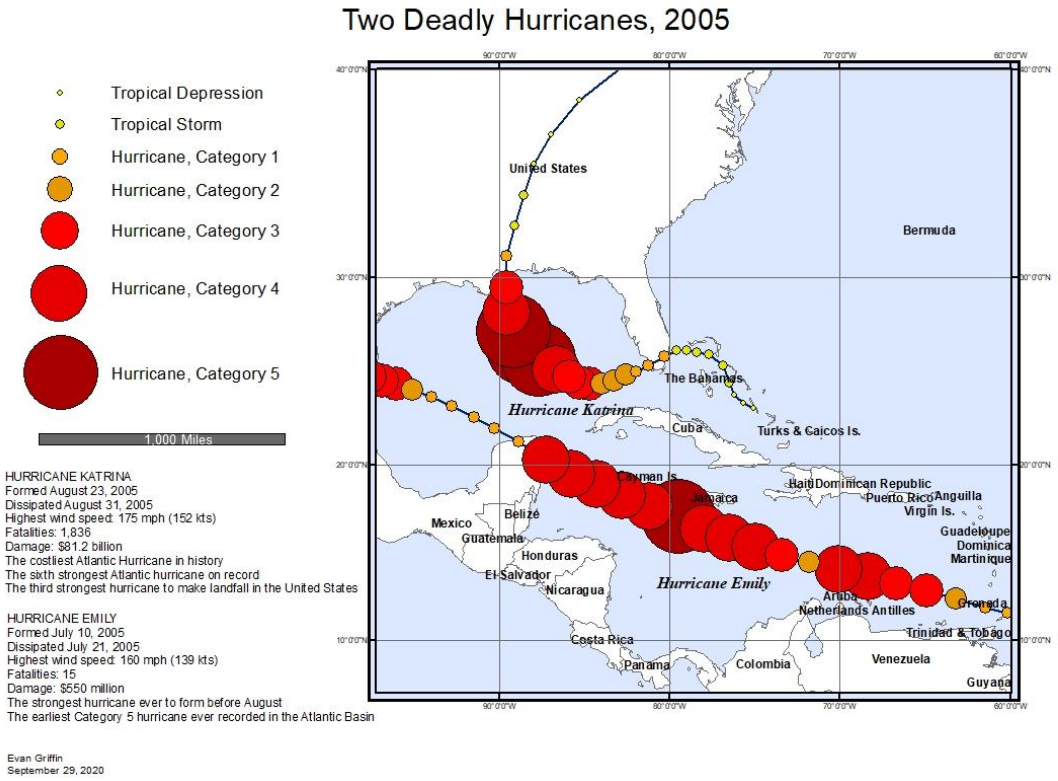
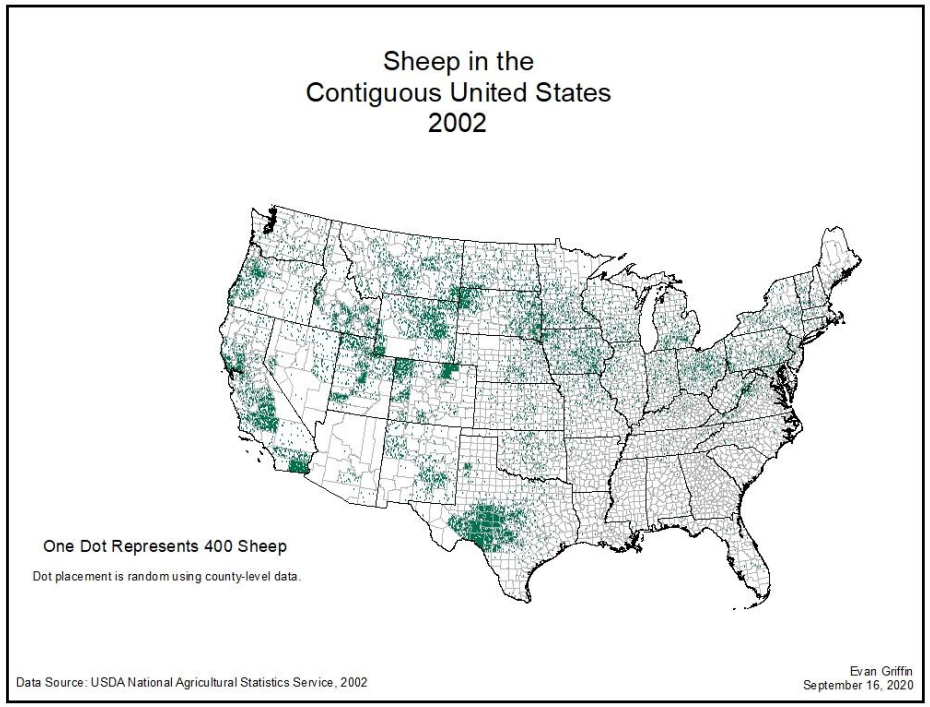
# EVAN GRIFFIN

Geography/GIS Major

Park University

# GRADUATED SYMBOL – DOT DENSITY



# SITE SUITABILITY ANALYSIS

## Reviving the Bay:
## A Site Suitability Analysis

### Identifying areas for artificial reef ball placement in Maryland's portion of the Chesapeake Bay.

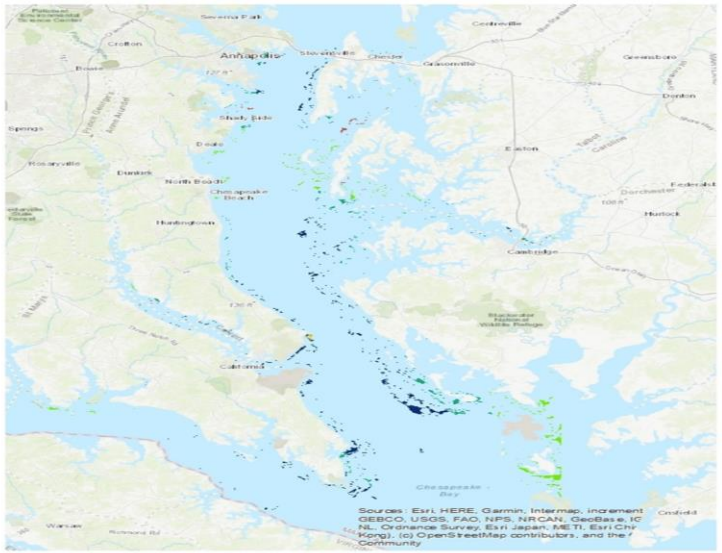
**Potential Reef Ball Sites**

Most Beneficial

Least Beneficial

Suitability based on:

Substrate Material (.35)
Slope Angle (.15)
Distance to Hot Spot (.50)




0 5 10 20 Miles

**Data Source:** data.imap.maryland.gov

## Introduction

Oxygen levels have decreased in the Chesapeake Bay due to a myriad of human activities in and around the bay. Wastewater, air pollution, and both agricultural and urban runoff have contributed to deadly drop in oxygen levels for portions of the estuary ("Dead Zones", 2020). Research has shown that oyster reefs help filter much of the runoff that contribute to these dead zones and in addition, create turbulence along the bay floor that allows for oxygen to mix throughout deeper areas where it is normally scarce. Oyster aquaculture is booming in the bay, but many "dead zone" areas remain. This study locates areas where the placement of reef balls (artificial reef growing structures) could be placed in order to increase turbulence along the bay floor. With improved oxygen conditions, the reef balls can then be used to grow more oyster reefs, further restoring the Chesapeake Bay's water quality.

## Methodology

*Data collection:* Data for this project was obtained from the State of Maryland's GIS website, data.imap.Maryland.gov. The datasets used contained a point feature class of dissolved oxygen at sample sites in the bay, a polyline topographic contour feature class, and a polygon feature class of benthic substrates of the bay.

*Methods:* The dissolved oxygen data was analyzed with the Getis Ord-G hot spot analysis to find clusters of low oxygen. The contour lines were converted to a DEM raster in order to determine slope. The raster calculator was used to distinguished slope areas of an angle less than 30 degrees. The benthic substrate polygons were also converted to a raster file, of which only the sand and sandy mud areas were kept as they are the preferred substrates for artificial reef. The low oxygen hotspot cluster data was used to create a Euclidean distance raster that calculated distance from the nearest hotspot. All raster data was reclassified to include the criteria of slope less than 30 degrees, sand or sandy mud substrate (sand ranking higher than sandy mud), and distance to a hotspot. These criteria were weighted so slope accounted for 35%, substrate 15%, and distance to hotspot was 50% of the total final site analysis.

## Results

Upon running all analyses, sites were selected on a scale that ranged from least beneficial areas to most beneficial areas for artificial reef ball placement. Areas that were deemed the most beneficial were located right before a steep drop-off into deeper waters. These areas are focused mainly near the mouth of the estuary before it empties into the Atlantic Ocean. Not all sites are necessarily suitable for oyster spat but will provide a much-needed mixing of oxygen in deeper waters.

Low Oxygen Areas "Dead Zones"

Substrate Composition

Low Oxygen Hot Spots

Slope Conditions in Preferred Substrate

Distance to Hot Spot

Evan Griffin
December 8, 2020

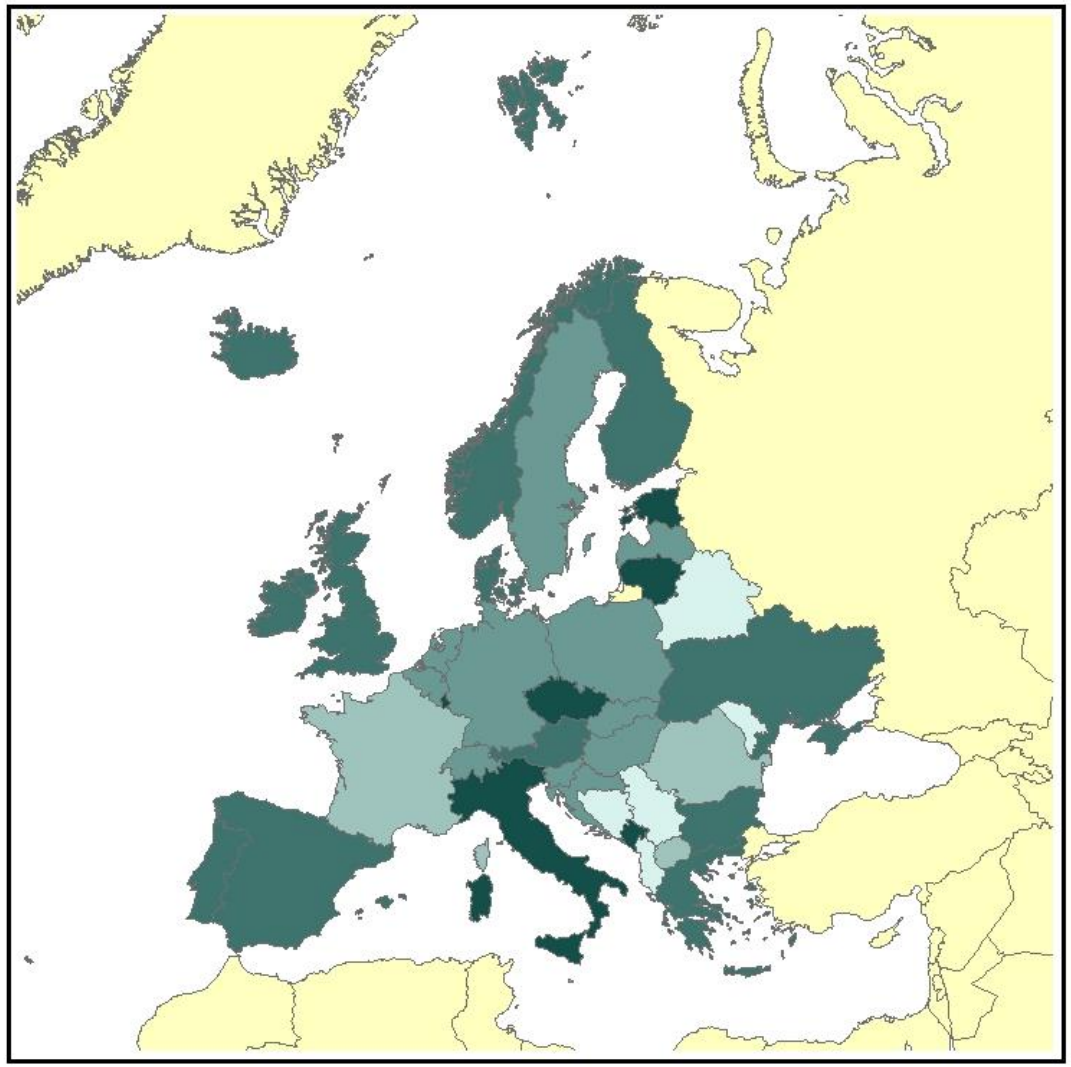
PARK UNIVERSITY

### References and Data


- Dead Zones. (2020, October 28). Retrieved from https://www.cbf.org/issues/dead-zones/index.html.
- Furgurson III, E.B. (2018, April 28). "Oyster Reef Installed in Severn River Could Break Up Dead Zones". Capital Gazette. Retrieved from https://www.capitalgazette.com/environment/ac-cn-reef-balls-20180425-story.html
- Maryland Bathymetry. (2019, August 27). Retrieved from https://data.imap.maryland.gov/datasets/4f3aecc0786f4f16a917a83cf03dd34b_0
- Maryland Benthic Habitat (2020, October 7). Retrieved from https://data.imap.maryland.gov/datasets/1e6cf46ed99045bdbe09ac51bd1f66ae_0.
- Maryland Chesapeake Bay Dead Zones. (2020, October 27). Retrieved from https://data.imap.maryland.gov/datasets/2abad6ad2335468bb8c25648e9a6a106_0

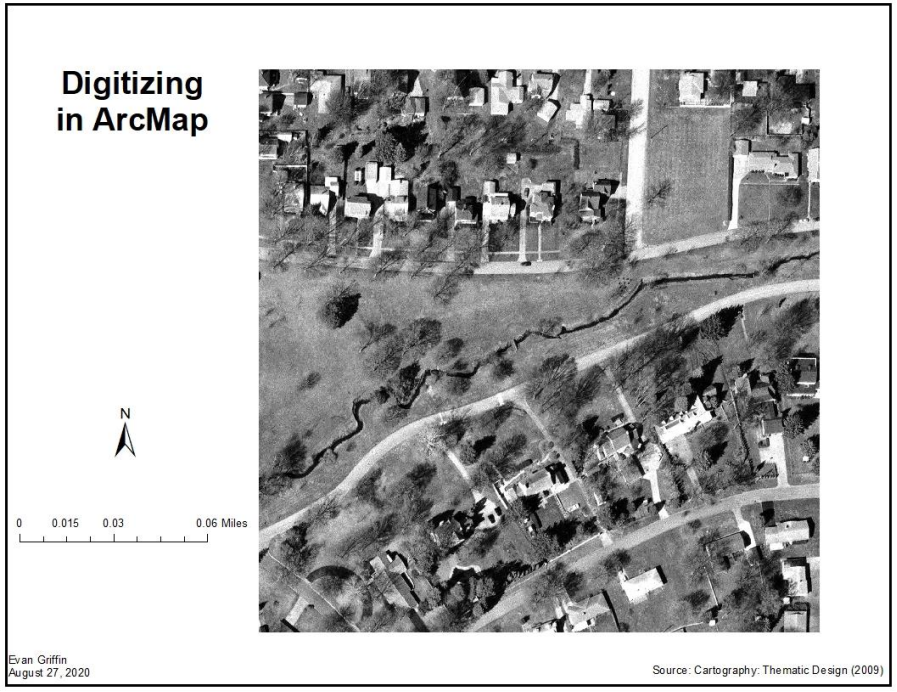
# CHOROPLETH MAPPING

- Data presented to showcase usage by population
- Illustrative of major cartographic principles

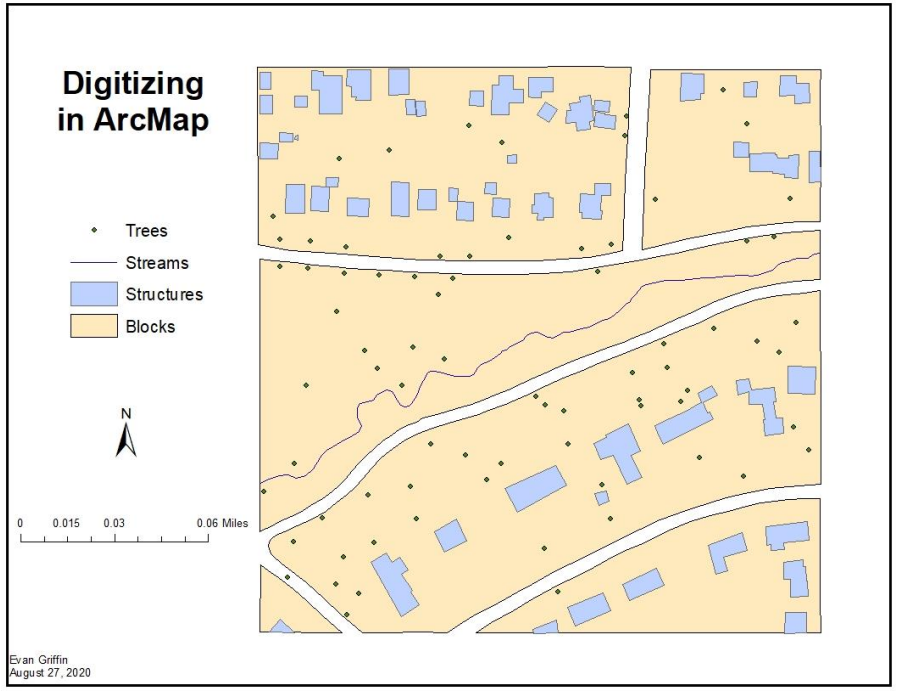


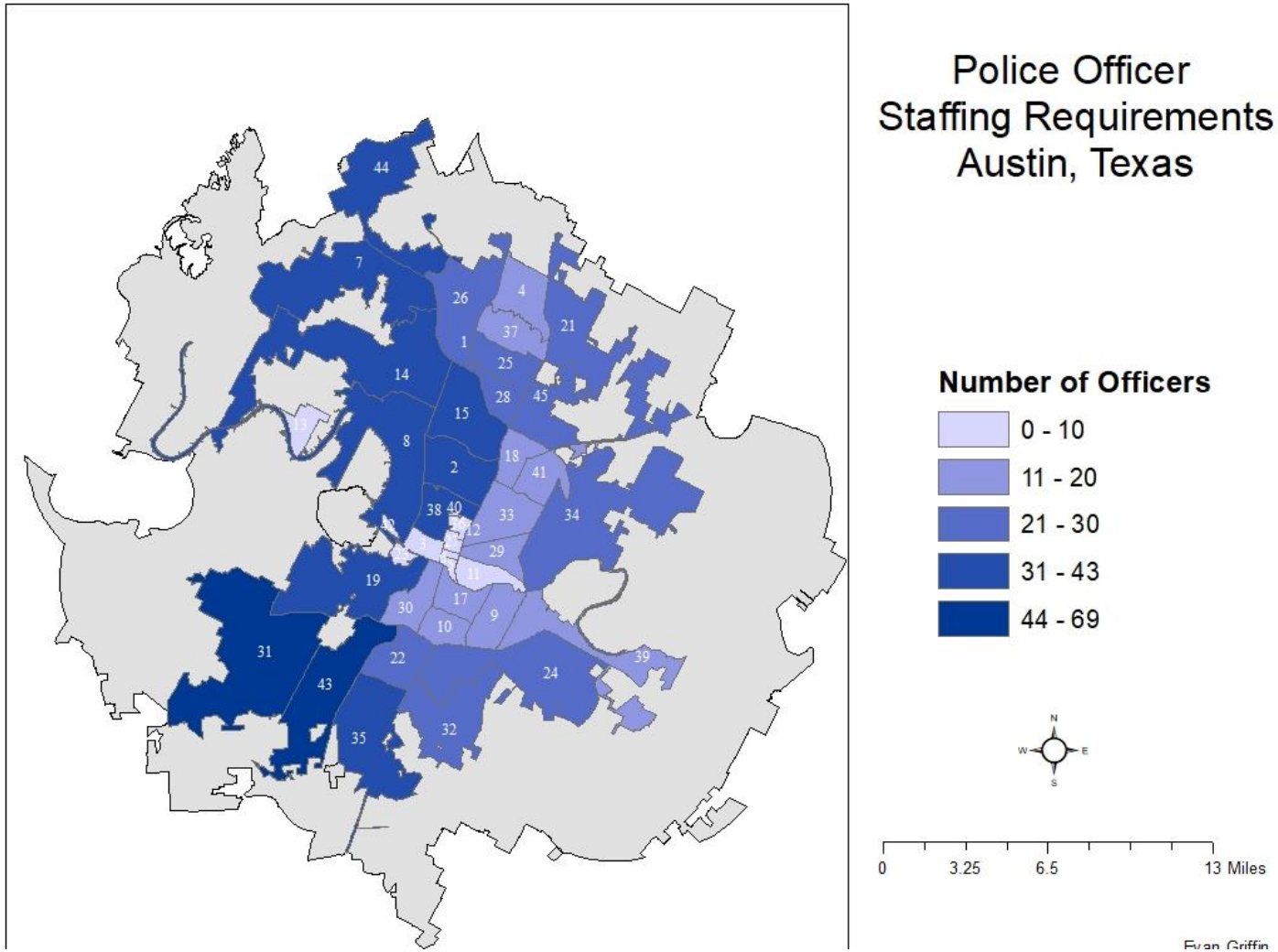
# DIGITIZING POLYGONS, POINTS, AND LINES

## Satellite Image



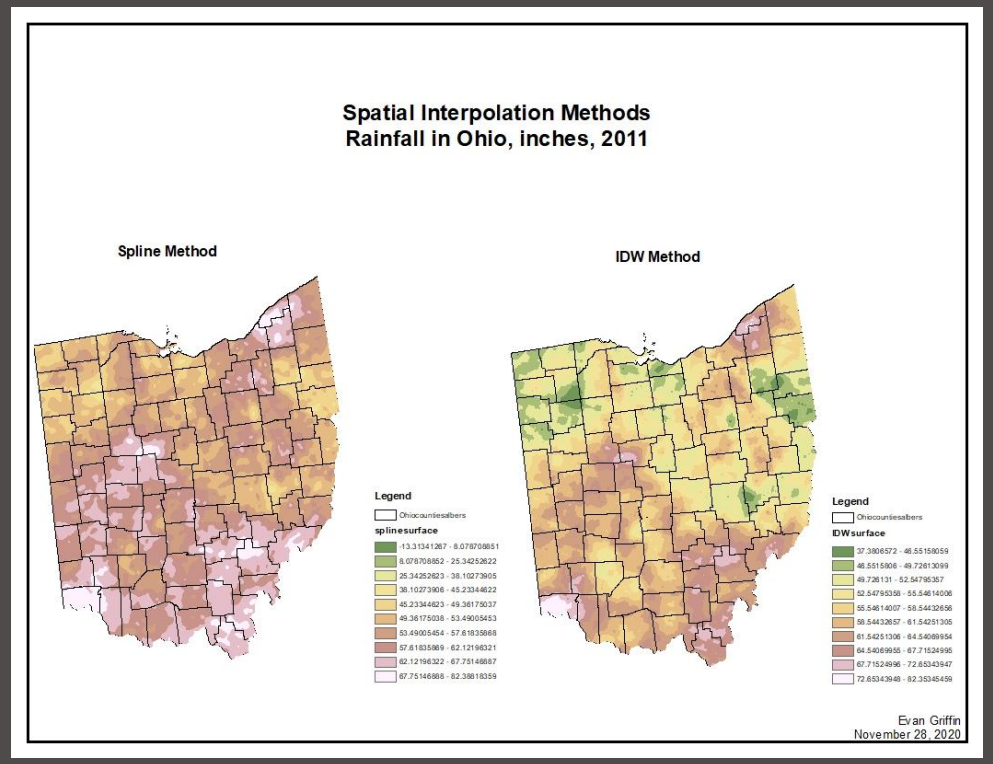

## Georeferenced and Digitized






# ANALYSIS OF ATTRIBUTE TABLE DATA

- Assessment of staffing needs of Austin Police Districts.
- Data tables joined
- Query Builder utilized to access pertinent data.




# SPATIAL INTERPOLATION

- Working with different algorithms to acquire desired results.

# MODEL BUILDING FOR ANALYSIS