



Premier Geospatial Conference
of the Rocky Mountain West **2018**

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PLSC

Society: PLSC

Track Chair: TBD

PLSC is dedicated to the improvement of land surveying education and practice. This half day track focuses on the basics of coordinate systems (knowledge essential to GIS) as well as the application of surveying in GIS and latest developments from the National Geodetic Survey. We encourage anyone doing geospatial work to attend.

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ASPRS: Big Data

Society: ASPRS – Rocky Mountain Region

Track Chair: TBD

Organizations from across industries are undertaking more projects supported by big data. As technology evolves, “big data” is becoming an ever-present challenge. These projects represent some of the most exciting things happening in GIScience today. This track will highlight emerging workflows that allow GIS professionals to analyze large datasets that support decision making and project goals.

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RMURISA

GIS: A Medium for Local and Regional Development

Society: Rocky Mountain URISA

Track Chair: TBD

A forum to share your success in using GIS for local and regional development in communicating concepts, plans and ideas to enhance prosperity, promote well-being and improve living standards.

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GISCO: Your Geospatial Connection

Society: GIS Colorado

Track Chair: Pete Magee

This track will present proposed and/or completed GIS projects that have fostered a collaborative working relationship between government departments and between government agencies. This can include anything from communication and workflows to software or applications

DRCOG's Regional Planimetric Project: A Case Study of Open Data Driving Innovation

Ashley Summers

The Denver Regional Council of Governments (DRCOG) has been facilitating an aerial photography project in our region since 2002. Funding comes from fifty partners, including local governments, public utilities, and public service providers. This collaborative partnership does two important things: it allows the group to buy expensive data that they could not afford on their own and it creates a common basemap for public entities to use for their planning and operations.

After the 2014 imagery project, the partners asked DRCOG to pursue a similar model for additional data. Specifically, they wanted planimetric features – delineations of the built environment – to be drawn from the high-resolution imagery product that we were already buying. With over twenty partners, we successfully completed a project to generate very detailed building roofprints, edge of pavement, sidewalks, parking lots and more. In addition, the products – which cover over 1100 square miles of the metro area - were made available for public download.

The partners and DRCOG had use cases in mind when purchasing the datasets including asset management and bike/pedestrian planning. After making this data open, we realized that others – including public, private, and academic entities – saw potential with the data as well. Since publishing it, we've seen a proliferation of uses in everything from technology startups to 3D modeling to energy research.

This project is an example of how open data can drive entrepreneurship, innovation, collaboration, and partnership.

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GIS in Business

Track Chair:

Business Intelligence, Project Management and Asset Management

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GIS in Conservation

Track Chair: Paul Millhouser

Conservation encompasses the preservation, protection, and restoration of natural and cultural resources. GIS mapping and analysis has a long history in this field, helping to identify areas with high biodiversity and/or cultural significance, identifying threats, supporting conservation decisions, and making complex issues easier to understand. GIS is used by government, corporate, and non-profit organizations, here in Colorado, nationwide and around the world to protect our history and our planet for ourselves and generations to come.

GIS in Emergency Management

Track Chair: TBD

Denver Street Trees and Road Safety: A Geographic Information Systems Analysis

Nicholas Coppola

At the time this research was conducted, according to the National Highway Traffic Safety Administration (NHTSA) the United States had seen a 7.2% increase in traffic fatalities from 2014 to 2015 which was the largest increase seen in 5-decades. More recent reports from the NHTSA show that in 2016 there was an increase of 5.6% from 2015.

According to the National Association of City Transportation Officials (NACTO) Urban Street Design Guide, vehicle speed is a critical element in "cause and severity of crashes" and street trees are considered a speed reduction mechanism. The implication behind this statement is that street trees can be used as a mitigation element in roadway design to assist in increasing traffic safety.

With the use of geographic information systems (GIS) software, tree canopy spatial data was evaluated with 10 sets of previously grouped streets that include segment types: light, moderate, heavy, and arterial. This presentation will show what correlation(s) were discovered between tree canopy coverage and traffic safety at select street intersections and corridors based on research conducted in 2016. More specifically, tree canopy coverage will be analyzed with crash rates, vehicle speeds, total number of crashes and crash severity.

Topics will include spatial data details, methodology for data collection, creation, and analysis, and overall results.

GIS in Recreation

Track Chair: Greg Matthews

Adding Value to "Colorado the Beautiful" Initiative - Aerial Mapping and Data Collection

Michael Carr

The main point of this abstract is increasing the value of the current Colorado the Beautiful Initiative through additional data points gathered by mapping the trail systems with the use of unmanned aerial systems and 3rd party software to build the additional data points to be included in the current mapped environment.

I have used Unmanned Aerial Systems and 3rd Party Mapping Software Companies (DroneDeploy, Precision Hawk, Pix4D, and DroneMapper) to build sample data to support my work

I have been able to create sample maps, photos, video of certain trail sections to show how additional data sets can be included to increase the value of the initiative for both the public and government sectors

With the data I have collected, I can discuss several points of interest with the conference. I can show how the data can be utilized to benefit the public sector: Safety, knowledge, and planning and the

government sector: trail maintenance, anticipating future problems- heavy traffic areas or lost hikers, plant health - fire danger and erosion, and intersection of multiple agency and private land area issues.

The Latest Trail Technology - Crowdsourcing, Maps, and Apps

Nate Irwin and Ryan Branciforte

Americans are increasingly recognizing the health, quality of life, environmental, and economic benefits that trails and active transportation offer. As a result, now more than ever it's important to connect people to our trails, improve the planning of new trails, and better understand how visitors use trails.

For this session, we'll explore what role technology plays in how people engage with trails. How can land managers utilize technology to publish better information to their visitors and also understand who's engaging with their recreational infrastructure? Learn how to reach and understand new audiences, using everything from apps that get people outdoors to crowdsourced data.

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GIS in Education

Track Chair:

Car Racing with Collector

Elizabeth Tulanowski

GIS educators often don't get the opportunity to work on "real" research projects or gain day-to-day experience with geospatial technology. In order to stay on top of an ever-changing industry, sometimes they have to get creative. In this instructional, and hopefully entertaining demonstration, presenter Elizabeth Tulanowski will show how Collector for ArcGIS was used to capture her path around a racetrack, and how the data was processed to calculate lap time and speed. Data setup including schema design, and accuracy considerations will also be discussed.

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GIS in Development

Track Chair: Guthrie Alexander

This track will offer the opportunity to see several projects and developments highlighting the advantages and challenges using open source and developing technologies in diverse contexts and applications.

FOSS4G in the Government (Proof of Concept)

Samuel Song

A proof of concept migrating existing Veterans Affairs National Cemetery's GIS data from MS SQL Server/ArcGIS software configuration to an open source GIS platform using PostGIS/PostgreSQL, QGIS, and JavaScript in order to reduce software licensing costs and annual subscription fees. There are many misconceptions about open source software such as not being equivalent to Commercial off-

the-shelf (COTS) software or it's less secure and may include malicious code. Some GIS professionals fear a transition to open source platform dues to its complexity and many different moving parts, but it is possible to fully adopt open source platform from existing ArcGIS configuration.

Developing a National Map of Subsurface Infrastructure

Geoff Zeiss

In its 2017 Infrastructure Report Card, the American Society of Civil Engineers assigned an overall grade of D+ to U.S. infrastructure. Addressing the problem of bringing national infrastructure up to a standard where it becomes an enabler of economic expansion rather than a drag on the economy is hindered by a lack of systematic information readily available to decision makers of the inventory of infrastructure assets, their location, and condition. Geospatial data and technology are key to providing an accessible platform making it possible for decision makers to have a uniform view of national infrastructure. The economic argument for the benefits of accurate 3D maps of underground infrastructure is well-founded. The value of mapping underground infrastructure is gaining increasing attention at the national level. France has embarked on a program to map all critical underground infrastructure. The Netherlands has mandated a national database for sharing information about underground infrastructure. This presentation will focus on why the time is right for a discussion with the objective of including subsurface infrastructure in the development of a national infrastructure map

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GIS in Government

Track Chair: Muthu Sampath

USGS 3D Elevation Program

Carol Lydic

The U.S. Geological Survey (USGS) National Geospatial Program is developing the 3D Elevation Program (3DEP) to respond to growing needs for high-quality topographic data and for a wide range of other three-dimensional (3D) representations of the Nation's natural and constructed features. The primary goal of 3DEP is to systematically collect 3D elevation data in the form of high-quality light detection and ranging (lidar) data over the conterminous United States, Hawaii, and the U.S. territories, with data acquired over an 8-year period. Interferometric synthetic aperture radar (IfSAR) data will be acquired for Alaska, where cloud cover and remote locations preclude the use of lidar in much of the State. The 3DEP initiative is based on the results of the National Enhanced Elevation Assessment that documented more than 600 business uses across 34 Federal agencies, all 50 States, selected local government and Tribal offices, and private and nonprofit organizations. The presentation will include the latest updates on 3DEP.

The Role of GIS in Developing a Comprehensive Stormwater Infrastructure Master Plan to Inform an Intergovernmental Agreement

Denise Magditch and Chris Martin

The Role of GIS in Developing a Comprehensive Stormwater Infrastructure Master Plan to Inform an Intergovernmental Agreement

Publishing Bureau of Land Management Data on the Web

Jason Frels and Stacey Crowe

The Bureau of Land Management (BLM) is an agency within the US Department of the Interior that manages public land in a multiple use and sustained yield manner. The BLM publishes a growing number of datasets related to its mission and programs to the public using Voyager and ESRI Geoportal software products.

This presentation will cover the various types and scales of BLM data (e.g., state level data, landscape level data, national level data), where these data are published and discoverable, and how the Voyager and ESRI Geoportal publication nodes are tied together for a seamless user experience. We will also cover how these technologies are integrated with other interagency platforms and metadata catalogs. Lastly, we will discuss the road ahead for maintaining a data presence on the web with increasingly changing technology and the opportunities that these changes in technology provide.

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GIS Graduate Presentations

Track Chair: Kaitlyn Scott

Trail Difficulty Per Segment: A GIS Based Analysis of Hiking Trails

Lisa Dubas

The standard “easy,” “moderate,” “difficult” trail rating system is a very subjective way to rate trails and does not give potential hikers enough information to decide if the trail fits their abilities. This Capstone project sought to make trail ratings less subjective, while giving potential hikers a way to see where the more difficult segments of the hike may be, and to provide information on what makes those segments more difficult.

A multi-criteria approach to hiking trail ratings per segment was developed, which used surface and obstacle information collected on the trail using Collector for ArcGIS, with subsequent analysis in ArcMap using publicly available elevation data. Factors, which contributed to rating the trail as a series of segments, included total trail distance, altitude, trail surface, obstacles encountered, trail gradient, and elevation gain.

The process was applied to ten trails throughout Maricopa County in Arizona, which will enable potential hikers to pre-screen the trails for sections that may give them difficulty. Hikers could use this information to choose a hike more suited to their abilities or use them as a preview of what they will encounter during the hike.

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Vendor Showcase

Track Chair: David Siddle, Brian Collison

The Vendor Showcase is an opportunity for businesses to demonstrate new and existing products related to geospatial technologies and information science. Attend to learn about current or emerging technologies and techniques that could help make the job easier. This is your chance to ask questions, provide suggestions and general user feedback.

True Field GIS Synergy Using Smart Devices + Apps + Laser Rangefinders + Receivers Increasing Field Collection Productivity

Derrick Reish

*How to best leverage the data collection equipment you already own
How mapping apps are enhancing the GIS world*

BYOD (Bring Your Own Device) has been the buzz term in GIS because using smart devices to collect field data is convenient, more cost-effective and easier to connect from the field to the office. Professional data collection apps are now getting more sophisticated by integrating external sensors like GNSS/GPS receivers, laser rangefinders, cloud technology and more. This presentation discusses how you can leverage available technology without breaking the bank or sacrificing data integrity to increase your GIS productivity.

Spatial Analysis Using ArcGIS Pro

Shelby Hines and David Vaillancourt

Learn essential concepts for using ArcGIS Pro to explore, analyze, and produce reliable information from your data. Topics include planning and preparing for spatial analysis, automating workflows, and exploring a variety of tools for proximity, overlay, space time, and 3D analysis.

AdventureSafely® - a New Technology for Saving the Lives of Outdoor Recreationalists

David Thomas

At AdventureSafely, LLC, we are developing mobile app technology intended to save the lives of hikers, mountain bikers, and others who venture off into remote areas where there is little or no cell coverage. How can your cell phone help you if you are in an area where there is no cell coverage? There are two different ways that our technology can help a person if there is no cell coverage. Attend this talk to learn about our unique strategies for speeding search and rescue efforts in such remote areas.

GRASS GIS: Striking Terrain Visualizations in the Rockies

Robert Dzur

For 33 years GRASS GIS has offered open source tools for geospatial analysis, visualization, and processing. With its roots in raster analysis, GRASS GIS has always provided a wide array of robust classic terrain analysis tools such as slope, aspect and shaded relief imagery. Recently contributed GRASS Add-on programs such as r.skyview extend GRASS's already highly capable terrain visualization capabilities. This module calculates the sky view factor (SKF; Zaksek et al., 2011) of the surrounding terrain at a given location with terrain shading based on the amount of sky visible at that location. The module is capable of multi-directional analysis resulting in striking terrain visualizations that enhance the definition of subtle terrain features and highlight from light to dark the degree to which the terrain is open to the surrounding landscape. Although this module is computationally expensive, its results offer the potential to improve error detection in LiDAR DEM production as well as serve as inputs to slope based sustainable land and zoning code development. This presentation will demonstrate the functionality of r.skyview through a tour of LiDAR-derived terrain visualization in areas from Ft. Collins, Colorado to the Southern Rockies Organ Mountains of Las Cruces, New Mexico.

Using ArcGIS Pro to Deploy Local Government Solutions

Shelby Hines

Many ArcGIS solutions can be quickly deployed to your ArcGIS Online or Portal for ArcGIS organization with the ArcGIS Solutions Deployment Tool. Learn how to deploy, configure, and load your data into these app configurations to support daily workflows in land records, public works, public safety and more.

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Poster Session

Track Chair: Doug Haller and Jake Fritz

The Poster Session is a great way to visually present current or past projects and/or cartographic productions without having to sign up for a full presentation in a designated room. Poster topics range all across the board on subject matter and are a great visual tool to present projects and maps.

2016 Quarterly Volume Weighted Average API Gravity by County, State of Wyoming

Joel Murray and Jason Boroos

The American Petroleum Institute (API) gravity is one of the key characteristics essential to defining the quality of crude oil. This poster explores quarterly volume weighted average fluctuations in API gravity for counties in the state of Wyoming.

Trends of Suburban Poverty Based on Walkability: A GIS Analysis of Minneapolis Suburbs

Rachel Pierstroff

Single-use zoning and car dependency are critical components of the disapproval of American suburbs because these aspects contribute to poor urban conditions for walking to key destinations. As suburbs become increasingly impoverished—both as poor households move to the suburbs and existing residents drop below the poverty line—the ability for low-income residents to access important destinations via non-car transportation becomes increasingly important. Two tools for modeling walkability in ESRI's ArcMap software were developed using the clientele of a nonprofit human services organization in suburban Minneapolis. The results are expected to show the limited ability of suburban residents to walk along road or trail networks to essential daily destinations, such as schools, grocery stores, and transit stops. With this new information, the organization will better understand the geographic characteristics of their clients, and be better equipped to plan services based on local infrastructure and client locations.

Utilizing Geospatial Modeling Techniques for Trend and Prediction Patterns on Eolian and Erosion Sediment Deposits

Jim Sanovia

This project integrates research objectives, sample collection, and evaluation of erosional and aeolian transport trends using laboratory and geospatial analysis. Site location is at Slim Buttes in Harding County, South Dakota and consists of several of the approximately 34 abandoned open-pit uranium mines in the county. Most of the mines are on U.S. Forest Service land and have received no capping or other remediation efforts for the past 50 years. More recently, US-EPA CERCLA funds and a \$179

million settlement have provided funding for the investigation and clean-up of these mine sites. Past studies have indicated the presence of heavy metals and other elements such as arsenic, uranium, radium, and thorium at various locations. Geospatial analysis of trends and predictions from all sites will provide a better understanding of these transport patterns. Field sample sites were analyzed for the presence of heavy metals and mean grain size. Samples were then sieved to separate fine to very-fine soil fraction to determine the percentage of material that could be subjected to aeolian transport in the study area. Directionality components of ambient and bulk sampling were analyzed geospatially using ESRI ArcGIS 10.5. This paper answers two important questions. First, do radionuclide concentrations tend to decrease moving away from the mine sites. The second, do the mean grain size have a directional pattern of the northwest to southeast lining up with regional wind trends.

Modeling Hydrologic Parameters in High Plains Aquifer Units Using GIS and a Convolutional Neural Network

Lilly Jones

The Ogallala and Arikaree units of the High Plains Aquifer consist of a heterogeneous sequence of silts, sands, clays, and gravels and comprise the northernmost extent of the High Plains Aquifer. The hydrogeologic complexity and variability of these units make it difficult to estimate hydrologic parameters for these units. For locations without monitoring wells, these values have been derived in the past through regression equations or by building process-based models.

Artificial intelligence and deep learning are emerging areas of inquiry in the hydrological sciences. Artificial neural networks (ANNs) consist of interconnected nodes of computational units that can be used to model complex, non-linear relationships between inputs and outputs. ANNs can be used to predict missing values in sparse datasets. Once trained, ANNs can be used for predictive analytics.

A geodatabase was built to integrate data from the several entities that manage these aquifer units. Site-specific contaminant and water quality data are being integrated into the geodatabase so that analysis can be performed. A convolutional neural network (CNN) will be constructed using published data as a baseline for training. Model calibration can be completed by withholding 20% of the data during the training phase, and then comparing CNN predicted hydrologic values against field-measured hydrologic values. The CNN can then be used to model hydrologic parameters and assess aquifer vulnerability for these High Plains Aquifer units.

Geodesign Applied to an Urban Campus and Its River Reach: Colorado College and Monument Creek

David Sachs and Will Rundquist

Situated in the historic downtown area of Colorado Springs, the Colorado College campus lies along Monument Creek, within the Fountain Creek watershed. Until 1935, Monument Creek was a healthy riparian system bordered by homes, park land, and campus and the historic downtown of Colorado Springs. Colorado College's campus landscape included the creek and its floodplain, but that connection was lost as flood control measures were put in place, water quality diminished, and urban infrastructure (stormwater conduits, streets, rail line, and utilities) encroached.

Using Colorado College and immediate surroundings as a study region, we use ArcGIS and Geodesign principles to 1) map historical and present-day infrastructure, 2) assemble hydrological, environmental, and land use data, and 3) identify prospective area for interventions that may enhance water quality and restore riparian ecology, and 4) design campus landscape elements that promote a healthy hydrological system for Monument Creek. Esri CityEngine software is used for creation/visualization of 3D models to be used for community input and dialog and to acquaint campus and city planners/decisionmakers with well-researched designs that, if implemented, promise to enhance the urban environment. Our undergraduate team and study project is a component of "Changing our Global Infrastructure," an international academic collaboration. Collaborating schools provide Geodesign

training through investigation of local/regional problems, develop and share science-based, data-rich landscape and urban designs that function with rather than negatively impact earth surface processes and habitats, developing a capability for rapid response to the current and future impacts of rapid global change.

Identifying Additional Land Suitable for Food Production on the Pine Ridge Indian Reservation

Amanda Ruiz

Food Sovereignty is based upon the ability to have food security and be self-sufficient. Whether it is a Nation, an Indigenous tribe, or a community. Creating foods, made readily available to the Oglala Lakota people on the Pine Ridge Indian Reservation will embrace cultural awareness of foods as medicine, restore a healthy balance to individual lifestyle, strengthen food security, and create sustainability on the Pine Ridge Indian Reservation by identifying land suitable for food production. The objective of this project is to identify additional land suitable for potential food production on the Pine Ridge Indian Reservation. This project looked at Landsat 7/8 National Land Cover Data (NLCD) datasets to identify how it had its land datasets classified. Further reclassifying and geoprocessing steps were taken to identify additional agriculture lands and for potential sites. The result of this project shows where potential additional lands could be used for agricultural use.

Monitoring Crop Growth Variations in a Wyoming Field using Growing Season Satellite Data

Anna Savage and Ramesh Sivanpillai

Farmers aim to minimize variation in crop growth and maximize output. Field with uniform crop allows for more effective harvesting and achieve consistent output quality. Identifying variations in growth is often conducted through scouting, which requires lot of time and resources. Also farmers might not be able to scout their fields multiple times within the same growing season. Remotely sensed images acquired from satellites could be a viable option for obtaining variations in crop growth. These satellites collect imagery in the visible and invisible regions of the electromagnetic spectrum at preset intervals which can be used for monitoring crop growth conditions throughout the growing season. In this study, we obtained 4 satellite images in the 2017 growing season for a field in Southeast Wyoming and derived estimated crop growth with a commonly used vegetation index. Our results indicate that satellite images were able to identify significant ($p < 0.01$) variations in crop growth throughout the growing season. These findings will be useful for the farmer to identify the sources of variations due to underlying factors such as soil, topography and moisture.

NHDPlus High Resolution

Ariel Doumbouya

NHDPlus High Resolution (NHDPlusHR) is an integrated geospatial data product which incorporates the National Hydrography Dataset (NHD), 3D Elevation Program (3DEP) data and the Watershed Boundary Dataset (WBD). NHDPlusHR is currently being produced and distributed by the US Geological Survey (USGS) National Geospatial Technical Operations Center (NGTOC). NHDPlus High Resolution data provides all of the NHDPlus Version 2 attributes such as natural flow estimates, flow adjustments for diversions, stream order and much more while providing the additional detail of the current High Resolution NHD and 1/3 arc-second seamless digital elevation models.

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