Virginia GIS Conference / Virginia Tech Office of GIS and Remote Sensing Poster Session
Poster Abstracts[1]

Chris Bruce
The Nature Conservancy
Coastal Resilience – Virginia Eastern Shore
The Nature Conservancy, working with numerous partners, has developed and customized the Coastal Resilience tool for the Virginia Eastern Shore. Coastal Resilience is a decision-support tool that incorporates the best available science and local data to enable communities to visualize the risks imposed by sea-level rise and storm surge on the people, economy, and coastal habitats of the Eastern Shore. The tool also supports identification of nature-based solutions for enhancing resilience and reducing risks where possible. Four of the Coastal Resilience tool's many web-based apps were deployed for this project: Regional Planning, Future Habitat, Flood & Sea Level rise and Coastline Change.

Sara Cerv
Virginia Tech
Predicting Seasonal Evergreen Vegetation Growth Using the PhenoCam Network
The phenology of terrestrial vegetation is highly sensitive to climate variability and integrates many of the feedbacks between terrestrial vegetation and the climate system. Satellite based remote sensing can provide global coverage of vegetation phenology, however, this remote sensing cannot depict vegetation changes in smaller areas. The PhenoCam Network allows for analysis for a small area of study at a high temporal resolution. We used the network to measure the evergreen vegetation at a loblolly pine site located at the Sweetbriar College. The PhenoCam records time-lapse images of a fixed area, over the course of a year, and we used these images to extract quantitative color information from the area of study, specifically, the green chromatic coordinate (GCC) and normalized difference vegetation index (NDVI). The GCC and NDVI quantify the vegetation index and patterns in the analysis can be associated with vegetation growth. Remote detection of evergreen vegetation growth is difficult to detect due to the low variability of color indices. Our analysis will determine the best method to detect the evergreen seasonal cycle.

Shaun Conway
City of Lynchburg
Proposed Enterprise Zone Amendments
The City of Lynchburg has two enterprise zones. Every year the boundaries of these zones are eligible for amendment upon approval of the City Council and the Virginia Department of Housing and Community Development. The city undergoes a rigorous analysis process to determine additions and subtractions to each zone with the goal being to maximize eligible properties, such as business and industrial land uses, and minimize non-eligible properties, which include residential and tax exempt land uses. The Proposed Enterprise Zone Amendments story map was created to help communicate any proposed changes to the citizens, business community, and elected officials of the City of Lynchburg. The Proposed Enterprise

[1] Only first authors are listed

Zone Amendments story map allows users to explore the proposed changes to both enterprise zones in detail by taking advantage of all the offerings that Esri's journal story map template has to offer. Pairing detailed descriptions of the zone changes with a fun and interactive map, the story map served as an invaluable means of communicating the why and how behind the proposed enterprise zone amendments. In addition to the proposed amendments, the story map also includes an overview of how Enterprise Zones are currently used and their positive impact on the community. The Proposed Enterprise Zone Amendments story map allowed the Office of Economic Development to take a complex and potentially controversial topic and communicate it in an effective, interactive, and engaging way.

Jessica Doherty
Blacksburg Transit – Virginia Tech Student

Using GIS Data for Analyzing Transit Route Deviations

The purpose of this project was to analyze fixed route deviation data, provide feedback to transit staff, and determine if bus stops should be added to a fixed route. Fixed routes follow set schedules, in which bus riders are picked-up at designated bus stops. Deviations off fixed route allow bus operators to deviate and provide service that is more convenient for riders. Riders call ahead of time to request a deviation, or ask the bus operator directly. Operators then get approval to deviate off the route. Generally, a limited number of deviations can be accommodated and they are serviced on a first-come-first-serve basis. Deviations can be very beneficial for bus riders; however, they can also lead to operational inefficiencies. Not only are deviation requests time consuming to service, they are also resource intensive for operational staff. Our goal was to analyze deviation location data and determine new stops could be added to the route. This route is a fixed-route serviced by Blacksburg Transit in Christiansburg, VA known as The Explorer route. Dispatch logs were reviewed to gather deviation location data from daily email reports. From these data, tables were created and street addresses were then assigned to each location. Data included 6-months of locations from January - June 2015 and from September 2016 - March 2017 to determine the frequency of stops made per location. These deviation locations were also plotted using Google's My Maps and then converted to a KML file for use in ArcGIS. Locations were then compared for the two periods. Certain locations were more popular than others, and there were a number of observed changes between the two time periods. Overall, the total number of deviation locations decreased; in 2015, there were approximately 60 unique deviations but only 24 in 2016-17. Total deviations also increased by almost 32%; in 2015, 412 deviations were made, whereas there were 543 observed deviations during 2016-17. / There were also specific changes for popular deviation locations. Most noticeable was the increased popularity of the Fieldstone deviation, which increased from 20% of all deviations in 2015 to 58% in 2016-17. Another location that saw considerable change was McDonald's on Roanoke Street; its use decreased from 17% in 2015 to 1% in 2016-17. The Dairy Queen deviation location, which did not did not exist in 2015, accounted for 5% of deviations in 2016-17. This project analyzed the frequency of deviations and used GIS to plot locations along the route. The resultant maps allow for the visualization of deviation locations and their distance from the route, so that new stops can be considered. Review of these data and maps should be presented to BT Operations staff for their consideration. For example since the Fieldstone deviation location is serviced several times daily, it could be a candidate as a permanent bus stop. Adding popular deviation locations as permanent stops would likely lead to a decrease in the number of phone calls required to arrange deviations and would allow for operational resources to more efficiently used.

Jon Emch
Virginia Tech
Vineyards in Loudoun County
The objective of this analysis was to find suitable parcels of land that could support a vineyard in Loudoun County, VA. Initial data points were gathered from existing vineyards in Loudoun County. The following factors will be considered: Derivation of soil types that are optimal for vineyards (using existing vineyards as points of reference), Considering optimal slope gradient. These constraints will be applied to the overall map of Loudoun county, VA to identify suitable regions. From there, proximity to towns (in order to take advantage of tourism), and available parcels within the county will be quantified on a scale of 1-10, 10 being the most suitable site.

Manano Felix
FHI360 INTERNATIONAL
GIS Visualization as a tool for effective targeted implementation of project activities: Insights from Uganda
Communication for Healthy Communities (CHC) is a 5-year, program that supports Government of Uganda & Implementing Partners design and implement quality health communication interventions to contribute to reduction in HIV infections, total fertility, maternal and child mortality, malnutrition, malaria & tuberculosis. This paper describes innovations taken by the program using Geographic Information System visualization to effectively analyze and visually present the layout of health facility data to promote targeted implementation of project activities. Primary and secondary data collection methods were used in selected sites of Uganda. These follow processes; Health Management Information System; Continuous collection of data from partner facilities to determine performance. GIS mapping; Identify sub counties with poor program indicators. GIS visualization; Lays out health facility data on maps enabling greater efficiency.

Iris Fynn
Department of Geography, Virginia Tech
Habitat Fragmentation Analysis - A case study of the New River Valley
Human activities such as timber logging, residential constructions and agricultural production have the worst impact on biodiversity, compared with natural occurrences such as fire, floods and volcanic eruptions. These human activities lead to habitat fragmentation which threaten the diversity and abundance of biological species such as birds and deer. By using remote sensing technologies, information on landscape characteristics such as shape, size and areas of patches were derived from NLCD images of 5 counties in the New River Valley from 1996 to 2012. The results show drastic change in regional landscape patterns within the study area and project significant impacts on its key biological species. The results of this research is important for remote sensing and GIS students as well as researchers interested in landscape ecological patterns.

Michael Graham
Virginia Tech
Remote sensing and geospatial analysis of tillage practices and crop rotation in U.S. Corn Belt
The U.S. Corn Belt is the most productive and intensively cultivated agricultural region in the United States. Until recently, the most common regional cropping pattern was a two-year rotation of corn (Zea mays L.) and soybean (Glycine max L.) (C-S). However, increases in corn prices have hastened an expansion in the area planted to corn. Much of this expansion has occurred by growing continuous corn (C-C) on existing land at the expense of C-S. Conservation tillage practices have increased in the Corn

Belt over the last several decades due to environmental and economic benefits. However, current research indicates a possible negative tillage x rotation interaction, wherein continuous corn suffers a yield penalty under less intensive, conservation tillage systems. Based on previous studies establishing remote sensing methods to detect changes in crop residue cover (CRC) and tillage status, multi-temporal Landsat imagery was processed to obtain differences in CRC% and tillage status between 1) crop species, and 2) crop rotation sequences, for a representative study area in Iowa. Mean CRC% in the study area was lower for C-C rotation (mean: 40.6%; sd: 17.0) than C-S (mean: 50.0%, sd: 22.0). For no-till (NT) practices, 22.1% of cropland in C-S rotation was in NT, whereas only 6.7% of cropland in C-C was managed as NT. These preliminary results indicate that CRC and tillage practices may differ by rotation sequence in Corn Belt agricultural systems. Future research should be aimed at examining relationships between crop rotation sequences and other biophysical factors using similar methods for other locations and years.

Patrick Green
Virginia Tech

Optimization of forest inventory through remote sensing and spatial analysis

Effective forest management requires accurate, precise, and up-to-date information. Traditional methods for collecting information involve extensive ground visits, possibly supplemented with remotely sensed information such as aerial photographs. As the need for quality information increases, so does the need for data collection techniques and procedures. This proposed research would investigate utilizing remotely sensed information in conjunction with spatial analysis techniques to optimize forest inventory. Three categories will be investigated in this work: Optimization of sample intensity, optimization of plot allocation, and small area estimation techniques. When designing a ground-based forest inventory, one of the first choices a forest manager must make is the number of sample units that will be allocated to a given forest stand. Often, previous experience is used as the guide; however, if a statistical method is utilized to calculate an appropriate sample size, an estimate of variability for the stand attribute of interest must be known. The proposed research will work to develop relationships between multispectral LANDSAT and/or SPOT imagery and the variability of a variety of stand attributes. This estimate of variability, along with other constraints, can be utilized to better determine the sample intensity needed to meet management objectives. In all forests, managed or natural, there are different amounts of variation across a management unit. Often, even within a single, highly managed, even-aged monoculture, significant amounts of variability are present. Due to natural processes, this variability often exhibits a clustered pattern. When allocating sample units to a stand, it would often be preferable to stratify an individual stand and perform a “sub-stand” stratified sample. Utilizing multispectral satellite imagery, a variety of spatial analysis techniques such as trend surface analysis or cluster analysis will be performed to identify these areas and in turn, allocate sample units appropriately. One of the largest challenges associated with forest inventory is often the magnitude of the work that must be conducted, often in a very short time frame. Ground based inventory data is expensive and slow to collect. Using a technique known as small area estimation, remotely sensed data, LANDSAT for example, can be used as an auxiliary variable (indirect estimator) to ground-based information (direct estimator) to better estimate values for domains too small to estimate with direct estimators alone. The model is a nested error regression model, which includes area-specific random effects and the sampling errors. In summary, through the fusion of traditional, ground based information and remotely sensed information; improvements in forest inventory can be made. Resources spent to collect ground-based information will be better utilized to produce accurate, up-to-date estimates of forest parameters. Ideally, these estimates will be comparable, if not superior, to full scale ground inventory information at a lower time and monetary cost.

Justin Haber
Virginia Tech
SIR Rates Of Cancer in Increasing Proximity To the Radford Arsenal
The Radford Ammunition Arsenal is largest polluter in Virginia and violates EPA Air Quality standards regularly. These EPA standards are in place to protect the population, and surpassing these EPA standards could be harmful to nearby residents. Our objective is to determine if air pollution from the Radford Ammunition Arsenal is decreasing the causing thyroid cancer to nearby residents.

Carrie Jensen
Virginia Tech
Using logistic regression to model headwater length dynamics in the Appalachian Highlands
Maps of headwater streams are highly inaccurate and almost never indicate ranges of network length, as more than half of headwaters are estimated to expand and contract seasonally or in response to storm events. Understanding where and when streams are flowing has myriad implications for water quality regulation, watershed management, and environmental policy. The objective of this project is to develop explanatory models of the variable wet stream network in headwater catchments of four physiographic provinces of the Appalachian Highlands: the New England, Appalachian Plateau, Valley and Ridge, and Blue Ridge. We used logistic regression to predict the presence or absence of a wet stream at each catchment pixel as a function of terrain metrics derived from 3 m Digital Elevation Models (DEMs) and stream runoff (discharge/catchment area). We mapped the wet stream length of 3 catchments (<70 ha) per province with a GPS unit 7 times each at multiple flow conditions to train the models. Model performance was high overall, with more errors of omission of stream pixels in the Appalachian Plateau and Valley and Ridge and more errors of commission in New England and the Blue Ridge. Model errors often coincided with aberrations in the surficial geology, such as boulder fields and landslide deposits, that do not have a distinct topographic expression. The topographic wetness index was the most critical predictor in all models. The local or mean topographic position index, which compares the elevation at a pixel to the mean neighborhood elevation, was also a predictor in all of the models except for that of the New England sites. Curvature was an additional variable in the Appalachian Plateau and Valley and Ridge but improved model performance only slightly. The importance of stream runoff in the models reflected the mapped variability of stream length in each province, with greater significance in provinces with more network expansion and contraction. We were able to better approximate the mapped stream length and configuration at different flows by varying the probability threshold of the model output; higher thresholds corresponded well to low flows, and lower thresholds represented wet conditions.

Erin Jones
City o Lynchburg
Government on the Go!
The City of Lynchburg's Human Resources department has a long standing series of classes that all new employees must complete. They range from Civics to Diversity and Inclusion and more. Recently, the Human Resources staff has made it their goal to revamp their series of classes from lecture style to a more engaging environment for learning about being a municipal employee. This is where GIS staff comes in. Members of the Human Resources team had previously seen the use of story maps for various City projects and events and commissioned the GIS office to create a story map for use in their newly developed Government on the Go class. The Government on the Go class is a planned tour through the City to see where government departments are located, learn about the City's history, and what it means to be a public servant. To enhance the class and keep the tour more interesting, the GIS team developed a Government on the Go story map utilizing the tour map template. Pairing images and

locations of the tour stops with department websites, the story map provides a fun and interactive map to keep participants engaged during the physical tour with a virtual tour that further expands on the information the tour guide provides. Being able to assist the Human Resources department in getting their class out of the lecture hall and out into the world with a story map has greatly increased class engagement and participation.

Joby Kauffman
Virginia Tech, Center for Natural Resources Assessment and Decision Support
Automated Timber Harvest Detection and Delineation Using Vegetation Change Tracker and County Parcel Data
A forest stand can be defined as a contiguous group of trees that are homogeneous in condition, species composition, age distribution, and ownership. One definition of forest stand age is the number of years since regeneration. Regeneration is often preceded by a clearcut harvest, the predominant type of forest disturbance in Virginia. This research illustrates the usefulness of parcel data, in conjunction with disturbance detection algorithms derived from remotely sensed data, such as Vegetation Change Tracker, for harvest delineation and timing of occurrence, along with stand age mapping. In addition, clearcut harvests often result in land cover and land use changes. Therefore, harvest delineation and timing can be thought of as important informational components for both forest resource monitoring and land change science. Its applications include growth and yield estimates at the stand level, and spatially and temporally precise wildlife habitat, water quality, carbon stock assessment, and land use/land cover change analysis.

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Gina Li
Virginia Tech
A Novel Web Application to Analyze and Visualize Extreme Heat Events
Extreme heat is the leading cause of weather-related deaths in the United States annually and is expected to increase with our warming climate. However, most of these deaths are preventable with proper tools and services to inform the public about heat waves. In this project, we have investigated the key indicators of a heat wave, the vulnerable populations, and the data visualization strategies of how those populations most effectively absorb heat wave data. A map-based web app has been created that allows users to search and visualize historical heat waves in the United States incorporating these strategies. This app utilizes daily maximum temperature data from NOAA's Global Historical Climatology Network (GHCN) which contains about 2.7 million data points from over 7,000 stations per year. The

point data are spatially aggregated into county-level data using county geometry from the US Census Bureau and stored in a Postgres database with PostGIS spatial capability. GeoServer, a powerful map server, is used to serve the image and data layers (WMS and WFS). The JavaScript-based web-mapping platform Leaflet is used to display the temperature layers. A number of functions have been implemented for the search and display. Users can search for extreme heat events by county or by date. The "by date" option allows a user to select a date and a Tmax threshold which then highlights all of the areas on the map that meet those date and temperature parameters. The "by county" option allows the user to select a county on the map which then retrieves a list of heat wave dates and daily Tmax measurements. This visualization is clean, user-friendly, and novel because while this sort of time, space, and temperature measurements can be found by querying meteorological datasets, there does not exist a tool that neatly packages this information together in an easily accessible and non-technical manner, especially in a time where climate change urges a better understanding of heat waves.

Justin Madron
University of Richmond
#MappingInequality

This poster shows small multiples of cities at the neighborhood level, graded by the Home Owners Loan Corporation. Known as HOLC, the organization created "security maps" that color-coded, graded, and identified credit worthiness and their risk of defaulting on mortgage loans in cities across the U.S between 1935 and 1940. They ranked cities from most "Hazardous" (1. St Joseph, MO) to "Best" (132. Darien/New Canaan/Stamford, CT) based on the amount of area designated A, B, C, or D.

Using 132 of the digitized "security maps" found in Mapping Inequality, each city is given a GPA based on the percent of total area for each grade. For example, if a city had 100% of its neighborhoods graded A, it would receive a 4.0. This provided a way to compare all the cities and place them in order from most "Hazardous" to "Best". All cities were viewed at the same scale for layout purposes. Works of Nicholas Rougeux: Inspiration for the poster

Cartography is the practice of making maps by combining science, aesthetics, and various techniques. Aesthetics matter, for they can entice and allure. While culturally situated, we are drawn to pleasing visuals, infographics, and maps. The HOLC maps are no exception. They show vibrant colors overlaid on grey city streets. Stepping back, they seem to mimic abstract art with their irregular shapes and organic composition. This is deeply unsettling when maps represent inequality, racism, and oppression. As geographer John K. Wright reminded us as early as the 1940s, maps are nothing if not processes of simplification and amplification. Visual rhetoric like cartography often works holistically—we tend to absorb a map's meaning as one overall feeling rather than reading it in a linear fashion as we would a more traditional written text. Even then as we move to read that map as a "text," it tends to be hard to shake that initial feeling.

Like the power of visual pleasure, cartography often scrubs the world of its complexity, its messiness, and its nuance. In the case of the redlining maps, the beautiful colors and shapes risk obscuring the story of the lived experiences, struggles, and values of the real people who lived in and are living in these neighborhoods. While obscuring these stories is not necessarily the intention of the map's creators, reception by real audiences in the medium of cartography is just as important as intention. Maps, then, have to be seen as useful fictions. This poster, for example, usefully brings a series of locations together into a fruitful comparison about the consequences of inequality; at the same time, we have to acknowledge that these maps classify and order these cities into a tidy narrative that is at heart much more complicated. We hope this poster highlights the complexities of cartography and engages users in

a deeper conversation about these issues. I encourage you to join this larger conversation and better understand #mappinginequality at Mapping Inequality

Michael Marston
Virginia Tech
Cluster Analysis of Virginia Climate Stations, 1960 - 2016
Recent research suggests that temperature and precipitation patterns have changed over the past few decades. The pattern shifts, particularly with precipitation, can differ greatly through space. Within this study, daily precipitation and air temperature data were gathered from the Global Historical Climatology Network (GHCN) database for 80 stations within the state of Virginia for the period of 1960 to 2016. Monthly mean values for the 57-year period of maximum air temperature, minimum air temperature, precipitation frequency (days), and monthly precipitation amount were computed for each of the twelve calendar months. The full time series (57 years) of 48 variables (4 variables x 12 months) were standardized and subjected to a cluster analysis to determine each station's group membership. Next, the time series of 48 variables were split into halves, with the first half of the historical record containing data from 1960 – 1988 (29 years) and the second half of the historical record containing data from 1989 – 2016 (28 years). For each half of the historical record, the average monthly values of the 48 variables were subjected to a cluster analysis to determine each station's group membership for each period. The resulting groups of stations from the full time series cluster analysis were spatially compared to the six climate divisions of Virginia, which are regions of spatially homogeneous climate as defined by the National Centers for Environmental Information (NCEI). The group memberships of stations from the first half of the historical record were compared to those of the second half of the historical record to determine if stations were grouped similarly for both periods. Results suggest that group memberships for several stations changed from the first half of the record to the second half of the record, indicating a possible shift in climate as portrayed by precipitation and air temperature over the study period.

Conor Martin
Ronoke College
A Spatial Analysis Model of Erosion Potential Using ArcGIS
Over the past century, the southern piedmont has experienced excessive gullying, an effect of accelerated erosion possibly due to agricultural land management practices in the 19th and early 20th century coupled with erodible soils, sloping land, and intense rainfall characteristic of the region. As part of a larger effort to assess the legacy effects of soil erosion at the Calhoun Critical Zone Observatory, we developed a spatially explicit soil erosion potential model using ArcGIS 10.2. This analysis modeled soil erosion as a function of four factors: slope, land cover, soil erosivity, and rainfall intensity. Each was represented as a raster layer derived from DEM's or satellite imagery. These layers were then multiplied together using the raster calculator following the Revised Universal Soil Loss Equation (RUSLE). The final model indicates varying levels of erosion across the Calhoun CZO, with less erosion occurring in the flat tops of ridges and in the valleys and higher erosion occurring on the slopes. This model will be used in separate studies to further research the lasting effect of erosion on the Calhoun Critical Zone Observatory.

John McGee
Virginia Tech-Department of Forest Resources and Environmental Conservation
Developing an sUAS DACUM to Prepare the Future Workforce
During the summer 2016, a panel of 11 UAS industry professionals from across the U.S. met in Virginia to identify and prioritize the major duties and tasks associated with entry-level sUAS technicians. This resulted in the development of an sUAS Technician DACUM (Developing a Curriculum). Educators are using the findings from the DACUM panel session as a cornerstone to design their sUAS curriculum. The sUAS Operations Technician DACUM is currently being employed to support geospatial education across the Virginia Community College System member institutions. By using the DACUM as a curriculum roadmap, faculty are able to better ensure that their educational content directly targets the needs of employers.

Nicholas Miller
Virginia Tech – Blacksburg Transit Intern
Using General Transit Feed Specification to Create Bus Route Maps for Blacksburg Transit
This poster will showcase the process for creating complete transit route maps. Examples will include full maps for both the Towns of Blacksburg and the Christiansburg towns. We will also provide an overview of how data are converted from GTFS to useable shape files for a variety of purposes.

Blacksburg Transit periodically updates route maps for use by staff. As interns at BT, we have been given the task of creating route maps that are accurate and user-friendly. Since BT services the Towns of Blacksburg and Christiansburg, it is our responsibility to update the route maps as changes occur.

The process to make these maps starts by locating BT's GTFS ("General Transit Feed Specification") files. GTFS was created as a standard data format after transit providers and users encountered issues revolving around the availability of route information. GTFS is now used by transit agencies all over the country, and is used regularly by BT for several purposes, including for use in map generation. GTFS feeds are publically available and files are in the form of text files; these files contain all of the information necessary to create route and bus stop shapefiles. At BT, GTFS data are updated frequently, allowing us to maintain as up-to-date data as possible. Before we can produce meaningful displays of the data in the form of maps, the GTFS data has to be converted into shapefiles. For this, we used a GTFS conversion tool developed by Esri. After converting our GTFS data into shapefiles, we are able to modify the routes and stops to create the route maps that are represent the transit routes and stops.

In the transit industry, it is common for modifications to routes and bus stops to occur often. Blacksburg Transit makes changes to routes, and opens/closes bus stops in both Blacksburg and Christiansburg occasionally, with the Blacksburg service experiencing changes most frequently. This past year, Blacksburg saw many changes around town, such as the addition of a new bus route to service a new apartment complex (The Retreat), the extension of a route (i.e., the CRC route), and the closing of a route due to construction (UCB route). As a result, the number of modifications that were needed to keep maps up-to-date increased. Thanks to the frequent updates to the GTFS data, we were able to quickly modify BT route maps in response to the change in transit routes and stops.

While our maps displayed to the public show all of our routes at full service, we are in the process of creating maps that highlight BT's different services. These include reduced, late night, and weekend services. On occasion, we also create maps in response to staff requests. Such requests may be for only select features such as a particular route, or a subset of bus stop. We use GTFS and Esri products to

analyze data and create maps for these requests. Overall, we have found GTFS to be in incredibly useful feature in the world of GIS.

Erik Olsen
Town of Blacksburg, Blacksburg Transit
Mapping GIS bikeshare destination & route data to plan an improved bicycle transportation system in Virginia's New River Valley
This poster demonstrates some popular destinations and routes based on bikeshare data from a sampling of apartment residents in Blacksburg, VA. Data collected from August 2016 to March 2017 were downloaded, summarized, and then explored. To extract data, access to the bikeshare's online reporting system was acquired, which permitted access to summary reports as well as raw data files. Further analysis was then completed using Excel to sort and categorize data. Data were mapped by first downloading GPX data files, and then converting them using Google's My Maps online. Further data processing was completed using Esri's ArcMap geospatial processing program to create maps of destinations and routes. An overall summary indicated the number of active users was 86 with 38 users with at least one rental (the apartment complex has approximately 820 residents). Data from bikeshare trips revealed there were a total of 35 riders that used the system of 8 bikeshare bicycles to complete 134 trips; each rider completed an average of 4 trips with 7 riders accounting for 65% of all the trips (the top rider completed 29 trips for 20% of the total) . The total distance traveled was 314 miles; the average trip length of 2.4 miles with 13 riders accounting for 84 percent of the mileage (the top rider completed 66 miles for 21% of the total). The total duration of bikeshare usage was 153 hours with an average of 1 hour 9 minutes per trip. Note that trip duration included the entire time the bikeshare was undocked from the bike station at the apartment complex, even if the rider stopped and parked the bicycle offsite. It appears that the majority of trips are to and from the Virginia Tech campus, most likely to attend class. Trips were observed to a few locations in the Town of Blacksburg including other apartment complexes, a grocery store, and a nearby mall. Trips were also observed along the Huckleberry Trail to the mall area in the Town of Christiansburg, including what appeared to be two 12-mile round trips with a duration approaching 3 hours. Popular routes to campus appeared to be roughly split between Prices Fork Road and a Plantation Rd-Smithfield Rd combination, with various routes across campus. Some routes also included popular campus roads such as West Campus Dr, Stanger Dr, and Perry St. It appears that only 2 trips occurred using portions of Main Street. These data may be useful in combination with data from other sources to make some predictions as to where a regional bikeshare might expand to, and what some recommended routes would be. It may also be possible to provide initial recommendations for bikeshare station placement, and to corroborate other efforts that support the need for additional or improved bicycling amenities and bicycling information. Using GIS to visualize bikeshare destinations and routes in combination with existing and planned bike amenities can be useful for improving the bicycle transportation system in our region.

Emma Powers
Virginia Tech
Accessible Blacksburg
Accessible Blacksburg is collaborative project between the Town of Blacksburg and Virginia Tech. The goals of the project include mapping accessible features, sidewalks, curb cuts, pedestrian crosswalks, bus stops and obstructions to access ADA compliance and ease of use. Geography students from Virginia Tech have volunteered to map features, collect slopes, lengths and other details, field verify, and perform analysis. The students created two collector applications through ArcGIS online, one for public input and the other for field verification. Finally, a mobile web application is under design to

make this detailed information available to the public. The application will be easy to use, allow data input to identify problems and desired enhancements and share this with Town and Tech staff.

Cameron Thompson
Roanoke College Student
Living Monuments: A spatial analysis of ecosystem services of campus trees at Roanoke College
Urban trees provide a variety of ecosystem services including water filtration, carbon sequestration, and energy savings. This study evaluated potential ecological and financial benefits from trees on the Roanoke College campus using ArcGIS 10.2 and the U.S. Forest Service's i-Tree model. The i-Tree model quantifies ecological and economic value of urban trees based on factors such as diameter, height, species, distance from buildings, and crown condition. GPS coordinates were used to create a base map for campus trees. Tree parameters were then analyzed using the i-Tree model and combined with the base map to create a spatial model of ecosystem services on campus. Future work will expand the model to include information about species and crown condition. This analysis of ecosystem services and economic value provided by campus trees will be used to inform future development on campus and in the surrounding community while also protecting the ecology of currently established plantings using ecological as well as financial arguments.

Hoa Tran
Virginia Tech Student
Mapping Land Cover Change in a coastal area of Binh Thuan, Vietnam Based on Object-Oriented methodology
The province of Binh Thuan, located at the Southern Coast of Vietnam, is characterized as the driest area of the whole country. At least 60% of the area of Binh Thuan is subject to drought and desertification processes, important forms of land degradation in arid and semi-arid areas. Drought and desertification contribute significantly to deterioration of ecosystems to environmental, and social issues in this region, including soil erosion, vegetation disturbance, poverty, water shortage and economic damage. In this research, we analyze high- resolution satellite imagery (Worldview 2 and Quick Bird) for assessment of Land Use/ Land Cover (LULC) in one of poorest and driest district Binh Thuan, Tuy Phong. Our research examines conditions during the interval 2011-2015 to understand specific impacts of drought, and to examine the soil quality, effectiveness of local management policies, and behavior of local people to struggle with this insidious hazard. With a Digital Globe Foundation grant to support acquisition of imagery, a field survey was conducted in summer 2016. Results from valuable resources to support further investigation of physical processes and social consequences of continued desertification within Binh Thuan Province. We acknowledge the support of the Digital Globe Foundation granted imagery data, of Virginia Tech for support of field research summer 2016.

Heng Wan
Virginia Tech Student
Recreational Park Location
A new recreational park is planned to be built in Tolland County, Connecticut, and the county officials want to visit the optimal location candidates by themselves to determine the best location to build this park. The size of this recreational park may be huge (many square miles, possibly covering several adjacent block groups) and it aims at providing a variety of recreational activities, including: hiking trails, cross country skiing, camping, picnicking, playgrounds, and perhaps a zoo and a golf course. By using ArcGIS, I computed a ranking of all the county's block groups and a table of the top 20 so that officials can refer this table to arrange the filed analysis.

The following factors were taken into account for assessing each census block groups: 1. Land cover- The land cover in the block group should be as highly variable as possible to guarantee the scenic quality. Mixed forests, wetlands and areas with open water are all good for building the park while all barren and developed areas and agricultural areas should be avoided. 2. Proximity to streams- For scenic quality, block(s) with a high percentage of area within 100 meters of a stream is preferred. 3. Terrain- Block group(s) with a high percentage of rough terrain is preferred because steeper slopes and uneven surfaces are good for hiking and scenic vistas and are also less likely to be useful for agriculture in the future. 4. Soils-To protect the potential agricultural base, the park should avoid to be built in any block group dominated by a soil mapping unit that is considered as Prime Farmland. ("Dominated" is defined as more than 80% coverage) Also, soils on the "Statewide Important Farmland" list are less desirable than those not on the list. Finally, for the construction of hiking trails, block group(s) with high percentage of the soils which are "Very Limited" for paths and trails should be ranked lower for assessment. 5. Access-The block group(s) should have an optimal density of roads. Here, "optimal density" is defined as a road density not too low(guarantee a reasonable access to the population) and a road density not too high (avoid making the park noisy from the traffic) 6. The block group(s) should have the lowest population density to displace as few people as possible for the construction of the recreational park.

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A descriptive analysis of the spatio-temporal distribution of valley fever in California

Valley fever is a disease caused by inhalation of spores from the Coccidioides fungal species. The pathogen is normally soil-dwelling, but, if disturbed, can become airborne and able to infect humans and other mammals. The endemic area for this disease includes the western U.S., but it is not well defined or understood. Coccidioides is very difficult to isolate from the soil, therefore, little is known about its natural distribution. The goal of this study is to better understand the disease's spatial and temporal distribution in California, the state with the second highest case totals in the country, as a first step in researching possible disease risk factors. This study analyzed incidence data, through descriptive statistics, as well as maps and time series visualizations created using ArcGIS 10.4, to look for spatial and temporal patterns in California. The results provide a robust picture of the distribution of valley fever in California for 2001 – 2010.