Site-Suitability Analysis for Placement of Green Infrastructure Projects along the Florida Gulf of Mexico Coast

Brennan Hinson and Kassie Ernst, PhD
Florida State University, Tallahassee, FL

INTRODUCTION

The United States Gulf of Mexico Region is riddled with issues surrounding hurricanes, floods, heavy rainfall, and other events which can lead to excessive flooding. In particular, Florida experiences these issues to a high degree- especially the coast. Flood prevention is crucial to protecting property and maintaining individual safety, and some strategies can even be combined with public area projects such as parks which aid social benefit and flood prevention.

Thus, it is crucial to identify the best possible locations for such projects to maximize the benefit they will bring to the community. With this project, we aimed to analyze various methods involved in green infrastructure and their effects on flood prevention. We focused on specific systems that help to mitigate excess water flow, broke down and modified indicators for site suitability, then applied the indicator list to a site in Pensacola to assess its suitability.

All in all, flooding is a very manageable issue, and the model designed by this project could be extremely beneficial in the development of green infrastructure.

METHODS

1. Conducted flood mitigation background research

- Area of focus: Gulf of Mexico Region
- Major flood event: event in which a dry area becomes submerged for an extensive period
- Analyzed driving effects of major flood events

2. Identified engineering-based solutions with a focus on green infrastructure (GI)

- GI development in conjunction with public recreational spaces (e.g., parks)
- Researched GI projects

3. Created a literature review on GI placement in public spaces for flood mitigation

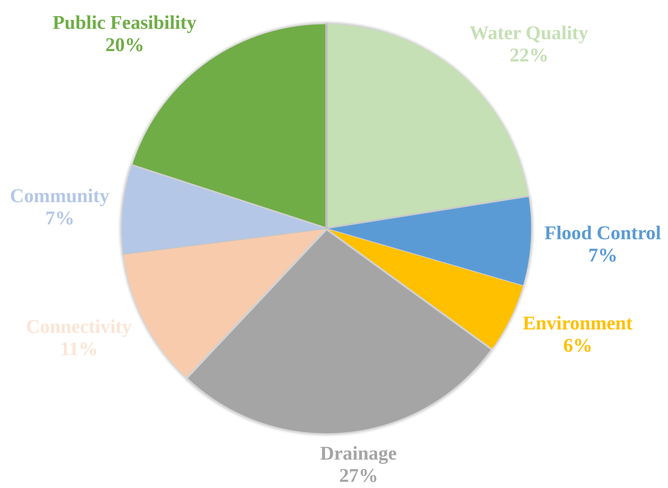
- Identified potential factors to consider when placing parks with GI elements
- Identifying a suitable location is the primary driving factor in GI placement

4. Finalized a set of indicators for GI implementation in public spaces

5. Applied indicator set to a case study – Beulah Landfill, Pensacola, Florida

- Superfund site (polluted locations which require an extensive solution to clean up hazardous material)
- One of the most populous locations in Florida without significant natural protection from flooding

SITE SUITABILITY ANALYSIS



Breakdown of factors most relevant in determining site suitability for GI projects

RESULTS

Beulah Landfill Breakdown			
Reported Overflow (300 ft)	Partial +5.625%	Soil (Group A or B)	N
Discharge Point (300 ft)	Y +11.25%	Public Space (100 ft)	Y +11%
100 yr Floodplain	N	Disadvantaged Area	N
500 yr Floodplain	N	Hazardous Activity (last 10 yrs)	Y +3.5%
Body of Water (300 ft)	Y +13.5%	Land Bank (designated by gov)	Y +10%
Slope (2-7%)	Y +13.5%	Publicly Owned/Desirable	Y +10%

Results yield a total of 70.375% suitability demonstrating that the site could be a strong potential candidate for a GI project, but better options may exist.

CONCLUSION

This project demonstrates relevant factors to consider when deciding whether a site is suitable for a green infrastructure public space project. Completing this required a lot of background research, as we explored a range of green infrastructure possibilities before deciding to focus on the implementation of GI public spaces to mitigate the effects of flooding.

My final list of indicators came from a variety of sources, as we used the developed background knowledge to make the final list as simple and concise as possible, allowing it to be manipulated for different situations, as it is not meant to be applied universally.

Ultimately, when the factors were applied to the chosen site, the site did not score as highly as an ideal location would. However, the application allowed me to make final changes to the list to ensure it made the most sense for sites in the Gulf of Mexico region. Additionally, the indicators are relatively straightforward, as they are all quantitative and leave nothing up to interpretation, causing the site assessments to be as consistent and replicable as possible.

All in all, this project was meant to help improve flood prevention methods, as the indicators could contribute to the implementation of GI projects that would reduce the drastic effects of flooding. The results demonstrate this, as the site's score would benefit the proposal process and provide more information as to the best course of action.

FUTURE PLANS

Create interactive map via ArcGIS

- Automates the application of indicators to sites

Apply indicators to other regions

- Tests on successful sites to identify key differences
- Changes to existing set of indicators to mirror test results

Scale up ArcGIS map

- Combines the regional differences with the map
- Creates a more expedited and applicable product

REFERENCES

Chen, Mengye, et al. "A Comprehensive Flood Inundation Mapping for Hurricane Harvey Using an Integrated Hydrological and Hydraulic Model." *Journal of Hydrometeorology*, vol. 22, no. 7, July 2021, pp. 1713–1726. *EBSCOhost*, doi:10.1175/JHM-D-20-0218.1.

Dolesh, Rich. "Parks Seen as Crucial to One Water Strategies." *Parks & Recreation*, vol. 53, no. 9, Sept. 2018, pp. 42–46. *EBSCOhost*, search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=131612578&site=ehost-live.

Hansen, R., Olafsson, A.S., van der Jagt, A.P., Rall, E. and Pauleit, S., 2019. Planning multifunctional green infrastructure for compact cities: What is the state of practice?. *Ecological Indicators, 96, pp.99-110. Landers, Jay. "Bypass Tunnel Will Shrink Floodplain, Foster Development in Downtown Austin." Civil Engineering (08857024), vol. 81, no. 4, Apr. 2011, pp. 32–33. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=59805219&site=ehost-live.*

Weber, T., Sloan, A. and Wolf, J., 2006. Maryland's Green Infrastructure Assessment: Development of a comprehensive approach to land conservation. Landscape and urban planning, 77(1-2), pp.94-110. Whitesides, Amy, et al. "The Vision Plan for Boston's Moakley Park: Designing Resilience and Recreation into a Boston Waterfront Park." Parks & Recreation, no. 4, Apr. 2019, pp. 56–61. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=135787374&site=ehost-live.

Yildirim, Yalcin. "Sustainable Responses Of An Urban Park For Disaster Resilience: A Case Study Of Hurricane Harvey." The International Journal Of Sustainable Development And World Ecology, Vol. 28, No. 8, Parthenon Pub Group, 2021, Pp. 720–32, Https://Doi.Org/10.1080/13504509.2020.1870249.

SUPPORTING REFERENCES AVAILABLE UPON REQUEST