

MS-GIST  
Master Projects Summer 2021  
Tuesday August 10<sup>th</sup> (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 *
08/10/2021 3:00 – 3:30 pm	<a href="#"><u>Protecting Ka Mo'omeheu o Hawai'i: A Cultural Resources Risk Assessment</u></a>	Kasiah Ruddell
08/10/2021 4:00 – 4:30 pm	<a href="#"><u>Determining Opportunity: The Need for Forming a Families Opportunity Index</u></a>	Erika A. Johnson
08/10/2021 4:30 – 5:00 pm	<a href="#"><u>Flood Risk Assessment of the Greater St George, Utah Area Based on Land Cover/Land Use and Watersheds</u></a>	Jasmine Moertle-Litson
08/10/2021 5:00 – 5:30 pm	<a href="#"><u>Tree Mortality Analysis of Giant Sequoia Groves in Sequoia and Kings Canyon National Park</u></a>	Gavin Youngstrum
08/10/2021 5:30 – 6:00 pm	<a href="#"><u>Analyzing Land Cover Change Detection Using GIS, Remote Sensing, and Machine Learning in the Colville National Forest, Northeast Washington, USA</u></a>	Bishan (Shelly) Zhao
08/10/2021 6:00 – 6:30 pm	<a href="#"><u>A Spatiotemporal Exploratory Analysis of Assault Crimes Near Portland's TriMet Public Transportation Network</u></a>	Robert J. Shigeta
08/10/2021 6:30 – 7:00 pm	<a href="#"><u>Understanding Patterns of Extraterrestrial Phenomena: An Exploratory Spatial Analysis of UFO Sightings Throughout the Contiguous United States from 1910-2014</u></a>	Hannajane Bull Prichett

## Protecting Ka Mo'omeheu o Hawai'i: A Cultural Resources Risk Assessment

Kasiah Ruddell

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### Abstract:

Archaeological and historic sites are important to contemporary societies all over the world, especially to peoples like the Kanaka Maoli, or Native Hawaiians, who have suffered the attempted theft of their culture and identity. The Hawaiian Island of Oahu is rich with cultural resources including over 2,000 archaeological and historic sites. Oahu is the most populated and industrial of the Hawaiian Islands and is not escaping climate change caused sea level rise and coastal erosion, so these sites are at risk of being damaged or lost. With so many cultural resources, it is difficult to discern what threatens each site via standard observation and field methods. In this study, a Cultural Resources Vulnerability Index is used to determine the level of risk for cultural resource sites on Oahu. This index combines both coastal vulnerability and anthropogenic risk factors as well as position on the island to provide a risk ranking. Coastal vulnerability includes flood zones, sea level rise, coastal erosion, elevation, and slope and anthropogenic factors include location in State Land Use Districts, population density, and air pollution. With such a rich density of cultural resources, this study illustrates how GIS can be used to examine multiple risks and ultimately ascertain which sites need immediate action. Lastly, a web application is used for easy visualization of the results.

### Keywords:

Cultural Resources; Heritage Management; Coastal Vulnerability; Human Threat; O'ahu, Hawai'i

## **Determining Opportunity: The Need for Forming a Families Opportunity Index**

**Erika A. Johnson**

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### **Abstract:**

The relationship between families and communities are apparent in the opportunity available to the family unit. How a family fairs in a community can have lasting effects, both generational and to the community that they are a part of. Measuring opportunity through an index is best practice because of its multi-dimensional aspect, however, no index exists when evaluating the opportunity of families. The nearest index to providing some indication is the Opportunity Index, but it also fails to capture the complexities that families contend with. Using the framework from the Opportunity Index, along with adding other markers of family opportunity based on research, a Families Opportunity Index was created to better quantify the opportunity of families for the counties of California. The new Families Opportunity Index includes added indicators for the Economy Dimension of the Index. By modifying the Economy Dimension to focus on data that would capture indicators that effect the most vulnerable of families, single parent families, and recently separated or divorced families, we can capture a more realistic picture of a family's opportunity for each California county. The expectation is that the Families Opportunity Index will be used to inform better public policy for Families.

### **Keywords:**

Families Opportunity Index, Opportunity Index; Family Opportunity, California Counties, Generational Opportunity

# **Flood Risk Assessment of the Greater St George, Utah Area Based on Land Cover/Land Use and Watersheds**

**Jasmine Moertle-Litson**

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## **Abstract:**

The Greater St. George area in Southern Utah is a hot spot for development. The gradual increase in population size has caused a large growth in construction. In 2018, a large storm hit the area and caused massive flooding in Washington, Utah. This was caused by new construction blocking a natural floodplain. This caused a diversion of the waters into the people's homes below. The point of this project is to identify the changes in the land from 2008 to 2018 along with displaying the natural water passages in the area. The areas that are overlapped with the flood zones that have been developed on, are at a potential risk of dealing with major flood damage. Using the unsupervised and supervised classification systems on ArcMap along with a watershed analysis, the flood hazard zones information will be displayed within the area. Both the unsupervised and supervised models signify that the major flood zones are now encountering more developed areas. This indicates that if more work isn't done to prevent flooding, then more homes are vulnerable to likely damage. Census data also indicates the communities with the highest flooding risk are low income and high minority communities. The impact of developing the area to support the growing population is ultimately having to cost the city and the citizens more money. Future development will need to make sure natural water ways are examined and flood damage to the city is avoided.

## **Keywords:**

St George Area, Flooding, Flood Zones, Classification Systems, Flood Risk

## **Tree Mortality Analysis of Giant Sequoia Groves in Sequoia and Kings Canyon National Park**

**Gavin Youngstrum**

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### **Abstract:**

Sequoia and Kings Canyon National Park is home to the giant sequoia tree, the largest trees in the world. Due to two decades of drought, sequoia trees in California have been dying at an alarming rate and it is only getting worse with rising temperatures. Dead and weak trees are susceptible to native bark beetles and as the drought continues to create more vulnerable trees, the bark beetle population has been increasing, causing more tree mortality. Fire is an important part to the life cycle of giant sequoia trees, and they have been known to survive through many fires throughout their existence. However, with an increase in forest fuel from the drought, rising temperatures causing drier tinder and many years of fire suppression, fires are getting unnaturally hotter and stronger, putting sequoia trees at risk. When scientists noticed dying foliage and canopy loss after many years of drought, the Leaf to Landscape Project was created through partnership with multiple federal agencies and universities to study the giant sequoia trees. Using remote sensing technology, they collected tree data in these national parks resulting in 38 sequoia groves. This study utilizes this data to analyze dead tree clusters and their proximity to giant sequoia groves using a variety of exploratory GIS methods. Variables were then used to try and understand why the dead clusters are occurring in these locations. Understanding where there are large clusters of dead trees will help assist with future fire planning for the protection of sequoia trees.

### **Keywords:**

Giant Sequoia Trees, Tree Mortality, Cluster Analysis, Hot Spot Analysis, Point Density, Remote Sensing, LIDAR, Wildfires, Climate Change

# Analyzing Land Cover Change Detection Using GIS, Remote Sensing, and Machine Learning in the Colville National Forest, Northeast Washington, USA

**Bishan (Shelly) Zhao**

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## **Abstract:**

The Colville National Forest comprises 1.5 million acres of land in Northeastern Washington. With around 120,000 residents living in surrounding communities, this is a populated rural region where access to natural resources is highly vulnerable to land cover change. Over the last two decades, the forest has undergone changes in the spatial frequency and structure of land cover types, making the analysis of it a priority for the protection of the region and its communities. The digital storage of remote sensing data, coupled with Geographic Information Systems technologies and machine learning methods has made it possible to compare the current state of the land to prior states. Using Landsat 8 data and supervised learning, this project has generated land cover models for summer conditions from 2013 to 2020. The Normalized Differenced Vegetation Index has also been estimated to describe the summer trend of vegetation health in the forest. This study serves to describe how human activity and natural processes in Northeastern Washington may influence land cover over time, and provides a description of the nature, significance, and rate of change that can inform adaptive management planning in the federal lands of the region.

## **Keywords:**

Remote Sensing, Land Cover Change, Supervised Learning, Maximum Likelihood Classification, Normalized Differenced Vegetation Index, Colville National Forest

# **A Spatiotemporal Exploratory Analysis of Assault Crimes Near Portland's TriMet Public Transportation Network**

**Robert J. Shigeta**

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## **Abstract:**

Portland's public transportation system, TriMet, is an extensive network of buses, light rail, and streetcars. Millions of passengers ride on the transit system every year. Likewise, each year thousands of people are victims of violent crimes in public spaces throughout the city. A geospatial analysis of assault crimes may offer law enforcement an invaluable tool for examining the spatial patterns of assaults. This project is a spatiotemporal exploratory analysis of assault crime near transit nodes in Portland, Oregon. The analysis calculates location quotients for aggravated assaults, simple assaults, and intimidation assaults at the macro, meso and micro levels. Location quotients measure the concentration of each offense type in buffered areas around transit nodes relative to the surrounding area at each level of the analysis. Location quotients at the macro level for each offense type in each year of the study period were between 2.4 and 2.8, indicating assault crime concentrations were approximately two and a half times to nearly three times higher in areas within 500 feet of the transit system throughout the entire city. The results of the macro analysis suggest that a spatial relationship exists between Portland's public transportation network and locations of assault crimes. Results of the meso and micro levels varied considerably between neighborhoods and intersections, suggesting other underlying factors should be studied.

## **Keywords:**

Portland TriMet, Public transportation, Assault Crime, Proximity Analysis, Location Quotient Analysis

# **Understanding Patterns of Extraterrestrial Phenomena: An Exploratory Spatial Analysis of UFO Sightings Throughout the Contiguous United States from 1910-2014**

**Hannajane Bull Prichett**

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## **Abstract:**

Are humans alone in the universe? This is one of the most profound existential questions of all time. It is a question that this project regrettably will not answer. We all want to know if UFOs are real because not understanding the unexplained is uncomfortable. Analyses in this project seek to uncover consistent patterns in the reported sightings of extraterrestrial phenomena in the contiguous United States in the last century. Using a dataset of UFO Sightings obtained from GitHub, military installation data retrieved from data.gov and census data, this project will analyze data to look for patterns and relationships between UFO sightings and population density, population movement over the last century, and UFO sightings relationships to military installations across the contiguous United States. To do so, tabular data was geocoded, and a geodatabase was established reflecting sightings between 1910 and 2014. The points were clipped to the contiguous United States and analysis of the data focused on density and buffer analyses to examine population density relationships, mean center for population movement through time, and buffer analyses to examine sightings relationships to military installations. Results tend to show a relationship between population density and increased sightings of UFOs. No conclusive results showing temporal patterns related to a mean center analysis and mixed results related to military installations were found. GIS based research on UFOs is an important and growing field of study. This study contributes to helping us better understand UFO data from a spatial science perspective.

## **Keywords:**

UFO's, Density Analysis, Buffer Analysis, Mean Center Analysis, Population Density