa Bay Watershed?

Methods

For this study, we used publicly available primary datasets of land use/land cover and census data to perform geospatial analysis (ArcGIS Pro version 3.0) that compared the percentage of AWFs and wetlands by census tract area to the percentage of residents of those census tracts that are not white or below the poverty line. This comparison was represented in bivariate choropleth maps. We performed statistical analyses (Microsoft Excel) in quintiles established by Jenks natural breaks to determine whether low income or predominantly non-white neighborhoods are more likely to occur in areas that have fewer wetlands and/or a higher proportion of artificial water features.

Primary Data Sources:

- Southwest Florida Water Management District
- United States Census Bureau

For every Census Tract...

$$\%\ \text{AWF} = \frac{\text{Area covered by Artificial Water Features (hectares)}}{\text{Census Tract Area (hectares)}} \times 100$$

$$\%\ \text{Wetlands} = \frac{\text{Area covered by Wetlands (hectares)}}{\text{Census Tract Area (hectares)}} \times 100$$

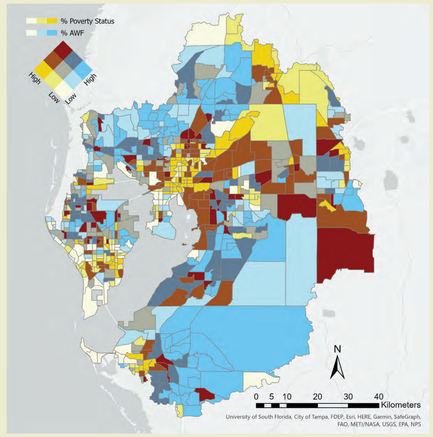
$$\%\ \text{Poverty} = \frac{\text{Population whose income in the past 12 months was below poverty level}}{\text{Total population}} \times 100$$

$$\%\ \text{NonWhite} = \frac{(\text{Total population} - \text{Population that is white alone})}{\text{Total population}} \times 100$$

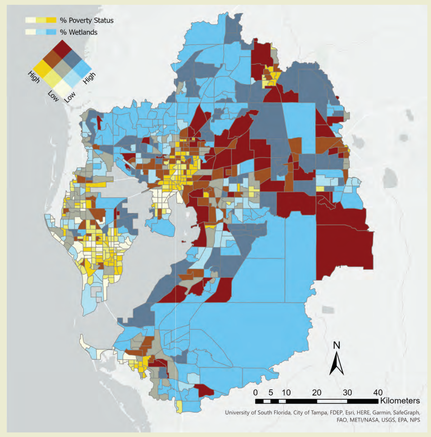
Results

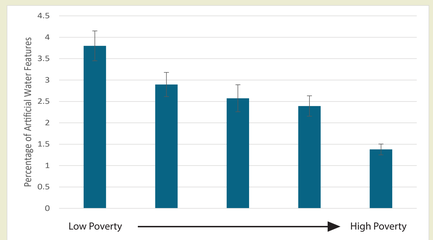
The Distribution of Residents Below the Poverty Line within Census Tracts

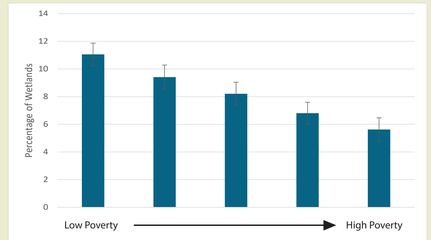
By Percentage of Artificial Water Features



By Percentage of Wetlands

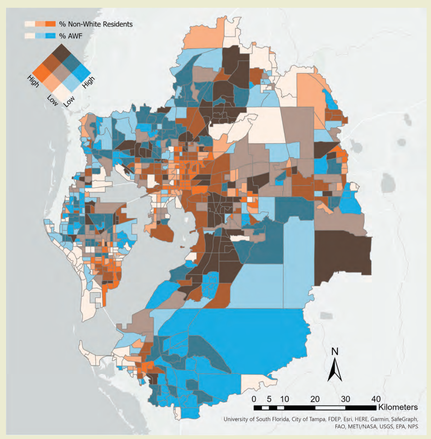




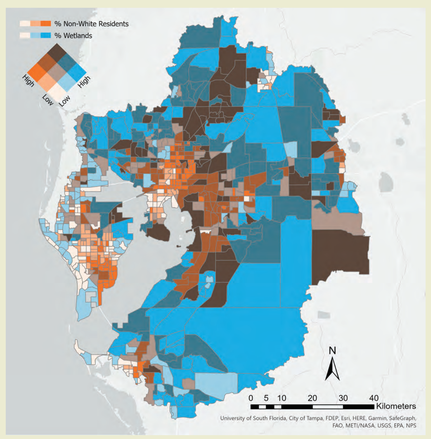


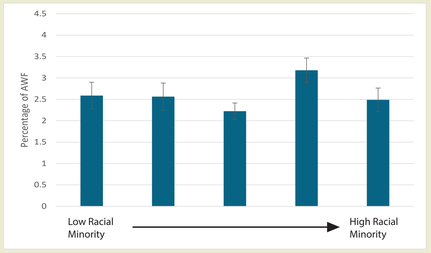
The Distribution of Residents that are Non-White within Census Tracts

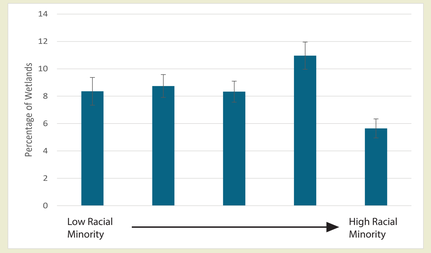
By Percentage of Artificial Water Features



By Percentage of Wetlands







Characteristics of Census Tract Quintiles

(Values are Averages and Standard Errors)

Table 1: Quintiles as defined by increasing percentages of residents below the poverty line

Quintile # (% Poverty) Avg. (SE)	1 (0-5.1%)	2 (5.1-8.6%)	3 (8.6-13.2%)	4 (13.2-19.8%)	5 (19.8-100%)
% AWF	3.80% (0.35)	2.90% (0.28)	2.57% (0.32)	2.39% (0.24)	1.38% (0.13)
% Wetlands	11.06% (0.82)	9.42% (0.87)	8.21% (0.83)	6.81% (0.79)	5.62% (0.85)

Table 2: Quintiles as defined by increasing percentages of non-white residents

Quintile # (% NonWhite) Avg. (SE)	1 (0-10.0%)	2 (10.0-16.8%)	3 (16.8-25.4%)	4 (25.4-39.0%)	5 (39.0-100%)
% AWF	2.59% (0.31)	2.56% (0.32)	2.22% (0.19)	3.18% (0.29)	2.49% (0.28)
% Wetlands	8.39% (1.01)	8.74% (0.84)	8.33% (0.77)	10.96% (0.99)	5.64% (0.70)

Conclusion

Summary of Results

- As the percentage of residents below the poverty line within census tracts increases, both the percentages of AWF area and wetland area decreases
- We did not detect a predictive relationship between the distribution of non-white residents and AWFs
- Census tract quintiles with higher percentages of non-white residents also had higher variability in wetland area

Conclusions

- Lower income neighborhoods have fewer surface water features (wetlands or AWFs) suggesting these residents, who lack economic resiliency, live in areas that also lack the benefits and environmental resiliency these features provide.
- Access to wetlands, but not AWFs, is more variable in neighborhoods with a higher percentage of non-white residents than it is in neighborhoods with a lower percentage of non-white residents.

Limitations and Next Steps

- All non-white residents are considered as a single group. Considering racial and ethnic identities separately may reveal further disparities.
- Age of neighborhoods are not considered. Considering cadastral dates and dates when AWFs were established could address this.
- Quintiles were based on demographics rather than surface water features. Changing this perspective could produce additional insights.

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USF Ecohydrology Research Group

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