MS-GIST
Master Projects 2019 Cohort
Wednesday December 11th, 2019 – ENR2 Room S107

Time	Title	Person
6:00-6:20	**Title: Storm Chasing with GIS: Substantiating Tornado Alley as a Dynamic Region**	**Jacob Logan**
6:20-6:40	**Title: Exploring 3D Visualization Techniques Using Geographic Information Systems Technology at the University of Arizona**	**James Wadsworth**
6:40-7:00	**Title: Modeling a Transportation Network for Released Immigration Detainees**	**Ya-Ching Lin**
7:00-7:20	**Title: Sinaloa Mangroves**	**Bree Rodriguez**

Title: Storm Chasing with GIS: Substantiating Tornado Alley as a Dynamic Region

Author: Jacob Logan, jacoblogan@email.arizona.edu

Keywords: Tornado Alley, tornadogenesis, tornadoes, region

Abstract: Tornado Alley is often depicted as a static entity, an entity which resides in specific locations, but tornadoes are a dynamic weather phenomenon. The process of tornadogenesis is not stationary; it moves during the year. The purpose of the project was to capture the pattern of change exhibited by tornadogenesis across the landscape during the year and examine this pattern in comparison to other natural phenomena. The question asked by the project: what pattern of change is exhibited by tornadogenesis, and how does this pattern of change account for multiple tornado prone areas within the contiguous United States? How does it substantiate Tornado Alley as a dynamic region, a region which moves as the seasons change? Methods included: Tornado data was acquired from NOAA's storm event database, transformed, and loaded into ArcGIS PRO. Multivariate dot maps were created, and hypotheses derived from viewing these maps. Hypotheses were tested using the Mean Center and Standard Deviational Ellipse spatial statistics tools. Maps of results supported a cyclical pattern of change. This observation was further validated through a model of change for result attributes. The pattern of change resembles an analemma and is like vasodilation and vasoconstriction, as seen from a transverse cut of a blood vessels lumen. In conclusion, contemporary depictions of Tornado Alley should consider the cyclical change inherent of tornadogenesis and of other natural

processes. Maps should include all tornado prone areas, because Tornado Alley is a region which changes locations according to the season; it is dynamic.

Title: Exploring 3D Visualization Techniques Using Geographic Information Systems Technology at the University of Arizona

Author: James Wadsworth, jamesw2@email.arizona.edu
Keywords: 3D GIS, web GIS, data development, ArcGIS Pro, ArcGIS Online

Abstract: As computers and geographic information systems (GIS) technology improves, more advanced visualization and analysis becomes possible. One area of GIS technology that is seeing improvement is the development of 3D GIS data. The primary focus of this project was to explore three types of building models that can be created from varying quality data and used by a wide variety of users. Using ESRI software, the goal was to provide guidance for GIS users to develop high quality 3D data relevant to their specific needs. Examples of created 3D products are photorealistic-textured buildings, thematically symbolized buildings, and 3D renderings designed for interior navigation. The resulting data were compiled into an interactive web application for visualization and making comparisons between methodologies. All methods involved using 2D building footprint source data and leveraging the attributes and geometry to create 3D structures. These models provide viewers with additional information that would be impossible to convey in two dimensions, such as viewing a route that occupies the same space on different floors of a building, like navigating between offices or classrooms. Interior navigation is one of many examples of an application that can be built upon the fundamental 3D data examined in this project. Additionally, institutions or organizations seeking to develop their first 3D data from 2D data could potentially use the findings of this project to inform their decisions and start supporting the advancement of 3D GIS at a faster rate than if they were to attempt to develop these data independently.

Title: Modeling a Transportation Network for Released Immigration Detainees

Author: Ya-Ching Lin, yachinglin@email.arizona.edu

Keywords: network analysis, Tucson, Arizona, transportation modeling, migrant shelters, asylum seekers

Abstract: Casa Alitas is a migrant shelter in Tucson, Arizona that assists individuals released from immigration detention to arrange travel to their sponsors throughout the country. In 2018, a large increase in the number of asylum seekers presenting at the southern border forced the shelter into rapid expansion, straining systems set up to deal with much smaller numbers. One ongoing difficulty has been the lack of reliability of Greyhound bus lines, the migrants' main

form of transportation. The purpose of this study is to use network analysis to model a transportation network capable of replacing commercial bus lines for the majority of the shelter residents' long-distance transportation needs. Data on the number and destinations of migrants arriving at the shelter between October 2018 and August 2019 were extracted from Casa Alitas' intake records. The optimal number and locations for proposed stops were determined using location-allocation analysis and different routing and scheduling options were formatted as vehicle routing problems. The resulting information on the relative cost and coverage of different combinations of vehicles, routes and stops were provided to Casa Alitas with the objective of informing its decision-making process. Although setting up a parallel transportation system would create a significant administrative burden for a volunteer organization, it may be a feasible option at times of extreme increases in migrant arrivals.

Title: Sinaloa Mangroves

Author: Bree Rodriguez, breeanne@email.arizona.edu

Keywords: Remote sensing, Google Earth Engine, Sinaloa, Mangroves, Landcover changes

Abstract: Mangroves are amongst the most productive ecosystems on which many coastal communities depend on and yet an estimated 35-50% of mangrove forests have been lost in the last four decades. Several large-scale efforts have taken place in the last 20 years to both quantify the multiple ecosystem services mangroves provide as well as to determine the total land cover area they occupy. Using Google Earth Engine's platform and Landsat datasets this study sets out to determine land cover changes along the Northern coast of Sinaloa, Mexico. This region has seen a large increase in both agriculture and aquaculture beginning in the late 1980s. Land cover changes encompassing mangroves, aquaculture, and agriculture will be quantified from year to year by running a Decision Tree Classification, CART, to map the distribution of these three land cover types and to quantify their respective land area changes over a 20 year time period.