MS-GIST Projects Summer 2022
Thursday, August 04

**** 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
08/04/22 01:00 - 01:25 PM	Mapping the Retreat of the Debris-covered Tasman Glacier in the Aoraki-Mount Cook South Island, New Zealand	Rose Garcia
08/04/22 01:30 - 01:55 PM	Assessing Drought Conditions by analyzing NDVI with Sentinel-2 Imagery using Google Earth Engine	Vladimir Berg
08/04/22 02:00 - 02:25 PM	A TIME SERIES WEB MAP AS A WAY OF COMMUNICATING WATER QUALITY AND WATER QUANTITY CHANGES IN THE LAS VEGAS WASH AND MUDDY WATERSHEDS IN NEVADA, USA	Matthew Przyborski
08/04/22 02:30 - 02:55 PM	MODELING POSTFIRE SOIL EROSION AND SEDIMENT DEPOSITION ON THE TONTO NATIONAL MONUMENT WITH THE UNIT-STREAM-POWER-EROSION-AND-DEPOSITION MODEL	Michael Macias
08/04/22 03:00 - 03:25 PM	Crime Analysis in Tucson: Violence and Vulnerability	Alexis Pells
08/04/22 03:30 - 03:55 PM	Tunnel Fire's Effects on Northern Arizona 2022	Wil Allen

Mapping the Retreat of the Debris-covered Tasman Glacier in the Aoraki-Mount Cook South Island, New Zealand

Rose Garcia
rmatheny@arizona.edu

08/04/22, 01:00 - 01:25 PM

Abstract:

As anthropogenic global climate change continues to accelerate, glaciers around the world are rapidly retreating. The Tasman Glacier offers a unique opportunity to demonstrate the challenge of mapping a debris covered glacier with a contemporary and rapid loss of ice at the terminus. Landsat 4, ETM+, and 8 OLI satellite Level-2 Reflectance imagery for years 1990, 2000, 2010 and 2022, are utilized for mapping the debris-covered glacier using a semi-automatic Support Vector Machine (SVM) classification. Normalized difference snow and ice index (NDSI) and normalized difference vegetation index (NDVI) are thresholded and used as supplemental data to optimize training samples and for general visualization purposes. To support delineation of the debris-covered glacier at the terminus location, morphometric parameters slope and aspect are derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (DEM). In addition to morphometric parameters, the DEM is used to calculate the glacier flow direction for the delineation of the Tasman watershed. A Global Land Ice Measurements from Space (GLIMS) digital glacier outline created for the 2013 Tasman Glacier system, and a 15 m (1/2 pixel) buffer are used to create the final outline of the Tasman Glacier system for each year. Variability of the terminus retreat is quantified by the surface area of resulting debris covered glacier and glacial lake. Post classification data points are created and validated to produce a confusion matrix to assess the quality and performance of the classified image. The average kappa index of agreement is ~ 0.85.

Keywords: Tasman, Glacier, SVM, Landsat, Debris, New Zealand, DEM

Assessing Drought Conditions by analyzing NDVI with Sentinel-2 Imagery using Google Earth Engine

Vladimir Berg
vyb3@email.arizona.edu

08/04/22, 01:30 - 01:55 PM

Abstract:

The Southwest arid region of the United States is facing an unprecedented 'megadrought' which has resulted in a water crisis that threatens agriculture production and natural ecosystems. To observe and analyze the consequence of a decline of water availability, Sentinel-2 Images were compiled and analyzed based on NDVI values. These trends were analyzed in the Yuma subcounty in the state of Arizona, which is a center for agricultural production. A time-series was made using the powerful Google Earth Engine (GEE), a free-to-use cloud computing service, which can compile hundreds of images over time for analysis. The time series created plots all average NDVI values from Sentinel-2 images for the study area between January 2019 and June 2022. Additional 4 images were extracted from GEE and analyzed in ArcGIS Pro. Utilizing ArcGIS Pro's built in raster analysis tools, one image for each year (2019-2022) were modified to display and assess the differences in NDVI values between the images. Based on the time-series, it is evident that NDVI values are trending downwards, indicating a decline in vegetation health for the Yuma subcounty. Observing the individual images, it is also clear that NDVI values are declining across the region, although more data needs to be collected on the ground to confirm this reduced vegetative productivity. Further study can be done Annually using the highly detailed Sentinel-2 images to assess the impacts of drought and change agricultural uses in specific plots that may not be viable with less water availability.

Keywords: Remote Sensing, Sentinel-2, Google Earth Engine, Yuma County, Agriculture

A TIME SERIES WEB MAP AS A WAY OF COMMUNICATING WATER QUALITY AND WATER QUANTITY CHANGES IN THE LAS VEGAS WASH AND MUDDY WATERSHEDS IN NEVADA, USA

Matthew Przyborski
mattborski@gmail.com

08/04/22, 02:00 - 02:25 PM

Abstract:

Important scientific findings can be underutilized if not communicated effectively. Also, these are often presented in journal articles that are too complex to be understood by the general public or simplified to the point of dumbing down the results for popular media outlets. Communication is especially important when human health and environment are at risk, and public buy in is necessary for policy change that can alleviate the known issues. This paper describes an exploratory analysis of water quality and water quantity relationships in the Las Vegas Was and Muddy watersheds in Nevada, USA and how those results can be effectively communicated to the public with use of a time series web map. Publicly available water quality and water quantity data were downloaded from the USGS, EPA, and regional sources and uploaded to an ArcGIS Online web map. This web map is time enabled so that relationships between water quality, water quantity and land use change over a 10-year period could be visually presented to and better appreciated by the general public and those living within the watershed in particular. Results indicate a rise in some pollutants over time as well as differences between the two watersheds.

Keywords: Lash Vegas Wash, Muddy watershed, LULC, Water Quality, Time Series, Land Use Change

MODELING POSTFIRE SOIL EROSION AND SEDIMENT DEPOSITION ON THE TONTO NATIONAL MONUMENT WITH THE UNIT-STREAM-POWER-EROSION-AND-DEPOSITION MODEL

Michael Macias
michelmacias1@email.arizona.edu

08/04/22, 02:30 - 02:55 PM

Abstract:

A major consequence of wildfire events is the acceleration of soil erosion by surface runoff. During a rainfall event, soil may become detached, transported, and eventually deposited elsewhere on the landscape. One approach to predict whether and where this erosion process could occur requires determining six empirically established factors, namely, rainfall erosivity, soil erodibility, slope length, slope steepness, vegetation cover, and erosion management methods. This project analyzed these landscape factors on the Tonto National Monument, an archaeologically rich site containing 14th century cliff dwellings in central Arizona's Tonto Basin. In the summer of 2019, over 80% of the monument burned, threatening its natural and cultural resources both from the fire itself and from the postfire erosion that followed. Chosen for its ability to predict both soil erosion and sediment deposition, the Unit-Stream-Power-Erosion-and-Deposition Model identified areas of the monument where the erosion process may have occurred and to what extent. This project used high resolution data to obtain each factor in raster format followed by further calculations based on changes in sediment transport capacity using a Geographic Information System (GIS) called ArcGIS Pro. The model predicted that 13.5% of the monument had high erosion, 27% moderate erosion, 15.5% low erosion, 8.7% stable, 3.2% low deposition, 6.2% moderate deposition, and 25.7% high deposition. Although this project's methodology focused on the 2019 fire event, it offers resource managers on the monument an approach to monitor and mitigate potential future fire events, reducing costs and focusing efforts to areas of highest risk.

Keywords: Soil Erosion, Sediment Deposition, Tonto National Monument, USPED Model, Postfire

Crime Analysis in Tucson: Violence and Vulnerability

Alexis Pells
arsamloff@arizona.edu

08/04/22, 03:00 - 03:25 PM

Abstract:

Crime throughout the Tucson city area reaches into the six figures every year. Over ten percent of this crime is considered to be violent: murder, aggravated assault, rape, and robbery. It is a widely accepted belief that violent crime is a factor of vulnerability in a neighborhood and can be found in conjunction with certain socioeconomic factors. In 2020, a study conducted through the University of Arizona and the City of Tucson determined that there are five major socioeconomic factors that determine vulnerability of a neighborhood. These factors did not include crime and this study incorporates the presence of those factors and violent crime statistics in a neighborhood to determine whether vulnerable neighborhoods are also victim to violent crime. The analysis consists of City of Tucson crime reports between 2019 and 2021, spanning the time before and after the study was accomplished to show that neighborhood vulnerability factors and violent crime are statistically significant to each other. Using various spatial autocorrelation and regression analysis functions within ESRI ArcGIS Pro, violent crime can be associated with almost all factors of what is considered a vulnerable neighborhood. Analyses conducted include Kernel Density, Average Nearest Neighbor, Optimized Hot Spot Analysis, Geographically Weighted Regression, and Global Moran's I. The results will be able to assist the City of Tucson with furthering their efforts to prevent violent crime throughout the city and aid the neighborhoods that need the most help.

Keywords: Tucson, neighborhood vulnerability, violent crime, spatial correlation, police

Tunnel Fire's Effects on Northern Arizona 2022

Wil Allen
wilallen1996@email.arizona.edu

08/04/22, 03:30 - 03:55 PM

Abstract:

Flagstaff, Arizona has a diverse landscape and despite the regular monsoons and snowfall, Flagstaff is still subject to fires. The Tunnel Fire started on April 17, 2022 and burned almost 20,000 acres just outside of Flagstaff's city limits. While the cause of fire is still under investigation, authorities do not believe it was started by lightning. Normalized Difference Vegetation Index (NDVI) and Normalized Burn Ratio (NBR) will be used to analyze the health of the landscape before and after the fire occurred. In addition, hydrological modeling was performed to model theoretical watersheds of Flagstaff and its greater area. Then several of the theoretical watersheds are used to define the study area around the fire as watersheds can play a role in the spread or containment of fires. Then further hydrological modeling was conducted on the defined study area. Data for this project was obtained by the National Map, Sentinel 2A, Landsat 8, and Landsat 9. Upon completion of this project, the difference in the NBR or the dNBR showed a fire scar on the landscape and the NDVI where the fire took place had its values decreased significantly. Climate change is leading to more forest fires and managing the forests is of upmost importance in preventing and minimizing damage from future fires as climate change affects the wind patterns, rain patterns, temperatures, and the overall health of the forests

Keywords: NDVI, NBR, Fire, Watershed, Tunnel Fire