MS-GIST Online
Master Projects 2020 Cohort
Thursday April 27th – 29th (Livestream via Zoom)

* There will be 5 minute breaks between each presentation to facilitate transitions in Zoom.

** Zoom links available on a per request basis. Contact: atgrogan@email.arizona.edu

Date/Time	Title	Person *
04/27/2020 1:00 – 1:30 pm	**Demographics as a Guide to Site Selection: A Case Study**	**Chris Moreno**
04/27/2020 1:30 – 2:00 pm	**Hiking Catalina State Park: Take a 'virtual hike' Along Many of the Park's Popular Trails**	**Chad Barnett**
04/27/2020 2:00 – 2:30 pm	**Assessing Heat-Island Boundary Anomalies of Photovoltaic Farms in Central Arizona using Landsat Level-2 Provisional Surface Temperature Products**	**Leland Sutter**
04/27/2020 3:00 – 3:30 pm	**Assessment of Post-Fire Vegetation Recovery in Washington State Using Landsat and Geographical Data**	**Leah Hare**
04/28/2020 1:00 – 1:30 pm	**Temporal Changes in the Tucson Bird Count: Abundance Across Land Cover Classifications from 2001-2016**	**Kiri Carini**
04/28/2020 1:30 – 2:00 pm	**Corridors of Mexican Gray Wolf Migration Across an International Border**	**Kellie McCune**
04/28/2020 4:00 – 4:30 pm	**Variability in Surface and Upper Air Moisture During Extreme El Niño Events**	**Renée C. Elder**
04/29/2020 3:00 – 3:30 pm	**How Are Hypodermic Needles Affecting Bernalillo County, NM and What Can Be Done to Alleviate the Problem?**	**Monica Gonzales**
04/29/2020 5:00 – 5:30 pm	**Utilizing Viewshed Modeling and Fire Analysis Techniques to Determine Fire Watch Tower Locations Following the High Park Fire, Colorado (2012)**	**Samuel Weston**

Demographics as a Guide to Site Selection: A Case Study

Chris Moreno

chrismoreno@email.arizona.edu

Abstract:

Business development companies, such as *The Irish Pub Concept*, promote the proliferation of Irish Themed bars outside of Ireland. Irish pubs are successful because they attract diverse clientele. Real estate development is also a business success factor and include the selection of a suitable pub site. Site candidates are based in part on target market demographics. A potential pub owner that knows the demographic profile of a potential site is better informed. This case study uses Esri's *Tapestry* segmentation demographics within *Business Analyst Online* to identify potential Irish pub sites in Maricopa County, Arizona. Two data sources include an interview with a current pub owner and sixty-six customer surveys from four successful Irish pubs. Surveyed customer ZIP codes identified *Tapestry* segments. Demographic criteria from the *Tapestry* Segments and the interview identified potential pub sites and Business Analyst Online tools were used to map the potential sites. Finally, the Site Selection tool determined the best sites based on weighted criteria. Two ZIP codes emerged as site winners. The data show that Irish pub customers are indeed diverse and belong to dozens of *Tapestry* segments. Business Analyst Online makes it easy to explore and compare sites using criteria extracted from *Tapestry* demographics.

Hiking Catalina State Park: Take a 'virtual hike' Along Many of the Park's Popular Trails

Chad Barnett
cdbarnett@email.arizona.edu

Abstract:

As cooler weather moves into Southern Arizona; more people are outside hiking in many of the Sonoran Desert's parks and natural areas. Catalina State Park is a favorite in the Tucson region incorporating sweeping mountain and valley views, colorful wildflowers, saguaro stands and varied wildlife. Many hikers within the park are out-of-staters and may not be acclimated to the local climate, where dehydration and heat-exhaustion are very real dangers. The tendency to base a hike on what individuals are used to at 'home' can lead to overestimating skill levels or underestimating need of proper gear. Search-And-Rescue teams can quickly become inundated with hikers needing rescued, often from individuals not being properly prepared, this can strain the local economy and, at times, place rescuers themselves in danger. This study was designed to help mitigate this issue by creating visual walkthroughs of popular hiking trails within this park. Length, altitude, coordinates, trail conditions, obstacles, and photographs were collected by hiking each trail and incorporated into an ArcGIS StoryMap (interactive slideshow), that the public can access from the comfort of their homes. This tool can help the individual make informed decisions about which trails they might be able to safely attempt in person.

Assessing Heat-Island Boundary Anomalies of Photovoltaic Farms in Central Arizona Using Landsat Level-2 Provisional Surface Temperature Products

Leland Sutter

lelandsutter@email.arizona.edu

Abstract:

Photovoltaic (PV) farms have become increasingly popular as environmental concerns have risen and costs of installing solar technologies have fallen. However, communities have voiced concerns regarding heat-islanding effects, especially in areas surrounding installations. This study asks two questions: 1) Does the size of PV farms affect land surface temperature (LST) directly at the site and, 2) Does this relationship hold true beyond these extents? This study uses Landsat 8 OLI satellite data to measure at sensor temperature brightness data to quantify the distance at which LST anomalies are occurring from four different sized PV installations in central Arizona. First, results show a moderately strong relationship between LST and size of PV farm (R^2 = 0.66), however, this relationship falls apart at the 30 m buffer (R^2 = 0.04) suggesting that the size of the installation has no effect on the temperature anomalies beyond the installation. Second, a t-test calculated significance between the LST of the immediate site and buffers. Again, at the 30 m buffer using p = 0.05, LST was significantly different (p = 0.021), with all other buffer zones also significantly different. This study shows a need to geographically expand monitoring efforts for sites and their surrounding areas.

Keywords:
Remote Sensing, Heat Island, Photovoltaic, Landsat, Land Surface Temperature

Assessment of Post-Fire Vegetation Recovery in Washington State Using Landsat and Geographical Data

Leah Hare
lhare@email.arizona.edu

Abstract:

Consequences of wildfires often result in the loss or change of vegetation, causing a reduction of biodiversity and an increase in soil erosion. This report considered environmental variables and their impact on fire recovery for six fires in Washington State over a five-year period. Variables included the differenced normalized burn ratio (dNBR), the normalized difference vegetation index (NDVI), land cover type, and topological variables. Regression modeling was performed using both Ordinary Least Squares (OLS) and Geographic Weighted Regression (GWR) to determine the best-fit model. Mixed vegetation showed the highest recover rate with varied rates for both forested and desert vegetation. OLS regression demonstrated that land cover had high multicollinearity with other variables and land cover factors, thus it was excluded from GWR calculations. The best-fit models revealed a positive relationship with pre-fire NDVI and burn severity for most fire locations, indicating an increase in revegetation based on an increase in burn severity. Topological variable slope had both positive and negative relationships with NDVI. R^2 values calculated through GWR were between 0.85 and 0.98. As Washington State is a diverse, widespread area, this study serves as an initial step to understand the potential relationships between fire recovery and the contributing factors.

Keywords:
Fire, Revegetation, Regression, Washington State

Temporal Changes in the Tucson Bird Count: Abundance Across Land Cover Classifications from 2001-2016

Kiri Carini
kcarini@email.arizona.edu

Abstract:

As urban areas grow around the world it is important to understand whether species biodiversity can adapt to these environs. Birds are known to be indicator species of ecosystem health. Furthermore, they are relatively easy to observe. In 2001, the Tucson Bird Count (TBC) was initiated to establish a long-term monitoring effort of bird biodiversity in urban Tucson. This project investigates long-term trends in the relative abundances of six common urban Tucson bird species across land classifications using the latest National Land Cover Database products, spanning 15 years. Using zonal statistics methods to aggregate bird count data within land cover classifications, this analysis determined mean relative abundance for six species over time and across land cover types. The results found that population abundance for these species has been relatively stable over time and consistent across land classifications. While overall bird species populations have declined in North America, in urban Tucson, birds are adapting. Further analysis of the TBC is needed to gain insight into species distribution and the complexities of urban habitats.

Keywords:
GIS, Birds, Biodiversity, Analysis, Tucson

Corridors of Mexican Gray Wolf Migration Across an International Border

Kellie McCune
kellieasheehan@email.arizona.edu

Abstract:

Historically, the Mexican Gray Wolf (*Canis lupus baileyi)* has been observed in a variety of habitats across the Chihuahuan and Sonoran deserts that span the Southwestern United States of America and into Mexico. This subspecies of wolf is known to migrate to lower elevations during seasonal changes in pursuit of their dominant food source, Mule Deer. Arizona Game and Fish have joined efforts with the equivalent agency in Mexico to reestablish habitats in both countries. However, ongoing changes to the international border wall construction could potentially disrupt migration between the United States and Mexico therefore also affecting breeding, habitat suitability, prey availability and ultimately the recovery of this endangered species. Using ArcGIS I establish a corridor between the Sierra Madre Mountains located in Chihuaha, Mexico and the Mexican Wolf Experimental Range near Alpine, Arizona, where the Mexican Gray Wolf is known to be. This corridor can then be used to inform restoration efforts or border wall construction changes that encourage the continued population recovery of the Mexican Gray Wolf.

Variability in Surface and Upper Air Moisture During Extreme El Niño Events

Renée C. Elder
relder@email.arizona.edu

Abstract:

This study focuses on the El Niño Southern Oscillation, which in its positive phase, El Niño, is a main cause of drought in parts of the North Atlantic tropical region. To evaluate impacts at the surface and in the atmosphere, the 1-month Standardized Precipitation and Evapotranspiration Index (SPEI), was computed for December, January, and February for each El Niño event, and each point was categorized by drought intensity. The Getis-Ord Gi* statistic was performed on the SPEI values to identify any significant clusters of very dry or very wet points. Then the seasonal average specific humidity was computed for five standard pressure levels in the lower atmosphere in order to construct vertical moisture profiles across the study area for comparison. At the surface, the 1997-98 and 2015-16 El Niño events are linked to more widespread drought than the 1982-83 event, with sustained light and moderate droughts in approximately 32-53% of the region at the end of the season. While the 1982-83 and 1997-98 events have very similar moisture profiles, the 2015-16 profile showed a drier lower atmosphere. Understanding variability in El Niño impact for other variables related to regional moisture can improve our understanding of the region's climate variability.

Keywords:
ENSO, specific humidity, SPEI, drought, tropics

How Are Hypodermic Needles Affecting Bernalillo County, NM and What Can Be Done to Alleviate the Problem?

Gonzales, Monica

mtgonzales@email.arizona.edu

Abstract:

Hypodermic needles sit on both sides of the human health spectrum – aiding those in need of medication due to health problems for a better quality of life, and in contrast, are also used in devastating drug use practices that are harmful and even deadly, cutting lives short. This analysis focuses on how hypodermic needles affect Bernalillo County, New Mexico and what can be done to alleviate the problem. Using online ESRI-based tool *Survey123 for ArcGIS*, government data, and a virtual statistical dashboard paired with public participation, this analysis was carried out through electronic services to that provided a user-friendly and accessible tool to the public. Results identified hot spots in Bernalillo County that showcase affected areas, which asks for consideration to allow (i) implementations of new drug-related programs for individuals addicted to drugs, (ii) city and county funded jobs which will aide in safety precautions for discarded needles, (iii) counseling options for drug abusers, (iv) humane rehab centers, and most importantly, (v) the overall safety and well-being of those who fall victim to drug addiction just as much as the well-being and safety of communities that make up Bernalillo County.

Keywords:

Hypodermic needles, Drug abuse, Addiction, Drug epidemic, Community safety and well-being

Utilizing Viewshed Modeling and Fire Analysis Techniques to Determine Fire Watch Tower Locations Following the High Park Fire, Colorado (2012)

Samuel Joseph Weston
weston1@email.arizona.edu

Abstract:

Early forest fire detection plays a large role in minimizing the size and intensity of fires in high risk areas. The damage that results from such events can negatively affect natural habitats, private and public lands, and can imbalance ecosystems. Precisely placed fire watch towers, equipped with fire detection technology, are one of the multiple ways to alert emergency response, thus lowering the size and intensity of these fires. This study aims to classify the severity of damage caused by the High Park fire (2012) in the Roosevelt National Forest, Colorado. Through the use of data collected by the Landsat 7 satellite, a Normalized Burn Ratio and a Normalized Difference Vegetation Index were created. Viewshed modeling was then utilized to determine the best area to place a fire watch tower based on level of visibility. This study produced an in-depth analysis on the High Park fire, suitable fire watch tower locations, and a tool created with ArcMap's ModelBuilder that can be used in future studies. Through the use of these GIS techniques, a better understanding of early forest fire detection could yield a reduction in the severity of forest fires everywhere and create a universal way to analyze them.

Keywords:
Viewshed Analysis, Fire Watch Tower, High Park Fire, Colorado