MS-GIST Projects Spring 2022
Tuesday, May 03

**** There will be 5 minute breaks between each back-to-back presentation to facilitate transitions in Zoom.***
***** Zoom links are available on request. Please contact Andrew Grogan - atgrogan@arizona.edu***

Date/Time	Presentation Title	Student Name
05/03/22 09:30 - 09:55 AM	Detecting Changes in the Great Sand Dunes National Park	Joseph Wade
05/03/22 10:00 - 10:25 AM	Vegetative Changes Within Areas of Critical Environmental Concern in Taos and Rio Arriba Counties of Northern New Mexico 2000 - 2020	Tala
05/03/22 10:30 - 10:55 AM	Quantifying the Relationship between Archeological Sites and Hydrologic Features: A Case Study	Rachel Pober
05/03/22 11:00 - 11:25 AM	Tucson Parks and Recreation: Land Acquisition Prioritization	Abdelrhman Ali
05/03/22 12:00 - 12:25 PM	Las Vegas Metropolitan Area Sprawl Assessment Using Shannon's Entropy Method	Casey Stuht

Detecting Changes in the Great Sand Dunes National Park

Joseph Wade
josephwade@email.arizona.edu

05/03/22, 09:30 - 09:55 AM

Abstract:

Sand Dune Geomorphology occurs much faster than most geological processes, and is heavily influenced by the small scale weather events and current climatology. Aeolian forces can be difficult to study directly, but they directly affect areas with large amounts of free sediment not restricted by vegetation. The Great Sand Dunes National Park was upgraded from a national monument in 2000, but the dunes themselves are thought to have formed as recently as 18,000 – 400,000 years ago after a large glacial lake receded from the valley. There is even evidence that large amounts of sediment joined the main dunefield 750 years ago due to a severe and prolonged drought. With improvements in technology, it is now possible to look at the dunes with LIDAR, seeing the changes from 2014 to 2021. Using Lidar data, it may be possible to identify possible causes or variables that influenced the changes that occurred to the Great Sand Dunes over the course of 7 years. Large nearby features like the 14,000 foot (4267 meters) Sangre De Cristo Mountains with their effect on the weather, and creating ephemeral streams from snowmelt. This study tests and identifies variables to ascertain whether they influence the dunes, and may help us predict what may happen in the near future, as well as possibly the far future, and the dunes may reveal secrets about how the climate is changing as they are impacted by the climate.

Keywords: Great Sand Dunes National Park, Aeolian Geomorphology, LIDAR, Climatology

Vegetative Changes Within Areas of Critical Environmental Concern in Taos and Rio Arriba Counties of Northern New Mexico 2000 - 2020

Tala
justtala@email.arizona.edu

05/03/22, 10:00 - 10:25 AM

Abstract:

Climate change will likely lead to major changes in plant distribution and thus in biomes and habitats. Humans and other species will be affected as our ecology is intimately linked not only to climate but also to habitat availability. This study looks at the vegetative changes within the Bureau of Land Management's Areas of Critical Environmental Concern designated areas. These areas are in Rio Arriba County and Taos County in New Mexico and the study is from 2000 and 2020 to determine if the Bureau of Land Management's protective measures have helped mitigate drought effects within the region. The study area includes the Areas of Critical Environmental Concern designated areas of Lower Gorge, Copper Hill, Ojo Caliente, and the Taos Plateau, which cover approximately 327,040 acres within the two study counties. Using surface reflectance and Normalized Difference Vegetation Index analysis, datasets are compared for changes in vegetation health over 5-year increments – 2000, 2005, 2010, 2015, and 2020. Datasets are also compared between 2000 and 2020. Although precipitation levels fluctuate over the temporal extents and vegetation changes accordingly, overall, there has been a decline in vegetative cover over the entire study area. These vegetation changes are most drastic within the Ojo Caliente and Lower Gorge/Copper Hill Areas of Critical Environmental Concern. More research is needed to determine whether the Bureau of Land Management's protective measures, or lack thereof, have contributed to the decline in vegetation, or if it has to do with the overall effects of long-term drought and climate change.

Keywords: Vegetative changes, Areas of Critical Environmental Concern, northern New Mexico, Bureau of Land Management, climate change

Quantifying the Relationship between Archeological Sites and Hydrologic Features: A Case Study

Rachel Pober
rpober@email.arizona.edu

05/03/22, 10:30 - 10:55 AM

Abstract:

Proximity to a water source has been a consistent environmental variable used in predictive modeling of archeological site locations. Currently, there is limited research that has been done to quantify the relationship between water sources and archeological site locations. The Sand Hollow area, located in Southern Utah, has had many modern construction projects consisting of roadway expansions, a reservoir, and golf courses. These projects required compliance with Section 106 consisting of mitigation measures using archeological excavation. With these required excavations, the Sand Hollow area provides a robust dataset of archeological sites. Thus, the Sand Hollow area is used as a case study to research if there is a correlation between hydrologic features and archeological sites using GIS. Sand Hollow reservoir was constructed in June 2000. A Digital Elevation Model (DEM) was downloaded from February 2000 to remove impacts from modern construction of the reservoir on the derived hydrologic features. To quantify the relationship between archeological sites and hydrologic features, buffer zones at 100, 200, 300, 400, 500, and >500 meters from hydrologic features are created. The chi-squared test is used to compare the observed to the expected relationship between archeological sites and hydrologic features. Through these methods, archeological sites were found to have a significant relationship to hydrologic features within the study area. The archeological dataset from Shifting Sands is divided into three time periods of Archaic, Anasazi, and Late Prehistoric. Using the chi-squared test, the Anasazi period has the most significant relationship to hydrologic features.

Keywords: Archeology, Hydrology, Predictive Modeling, Environmental Variable, Chi-Squared Test

Tucson Parks and Recreation: Land Acquisition Prioritization

Abdelrhman Ali
akali@email.arizona.edu

05/03/22, 11:00 - 11:25 AM

Abstract:

Parks play an essential environmental and cultural function by improving the quality of life and creating valuable green space. Providing new parkland with adequate distribution and accessibility can assist in planning and development and enhance recreation projects. The Parks and Recreation Department in Tucson needs to identify and evaluate acquisitions to make informed decisions on building new parks. Doing that will provide value and benefits to the system and grow equitable access to the parks —it also aligns with other city goals to understand potential priorities of expanding the parks for underserved areas. A comprehensive acquisition strategy was formulated based on several factors to evaluate and prioritize parkland opportunities that ensure the parks are equally distributed. Using existing data from The Trust for Public Land, Pima Association of Governments, and other datasets from the City of Tucson's open data portal, ranked suitability analysis was used to find suitable areas for new parks. The analysis gave us a classification of all the possible places that can be considered appropriate and the rank of their importance. Moreover, Model Builder was utilized to update and automate the individual factors for future analysis. The outcomes of this study will provide the city with a roadmap for acquiring land for parks that meet the community's needs.

Keywords: Land Acquisition, Suitability Analysis, Prioritization, Parks, Accessibility.

Las Vegas Metropolitan Area Sprawl Assessment Using Shannon's Entropy Method

Casey Stuht
cstuht@email.arizona.edu

05/03/22, 12:00 - 12:25 PM

Abstract:

A population center's growth, known as urbanization, can pressure delicate environments and place strain on a region's natural resources. Remote sensing combined with Geographic Information Systems can analyze and map the phenomenon of urban sprawl. This study quantifies growth within the Las Vegas, Nevada urban boundary using the aforementioned tools and Shannon's Entropy method for 2000 and 2020. Shannon's Entropy measures urban morphology, calculating compactness and dispersion of binary categorization, in this case, 'developed' and 'undeveloped' land cover. Eighteen multi-ring buffers were placed around Las Vegas City Hall at 1-mile intervals and found entropy values of 1.10 and 1.15 respectively. In comparison for the same years mentioned, five multi-ring buffers were set around the study area's three main highways at 1-mile intervals and found entropy values of .608 and .628 respectively. All entropy values using the multi-ring buffer method were > 50% of log(n) for each dataset, meaning that the 'developed' land cover spatial variable is evenly dispersed across the study area with compactness or clustering of the 'developed' class found within each buffer zone. Temporally, over the 20-year period, the dispersion of development continued, with an increase in entropy values. Further, a geographic quadrant assessment revealed that the greatest land cover change-over from 'undeveloped' to 'developed' occurred in the northwestern and southwestern portions of the study area. This exercise provides a framework for developing municipalities that seek a cost effective, accessible, and expeditious method to better recognize sprawl patterns with the aim of correcting inefficient land and resource management.

Keywords: Land Use, Urbanization, Urban Sprawl, Remote Sensing, Shannon's Entropy