



## Sessions at a Glance

### Pre-Conference Workshops

#### GIS and Python Programming Using ArcGIS Pro and ArcPy

**Time:** 8:00 am – 4:30 pm

**Instructor:** Lucas Kaim Thelen

**Cost:** \$25

**Workshop Description:** This workshop will explain fundamentals of Python as an object-oriented programming language, and how you can use Python in ArcGIS Pro to script geoprocessing workflows for batch processing and map automation. Workshop will be presented in a format combining lectures and guided exercises.

**Intended Audience:** People who want to learn Python or use Python to automate GIS workflows.

**Tech requirements:** Participants should have some GIS experience.

**Capacity:** 20

#### Census Data for Redistricting and Planning

**Time:** 1:00 pm – 5:00 pm

**Instructor:** Jim Castagneri and Lacey Loftin

**Cost:** \$20

**Workshop Description:** In this virtual workshop, we will discuss census geography with a focus on redistricting data from the 2020 census and how it can be used for your local community. We will also discuss the wide variety of decennial and American Community Survey (ACS) data for grant writing and regional and local planning purposes.

**Intended Audience:** People who want to learn about Census data and how to use it in redistricting.

**Tech requirements:** Basic understanding of ArcGIS recommended, but not required. A bonus would be to have an idea of a project you want to work on and bring your questions. Participants may follow along virtually using their own web-connected computers.

**Capacity:** 30

### Keynote

#### Colorado 911 Update

Daryl Branson

State 911 Program Manager at Colorado Department of Regulatory Agencies

*Daryl has worked as a public safety dispatcher, a shift supervisor, and Public Safety Answering Point (PSAP) director in Missouri, Wisconsin, and New Mexico. He recently served as the executive director of the Colorado 9-1-1 Resource Center and is the current State 911 Program Manager for the Colorado Department of Regulatory Agencies, working on the Public Utilities Commission.*

## **2020 GISITR Scholarship Winner**

### **Integrating Visualizations of Spatial and Temporal Uncertainty Kate Carlson University of Colorado Boulder**

*Uncertainty is inherent within geospatial data. Quantification and communication of uncertainty is important to establish reliability and confidence in the analysis. This research focuses on attribute uncertainty present in two systems of wetlands classification and creates an effective visualization tool to aid in the analysis and communication of uncertainty present within the data. Multiple classification methods exist for wetlands, which creates ambiguity in their definition and delineation.*

*Two examples of classification systems are the Cowardin system, used by the National Wetlands Inventory, and the hydrogeomorphic (HGM) system used by researchers to assess wetland functionality. Uncertainty analysis was undertaken using confusion matrices, comparing the Cowardin and HGM classifications to identify areas and types of misclassification at multiple attribute resolutions. The first attribute resolution is coarse and identifies areas where the Cowardin and HGM classifications agree and disagree on the existence of wetlands. The second attribute resolution is finer and compares specific sub-classes (riverine, palustrine, lacustrine wetlands types) within the Cowardin and HGM systems rather than a broader binary presence or absence of wetlands. To create a visualization, the confusion matrix was transformed into a visual tool that aids in the quick determination of where to focus attention on analysis of attribute uncertainty.*

*The matrix shows misclassification at both the coarse and fine attribute resolutions. This visualization methodology can be used to assess attribute uncertainty that exists in other types of classed data such as land use and land cover.*

## **GIS Colorado**

### **Detox Your GIS Data Stacen Gross**

*Next Generation 9-1-1 or NG911 is coming to Colorado! Is the GIS data that you maintain for your agency ready to route 911 calls and determine the appropriate responders to send to the emergency? This presentation will introduce you to the NG911 requirements and the steps you can begin taking now to assess your data. Once the asses phase is complete, you will likely need to make updates and improvements to your data. Finally, we will discuss how to best maintain and manage your NG911 ready GIS data going forward.*

### **Real Time GIS: Lessons Learned from a DIY GeoEvent Implementation Arthur Smith**

*The modern world is experiencing another digital revolution: everything from cars, to stoplights, to irrigation systems are now connected to the internet. GIS is an incredibly powerful tool for analyzing and visualizing data sourced from the Internet of Things (IoT). Geospatial technology makes it possible to turn vast amounts of sensor data into understandable and actionable information. However, preparing your enterprise GIS to handle real time IoT data takes planning and creativity. This presentation will give you an idea of what it takes to implement Esri's GeoEvent Server, but will also enlighten you to the variety of ways you can accomplish your real time GIS goals without being tied to a specific vendor or product. Join me to see how we did this at PDC Energy to gain insights from the digital oilfield and make real time data available companywide via a web mapping application.*

## **Using Regional Assessments and Local Knowledge to Identify Climate Resilient Wildlands in Central Colorado**

**Alison Gallensky**

*Population pressures and a changing climate threaten Colorado's natural landscape. Devastating wildfires and decreasing herds of elk are symptoms of those threats. Fortunately, science predicts there are many places in Colorado's diverse landscape that can remain resilient in the face of these challenges.*

*Rocky Mountain Wild is a small conservation organization that works to protect biodiversity in the Colorado Region. We are collaborating with the conservation organization Wild Connections to identify resilient wildlands in Central Colorado and movement corridors between them. Our goal is to protect those areas and create a biologically healthy future for this region.*

*GIS modeling is an important component of this project. This year we combined regional modeling done by The Nature Conservancy with local data sources to prioritize wildlands and movement corridors to be protected. Input from experts with on-the-ground knowledge helps make the model more useful.*

*This presentation is a follows up on to my presentation at last year's GIS in the Rockies Conference. I am enthusiastic to share the progress we have made this year and to talk about the next steps in this ongoing effort.*

## **Builder vs Builder: What You Need to Know About ArcGIS Experience**

**Malaika Penn**

*ArcGIS Experience Builder is a new option for generating content quickly for geospatially driven websites. Join Malaika Penn as she explores the strengths (and differences) between custom WebApp Builder options and the New ArcGIS Experience Builder, including a technical demo highlighting the differences. GIS managers and analysts alike will want to check out this talk for takeaways and advice on the best way to make the transition to ArcGIS Experience Builder and when to make the move.*

## **No Frills - Start to Use Lidar Data in Practical Applications**

**Nick Viau**

*In this presentation, I will show you just how easy it is to actually get off the ground with lidar data. This will be a live demo of an actual workflow that can be used to turn raw lidar data into powerful decision-making information. You will see the full workflow from data download to final map products in a fast-paced hour of 3D fun!*

## **PLSC**

### **Quest to Find Hayden's 1873 Denver Baseline**

**Patrick McGranaghan**

*Hayden's survey and triangulation of Colorado territories in the 1870's established a legacy for mapping the state. In this talk Patrick McGranaghan will discuss the events of this survey. Patrick will report on research in finding the present day location of the Denver baseline. This baseline was the foundation for the triangulation network that would map 700,000 square miles of Colorado. Along the way he will talk about projections, datums, historical plats and maps, the haversine formula and statistical analysis. This is a deeply researched quest that called on many geospatial disciplines. Join Patrick in the quest to find the Denver baseline.*

## **Modernizing the National Spatial Reference System**

**Brian Shaw**

*The National Oceanic and Atmospheric Administration's (NOAA) National Geodetic Survey (NGS) has been providing the positioning infrastructure for the nation since 1807 when Thomas Jefferson created the Survey of the Coast. Society continues to learn more about how dynamic our world is, through improvements in technology with satellite based positioning, and other new systems of measurement that did not exist when today's National Spatial Reference System (NSRS) was developed. The world is in constant change and there is a need to track changes in our environment with faster and more accurate observations. This can be accomplished with a modernized NSRS that will provide a precise, consistent and accurate positioning infrastructure that is readily and easily accessible primarily through Global Navigation Satellite System (GNSS) observations. The NSRS will provide the spatial infrastructure for the future of self-driving cars, building information models, and improving flood plain mapping for the safety of life and property. The NSRS will be easier and more cost effective to maintain providing the ability to account for dynamic changes in positioning such as plate tectonics; subsurface ground fluid withdrawal induced subsidence -- in some places inches per year of vertical change; and other geophysical phenomena. This presentation will provide an update of how the future NSRS will improve and what can be done to prepare for this paradigm shift in positioning.*

## **PLSS Monument Database Development at Denver Water**

**Neil Wagner**

*As one of the largest landowners in Colorado, Denver Water is responsible for managing thousands of acres of property. This includes producing surveys, plats, and legal documents that are accurate to an acceptable tolerance. Operating in a Public Land Survey System (PLSS) state means that this accuracy is closely tied to field observed positions of PLSS monuments. The goal of this project was to develop a database solution that would allow for longevity of high accuracy GPS positions that could be published for an end user application at the company wide level. One of the largest challenges of this project was to streamline the process of including multiple data formats into the database. Some of these data streams included high precision GNSS data, photographic data, and additional metadata that could be used to file Colorado Department of Regulatory Agencies (DORA) monument record sheets. The workflow incorporates the Trimble Access and ArcGIS collector for Collection, Trimble Business Center for processing, and ArcGIS Online for end user applications. This development also serves as a proof of concept where we intend to incorporate all data collected by the Denver Water Survey team into a similar database structure.*

## **Overview of Colorado State Plane Coordinate System and NATRF2022**

**John Hunter**

*The transition from NAD83 to NATRF2022 is well underway. As you may already know, significant differences exist between the two. Not only is there a significant horizontal and vertical difference but the change to NATRF2022, known as the Modernization of the National Spatial Reference System of 2022, has several other changes you may not be aware of. That correct, Longitudes may look different to you and there are several implications regarding units and their respective conversions to other units. Colorado State Plane Coordinates will be completely different in the new system. We will shift from the three NAD83 zones to a NATRF2022 system containing two layers of zones; One layer being a single state-wide zone, and the other layer containing 30-40 small Low Distortion Zones (LDZ's) covering most of the state. As you might guess, there is plenty for GIS users to start considering. For example: Transforming old NAD83, or WSG84 referenced datasets to the new system, or when to start using the new system, and what resources are available to assist in those efforts?*

## **URISA**

### **Asset Management Workshop**

**Phyllis Thomas**

*Asset management fundamentals for private and public infrastructure managers. The workshop will cover current implementation strategies, best practices, and case studies.*

### **Moving Data Between GIS and Other Systems**

**Holly Coxon**

*Organizations are recognizing that while they spend a lot of money building their datasets, the data is often stored in silos. At the same time, the value of spatial data is increasingly being recognized outside of the GIS department for its ability to enable location intelligence and power business decisions.*

*This presentation will help you remain at the leading edge of your field by providing a primer on the two modern approaches to integrating data between systems: data integration and application integration. You will learn the key concepts and the advantages of each method so you can identify what's best for your organization.*

*You will walk away with a solid understanding of integration best-practices that maximize the value of your data by making it available to the people who need it.*

### **Mapping the Certified GIS Professionals (GISPs) in the U.S.**

**Dapeng Li**

*The Geographic Information Systems (GIS) Professional (GISP) certification program has enjoyed great popularity in the past few years. We employ a data-driven method to study the characteristics and spatial patterns of the members in this certification program in the United States. The results show that the majority of GISPs (97.3%) are in urban areas and about 75% of the GISPs are male. Among all the GISPs, 3,971 GISPs (43.3%) play a managerial role, while 4,983 individuals (54.5%) assume a non-administrative role. Among the GISPs with a non-administrative role, 348 GISPs (7%) fall within the GIS Developer group, 3,392 GISPs (68%) belong to the GIS Analyst group, and 1,243 GISPs (25%) play other roles. Additionally, we also analyzed the spatial patterns of the GISPs at the state level and mapped out two hotspots and two coldspots. This study can help GIS educators and practitioners develop a better understanding of the current state of this certification program and make a contribution to the development of GIS as a profession.*

### **Real-Time Spatial Insights for Crime Management**

**Vince A. Rosales**

*The City of Modesto PD has been using GIS to provide powerful map-based visualization and spatial analytics for many years. Officers in the field, investigators at HQ, and the Real Time Crime Center all use these tools. Hear about the latest capabilities strengthening these insights - new data sources, a public camera registry, and others. Using location, Modesto PD has lead the creation of a new public safety GIS consortium across our county.*

## **Risk + Resiliency: Emergency Response Planning for Water Utilities**

**Caitlyn McNabb**

*In the context of AWIA compliance and risk + resiliency emergency response planning, this presentation will cover the challenge of aging infrastructure in America and provide examples of automated solutions to this problem. By simulating pipe taken out of service, or isolated, during a water main leak or break, Sedaru Outage informs risk and emergency response planning by generating a response plan for every possible outage scenario and calculates the relative Consequence of Failure (CoF) for all pipelines in the network.*

## **ASPRS**

### **Buildings and 3D Modeling**

**Srini Dharmapuri and Jason Caldwell**

*As a century old mapping company, Sanborn has been in the front of data collection involving imagery (vertical and oblique) as well as developing meaningful product from the collected data. Creating a building dataset from imagery or Lidar has been performed for quite some time as buildings is one of the key input to the creation of impervious mapping. Sanborn has used the building information to offer a suite of 3D building products for 3D visualization, GIS applications, architectural modeling, 3D graphic design, and 3D simulators. Sanborn 3D Building products are accurate, geo-registered (x,y,z) models provided in formats ready for most 3D application tools. The five available levels (LOD01- LOD04) deliverable for Sanborn 3D buildings products display varying levels of building detail and are delivered as accurate, geo registered (x,y,z) models ready for seamless integration into most 3D application software. Sanborn will discuss about different levels of product (LoD01-LoD04) and the process involved in creating the products.*

### **Reflections on September 11, 2001 Impact on Geospatial Practitioners**

**Jeffrey Young**

*This presentation explores the profound impacts of 11 September 2001 on the geospatial community in the Rocky Mountain Regions and beyond--- Note---this may be better suited as an interactive session rather than a recorded paper.*

### **Delivering GIS Education: University of Denver's Response to COVID-19**

**Kristopher Kuzera**

*When the COVID-19 pandemic struck in the spring of 2020, universities from all over were forced to quickly pivot from a curriculum focused largely on in-person teaching to one that was exclusively virtual. With strong efforts to maintain the high quality education delivered to students, the rushed transition still led to adaptations that might only be seen as temporary fixes, given the rapid transition to online.*

*As the pandemic persists, a more permanent pedagogical approach is needed for transitioning courses that will allow the delivery of quality education to continue. Although universities are working to return some courses back to the in-person format, given social distancing and other health guidelines still in place, many institutions continue to provide courses that are largely virtual, or a hybrid of in-person and online learning.*

*This talk will examine how some of the GIS courses traditionally taught in-person at the University of*

*Denver are now being delivered, in response to new guidelines put in place in the city of Denver and throughout Colorado. We will discuss adjustments made for accommodating social distancing and safety within the classroom, strategies for engaging students not attending in-person, and measures for ensuring equitable access for all students during the current health crisis and beyond. The goal throughout this transition is to possibly rethink what the educational experience might be after COVID-19, while continuing to deliver the same GIS skills for students desired by professional organizations hiring for internships and careers upon graduation.*

### **Dominica After Maria: Assessing Changes to Benthic Habitats Ryan Shields**

*Timely and spatially accurate high-resolution data are essential for marine planning and management activities. Hurricane Maria severely altered ecosystems on several islands, including Dominica, during the 2017 hurricane season. Immediately after the hurricane, Landsat imagery was utilized for change detection on Dominica and other SIDS. However, little has been done to examine the effects of the 2017 hurricane season on the marine ecosystems. To that end, we undertook to examine changes to the marine space surrounding Dominica by comparing high resolution satellite imagery from 2019 with a high resolution object-oriented classifications derived from imagery acquired prior to the 2017 hurricane season. We found there was a net increase in the area of seagrass which may affect management of various marine issues such as the invasive seagrass, *Halophila stipulacea*. Coastal accretion and landslides were also frequently present on the coastline with some events covering small sections of reef.*

### **GIS in Government**

#### **Mapping Crashes in Boulder County Mack Johnson and Dave Watson**

*Accurately mapping crashes is an essential step for government agencies to improve the safety of drivers, cyclists, and pedestrians who use their road network. The location data for crash records vary in accuracy, from precise coordinates to crashes listed as a couple hundred feet from a mile marker. It can be a daunting task for agencies mapping their own data. Boulder County has come up with creative solutions to address the variations of data quality and accurately visualize as many records as possible. By preparing data for spatial identification and then grouping crash records based on varying location information, each group uses a specific mapping method. These methods include coordinate-based data, geocoding, identification by mile marker, linear referencing, and manual placement. We will demonstrate some of the solutions used to map crashes in Boulder County.*

#### **Sidewalk Repairs - Going from Paper to Digital Charles Osterman**

*Adams County had used a paper-based workflow to collect information about the locations of needed repairs for the annual sidewalk and concrete replacement program for many years. Moving this data collection to Survey 123 and the asset management system has reduced errors, saved staff time, and reduced costs. We will discuss the advantages we found with Survey 123, how it works with the asset management system, and how the project improved collaboration between employees while reducing costly mistakes due to miscommunications inherent in the old workflow.*

## **Update on DRCOG's Regional Data Projects**

### **Ashley Summers**

*The Denver Regional Council of Governments facilitates regional acquisition projects for foundational data such as imagery, lidar, planimetric features, and land cover. With our projects, we aim to create value for the whole community by acquiring products that support a wide variety of users and use cases and by freely distributing data. During this presentation, we will provide an update of projects in progress and explain how to get involved with upcoming projects.*

### **Automation Of Spatial Data Validation: NHDPlusHR, NGTOC, USGS**

#### **Greg Cocks**

*The National Hydrography Dataset (NHD) represents the surface water drainage network of the United States with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gauges. The NHD High Resolution, along with the Watershed Boundary Dataset (WBD) and 3D Elevation Program (3DEP) data, is used to create the NHDPlus High Resolution (NHDPlusHR.) The publicly available spatial data maintain the richness of the NHD complex database model, including multiple feature datasets, feature classes, event feature classes, attribute tables, relationship classes, domains, and feature-level metadata. After generation, over 220 HU4 NHD large spatial data sets across the contiguous US (and more in Alaska) need to be validated. These same 220+ data sets, as well as Alaska's, will then be refreshed and then validated on a broad 3-year cycle. As part of the creation of this inherently spatial dataset, a program of systematic and complete data validation is necessary before it is released to the public. The automation of this validation has been ongoing over the last few years and continues – incrementally replacing the manual processes that had / are being used. For the expected 60+ Python scripts (integrated into a larger process) that have been and will be written to support this validation, script speed is important in making complete data management and QA/QC across these large datasets feasible – so numpy, pandas and (likely) soon geopandas & (scripted) network tracing are / will be utilized to support this automation.*

### **National Trail Networks, the US Geological Survey's National Digital Trails Project**

#### **Tatyana DiMascio and Elizabeth McCartney**

*A major component of the Department of Interior's (DOI) vision is to "Increase access to outdoor recreation opportunities for all Americans so that our people can be healthier, more fully enjoy the wonderful features of their federal lands, and take advantage of hunting, fishing, and other outdoor recreation pursuits that are the roots of the conservation movement." In support of DOI, the US Geological Survey (USGS) has been advancing this vision via the National Digital Trails Network (NDT) project over the last two years. One of the project goals is to build a robust nationwide geospatial trails dataset including, at a minimum, trails from key Federal agencies including the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, and the Bureau of Land Management. This presentation will cover how USGS has been integrating trails data nationwide and its vision for future trail data collection.*

### **National Digital Trails – Expanding Recreation Opportunities**

#### **Greg Matthews and Elizabeth McCartney**

*The purpose of the National Digital Trails Network (NDT) project is to support the Department of Interior priority to increase access and expand recreational opportunities on the Nation's public lands by connecting trail systems.*

## **GIS and Resources**

### **Converting Symbology from Esri ArcGIS to Adobe Illustrator**

Brendan Berve

*Since 2009, when the U.S. Geological Survey began producing the digital US Topo series, staff have designed custom vector symbology in Esri ArcGIS software. Because all map production was done within ArcGIS, this was efficient and ensured that symbology could be shared without file conversion and resulting degradation. However, the design tools in ArcGIS are limited. Adobe Illustrator provides almost complete control over the design and manipulation of vector objects. A graphic design background is not necessary to transition from ArcGIS to Illustrator; Adobe's detailed tutorials suffice. This presentation outlines the short process of converting existing ArcMap symbology to Adobe Illustrator-based symbology and demonstrates some benefits of designing symbology natively within Illustrator.*

## **Posters**

### **Measuring Height Characteristics of Sagebrush Using Imagery Derived from Small Unmanned Aerial Systems**

Ryan Howell, Student Story Map

*In situ measurements of sagebrush have traditionally been expensive and time consuming. Currently, improvements in small Unmanned Aerial Systems (sUAS) technology can be used to quantify sagebrush morphology and community structure with high-resolution imagery on western rangelands, especially in sensitive habitat of the Greater sage-grouse (*Centrocercus urophasianus*). The emergence of photogrammetry algorithms to generate 3D point clouds from true color imagery can potentially increase the efficiency and accuracy of measuring shrub height in sage-grouse habitat. Our objective was to determine optimal parameters for measuring sagebrush height including flight altitude, single- vs. double- pass, and continuous vs. pause features. We acquired imagery using a DJI Mavic Pro 2 multi-rotor Unmanned Aerial Vehicle (UAV) equipped with an RGB camera, flown at 30.5, 45, 75, and 120 m and implementing single-pass and double-pass methods, using continuous flight and paused flight for each photo method. We generated a Digital Surface Model (DSM) from which we derived plant height, and then performed an accuracy assessment using on the ground measurements taken at the time of flight. We found high correlation between field measured heights and estimated heights, with a mean difference of approximately 10 cm ( $SE = 0.4$  cm) and little variability in accuracy between flights with different heights and other parameters after statistical correction using linear regression. We conclude that higher altitude flights using a single-pass method are optimal to measure sagebrush height due to lower requirements in data storage and processing time.*

### **Adco To Go Open Restaurants Web App**

Charles Osterman, Professional Web Mapping Application

*Adams County partnered with local municipalities during the shutdown due to COVID-19 to create the Adco To Go campaign, which features restaurants that are open for delivery or pickup throughout the county. The local municipalities provided information about restaurants open in their cities, which we supplemented with existing data about business locations that the county already had. To capture as many open restaurants as possible, we proceeded to verify the open/closed status of all the restaurants we had data for by calling and/or checking their websites. Next, we created a web app that makes it easy for the user to enter their address and see what open restaurants are near them. To keep the map up-to-date, we created a simple form in Survey 123 for restaurant owners to request their restaurant be*

*added to the map or to change their open/closed status, and placed a link on the splash screen of the map. When a new survey is submitted, a webhook to Outlook notifies the appropriate staff to verify and approve the request.*

### **US Topo Symbology 2020 Updates**

**Brendan Berve, Professional Traditional Poster**

*The U.S. Geological Survey (USGS) digital US Topo series continues to evolve requiring changes in symbology. As new features are added, new symbol design is needed, and modernization of existing symbology is important to keep pace with cartographic trends. These changes range from a slight adjustment to a complete symbol redesign. Updating symbology and adding new features requires multiple revisions, cooperation between teams, and occasionally cooperation between agencies. The goal is to enhance the digital US Topo series with clear, distinct, and intuitive symbology for our users. This poster details symbology changes that occurred in 2020.*

### **Bridging the Pedestrian Data Gap: Planimetric Data and Urban Sidewalks**

**Nicholas Coppola and Wesley Marshall, Student Traditional Poster**

*Sidewalks are a fundamental yet under-researched topic in transportation, as most of the existing literature tends to focus on a single city or relatively small areas due to a general lack of comprehensive sidewalk data. With recent advances in remote sensing technology, however, this is beginning to change. This paper analyzes city sidewalk characteristics (availability, width, and land coverage) derived from planimetric spatial data. This investigation includes comparing over 400,000 sidewalk segments from 24 United States (U.S.) cities against sidewalk requirements from the Americans with Disabilities Act (ADA) and U.S. Access Board, as well as recommendations from the Federal Highway Administration, American Association of State Highway and Transportation Officials, National Association of City Transportation Officials, and Institute of Transportation Engineers. We then seek to understand the provision of sidewalks with respect to city-level sidewalk maintenance policies and socio-demographic/socio-economic factors. The results suggest an overall deficiency of sidewalks. The 24 cities averaged 47.5% sidewalk availability, which equates to 0.95 sidewalk miles (1.53 km) for every 2 miles of roadway (3.22 km). Regarding width, more than 10% of existing sidewalks failed to meet the 3-feet (.91m) minimum ADA requirement, and almost 40% of existing sidewalks were less than 4-feet wide (1.22m), as recommended by the U.S. Access Board. In terms of city differences, newer cities tended to provide less sidewalk availability. The results also suggest racial disparities regarding both sidewalk availability and width.*

## **Sponsor Hour**

### **Preparing Students for Careers in Geospatial Sciences**

**Ken Driese, WyGISC**

*As geospatial science becomes increasingly important in fields as diverse as business, engineering, science, and the humanities, preparing students for successful careers requires multidisciplinary programs combining fundamental theory with hands-on experience. At the same time, students in a changing economy, often with work and family obligations, need flexible programs to accommodate their diverse circumstances and schedules. In response to this challenge, distance-learning approaches for training students in geospatial science are an important part of the geospatial education puzzle, and online professional degrees and certificates are playing a key role. Students earning these online*

*credentials are becoming a growing part of the geospatial workforce, a trend that is likely to accelerate in the years to come.*

## **What's New? Remote Sensing Innovations and Applications for Trees & Water**

**Jason Nyberg, Quantum Spatial**

*A look at some lidar and imagery derived innovations for forestry/vegetation and water resource mapping and management*

## **Improve Efficiency and Planning with High-Res Imagery**

**Chuck Dostal, Nearmap**

*What are you using to plan for the smart cities of the future? Having access to real location intelligence helps you identify areas for development, pinpoint potential problem situations, and track property assets over time and remotely. Aerial data helps better inform and guide decisions to eliminate project workflow inefficiencies, tighten project timelines, and can help save lives . In Government, the collaboration between aerial imagery and GIS data is critical—it vastly improves the quality of life for all individuals occupying a given geography.*

## **Technology Spotlight**

### **ArcGIS Enterprise, Hosted and Managed Cloud Strategies**

**Steve Mulberry, GISinc**

*Is the cloud intimidating to you? Push your fears aside for this educational session covering Hosted and Managed Cloud Strategies for ArcGIS Enterprise. GISinc will share deployment strategies, methods of security, successful examples, and even recommend some deployment tools.*

### **Got a Drone - Now What? Mapping with Your UAV**

**Jeffrey Hatzel, Blue Marble**

*The rapid emergence and proliferation of drones is having a profound impact on our lives and nowhere is this seen more clearly than in the field of mapping. Both 2D and 3D mapping projects stand to benefit from the on-demand data collection capabilities of this versatile technology. In this presentation, we will explore several map-based workflows that take advantage of UAV-collected data for visualization and analysis. Beginning the presentation, we will process overlapping drone-collected images to generate a three-dimensional reconstruction of a target area using the principles of photogrammetric analysis. The resulting 3D point cloud is the raw material upon which countless geospatial procedures are based and as an illustration of the inherent potential of this data format, we will follow a series of workflows that utilize this data. After classifying and filtering the points to isolate those representing ground, we will create Digital Terrain Model (DTM) from which we will generate vector contour lines and calculate pile volume. UAV hardware is rapidly improving even as the costs continue to drop. For those of us in the mapping industry, this technology is quickly becoming a valuable and accessible addition to our geospatial toolbox.*

## **How to Build Web App for Cemetery Management Using AGOL and Survey 123**

**Ruth McColly, FLO Analytics**

*City of Omak's cemetery management system, which relied on outdated software, paper maps, and handwritten notes, wasn't working. Although based on a GIS system, the software the City was using was no longer supported by modern computer operating systems, leaving the City to move their management system offline. Office staff had resorted to using paper maps, which made it difficult to locate information quickly and were difficult to synchronize with cemetery site records. Relying on paper records also left the system vulnerable to human error (like misreading someone's handwriting) and all the risks involved with storing important information saved on paper, like natural disasters.*

*In this presentation, we'll walk you through how to build a cemetery web app using Esri's ArcGIS Online and Survey123, using City of Omak as a case study. We'll demonstrate how the City moved a cumbersome cemetery management system to a user-friendly web map and web application, connected to Esri's Survey123 application, that allows staff to easily track and manage all grave information, from any device.*

## **Embracing the Digital Twin - Fueling Your Organization's Digital Transformation with GIS and Cityworks**

**Matt Ponder, Cityworks**

*The current situation with COVID-19 has accelerated the digital transition for many organizations. But how can we accurately represent our assets and processes in a digital format? In this presentation, Matt Ponder discusses how GIS and Cityworks can serve as digital twins for your organization's workflows, and presents the benefits that can be derived from undergoing the digital transformation.*

## **Post-Disaster Mapping**

**Craig Gooding and Tyler Kaebisch, Ayres Associates**

*Fires, floods, hurricanes, tornadoes, droughts, and other natural disasters can change the face of the land and how it can be used. Planning, budgeting, and executing recovery, mitigation, and rebuilding requires a thorough understanding of the changes that occurred. It is also necessary to study how the natural processes are acting on features across the landscape. A well-planned and customized mapping program can provide the data needed for safe and cost-effective post-disaster efforts.*

*Ayres Associates will present three mapping projects that supported post-disaster recovery work: two related to flooding and one following a tornado. The presentation will describe the nature of the information needed and what its purpose was, the challenges and processes in planning, acquiring, extracting, and delivering the data, and the benefits the clients and their citizens received from the information provided.*

## **Pedaling Towards Innovation, a.k.a Tour de GNSS**

**Phil Ponce and Nikolas Smilovsky, Bad Elf**

*The digital map has revolutionized the ease with which we use spatial data, whether it be in cars, walking, or on a bike! To keep pace, jurisdictions must further rely on GIS technology to organize and present their data. An accurate GIS helps city staff make critical decisions, not only for preventative maintenance, but especially when new construction requires the knowledge of exactly where existing infrastructure is. Satellite-based positioning systems and modern GNSS technologies provides a viable solution for managing an accurate GIS.*

*As we strive to improve our GIS data, GNSS accuracy is a critical component of making better informed decisions. Innovative solutions like BikeRAC (Rapid Asset Collection) by Engineering Mapping Solutions enable municipalities to quickly, confidently, and eco-consciously collect mass amounts of spatial data. Using novel GNSS solutions like BikeRAC, coupled with the AZGEO Data Hub, Esri ArcPro, and Collector, jurisdictions can improve their existing GIS confidently and inexpensively.*

*This presentation illustrates an ongoing project EMS is conducting at the Town of Cave Creek. Cave Creek engaged EMS to employ their BikeRAC solution to canvas their entire service area collecting centimeter-accurate GPS points. Points include hydrants, manholes, valves, meters, and any other visible features that assist in the GIS update. Especially helpful are previous Blue Stake locations. The ESRI Collector for ArcGIS facilitates the field collection, in the office, the GIS technician leverage the collected information in the update process. In a town like Cave Creek that has limited documentation on older infrastructure, this level of highly accurate information is proving invaluable in the effort to build a GIS that truly represents grounded truth.*

### **Using Vision Based AI for Better Cities and Roads**

**Justin Dantonio, Nexar**

### **Providing an Efficient and Effective Gateway to Data Governance, 1Spatial Inc.**

**Brian Soliday and Melissa Ubaldo, 1Spatial Inc.**

### **Centimeter GNSS with Laser Offsets for ArcGIS Collector**

**Tyler Gakstatter, Anatum GeoMobile Solutions LLC**

### **3D Reality Modeling for City Planning and Urban Design**

**Del Stewart, Aerometrex**

### **Getting to Know Frontier Precision**

**David Siddle, Frontier Precision**

## **Virtual Exhibit Hall**

**WyGISC**

**Quantum Spatial**

**Nearmap**

**Anatum GeoMobile Solutions LLC**

**GISinc**

**FLO Analytics**

**1Spatial Inc.**

**Cityworks**

**Blue Marble**

**Bad Elf**

**Ayres Associates**

**Nexar**

**Aerometrex**

**Frontier Precision**

## **Panels**

### **Geospatial Skills Focus Group**

*You are invited to participate in a research study [pending IRB approval] on geospatial skills! Practitioners and researchers at the Denver Regional Council of Governments (DRCOG), University of*

*Colorado Denver, and University of Denver, are convening professionals, educators, and students to discuss potential gaps in geospatial training. We want to understand how to better align the skills required in a professional setting with the skills taught in an academic setting within the geospatial industry. We will use the information collected through the focus group to develop recommendations such as what to learn, what to teach, and how to hire entry-level geospatial employees. Join us to share your thoughts and experience!*

## **GISCO**

*Your geospatial connection! GIS Colorado Strategic Planning Annual Update and Community Feedback Panel*

## **URISA**

*Networking, Professional Engagement, and Career Paths for GIS Professionals*

## **PLSC**

*As a follow up of a talk by John Hunter, PLS about the 2022 realization, datum shift and Colorado State Plane Low Distortion Projections (LDPs), please join Brian Dennis PLS (Galloway), Steve Parker PLS (NV5), Cory Sharp PLS (City of Colorado Springs) to discuss about how these changes will affect the way surveying data sets will be brought into Geodatabases in the future. As well as, what the PLSC and the Colorado Surveying community is doing to prepare and stay ahead of these big changes that will be coming.*

## **ASPRS**

*Topics include Mission, Introductions, History, Thematic Areas of Expertise and Best Practices, Consider getting involved locally and Nationally-- Becoming a member, Rocky Mountain Region, Certificate Program, Student Engagement and Scholarships, Q&A*