

# A City Underwater

## Leveraging Green Infrastructure to Mitigate Flood Risk in New Orleans

### Why Does New Orleans Flood?



Over the past 20 years, New Orleans has experienced 42 flood events [1]. This is primarily the result of the city being heavily paved and low-lying. Over 50 percent of the city is already below sea level. Groundwater pumping and dewatering have caused the city to further sink. New Orleans is susceptible to both riverine flooding from the Mississippi River and localized flooding from heavy downfalls [2].

### How Green Infrastructure Works

Green infrastructure provides a cost-effective solution to reducing stormwater runoff and protecting floodplains. Green infrastructure ranges from small-scale projects, such as rain gardens and bioswales, to large-scale conservation efforts. In addition, green infrastructure provides ecological benefits including pollution reduction, carbon sequestration, and groundwater recharge [3] [4].



### Objectives



### Methods

A raster analysis was conducted which took into account the following data sets:

1. Elevation
2. Population Density
3. Critical Infrastructure
4. Land Use

Suitability was defined by a two-tiered weighted analysis. The first weighted analysis characterized flood risk and included elevation, critical infrastructure, and land use data. The second analysis was a weighted sum which included flood risk and population density to determine suitable locations.

The elevation raster was made using the mosaic tool to join 5x5 Lidar DEM cells. Critical infrastructure locations were chosen based on previous research of flood mitigation.

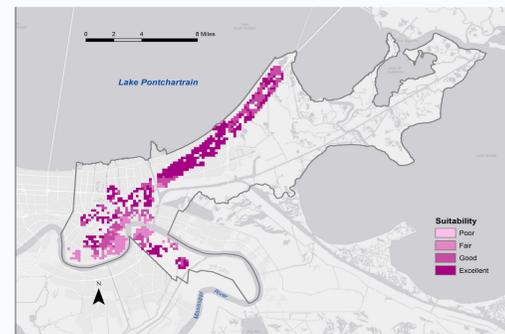
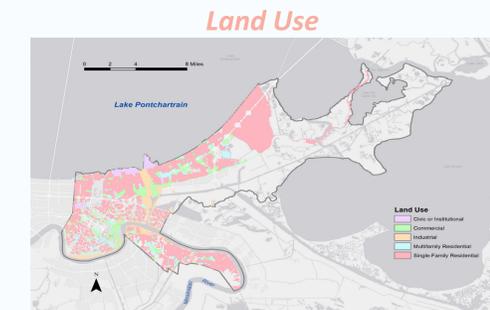
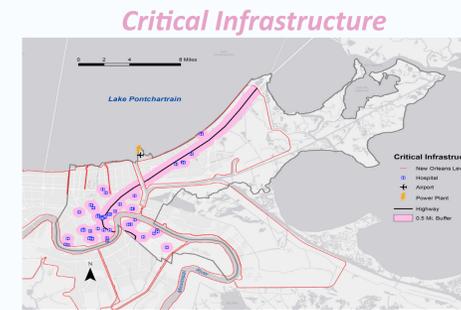
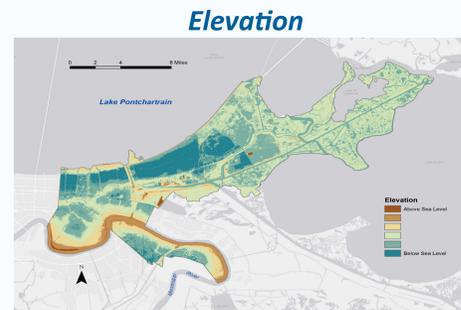
### Suitability Assessment

#### Risk Score Weighting:

- 2% Land Use
- 2% Critical Infrastructure
- 96% Elevation

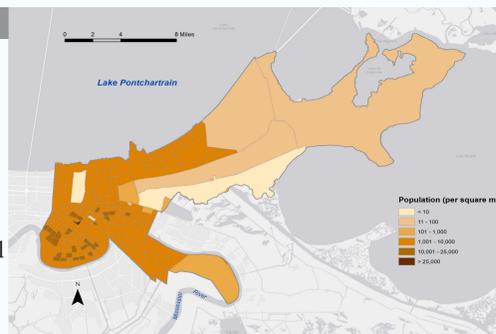
Data Restricted to:

- Critical Infrastructure
- Impermeable Land

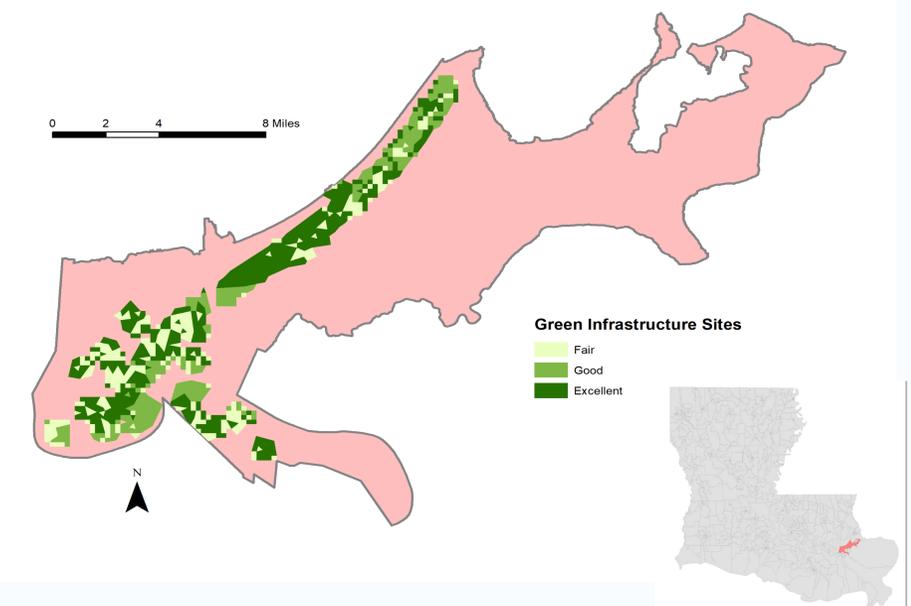


**Suitability**  
For initial suitability, elevation, infrastructure, and land use data were used to determine areas where flooding would cause most damage (i.e. risk). These values were then reclassified on a scale of 1 to 4, 4 being most at risk (most suitable) and 1 being least at risk.

**Population Density**  
Population density was calculated based on the 2010 U.S. Census. Data were reclassified on a scale of 1 to 2, 2 being above 1,000 persons per square mi., 1 being below. Population was then added to the initial suitability via weighted sum to determine a final suitability score.



### Final Suitability Assessment



### Limitations

- Infrastructure data was limited to areas contained within the New Orleans Levee system.
- Flood maps were not considered in the final analysis as the FEMA National Hazard Flood Layers shows the entirety of New Orleans as lying within a flood zone.
- New Orleans' levee system extends beyond the city limits  
Would need consider entire system → Complete Analysis

### Green Infrastructure Should be Implemented Near:

- Mid City
- Mississippi River
- Lake Pontchartrain

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Projection: NAD 1983 StatePlane Louisiana South FIPS 1702 (US Feet)  
Data Sources: U.S. Census Bureau (2010), Louisiana Statewide Lidar, City of New Orleans GIS, U.S. Energy Information Administration, ESRI map of USA Hospitals, Airports and Highways.

#### Literature:

- [1] NOLA Ready. Ready for Rain. The City of New Orleans. <https://ready.nola.gov/rain/>.
- [2] USEPA. Green Infrastructure: Manage Flood Risk. <https://www.epa.gov/green-infrastructure/manage-flood-risk>.
- [3] Bolund, P., & Hunhammar, S. (1999). Ecosystem services in urban areas. *Ecological economics*, 29(2), 293-301.
- [4] Lundy, L., & Wade, R. (2011). Integrating sciences to sustain urban ecosystem services. *Progress in Physical Geography*, 35(5), 653-669.

#### Images:

- Mediterranean Sea. Retrieved from <https://focusedcollection.com/181846482/stock-photo-view-horizon-line-ocean-daylight.html>  
New Orleans, Louisiana (2018). Retrieved from <https://www.flickr.com/photos/pedrosz/25237902597>  
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