

MS-GIST Online
 Master Projects 2018 Cohort
 Thursday August 1st & 2nd, 2019 – Livestream:

* Click presenter’s name to access the live Zoom stream of their presentation at the scheduled time

** In person presentation – ENR2 S577

Date/Time	Title	Person *
8/01/2019 10 – 10:30 am	<u>Develop an Open Source GIS Application to Perform Airport Disaster Analysis and Simulation Using QGIS 2.18 Python Scripting</u>	<u>Ali Baqi</u>
8/01/2019 1:00 – 1:30 pm	<u>Analysis of the Ecological Effects of Proposed Barrier Construction on the US/Mexico Border</u>	<u>Patricia Schwartz</u>
8/01/2019 2:00 – 2:30 pm	<u>Preferred Bee Colony Locations in Fort Collins, Colorado</u>	<u>Holli Crowley</u>
8/01/2019 3:00 – 3:30 pm	<u>Locating Possible Food Deserts in Beaverton and Hillsboro, Oregon</u>	<u>Max Strain</u>
8/01/2019 3:30 – 4:00 pm	<u>Using Multispectral Imagery to Find Historic Artifacts and Associated Geophysical Correlations</u>	<u>Billy Zsambok</u>
8/02/2019 11:00 – 11:30 am	<u>Association between Population Density and Traffic/Pollution Events in Los Angeles County, California</u>	<u>Bassel Takidin</u>
8/02/2019 12:30 – 1:00 pm	<u>Vehicle Miles traveled and Population Analysis of City of Sparks, NV Roadways</u>	<u>Brooke Stathis</u>
8/02/2019 2:00 – 2:30	<u>Migration Patterns of Aphid Pests in the Southwest United States</u>	<u>Marisa Noble</u>

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8/02/2019 3:00 – 3:30 pm	<u>Emergency Medical Response Times in Coconino County Arizona</u>	<u>John Ehlen</u>
8/02/2019 1:00 - 1 pm	<u>Applications for Citizen Scientists: Enable Effective and Enthusiastic Civil Science Participation with Technology</u>	<u>Heidi Petersen</u>
8/05/2019 2:00 – 2:30 pm	<u>A Spatial Analysis of the Locations of Title Loan Lenders in Tucson</u>	Nicholas O’Gara **

Title: Develop an open source GIS application to perform airport disaster analyses and simulation using QGIS 2.18 python scripting

Author: Ali Baqi, alibaqi@email.arizona.edu

Keywords: open source, Federal Aviation Administration FAA, electronic Airport Layout Plan eALP

Abstract: This project presents a pilot standalone interface to perform geospatial analysis on airport data, generate visual representations, and export text reporting data and/or critical work orders that can help to overcome airport emergency events. The Geodatabase structure used in this project is based on the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-18B Electronic Airport Layout Plan (eALP) Geospatial Certification and standards. eALP Geospatial data consists of airport features and infrastructures, and it is the foundation for this project, which is implemented with Python and the QGIS 2.18 API. Test data will be provided from Dallas Love Field Airport (DAL) in Dallas County, Texas. The developed application will include a brief overview of the geodatabase structure. Functionality of this GIS application includes capacity to simulate hurricane effects on airports in the USA, visualization, reporting, analyze Airport property damage locations and estimated casualties, the goal of this application is to provide the ability to guide the emergency operation in case of disaster, minimize response time and provide a recommendation about reconstruction process and priorities. The final product will enable airport operation and emergency personals to feed this free open source application with the hurricane and airport data to perform disaster analyses and to produce damage graphical representations.

Title: Analysis of the Ecological Effects of Proposed Barrier Construction on the US/Mexico Border

Author: Patricia Schwartz, pschwartz@email.arizona.edu

Keywords: border ecology, habitat disruption, Sonoran Desert, migration corridor

Abstract: Construction of the proposed wall on the US/Mexico border threatens to disrupt significant animal migration corridors. One of many critical areas for borderlands fauna that could be affected is the Buenos Aires Wildlife Refuge and its counterpart region in Mexico. Heightening of existing walls would make them impenetrable by most animals, including three critically vulnerable endemic species: Chiricahua Leopard Frog (*Lithobates chiricahuensis*), North American Jaguar (*Panthera onca*), and Ferruginous Pygmy-owl (*Glaucidium brasilianum*). GIS analysis examines the intersection of the range of these species, location of the proposed wall and vegetative land cover of the region. Vector maps created from USGS species range data and public infrastructure plans provide a base layer for visualizing areas of predicted disturbance. Geoprocessing analysis highlights “corridor” regions at risk of being disrupted extending 25 miles on either side of the border. These maps are overlaid with NVDI images generated from LANDSAT Earth-observing satellite data to identify areas of importance. Results and conclusions support a common narrative of ecologists and biologists: that border wall construction will bisect the migratory pathways of threatened species. The base analysis of this study could be used for more thorough and holistic analysis of singular, as well as to create models projecting ecosystem interference based on spatial relationships. As these ecosystems adapt to construction and militarization on the border, this study provides a basis for analyzing the change in species range and planning for conservation strategies, including prioritization of dense and diverse areas.

Title: Preferred Bee Colony Locations in Fort Collins, Colorado

Author: Holli D. Crowley, hcrowley@email.arizona.edu

Keywords: bee, urban beekeeping, habitat suitability, Fort Collins, Colorado

Abstract: As land is developed, natural honeybee (*Apis mellifera*) habitats are threatened as their colonies are disrupted or destroyed. A reduction in honeybee population can negatively impact crop and agricultural development. These impacts have a direct effect on the economy and food availability. The city of Fort Collins, Colorado, has implemented municipal codes that allow urban beekeeping to take place within city limits, which can reinvigorate local bee populations. This study identified suitable honeybee colony locations based on the municipal code for bee colony placement and best practices of beekeeping. Geospatial considerations for bee colony locations included the size and flood potential of land parcels; proximity to naturally occurring

water sources; and potential exposure to toxins from chemical application on nearby land. Geographic information systems (GIS) were utilized to map suitable locations for honeybee colonies and quantity of colonies permitted in those locations. The products created in this study inform citizens of the city which land parcels are best suited for the placement of bee colonies. This study found that all land parcels were unacceptable for bee keeping because of their proximity to potential sources of toxins. This result is moot because providing bee colonies with clean water and feeding sources diminishes the need for the bees to seek out alternative supply sites that could be toxic. Therefore, the significant result of this study is that there are 12,169 acres of land that are acceptable for bee colony placement in Fort Collins.

Title: Locating Possible Food Deserts in Beaverton and Hillsboro, Oregon

Author: Max C. Strain, mstrain2@email.arizona.edu

Keywords: food desert, Northern Oregon, grocery stores, AppStudio

Abstract: As suburban areas begin to expand cities must plan for new infrastructure and amenities to help support the growing population. In planning for growth, certain amenities can be overlooked due to their availability to the current population and may lead to future issues. One of these issues can be access to fresh and affordable food as some cities have not dealt with a population that relies solely on public transportation. Lack of access to these resources create areas called food deserts. Currently, the cities of Beaverton and Hillsboro, Oregon are experiencing a surge in population growth and could be facing this issue. Using ESRI's AppStudio, a field collection phone application was created to allow users to log a grocery stores coordinate data, the services they offer, and average price based on the sale of milk and bread. This along with census block, public transportation, and road data were used to create a geographically weighted analysis and multi-ring buffer system to simulate grocery store service areas, analyze store clustering, and determine if any census blocks fall within a food desert. Analysis of the area shows one census block located within a food desert with ten percent of others at risk. This could be improved by building more grocery stores or extending public transportation lines in certain areas. The final product will help create an open source grocery store data layer and detailed process that other cities can follow to analyze if parts of their city would fall under a food desert.

Title: Using Multispectral Imagery to Find Historic Artifacts and Associated Geophysical Correlations

Author: Billy Zsambok, billyz@email.arizona.edu

Keywords: artifact, multispectral, geophysical, man-made, satellite

Abstract: This paper explores the use of high-resolution satellite imagery to discover historic artifacts on Fort Huachuca's East Range. The East Range is a protected military area of approximately 42 square miles used by the United States Army for research, testing, evaluation, and training. Historic artifacts in the East Range consist of ranches established between the 1920s and 1940s, and military-related objects dating back to World War II. Unfortunately, there have been few resources available to fully map this area for these artifacts so they may be protected and preserved. This study used multispectral imagery from DigitalGlobe's WorldView-3 (WV-3) satellite which collects data in the visible and near-infrared wavelengths. Collection from the shortwave-infrared array on WV-3 was not available. Artifacts were determined by Spectral Angle Mapping (SAM) and Local Anomaly Detection (LAD) techniques using SOCET GXP. A custom ArcGIS model and mobile Collector for ArcGIS application were used to process and record artifact detections. Fort Huachuca's Environmental and Natural Resources Division provided data including known artifact locations, soil, and vegetation types. This data was processed to identify geophysical correlations to artifact detections. Man-made features were positively identified using SAM with 70% accuracy, LAD with 60% accuracy, and 100% accuracy when used together. Despite successful identification, geophysical correlation was prevented due to numerous detection counts on large man-made objects skewing the results. Additionally, not all man-made features were detected using these methods. This study proved successful detection of man-made features from satellite imagery is possible using techniques tailorable to nearly any environment.

Title: Association between Population Density and Traffic/Pollution Events in Los Angeles County, California

Author: Bassel D. Takidin, btakidin@email.arizona.edu

Keywords: Department of Transportation (DOT), census, air pollution, traffic, Los Angeles County

Abstract: In Los Angeles County, as the population density increases consequently so does vehicle traffic and air pollution. Before you drive anywhere, you open up a GPS on your phone and see how long your commute will take. Where did all this traffic come from? Why are certain sections of the freeway more crowded than others? How much air toxins are we breathing while on the freeway? This paper documents the analysis undertaken to relate population density wealth demographics and how it affects traffic and pollution on Interstate Highways in Los Angeles County. Multi-level variables capture the physical environment and context of the respondents (air pollution, climate, land use, local GDP per capita, population density, unemployment rate, etc.). The process of linking the data involved LA County Census, LA Department of Transportation, and TIGER Geodatabases air pollution data. Contextual variables

are typically available at the regional level, pollution and climate data are recorded at monitoring stations, and Geographic Information Systems (GIS) spatial interpolation techniques are applied prior to linking these to a particular respondent. GIS is increasingly used to process, analyze and display georeferenced data effectively due to its mapping capabilities. The resulting dataset provides a unique tool for quantitative investigation of interrelationships at the group and regional level of Los Angeles County, California. After analysis and geographic representation of the data, the results showed that traffic in LA County is not biased to areas of low income. But measures of toxic air pollution are higher in low income population settlements.

Title: Vehicle Miles traveled and Population Analysis of City of Sparks, NV Roadways

Author: Brooke H. Stathis, Brooke.stathis@dri.edu

Keywords: City of Sparks, VMT and Population Analysis, regression modeling, Washoe County, transportation greenhouse gas emissions

Abstract: Population growth and the increased traffic in the City of Sparks, NV has subsequently resulted in large traffic congestion delays. Transportation is a large contributor to Greenhouse Gas emissions (GHG), and the amount of pollution emitted from vehicles can be mitigated by efficient and sustainable on-road travel. This paper aims to perform an ordinary least square (OLS) regression model to analyze the on-road congestion hotspots in Sparks, NV based on vehicle miles traveled (VMT) data for the City of Sparks and population estimates from the Census Bureau. Correlation of traffic and population addresses the issue of whether adding new roadways will be needed to meet the needs of a growing population and reduce both congestion and GHG emission in the City of Sparks. The OLS regression model for 2017 population and vehicle miles travelled for 2015 showed a weak correlation ($R^2 = 0.017$). The VMT data is not normally distributed, with 20 of the 1417 VMT data points deviating greater than 3 standard deviations from the mean. Of those 20 data points, 16 intersect polygons with population estimates of 0, and are likely responsible for the weak correlation. Miles travelled by vehicles in Sparks is not significantly correlated with population, implying that other explanatory variables should be explored. Potentially looking at more detailed census data (blocks) or analyzing commuting data which could better explain traffic congestion in Sparks, NV.

Title: Migration Patterns of Aphid Pests in the Southwest United States

Author: Marisa R. Noble, mnoble2@email.arizona.edu

Keywords: blue alfalfa aphid, pea aphid, cowpea aphid, spotted alfalfa aphid, US Southwest

Abstract: As agricultural land disappears throughout the United States, insects continue to adapt and change their migratory and feeding habits in order to sustain their populations in spite of shrinking food sources. The blue alfalfa aphid (*Acyrtosiphon kondoi*), the pea aphid (*Acyrtosiphon pisum*), the spotted aphid (*Therioaphis maculata*), and the cowpea aphid (*Aphis craccivora*) have been pests to agriculture in the Southwest United States for many years and continue to cause financially-calculable damage to crops like alfalfa, sorghum, and corn. To understand their migration patterns is to better realize the lengths at which these insects are performing in a world with growing populations and dwindling cropland. This research also gives us the opportunity to see potential threats or new patterns so that pest management can be proactively engaged. Early recognition of an insect in an area could mean more environmentally conscious pest management methods along with the dissemination of more expansive knowledge to farmers and growers of proper ways to mitigate the effects. This research resulted in a map of the migratory patterns of these insects in relation to space and time according to articles and firsthand accounts from farmers and entomologists of the areas where locations have been pinpointed. The GIS tools used to accomplish this included the creation of new polygons overlaid on existing topographic maps. The conclusions aide in the understanding of these pest aphids and their migratory patterns in a way that lets us recognize possible new territories or field crop interests.

Title: Emergency Medical Response Times in Coconino County Arizona

Author: John Ehlen, johnehlen@email.arizona.edu

Keywords: EMS, Coconino County, Arizona, network analysis, response time

Abstract: One of the most crucial factors affecting patient survival in an emergency is EMS response time, and one of the biggest problems facing forward-looking EMS providers is the ability to maintain adequate response times in a cost-effective manner as population increases. This study focused on Coconino County, located in northern central Arizona. Coconino County is the second largest county in the U.S. when measured by contiguous land area, totaling 18,661mi². Roughly 50% of the population resides in just 0.35% of the land area (66mi²), in the County's seat Flagstaff AZ. The other 50% of the population resides in rural areas with poor infrastructure and low population density. The county suffers from seasonal traffic congestion due to inclement weather and high rates of tourism associated with the Grand Canyon National Park. Due to this, Coconino County provided an exemplary opportunity to study ambulance travel times in both low population density rural areas and high population density urban areas. The evaluation was done using GIS and publicly available data from AZDOT, AZDHS, and the USGS TNM datasets. The final cartographic products were developed using ESRI's Network Analyst Extension and were used to produce a service area analysis that aids in understanding the current scope of EMS response times. The results indicated two things: while the county has adequate coverage in the major urban areas, there are significant improvements to be made to the

network infrastructure; public education can be an effective lifesaving tool in the rural parts of the county.

Title: Applications for Citizen Scientists: Enable Effective and Enthusiastic Civil Science Participation with Technology

Author: Heidi M. Petersen, petersenh@email.arizona.edu

Keywords: citizen scientist, invasive plants, crowd sourcing, volunteers, habitat management

Abstract: Citizen scientists bring an open-source advantage to research. Like other open-source methods, there are both benefits and downfalls to this approach. In some cases, the unintentional result of data collection tools available to the volunteers in the field can deteriorate the benefits of volunteer data collection, such as mismatched data schema. This project aims to document the creation of an application designed for use by non-expert volunteers to identify and log the locations and species of invasive plants. Key variables included geospatial positioning, the inclusion of photographic and notational additions to point data, and easy access to an image-supported index to aid in plant identification. A web application that shows high accuracy with minimal additional training could prove useful for general area data capture beyond the control area. This manuscript seeks to investigate such a product compilation with embedded web applications in which an ESRI story map acted as an image-rich index for assisting in plant identification, and an included ESRI Web Application that allowed users to input data collection. The project houses these components in yet another Story Map, acting as a guide for the applications' use. The application included the ability to update volunteer-captured data to a pre-formatted layer intended for multi-agency use and extraction, and ease of use with an intuitive interface.

Title: A spatial analysis of the locations of title loan lenders in Tucson

Author: Nicholas O'Gara

Keywords: alternative financial services, financial security, high-interest loans, banking, predatory lending, title loans, Tucson

Abstract: Tucson joins other cities in Arizona and around the United States in grappling with financial vulnerability among portions of its community. Residents operating without financial safety nets, and with potentially limited access to traditional financial networks and credit, may seek out alternative financial services to meet either routine financial obligations or unforeseen challenges. Nearly a decade after the expiration of the law in Arizona that allowed payday loans — which have been said to target low-income and minority communities — residents have the option of borrowing in the form of short-term, high-interest auto title loans. While proponents

say such loans provide a necessary financial service, some studies say they lead to cycles of debt and high indebtedness and have been deemed predatory by consumer advocates. This study attempts to create a profile of the communities in Tucson in which such lenders are located through a spatial analysis that explores economic and demographic variables. The analysis models and adapts previous studies on payday loan lenders in other parts of the country by comparing the economic and demographic composition of the areas in Tucson with the presence of title loan lenders with the areas occupied by traditional banks and credit unions as well as a metropolitan study area and the county. The project aims to compare the differences in these communities and identify variables that may influence the location of title loan lenders.