2021 NC ASPRS Conference Registration

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Monday, November 15, 2021	
Time	Day 1 Workshop
8:00am- 12:00pm	★ Workshop- UAS a day in the life- Jamey Gray, GPI The goal of this workshop is to present a comprehensive overview of a typical real-world mapping project using a UAV. Topics to be covered included site identification and analysis, FAA Regulations, survey ground control, flight planning, data acquisition/processing, accuracy assessment using ASPRS standards, and final product delivery. Fundamental photogrammetry principles will be presented in a general sense along the way as well. Audience discussion will be encouraged to further relate these topics to real-life applications that can be applied to both public and private sector work.
Break	Lunch Break
	NC-ASPRS Welcome
1:05pm- 2:05pm	Keynote- NGS Working in NGS's Modernized NSRS in 2022- Scott Lokken -NGS Mid-Atlantic Regional Geodetic Advisor Dave Zilkoski - Geodetic Consultant, Geospatial Solutions by DBZ (Retired NGS Director) This presentation will provide an introduction to what working in NGS' modernized NSRS in 2022 will mean to North Carolina surveyors and mappers
2:05pm-2:10	**Premium Sponsor: Weston & Sampson**
Time	Session 1
2:10 pm- 2:35 pm	★ UAS Photogrammetric Accuracies- John Knowlton, AECOM
2:35 pm- 3:00 pm	Ecoregional Framework to analyze Land use/cover dynamics in Northwestern region of Jordan- Dr. Rana N. Jawarneh, Yarmouk University
3:00 pm-3:25 pm	Application of Optimization Model in Matching Building Footprints by Different Agents Wenjun Yang, University of Kansas
3:25 pm- 3:50 pm	★ Unmanned (UAS) Airborne LiDAR & Imagery; Geospatial Applications & Limitations Ravi Soneja, CMT-LiDAR- AYRES
3:50 pm - 4:15 pm	ACCURACY ASSESSMENTS FOR INUNDATED VEGETATION MAPPING USING L-BAND AND C-BAND SAR DATA- Abdella B Salem, North Carolina A &T State University
4:15 pm- 4:40 pm	Corn Lodging Influence on Yield: Using U-Net Semantic Segmentation- Freda Dorbu, North Carolina A&T State University
4:40 pm- 5:00 pm	★ NCDOT Test Site Drone Sensor Assessment and Validation Project Results Matthew Elious, WSE of North Carolina
Tuesday, November 16, 2021	

Time	Session 2
8:00am - 8:05 am	**Premium Sponsor: GPI**
8:05am - 8:30 am	Creating Digital Twins - Travis Howell, Withers & Ravenel
8:30 am - 8:55 am	Transportation Mapping - Ron Leach, ESP Associates, Inc.
8:55 am - 9:20 am	Land Movement Detection from Terrestrial Laser Scanner (LiDAR) analysis- Pamela Carolina Pesántez-Cabrera, University of Cuenca
9:20 am - 9:45 am	Artificial Intelligence combined with UAVs is set to increase drafting efficiency in AEC Adam Kersnowski- Airworks
9:45 am - 10:10 am	Detecting Erosion Vulnerability in HUC 12 Watersheds- Richard Wohler, GPI
10:10 am - 10:15 am	Student Presentation introductions
10:15 am - 10:30 am	Comparing a performance of wetland vegetation structure using SfM and LiDAR derived point clouds- Elijah Dalton, University of North Carolina at Wilmington
10:30 am - 10:45 am	Land Cover Change in Monrovia, Liberia, Africa with Remotely Sensed Imagery- Samuel Zulu, University of Fayetteville State-
10:45 am - 11:00 am	UAVs' Application in Road Traffic Monitoring- Tewodros Gebre, North Carolina A&T State University
11:00 am - 11:15 am	The Applicability of Geospatial Techniques for River Run-off Modeling in Northern Pakistan- Rabia Munsaf Khan, State University of New York - College of Environmental Science and Forestry
11:15 am - 11:30 am	Hyperspatial UAS data and machine learning approaches for Coastal Plain wetlands delineation-Asami Minei, University of North Carolina Wilmington
11:30 am - 11:45 am	Identifying Ecosystem Vulnerability for Nature-Based Solutions to Mitigate Coastal Flood Inundation- Greer Shivers, University of North Carolina Wilmington
11:45 am - 12:00 pm	Detecting Woody Plants in Dryland Regions using Data from National Ecological Observatory Network- Thomas Hutsler, University of North Carolina at Wilmington
Break	Lunch Break
Time	Day 1 Workshop
1:00pm - 1:15pm	Potomac Region Update- David Lasko-
1:15pm - 3:00pm	Workshop Panel- Certifications Where, Why, and How- what are the certifications and why should I get one. Panel discussion with People who are currently in the process of getting a certification- Panel discussion Connie Krampf, Mike Barnowski, Matthew Nanney, Ravi Soneja, Amy Avery-Holz, Jamey Gray
3:00pm - 4:45pm	Workshop-ASPRS Standards and specification- what you need to know- Harold Rempel, ESP Associates, Inc
4:45pm - 5:00pm	Wrap up- Student awards.

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Sponsor

Keynote-

Working in NGS's Modernized NSRS in 2022, Scott Lokken -NGS Mid-Atlantic Regional Geodetic Advisor and Dave Zilkoski - Geodetic Consultant, Geospatial Solutions by DBZ (Retired NGS Director)

This presentation will provide an introduction to what working in NGS' modernized NSRS in 2022 will mean to North Carolina surveyors and mappers. It will briefly address the following questions:

- Why is NGS modernizing the NSRS?
- What are the expected coordinate changes (horizontal and vertical) in North Carolina from the old to the new NSRS?
- What does NGS mean by time-dependent coordinates and why is it necessary for the new, modernized NSRS?
- What are the differences between Scientific and Hybrid Geoids?
- How was the hybrid geoid model Geoid18 generated and what does this mean to North Carolina Surveyors and Mappers?
- How will NAPGD2022 Orthometric heights be determined using GEOID2022?
- What models, tools, and products are being developed by NGS to help users transition to the new 2022 datums?
- What outreach activities are being performed by NGS to better inform the surveying and mapping community about the new, modernized NSRS

Keynote BIOS:

Since retiring from government service in 2009, Dave Zilkoski has worked as a geodetic consultant, providing technical guidance on issues related to NGS' modernization of the National Spatial Reference System [the replacement of NAD 83 and NAVD 88 with North American Terrestrial Reference Frame of 2022 (NATRF2022) and North American-Pacific Geopotential Datum of 2022 (NAPGD2022)]; reviews the results of GNSS survey projects; and performs training sessions on guidelines for estimating GNSS-derived coordinates, procedures for performing leveling network adjustments, the use of ArcGIS for analyses of adjustment data/results, and the proper procedures to follow when estimating crustal movement rates using GNSS and geodetic leveling data. Mr. Zilkoski is Chair of North Carolina Geodetic Survey Advisory Committee, a member of the North Carolina 2022 Reference Frame Working Group, past Chair and current member of the Standing Committee on Geospatial Data Acquisition Technologies (AKD70), Current President of the American Association for Geodetic Surveying (AAGS), a member of the American Geophysical Union, a fellow of AAGS, a GPS World Survey Scene guest editor, and a faculty member of GeoLearn (https://www.geo-learn.com/).

Mr. Zilkoski has authored a number of papers on GNSS-derived heights, subsidence, surveying, and vertical datum including a chapter in The DEM Users Manual (2001, revised 2006 ASPRS, Bethesda, MD, David F. Maune, ed.). As Guest Editor of GPS World Survey Scene, he has authored a series of newsletters on establishing and analyzing GNSS-derived coordinates, understanding NGS hybrid and scientific models, and NAPGD2022 (https://www.gpsworld.com/tag/david-b-zilkoski/).

Scott Lokken is the Mid-Atlantic Regional Geodetic Advisor for NOAA/NOS/National Geodetic Survey. He works out of the Raleigh, NC office.

Professional-

UAS Photogrammetric Accuracies- John Knowlton, AECOM

Usage of unmanned aircraft systems is now commonplace in many different professional disciplines, however an understanding of final data accuracies, how to achieve them, and how to test them is not as common. This presentation will explore UAS photogrammetric accuracies, how they are impacted by error, the removal of error, and how to plan for success with your UAS missions.

*John Knowlton oversees the AECOM commercial UAS (CUAS) services as well as leads a diversified team of geospatial professionals that are responsible for a broad range of spatial data support services including LiDAR, photogrammetric, and GIS related data products. He has close to 20 years of GIS and geospatial experience and is an ASPRS certified photogrammetrist (CP), certified GIS professional (GISP), and project management professional (PMP***)**

Ecoregional Framework to analyze Land use/cover dynamics in Northwestern region of Jordan- Dr. Rana N. Jawarneh, Yarmouk University

The physiographic settings of a region influence its land use/cover regimes, dynamics, and rates. Studying land cover dynamics across an environmental gradient is a pressing need towards understanding how physiographic characteristics of different ecoregions affect the patterns and

magnitude of change. Northwestern Jordan is a physiographically heterogenous area with dramatic changes in dominant land cover types within a short distance along an east-west gradient. Here, contemporary land cover dynamics were quantified at regional scale using at the first stage Landsat 8 imagery and Google Earth Engine cloud-based computational platform. In GEE, the K-means clustering algorithm was implemented for unsupervised classification. The Jordan valley floor and foreland, high plains, the highlands, and the semi-arid- flat plains ecoregions were used as a stratification framework to document trends in contemporary land use/cover dynamics over the northwestern region of Jordan.

Dr. Rana N. Jawarneh is an associate professor of GIS and Remote Sensing at the department of Geography, Yarmouk University. She earned her Ph.D degree in 2012 from the University of Oklahoma (USA) and the Master's degree in 2008 from University of Arkansas (USA). Her research focuses on the applications of Geoinformatics in studying spatio-temporal dynamics of land cover-land use, modeling urban growth, and assessing land degradation in semi-arid regions.

Application of Optimization Model in Matching Building Footprints by Different Agents- Wenjun Yang, University of Kansas,

The technology of matching geospatial data plays a critical role in GIS and Remote Sensing when researchers try to harmonize datasets made by different agents or at various points of time. For example, the building footprints extracted from the same remote sensing image may differ because of the different agents or technologies. To solve this dilemma, we can use matching methods to identify corresponding features. By doing this, researchers can compare two maps under the same geographical extent and figure out which one represents reality more correctly. To generate the optimal matching result, this study will introduce an optimization-based matching method. The model we refer to is one variation of the classic optimization problems: the generalized assignment problem. The generalized assignment problem allows one worker to be assigned to multiple tasks, which reveals an "one-to-many" relation. In matching two datasets, this concept can be interpreted as one feature from one dataset has multiple corresponding features from the other datasets.

Wenjun Yang, University of Kansas,PhD Candidate in the Department of Geography and Atmosphere Science, the president of 2021 KU GIS@DAY.

Unmanned (UAS) Airborne LiDAR & Imagery; Geospatial Applications & Limitations- Ravi Soneja, Ayres

This presentation will highlight a variety of applications for UAS LiDAR & Imagery for surveying and mapping as well as remote sensing professionals.I will distinguish between photogrammetry and LiDAR, and the inherent limitations of a photogrammetry only approach. Background on UAS LiDAR technology, best practices in data acquisition and limitations of the technology will be covered. In addition, I will focus on three surveying and mapping projects which utilize UAS LiDAR and highlight deliverables for each of these projects.

Ravi Soneja is a Geospatial Services Technician and the Technical Lead for the Unmanned Airborne LiDAR program at Ayres Associates. A Certified Mapping Technologist in LiDAR through the American Society for Photogrammetry & Remote Sensing (ASPRS), Ravi has extensive experience in UAS flight planning, survey control configuration, LiDAR & imagery acquisition, LiDAR calibration,

pre/post-processing, and final deliverables. In addition, Ravi is also involved in the development of solutions-based approaches for clients.

ACCURACY ASSESSMENTS FOR INUNDATED VEGETATION MAPPING USING L- BAND AND C-BAND SAR DATA- Abdella B Salem, North Carolina A &T State University

Synthetic Aperture Radar (SAR) is a remote sensing method that is capable of collecting data during night and day. SAR signals are capable of penetrating clouds and vegetation canopies. In this study, we examined the reliability of floodwater maps derived from Sentinel-1B, C-band SAR data compared to floodwater extent maps derived from full-polarized L-band UAVSAR data.

We analyzed the Satellite and UAVSAR data during flooding in North Carolina's coastal plain areas resulting from Hurricane Florence. UAVSAR collected daily data over several flight lines with repeat paths, beginning on September 18 through September 23 in the year of 2018. Sentinel-1B sensed the areas on September 19, 2018. For this research, UAVSAR data and Sentinel-1B SAR on the same date were collected and analyzed. UAVSAR data were processed using polarization decompositions method to identify land cover classes based on their scattering mechanisms. We used UAV high resolution optical imagery to delineate and label land cover classes samples to train random forest classifiers. Also, reference samples from optical data were randomly selected to validate classification results obtained from the two datasets.

Abdella B Salem: Graduate Student at North Carolina A &T State University, Department of Built Environment. Completed Bachelor of Geosciences and a Master of Applied Earth Sciences at the University of Khartoum and North Carolina Central University respectively.

Corn Lodging Influence on Yield: Using U-Net Semantic Segmentation- Freda Dorbu, North Carolina A&T State University,

Corn yield is dependent on factors such as plant density, presence of water and nutrients, temperature, and type of crop variety. Prediction of corn yield from a technological-aided approach assists farmers to make decisions on adopting measures that could improve yield to feed the increasing human population. Identification of lodged plants from crop imagery and data-driven analysis provide cost-effective time sensitive information to the stakeholder to decide the best cultivation recovery mechanism such as increasing corn seed per hole before the end of the corn season. The study area was divided into three blocks with different treatments. The remote sensing images were processed and the digital elevation model (DEM) and orthoimages of the area were created. Plant height was determined from DEM and Normalized Difference Vegetation Index (NDVI) was estimated using the orthoimages for crop growth and yield analysis. U-Net architecture was used in this study for lodged and non-lodged plants image segmentation considering the changes of crop heights and NDVI extracted from the multi-temporal UAV captured from the time of planting (April) to harvesting (August).

Freda Dorbu, North Carolina A&T State University, A PhD student at North Carolina A&T State University

NCDOT Test Site Drone Sensor Assessment and Validation Project Results- Matthew Elious, CP WSE of North Carolina

Early 2019, Weston & Sampson performed drone imagery acquisition and post processing as a sensor validation project using a test site sanctioned by NCDOT of North Carolina. The project was designed to assess the following:

1. assess the UAS sensor performance of a drone flown at 3 separate flight heights

2. assess the geospatial accuracy from processes and products generated by 3 separate software packages

3. assess whether or not the sensor can be used to meet 1" = 50' engineering scale and 1' contours accuracy based on ASPRS Accuracy Standards.

This presentation will share details of the technologies used, the comparative accuracy assessment of results, and the conclusions reached from the entire validation process.

Matthew Elious, CP WSE of North Carolina, is the Photogrammetry & Remote Sensing Team Leader at Weston & Sampson. Mr. Elious holds a Post Graduate Diploma in Photogrammetry (P1) for ITC, Holland and an M.S. Degree in Geodetic Science from the Ohio State University. His professional career spans over 35 years from applications software development to managing Geospatial/GIS projects including open-end photogrammetric and LiDAR projects for State DOT's as well as FAA's WAAS aeronautical and obstruction survey projects.

Day 2

Creating Digital Twins - Travis Howell, Withers & Ravenel

We've all heard the phrase, 'A picture is worth a thousand words'. What if we throw a picture up that consists of 5 million data points and each one of those points represents a surveyed XYZ location? Millions of data points can be generated in a matter of minutes to accuracies comparable to traditional surveying methods, all possible with UAS and LiDAR sensors. Remote Sensing hardware and software are continually changing, therefore, it is critical to ensure a surveyor is choosing the "right tool for the right job".

Travis is a Geomatics Project Manager and an early adopter of combining drones and remote sensing technologies. He is a firm believer in using the right tool for the right job, but also continually advocates R&D into new applications. Travis is a Registered Forester and a graduate from NC State University. He readily uses his knowledge and experience to enhance a wide variety of geomatics projects at WithersRavenel.

Transportation Mapping - Ron Leach, ESP Associates, Inc.

This presentation will showcase a transportation mapping project that utilizes various technologies and approaches to provide a comprehensive and seamless map of existing conditions within the I-35 corridor near San Antonio, TX. By leveraging the strengths of aerial lidar and imagery, mobile lidar, terrestrial lidar, photogrammetry, and conventional survey, ESP is providing a solution that creates a seamless transition between data types, densities, and accuracies. This hybrid approach allows for the efficient application of the right technology in each project area to support the goals of the client.

Ron Leach has over 25 years of experience in the science of mapping from aerial platforms, joining ESP Associates in 2020. His experience includes a wide variety of large and small-scale projects, including multi-year geospatial contracts with state and federal agencies to private sector mapping projects. Since entering the private sector, Mr. Leach has worked with a variety of technologies and has helped adapt products and workflows to the ever-changing suite of sensors available to the mapping community.

Land Movement Detection from Terrestrial Laser Scanner (LiDAR) analysis- Pamela Carolina Pesántez-Cabrera, University of Cuenca

At the beginning of 2018 a landslide was triggered in the Reina del Cisne (Cuenca - Ecuador) following the cut that was applied to a hillside for the construction of a small access road. From May to June 2018, the period of analysis of this work, the landslide has caused structural damage to several homes, deterioration of a field and the total collapse of the road that caused it. Field visits and the comparison of point clouds obtained with a terrestrial laser scanner (LiDAR) in the months of May and June 2018 have highlighted the high activity of this landslide. This article introduces the process that was performed to compare the point clouds obtained. The results show the feasibility of using a terrestrial laser scanner (LiDAR) for early detection of landslides.

Pamela Carolina Pesántez-Cabrera is a student of Civil Engineering at the University of Cuenca. Currently, I'm a researcher in Disaster Assessment, Monitoring and Management using terrestrial laser scanner (LiDAR) technology..

Artificial Intelligence combined with UAVs is set to increase drafting efficiency in AEC- Adam Kersnowski, Airworks

Artificial Intelligence is promised to increase efficiencies in many industries, and enable new business models like self-driving cars. Many of the tasks that engineers work on today won't be the same tasks they'll work on tomorrow, and artificial intelligence is expected to drive this apparent change in the profession. Companies are starting to work on various applications that automate the inspection of infrastructure through artificial intelligence, calculation of construction cost based on a few key parameters and statistical models, or propose finalized design solutions. Similar to self-driving cars, however, who some thought would already be deployed at scale today, the application of artificial intelligence doesn't automatically solve all challenges, and the technology has to be implemented in a thoughtful way. This session will cover the potential, the shortfalls, and the challenges of artificial intelligence based on the example of a feature extraction algorithm that vectorizes aerial data from UAVs or aircraft, in order to automate the CAD drafting process. While there are certain limitations, Artificial intelligence has significant potential to advance the industry in making sense of massive amounts of data.
The key findings we'll present in the session are the following:

- § Use case and demonstration for software that creates CAD drawings autonomously by extracting features of aerial images;
- How AI has proven useful in automating certain workflows, such as drafting of pavement markings, roads, utilities and topography

- AI challenges such as in identifying and drawing accurate building footprints; requiring manual analysis, and often traditional surveying tools
- How the adoption of AI will require more complex metrics of success, such as intersection over union and number of nodes as a measure for accuracy, and drafting time comparisons as a measure for efficiency, and how these metrics could look like.
- Current results that demonstrate the potential of AI to reduce survey linework drafting times by at least 50%

Keywords: artificial intelligence, AI, machine learning, image processing, data processing, big data, surveying, UAV, UAS, drones, accuracy, aerial data, photogrammetry, existing conditions, topography, modeling, Telecom,

Adam Co-founded Airworks in 2017 with David Morczinek. His roles include the development and implementation of strategic plans for UAV operations within the construction industry and the general company operations. Prior to that, Adam started a construction business in 2006, where he was the visionary for finding innovative ways to grow revenue and increase margins. After years of highly specialized work he wanted to revolutionize technology within his business. He implemented the use of UAVs in his construction company to inspect building facades, roofing components and other hard to access areas. That idea eventually led to the development of UAV acquired data for AI in the construction industry.

Detecting Erosion Vulnerability in HUC 12 Watersheds- Richard Wohler, GPI

Agricultural lands can often become susceptible to water erosion, which can lead to soil nutrient export and downstream water quality problems. By analyzing LiDAR digital earth models, soil data, land cover, precipitation data and culvert locations, a vulnerability index can be created. This index is based on areas that contribute to surface water quality, the Stream Power Index, and the Universal Soil Loss Equation (USLE). This presentation dives into GPI Geospatial's work on identifying vulnerable areas within HUC 12 watersheds with a case study from a recent project, and will give detailed insight on how GPI's team used various ArcGIS processing techniques to deliver our clients their final data.

Richard Wohler was born in Shawano, WI in 1959. He received a B.S. degree from the University of Wisconsin- Madison in 1981. His degree was in Geography with an emphasis on Cartography. He joined Air Photo Tech in Anchorage, AK as a CADD/Cartographic Technician in 1982. In 1987, he returned to WI and joined Aero-Metric, Inc. as a CADD Technician, but quickly moved into a Marketing/Sales Role within the corporation. In 2009, he transitioned into the Lead Corporate Estimator. When Aero-Metric, Inc. merged into QSI in 2014, he continued his role as Public East Estimator until 2017. He, most recently, accepted his current position with GPI Geospatial as a Business Development Associate for the Upper Midwest Region. His career skills include Geospatial Business Development, Marketing/Sales, Program Management & Estimating. His software knowledge base includes MS Word/Excel/Access, ESRI ArcGIS, Global Mapper, Mission Pro/Track Air Flight Planning.

Undergraduate Student

Land Cover Change in Monrovia, Liberia, Africa with Remotely Sensed Imagery- Samuel Zulu, University of Fayetteville State

Urbanization has been significant in Western Africa, especially in Montserrado County in Liberia. Such urbanization has caused natural habitat loss and fragmentation, resulting in the decrease of biodiversity. Therefore, mapping and quantifying changes of urbanized area as well as other land cover types, such as wetland, grassland, forested land, along the Mesurado River in the Montserrado County in Liberia would provide insights for natural habitat management and urban planning. In this research project, we generated land cover maps from Landsat imagery data (Landsat 7 and Landsat 8) in 2003 and 2015, from which quantification of changes were computed. A preliminary result showed that the Mesurado flood plain decreased significantly between 2003 and 2015.

Samuel Zulu is a current student who is passionate about creating visual interpretations of data. He is expected to graduate from the University of Fayetteville State. With a major in Geospatial Science in the Fall of 2021. Samuel believes that GIS is critical for conserving natural resources and protecting the environment. He aspires to one day address global challenges such as mitigating the size of human impact on the environment.

Comparing a performance of wetland vegetation structure using SfM and LiDAR derived point clouds- Elijah Dalton, University of North Carolina at Wilmington

Wetlands are considered one of the most productive ecosystems, but they are at a high risk of degradation from anthropogenic climate change, especially in coastal regions. The introduction of LiDAR technology and the SfM–MVS algorithms based on UAS data have extended our ability to detect, identify, and map wetlands remotely. UAS derived images provide a means to produce 3D point clouds using photogrammetric mapping. UAS mounted LiDAR sensors can provide more dense 3D point clouds that can both be used to improve wetland classification and monitoring. Point clouds derived from these methods vary in data collection methodologies and processing, therefore, a detailed comparison of a simple performance of wetland vegetation structure using these methods is necessary. In this research, point clouds produced by UAS photogrammetry and UAV-borne LiDAR data collected over multiple wetland study sites along the southeastern NC coastal region, providing for a range of wetland types from estuarine, to riverine and palustrine. We compare the estimated RMSE and CHM over four sites and report the results of statistical tests of the difference between photogrammetric- and LiDAR-derived point clouds.

Elijah Dalton is an undergraduate senior at UNC Wilmington with honors distinction from Selma, North Carolina. He is pursuing a Bachelor of Science in Environmental Science with a concentration in biological sciences, and a Bachelor of Arts in Geography with a GEOINT certification. He is currently conducting undergraduate research with the Department of Geography comparing a simple performance of wetland vegetation structure using Structure from Motion and LiDAR derived point clouds.

Graduate Student

Land Movement Detection from Terrestrial Laser Scanner (LiDAR) analysis-Pamela Carolina Pesántez-Cabrera, University of Cuenca,

At the beginning of 2018 a landslide was triggered in the Reina del Cisne (Cuenca - Ecuador) following the cut that was applied to a hillside for the construction of a small access road. From May to June 2018, the period of analysis of this work, the landslide has caused structural damage to several homes, deterioration of a field and the total collapse of the

road that caused it. Field visits and the comparison of point clouds obtained with a terrestrial laser scanner (LiDAR) in the months of May and June 2018 have highlighted the high activity of this landslide. This article introduces the process that was performed to compare the point clouds obtained. The results show the feasibility of using a terrestrial laser scanner (LiDAR) for early detection of landslides.

Pamela Carolina Pesántez-Cabrera, University of Cuenca, I'm a student of Civil Engineering at University of Cuenca. Currently, I'm a researcher in Disaster Assessment, Monitoring and Management using terrestrial laser scanner (LiDAR) technology.

The Applicability of Geospatial Techniques for River Run-off Modeling in Northern Pakistan-Rabia Munsaf Khan, State University of New York - College of Environmental Science and Forestry

Due to global warming and climate change many developing countries are facing serious threats regarding water resources and Pakistan is no exception. Therefore, it is important to monitor the glaciers and their respective catchments to understand the available water resources. Unfortunately, conventional methods are resource extensive but integrating earth observation data with hydrological models powered by GIS capability can be used to observe the effect of climate change on water resources. The current study focuses on the application of Snowmelt Runoff model + glacier (SRM+G) for simulation of daily discharge value for the North facing Astore Basin in Northern-Pakistan. The model inputs include SRTM Digital elevation Model, Rainfall estimation 2.0, Landsat 8 imagery and MODIS snow cover daily product. Data were pre-processed using R script before feeding into the model. It was observed that the overall runoff is influenced by varying temperature, precipitation and glacier melt off. The results suggest that this model can be efficiently used for modelling as the results for both calibration and validation were in acceptable range and can be used for policy making.

*Rabia Munsaf Khan, State University of New York - College of Environmental Science and Forestry, a Fulbright PhD researcher specializing in Geospatial Information Science and engineering from SUNY-ESF. I am also working as Communications Councilor Chair for ASPRS SAC. Currently, I am working as Secretary for the International Student Association at SUNY ESF. I am also the region lead for IEEEXtreme 15.0. I have worked as session manager for IGARSS 2020, won second position in "Women in Geoscience " Inspire Us photo competition and got featured in GRSS promotional video***.**

Hyperspatial UAS data and machine learning approaches for Coastal Plain wetlands delineation-Asami Minei, University of North Carolina Wilmington

Wetlands provide critical ecosystem services and are at heightened risk of degradation. There is a growing need for high resolution, spatially and temporally precise delineation of wetlands across a variety of stakeholder groups. Traditional wetland delineations are costly and time-intensive, while aerial surveys are relatively fast and relatively unobtrusive. In order to more accurately assess and predict wetland location in the Atlantic Coastal Plains, we demonstrate the utility of newly acquired UAS technology equipped with a hyperspatial LiDAR sensor. In collaboration with the NC Department of Transportation, we test the comparative accuracies of a Coastal Plain wetland prediction model fitted with UAS and airborne LiDAR terrain and multispectral data using machine learning approaches. Because LiDAR sensors aboard a UAS can measure elevation data even underneath the dense canopy cover, we hypothesize that significant identifying features of Coastal Plain wetlands will be more accurately captured by UAS-borne LiDAR. We show that the UAS hyperspatial LiDAR derivatives outperforms the airborne LiDAR data in deriving high resolution and high classification accuracy rate.

Asami Minei is currently in the last semester at University of North Carolina Wilmington, where she continues to work towards her Masters of Geosciences degree, and also heavily involved in the NCDoT wetland project. She is accepted into the research lab for Dr. Pricope and Asami to develop a Coastal Plain wetland delineation model using UAS data and machine learning.

Identifying Ecosystem Vulnerability for Nature-Based Solutions to Mitigate Coastal Flood Inundation- Greer Shivers, University of North Carolina Wilmington

Assessing the vulnerability of wetlands to potential flood exposure and vegetative responses allows management actions, such as nature-based solutions (NbS) to be enacted based on preserving wetland ecosystems and their services, specifically flood mitigation. NbS addresses societal issues by managing and restoring ecosystems that provide benefits to society and biodiversity. Changes in ecosystem dynamics are found by analyzing spatial and multispectral data to create an index of vulnerability (IoV). The IoV consists of exposure risk and sensitivity to flood events. Exposure risk consists of flood scenarios based on floodplains, sea level rise, and high tide flooding. Sensitivity consists of performing spectral indices (NDVI, NDWI, NDMI, SAVI) in a time series analyses with Landsat 8 data to provide insight into the health of vegetation and changes in moisture levels that impact ecosystem functionality. Through the NOAA Sea Grant Karl Havens Memorial South Atlantic Regional Research on Coastal Community Resilience, an IoV for Page’s Creek and Jack Smith Creek, NC is being implemented to identify optimal solutions for restoring the services of wetlands in urban coastal areas.

Greer Shivers is a second year graduate student at the University of North Carolina Wilmington in the Earth and Ocean Sciences department working towards an MS in Geoscience concentrating in Geospatial Technology. She received her Bachelor's in Environmental Science concentrating in Conservation from UNCW in May of 2020. Greer is a lifelong resident of Wilmington, NC.

Detecting Woody Plants in Dryland Regions using Data from National Ecological Observatory Network-Thomas Hutsler, University of North Carolina at Wilmington

Dryland regions are of vital importance for a significant portion of the world population, as they provide ecosystem functions and services in addition to providing land for agriculture and livestock. Since the 1800s, dryland regions have been rapidly degrading through processes such as desertification and woody plant encroachment (WPE). Therefore, it is critical to accurately determine the distribution of woody plants in dryland regions so that land management activities targeted at WPE can be implemented efficiently. We aim to develop methods to detect woody vegetation by integrating remote sensing and machine learning techniques and evaluating their efficacy for classifying woody plant cover at Santa Rita Experimental Range, where novel data has been collected by the National Ecological Observatory Network (NEON). A variety of classification models are compared using metrics such as confusion matrices and producer's/user's accuracy. Two classification schemas (binary and multi-class) are also tested to compare model performance under each schema. Software and data used are open source, when possible, to facilitate replicability and accessibility.

Thomas Hutsler, University of North Carolina at Wilmington, a graduate student at the University of North Carolina at Wilmington. After earning my BS in Ecology/Conservation Biology, I worked in southern CA and northern NV as an ecological field crew leader. During this work experience I learned first-hand about the land management issues faced by organizations in dryland regions, especially concerning woody plant encroachment and grazeland management. This inspired me to pursue a MS in Geoscience to develop approaches for monitoring woody plants.

UAVs' Application in Road Traffic Monitoring- Tewodros Gebre, North Carolina A&T State University,

These days, vehicles are one of the classes of objects in road transportation to which the research community pays particular attention. Determining the number of cars on roads or parking lots represents one of the most vital aspects of highway designs and management activities. Traffic data collection, being the basis for infrastructure and safety designs, is a crucial task that has been accomplished with different levels of technology. This essential yet laborious job has been eased with the introduction of sensors and Unmanned aerial vehicles (UAVs). The introduction of UAVs in transport engineering opens the door to maximize road safety and provides a robust tool to manage highways to optimize their utilization to the highest capacity. This work reviews state-of-the-art UAVs' applications in road transportation management and proposes a framework for performing significant traffic monitoring activities.

Tewodros Gebre, North Carolina A&T State University, Ph.D. Student; AI and Remote Sensing Application In Transport Engineering , AST Department, North Carolina A&T State University

Workshops:

Day 1

UAS – A Day in the Life- Jamey Gray, GPI

The goal of this workshop is to present a comprehensive overview of a typical real-world mapping project using a UAV. Topics to be covered included site identification and analysis, FAA Regulations, survey ground control, flight planning, data acquisition/processing, accuracy assessment using ASPRS standards, and final product delivery. Fundamental photogrammetry principles will be presented in a general sense along the way as well. Audience discussion will be encouraged to further relate these topics to real-life applications that can be applied to both public and private sector work.

Mr. Gray is currently a Senior Geospatial Manager at GPI in North Carolina. He is a PLS with over 17 years of diverse surveying experience. Jamey's current focus area involves GIS, photogrammetry, LiDAR, geodetic control surveys, and UAS operations. He is a licensed surveyor in NC, SC, & TN, a GISP, and has been a FAA Part 107 Remote Pilot since 2017.

Day 2

Workshop Panel- Certifications Where, Why, and How- what are the certifications and why should I get one.

Panel discussion Connie Krampf, WSE, Inc.; Mike Barnowski, Dewberry; Matthew Nanney, AECOM; Ravi Soneja, CMT-LiDAR- AYRES; Amy Avery-Holz, ESP and Associates; Jamey Gray, GPI

ASPRS certifications are internationally recognized as a benchmark for knowledge and understanding of the geospatial sciences. ASPRS Certification is for those in the mapping profession who want to be recognized as qualified, peer-approved mapping professionals. It is designed to separate those who are merely owners of technology from those who have an understanding of the principles of the mapping sciences. ASPRS Certified Mapping Scientists and Technologists have demonstrated mastery of the processes and methods used to produce many different mapping products and are able to make assurances of the accuracies associated with those products. Certified Mapping Scientists and Technologists understand and can quantify errors associated with the choice of equipment, acquisition conditions, and processing methods used to create the final deliverables. Simply put, ASPRS Certification assures your client that you have the experience and skills to provide the mapping services requested.

Getting a certification is a big step in any career. Often we are confused by what certifications are available and how to get them. This workshop will start with an overview of what certifications are available from ASPRS and how to determine the certification you need and be followed with a panel discussion with people who are currently in the process or have just completed the process of getting an ASPRS certification.

Connie Krampf, CP, CMS/GIS-LIS, FAA Drone Pilot, is a Project Manager-Photogrammetry at Weston & Sampson. Connie holds a MS degree in Computer Science from the University of Illinois, Springfield, and a BS degree in Civil Engineering specializing in Photogrammetry from China. Connie has been working in Photogrammetry and the GIS industry for over 27 years. Connie's professional experience includes, but is not limited to, production, management, application development and implementation, software, and hardware installation, troubleshooting, job training and new skills including Artificial Intelligence in Machine Learning/Deep Learning. Connie has worked on a great variety of projects from a few acres to statewide projects in photogrammetry, Lidar with airborne and drone platforms, and GIS. Connie volunteers for ASPRS with the scholarship award committee and provides published book reviews for the PE&RS journal.

Mike Baranowski, CMT-Lidar, GISP, is a Senior Geospatial Analyst at Dewberry. Mike holds a bachelor's degree in Geography from UNC-Chapel Hill along with an Associates degree in Geomatics/Survey Technology from Central Piedmont. Mike has been working in the Geospatial/Survey industry for over 14 years with extensive experience in both field and office work. Currently at Dewberry Mike works on all phases of aerial lidar work from acquisition, planning, calibration, production management, and quality assurance/quality control.

Matthew Nanney has over 15 years of experience in the applications of UAS remote sensing, GIS, photogrammetry, mobile data, GPS solutions, LiDAR, data analysis, statistical/geospatial analysis, surveying, and archaeology, ArcGIS Server, and enterprise database management. Matthew is a Senior UAS Instructor and has been a Part 107 FAA UAV pilot since 2016. He has served as the GIS Mobile Technology and Remote Sensing Manager at AECOM in Raleigh, NC. He oversees a group specializing in UAS remote sensing, GIS mobile data collection, terrestrial LiDAR, data visualization, and BIM to support environmental assessments and permitting activities.

Ravi Soneja is a Geospatial Services Technician and the Technical Lead for the Unmanned Airborne LiDAR program at Ayres Associates. A Certified Mapping Technologist in LiDAR through the American Society for Photogrammetry & Remote Sensing (ASPRS), Ravi has extensive experience in UAS flight planning, survey control configuration, LiDAR & imagery acquisition, LiDAR calibration, pre/post-processing, and final deliverables. In addition, Ravi is also involved in the development of solutions-based approaches for clients.

Amy Avery Holz is a Geospatial Analyst at ESP & Associates, with 22 years of industry experience. She is also the current Secretary/Treasurer for NCASPRS

Jamey Gray is currently a Senior Geospatial Manager at GPI in North Carolina. He is a PLS with over 17 years of diverse surveying experience. Jamey's current focus area involves GIS, photogrammetry, LiDAR, geodetic control surveys, and UAS operations. He is a licensed surveyor in NC, SC, & TN, a GISP, and has been a FAA Part 107 Remote Pilot since 2017.

Workshop-ASPRS Standards and Specifications- What You Need to Know- Harold Rempel, ESP Associates, Inc

Standards and specifications are what drive our ability to provide accurate information to the Remote Sensing world. They ensure that both the producers and users of data use a common set of guidelines for remote sensing projects. This workshop will cover the existing standards and

specifications that are documented by ASPRS and will highlight the industry and client-side roles in understanding and applying the standards. The workshop will conclude with an overview of best practices when producing data to, and testing against the standards along with ethical considerations for independent quality control testing.

Harold Rempel is licensed as a Surveyor Photogrammetrist in Virginia, a Professional Photogrammetrist in Oregon, an ASPRS Certified Photogrammetrist and Certified Mapping Scientist-Lidar, and a certified Geographic Information Systems Professional. Mr. Rempel began his career as an intelligence analyst in the United States Marine Corps working with multiple, remote sensing technologies on national and tactical platforms. He was trained in remote sensing analysis and photogrammetry at the Defense Mapping Agency and various Department of Defense schools during his service.

After transitioning to the private sector in 1997, Mr. Rempel started as a stereo compiler on analytical stereo plotters and point transfer devices at Fugro EarthData's North Carolina office. He was instrumental in the assessment and selection of the first softcopy systems utilized in that office. Since 1997, he has served in a variety of positions including project coordinator, project manager, production manager for work on the first North Carolina statewide LiDAR program, director of project management, and operations manager. Mr. Rempel has been the senior geospatial manager at ESP Associates' home office in Fort Mill, S.C. since 2013.