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The MapLegend

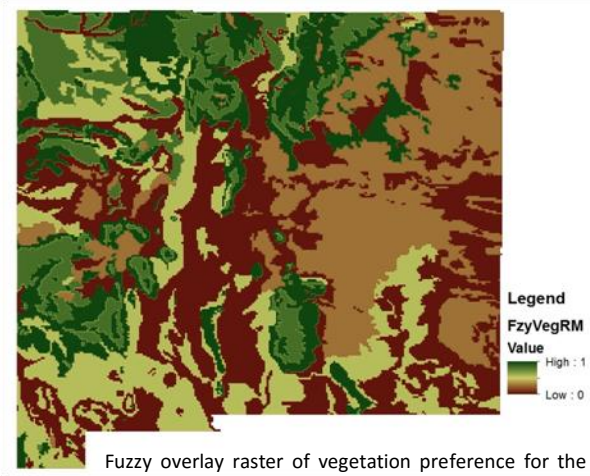
Bighorn Sheep Reintroduction in New Mexico

Danial Beene

Bighorn sheep are an important species of wild sheep in North America. Historically, they have inhabited large swaths of the Rocky Mountains from the Peace River in Canada down to Mexico, and much of the American southwest. Their numbers, however, has been reduced to nearly one-tenth their population prior to European exploration of the west. By 1900, the species faced imminent extinction, with their population dwindling to mere thousands nationwide. Since that period, there have been various remediation efforts to sustain the population, including conservation movements, national parks, reintroduction, and controlled hunting practices. One subspecies, Ovis canadensis auduboni, has gone extinct.

In New Mexico, there are two subspecies of bighorn sheep: Rocky Mountain (Ovis canadensis canadensis) and Mexican desert (Ovis canadensis Mexicana). The former inhabits remote mountain regions throughout the north-central and eastern portion of the state, and the latter occupies drier and more open terrain in the south-central and southwest. Known grazing ranges of bighorn sheep in the state are sparse and rather diminutive.

Though the population of the sheep is considerably smaller than historical averages, the conservation status of the species is currently at least concern. Despite the status, there are active and successful reintroduction measures of the sheep in the southwest – most notably the Catalina bighorn restoration in the Santa Catalina Mountains outside of Tucson, AZ. Concerns of reintroduction are numerous, ranging from habitat suitability to disease and predation. Through the use of a GIS, habitat and disease can be geospatially visualized. Predation is more difficult to predict meaningfully – the current reintroduction in the Santa Catalina mountains tracks predatory events and has noticed a steep decline in them as the sheep have begun naturalize to their new habitat.



Fuzzy overlay raster of vegetation preference for the Rocky Mountain sheep.

There are two distinct seasonal habitats observed for bighorn sheep typified by the winter/spring range and the summer/fall range. Bighorns tend to occupy the winter/spring

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The Map Legend

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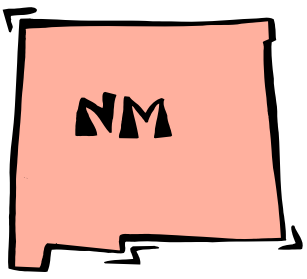

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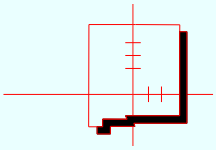

2016 GIS Calendar of Events

ESRI International UC, June 27– July 1, **San Diego, California**

UAS Mapping Sept 12-14 in **Palm Springs, Ca**

NSGIC Oct 24-28th in **Indianapolis, Ind.**

NM Data Users Conference November 10th in Albuquerque NM.

National Tribal GIS Conference November 14-18 in Albuquerque NM.

GIS DAY November 16th **Everywhere!**

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Message From The President—Laura Gleasner

I would like to say congratulations and thanks to all the NMGIC award winners! They are all very deserving! Whether it was for one of our NMGIC meetings or for the Southwest User's Group Meeting (SWUG) Rick Koehler, Shirley Baros, Jason Fink, and Leland Pierce can always be counted on to jump in with ideas and service!

Since 1984, NMGIC members have given their time and energy to bring geospatial technology and application news to the GIS community. Countless hours have been given to develop meeting themes, line up speakers, plan lunch and let's not forget finding door prizes! Many hours have been given toward GIS education – not only for the students who will be joining the geospatial workforce, but to current staff who need to keep up with the changing technology. Thank you to all the members who volunteer with the set-up for the meetings and workshops. Many of you are willing to step in when there are gaps in our meeting agenda. You are all greatly appreciated!!!

NMGIC offers a scholarship worth up to $1000 to students working on GIT programs!!!

See *http://nmgic.com*

Good Bye GeCo/SWUG

We regret to inform the NMGIC Members of the passing of GeCo (**Ge**oSpatial **Co**nference of the West) – formerly known as SWUG and SWAIUG.

The first SWAIUG (SW Arc/Info User Group) Conference was held in Albuquerque in October, 1986. The goal was to stimulate and share ideas toward the efficient use of automated geographic information system (GIS) technology. In 1992 it was renamed SWUG (SW User Group). Five states – New Mexico, Wyoming, Colorado, Utah, and Arizona – took turns hosting the event. The last SWUG conference was held in New Mexico October 2012.

In 2013, the five states agreed to change the name to GeCo due to the confusion with ESRI's Southwest User Conference (SWUC). Wyoming hosted the first GeCo conference, followed by Colorado, and Utah. Arizona was scheduled to host the conference for 2016 with New Mexico scheduled for next year.

SWUG/GeCo was a great way to bring professionals from the five states together in the past, but with the reduction in available travel funds and the amount of work involved in hosting joint conferences it became too burdensome. All five states voted to let SWUG die a natural death. Utah was the last state to host GeCo in May 2015.

Hopefully there will be opportunities in the future to bring all five states together again.

Do you have information about a project, new techniques, GIS and related issues, announcements, news, etc. that you would like published in the Map Legend?

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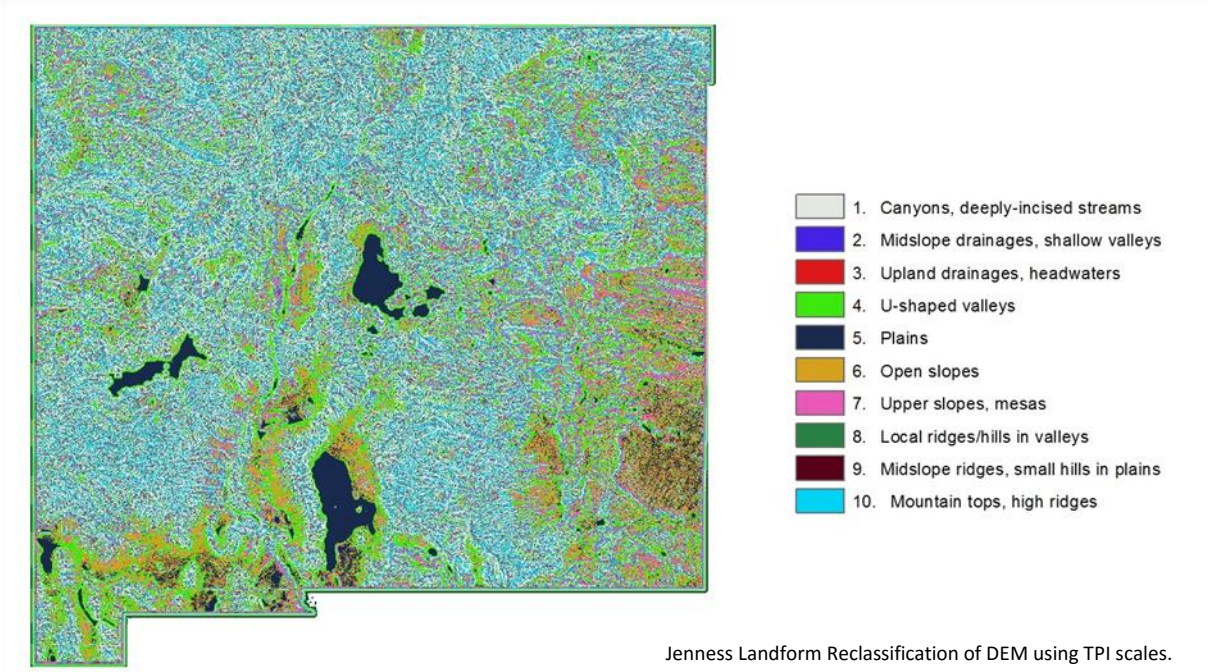
habitat for longer periods of the year and the transition to a new habitat is onset by local greenups along streambanks. The main factors for a tenable habitat are forage, escape terrain, water, and human avoidance. This GIS maps the potential habitat of each subspecies of bighorns in the state as an indicator of potential reintroduction zones. Further, the risk of disease transmission is mapped and considered with these reintroduction areas.

Forage is typified by preferred plant species and mineral deposits, as sheep will gravitate toward natural salt licks for nourishment. Plant data was compiled from the UNM RGIS General Vegetation Dataset and a tailored dataset of Kuchler plant associations statewide. Selections of plant species were made and reclassified preferentially based on documented observations for each subspecies of bighorn sheep. The selections were reclassified to values ranging from one to four and further reclassified using fuzzy logic so that the points with the highest values combined were assigned a number approaching one with the lowest values approaching zero. The final output of all analyses in the project were combined into one fuzzy overlay. Similarly, mineral deposits were identified from an RGIS dataset and reclassified with fuzzy membership. The forage maps for each subspecies in their respective ranges are shown below.

Preferred aspect and elevation as noted by range observation does change seasonally and was visualized in the GIS by reclassifying a 60-meter statewide digital elevation model.

Escape terrain is a key defining factor for bighorn sheep range. It is typified by rocky, precipitous terrain near steep upward slopes and extends toward rock outcroppings and bluffs with grasses. Because visibility is paramount for the sheep, they will avoid densely forested areas and prefer sparse shrub cover. Effectively depicting this facet of the habitat required the use of multiple data layers and analysis techniques.

Terrain roughness can be visualized by using the Topographic Position Index (TPI), a tool that identifies the topographic position of each pixel in a surface raster relative to its neighbor. Positive values means that a pixel is higher than its neighbor while negative values indicate that it is lower. A value of or close to zero indicate flat areas or shallow slopes. Different information about topography can be gleaned by calculating TPI at different scales, and an overlay of two different TPI scales can produce an intricate representation of terrain and classify it into multiple landforms. An Esri plugin for ArcMap created by Jeff Jenness of Jenness Enterprises classifies terrain into ten unique formations – these were reclassified and included in the final fuzzy overlay based on preferences of each subspecies.



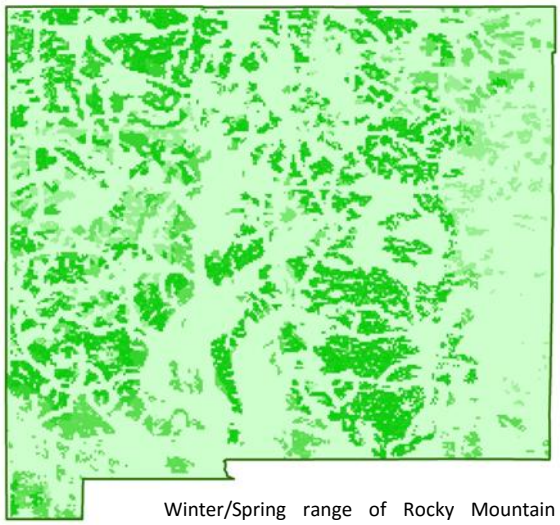
Jenness Landform Reclassification of DEM using TPI scales.

Tree density is most precisely calculated by using the stand density index, a dataset of which is available for the state of New Mexico from the NM Conservation Service. Shrub density was derived from the Kuchler plant associations, from which a mean of all associations was calculated. High density of trees and shrubs was reclassified with low values and vise-versa.

Bighorn sheep obtain water from a number of sources – intermittent streams, springs and natural seeps, ponds, dew, and catchment tanks. Dew cannot be mapped effectively in this GIS beyond the assumption that the vegetation layers will capture appropriate grasses on which dew accumulates. The remainder of water information was gathered from three sources – the RGIS Surface Water and Surface Drainage

vector dataset, the National Hydrography Dataset (NHD), and the Office of the State Engineer (OSE) 2015 wells point data. All three sources required some data management to be useful for this GIS.

Once these three datasets were managed to fit within the current GIS, they were reclassified according to multiple-ring buffers drawn based on average daily migration, with the value of three for the innermost ring down to the value of zero outside all buffer zones. A fuzzy overlay was applied to all three layers to visualize ideal water sources and their ranges within the state.



Winter/Spring range of Rocky Mountain Bighorn Sheep

While some bighorn sheep herds have adapted to human interference, disruption from human activity can be considerably detrimental to overall herd productivity and health. In general, bighorn sheep herds will tend to occupy one general geographical area throughout their lifetime (Chapman and Feldhamer, 1982), so migration can be assumed based on traits and patterns of subspecies. Creating a comprehensive map of human disturbance statewide is a lofty task, but the application of fuzzy logic can definitively isolate areas of avoidance by bighorns and assign higher values within the fuzzy membership as distances from those areas increase. Using census tract data to identify cities and towns, and highway line data statewide, multiple-ring buffers were drawn based on daily average migration of each subspecies. The final output was included in the fuzzy overlay.

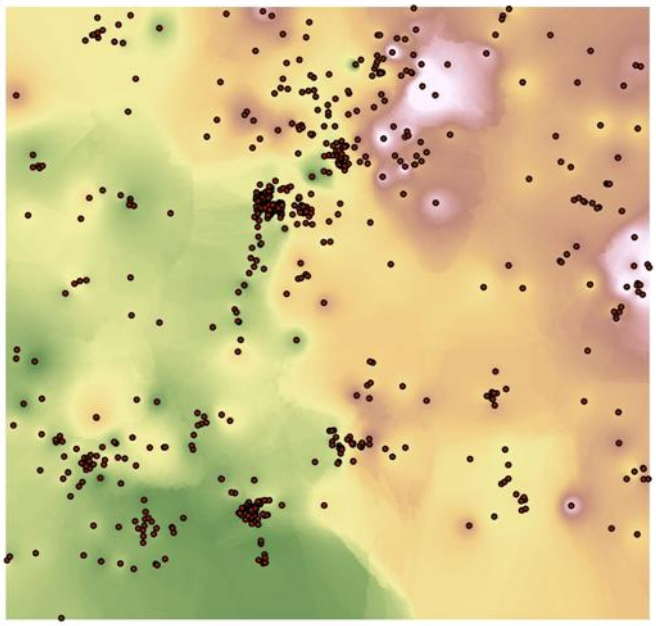
As is evidenced by the sizeable decline in population over the last century, bighorn sheep are highly susceptible to disease. Respiratory ailments are transmitted via lungworm, which causes pneumonia and bronchial infections, and are the largest contributor to herd decimation (Chapman and Feldhamer, 1982). The bacteria that cause pneumonia in bighorn sheep, most notably Mycoplasma ovipneumoniae and other bacteria in the family Pasteurellaceae, are not native to North America. Domestic sheep are significant carriers of both of these bacteria, and interspecies contamination poses the greatest risk of transmission. There is also a direct correlation between incidences of lungworm infestation and high amounts of springtime rainfall in the previous year (Chapman and Feldhamer, 1982).

The BLM manages livestock grazing allotments statewide, a vector shapefile of which is available for download from www.data.gov. Because the allotments are designated for certain species, the shapefile of all allotments was overlaid on the BLM sheep grazing map, and areas with domestic sheep were extracted into a new layer. While bighorn sheep and domestic sheep do not tend to compete for the same areas, interaction between the two species can occur during seasonal or daily migration of bighorn sheep.

It is not necessary to draw a buffer around the grazing allotments because, in theory, domestic sheep do not migrate outside of their designated areas. Using the final outputs of each seasonal habitat model, five fuzzy overlays were drawn indicating the risk of the BLM allotments on potential bighorn sheep habitats – one for each season/species, and one combined overlay. The combined overlay clearly shows target areas of avoidance for reintroduction in the southeastern portion of the state.

The National Oceanic and Atmospheric Administration (NOAA)'s National Climatic Data Center (NCDC) Climate Data Online (CDO) provides free access to global historical data of temperature, precipitation, wind and degree days. Using the CDO's search algorithm, average monthly precipitation data was accumulated for the months of March through June of 2015. The output was a robust spreadsheet listing total precipitation in hundredth of an inch (TPCP) for each station with XY location data per month on individual columns. The data required some processing before conversion to a point data shapefile.

Average TPCP per gauging station was calculated and converted into a raster coverage in ArcMap. To accurately utilize this data into a raster coverage, inverse distance weighting (IDW) was utilized. IDW is a method which determines the values of cells in a set based on sample cells, in this case TPCP at individual stations, by calculating the weight as an inverse of the distance from the sample. The final output of IDW in this GIS shows areas of heavy rainfall statewide with the most near Taos, NM (Figure 16).



IDW of 2015 springtime rain accumulation in New Mexico with point overlay.

In a model identical to the grazing allotment risk, average springtime TPCP is combined into five fuzzy overlays for a final visual representa-

tion of risk areas for disease transmission from heavy rainfall.

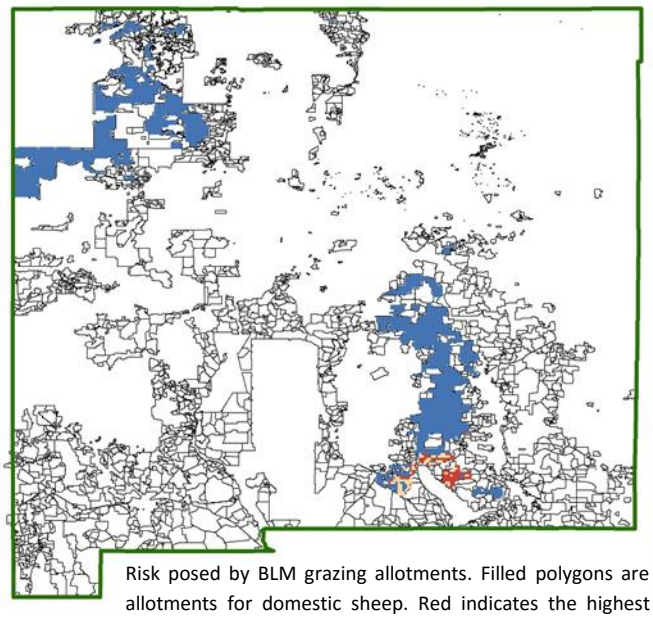
Six models were built in the completion of this GIS – one for each seasonal range of both subspecies of bighorn sheep in the state, and one each for disease transmission risk assessment of proposed relocation areas. The outputs show a wide range of potential reintroduction habitats that are best viewed individually when considering only one subspecies of bighorn sheep.

The range identified for Rocky Mountain sheep is vast – stretching in numerous small pockets across nearly every region of the state. The highest risks are found in the south central portion near the Barbary Hills BLM grazing allotment and its neighbors. There are other pockets of high risk along a majority of domestic sheep grazing areas. A possible recommendation for relocation would be to prioritize the northwestern portion of the state, albeit a tenuous region when considering precipitation.

The raster overlay of TPCP for spring 2015 indicates the heaviest rainfall in the northeastern quadrant of the state, centralized mostly in the forests around Taos. It is noteworthy, though, that the highest TPCP for the four-month span mapped is just more than 16 inches – just two inches higher than the springtime average for the region. It is uncertain whether this amount of rain will lead to an infestation.

Historically, Mexican desert bighorn sheep occupy the southern portions of New Mexico; in general the findings of this GIS were consistent with that range. As previously mentioned, the output consists of more rigidly-defined polygons than that of the Rocky Mountain sheep habitat, a result due to the indeterminate elevation preferences of desert sheep. As such, the risk associated with domestic sheep grazing produced more clearly defined key avoidance areas: Indian Draw, Cornucopia Ranch, Cauhape, Pretty Bird Hills, Long Canyon, Encino Draw, Cottontail, Deer Canyon, Texas Hill, Box Canyon, Little Box Canyon, and Dark Canyon are some of the allotments posing the greatest risk. The TPCP overlay on the Mexican desert bighorn habitats indicates that there is little to no risk associated with 2015 springtime rainfall, with the highest values measuring just shy of two inches.

It can be drawn from these results that there are indeed vast swaths of land in the state of New Mexico that are suitable for bighorn sheep insofar as observed habitat preferences. The most pervasive disease transmission risk posed to bighorns is from interaction with domestic sheep. The model for average TPCP is temperospatial and as such will need to be updated yearly to most accurately reflect the risk of heavy rainfall on the animals.



Risk posed by BLM grazing allotments. Filled polygons are allotments for domestic sheep. Red indicates the highest

To view the entire GIS and see risks on individual habitats as a map package on ArcGIS Online, go to http://www.arcgis.com/home/item.html?id=ab58870a57d44c099d9f7a4e54a56cd7. Further inquiries can be sent to Daniel Beene at dbeene@cnm.edu.

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Hydrant Inspections Web Map

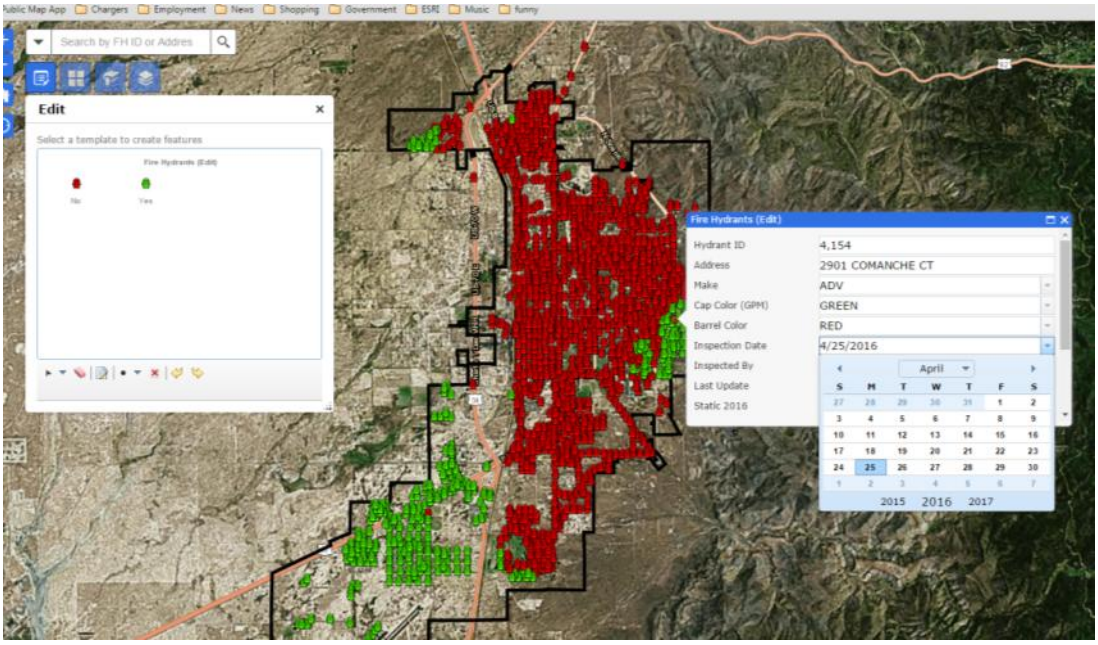
Tony Pistilli, GISP

The City of Alamogordo GIS (Geographic Information System) department made the decision to utilize ArcGIS Online a few years ago deeming the platform as the most cost-effective solution to serving the public and city departments' GIS maps and data.

One of the latest projects we have just launched was the Fire Hydrant Inspection Web Map. This web-based solution allows those inspecting the fire hydrants to edit attribute information in the field with the use of a smart phone or tablet. This process has typically been accomplished using paper forms which were later compiled and entered into a spreadsheet at the office creating duplicate work.

One of the benefits of the online mapping solution is that the data is collected or edited while in the field with pull down menus for data entry making the process much faster and more consistent. Another benefit is that as soon as the inspection is completed in the field the color of the hydrant turns from red to green showing that the hydrant inspection has been completed for that particular hydrant. Supervisors can see the progress of the inspections in real-time. This ability to visualize the inspection progress makes it very easy to tell if hydrants have been missed. If the inspectors come across a hydrant that is not on the map, they have the ability to add the hydrant themselves. This keeps the integrity of the GIS data layer and the tabular data in tact.

When it comes time for the Fire Department to submit their annual ISO report, the GIS layer can be easily converted to an Excel spreadsheet as needed. This is just one of many possible solutions utilizing GIS technology to enhance and simplify workflows for any department within the city. Other department managers are able to see the benefits of GIS technologies through projects like this creating great interest in ways to enhance their workflows utilizing the power of GIS.



Testimonial from Norman Bloom, Lt. Alamogordo Fire Dept:

"The advantage of the color system also identifies at a glance what hydrants have been missed during annual inspections for easy follow up and accurate documentation.Today, we sent a company out to check on a citizen complaint about a leaking hydrant. The crew identified the problem but failed to write down the specific hydrant number. Within a minute, we found that specific hydrant on the map and had all needed information to submit the appropriate work order for repairs. With this new system, we can run a specific query to identify information that was too cumbersome under the old system. Total number and location of out of service hydrants and gallon per minute (GPM) capacities for specific areas are two examples that can impact fire department response. The time saved on updating our database is simple to use. I spent approx 10 minutes showing one of our firefighters how to input the data and expected him to only complete 40-60 hydrants. Within an hour and half, he had inputted all District 2 hydrants and had identified one that was missed that did not exist in the original data base. Once all the base line data is entered, next year testing will be even smoother!

When we talk about GIS data stored in a database, the conversation tends to revolve around either the ESRI geodatabase or PostGIS (PostgreSQL) - the open source alternative. But most database vendors now include spatial support – including Microsoft SQL Server and SQL Server Express. In this article, I will show you how to create a spatial table in SQL Server, how to load your data for editing in QGIS, and how to serve it as a REST endpoint using Go.

Creating a Spatial can add some data. To insert geometry in to the table, you can use STGeomFromText() and pass a geometric object in Well Known Text. Using SQL again, you can add data with the following:

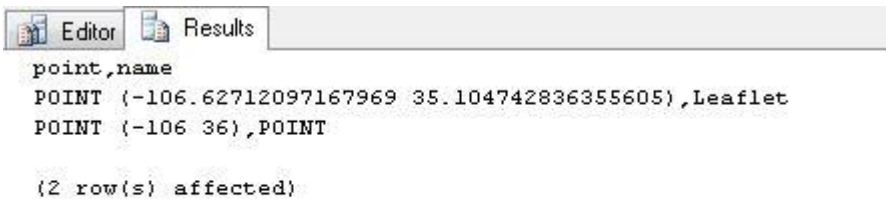
```
INSERT INTO Table Name
VALUES(
 geography::STGeomFromText(
      'POINT(-106.6294813156128 35.10532213500743)',4326),
      'Big I'
      );
```

The above SQL inserts a point at the specified coordinates using WGS84 and names it Big I. Now you can open the table in ArcMap or QGIS and it is business as usual. But before I get to that, you can also use SQL to query your table. The below SQL is an example of a Nearest Neighbor query that returns the two closest results.

```
USE Database Name

GO

DECLARE @g geography = 'POINT(-106 35)';

SELECT TOP(2) point.ToString()as point, name FROM Table Name

WHERE point.STDistance(@g) IS NOT NULL

ORDER BY point.STDistance(@g);
```

The above SQL queries the table and returns the two points closes to the specified point - @g.

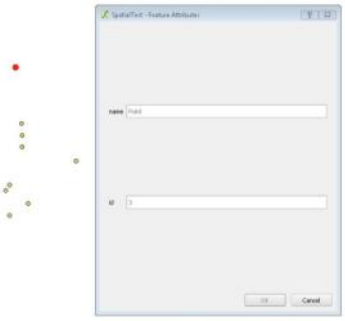
On my test database, I get the results in the image.



Next, viewing and Editing…

Viewing and Editing Data in QGIS

You can load this data in ArcMap or QGIS. In QGIS, you can add the table by selecting Layer -> Add Layer -> Add MSSQL Layer (Ctrl+Shift+M). Enter your database connections properties and connect. You may receive the error: No geometry_columns table found. Just click yes and you will see your table in the list. Select your table and click Add. You should now see your data. Now you can perform your normal GIS workflows. For example, you can identify or edit.



Serving the Table Using Go

For use in a web map, you can serve the table as a REST Endpoint using Go. The Go server works by executing a SQL query:

select point.ToString() as point, name from Database Name

and serving the results


```
[{"geometry":"POINT (-103 33)","name":"Point     "},{"geometr
31)","name":"Paul      "},{"geometry":"POINT (-106.6271209716
42.166472402733184)","name":"QGIS      "},{"geometry":"POINT
```


My test table has an endpoint at http://mydomain:6088/getgeom which displays all the data as JSON – shown in the above image.

Using Leaflet.js and Omnivore, I can display the data on a map by making an AJAX call and looping through it.

```
for (var x =0; x < result.length; x++){
        var t = omnivore.wkt.parse(result[x].geometry).addTo(map);
        t.bindPopup("Name: " + result[x].name);
}
```

The server also has an endpoint that allows posting geometry. A parameterized SQL query will insert the form data(g=POINT(-106 35) &name=FromPost&id=123):

db.Query("insert into dbo.SpatialTest values (geography::STGeomFromText(?,4326),?,?)", g, name, id)

The full Go code is available on request and can be customized to your table by editing the connection string. It will run as a standalone executable on Windows, Mac, or Linux.

Conclusion

The goal of this article was to show you another way to serve GIS data using a standard SQL Server database table and how you can incorporate it in to your current GIS workflow. How GIS data is stored is up to the application architect, but it should be of no consequence to the end user. They are only concerned about adding, editing or querying their data to accomplish their goals. As GIS professionals, we need all the tools we can get to solve problems. As the saying goes:

When you only have a hammer, everything looks like a nail. Hopefully this article has added a new tool to your belt.

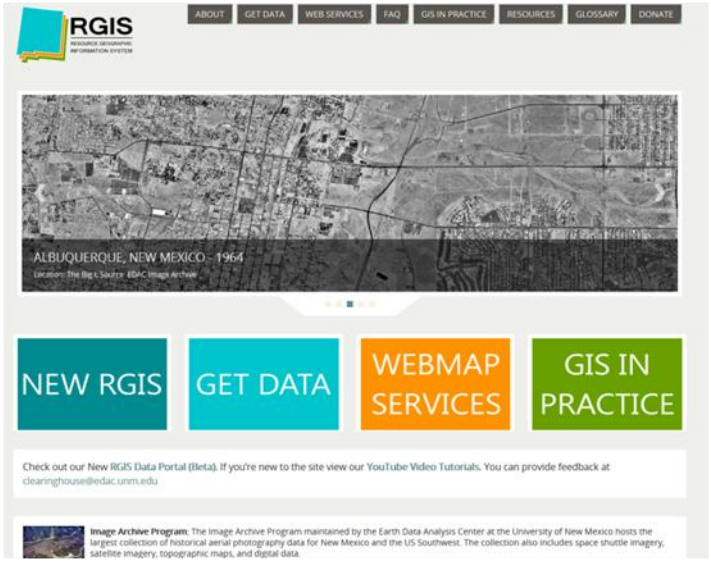
NATIONAL GEOGRAPHIC
NETWORK OF ALLIANCES FOR GEOGRAPHIC EDUCATION
GREAT SEAL OF THE STATE OF NEW MEXICO
•1912•
NEW MEXICO

NM RGIS—The State Digital Data Clearinghouse

The Resource Geographic Information System (RGIS) is New Mexico's statutorily designated (2013) State Digital Geospatial Data Clearinghouse. RGIS is the state's primary source for geospatial data and information, technologies, and services.

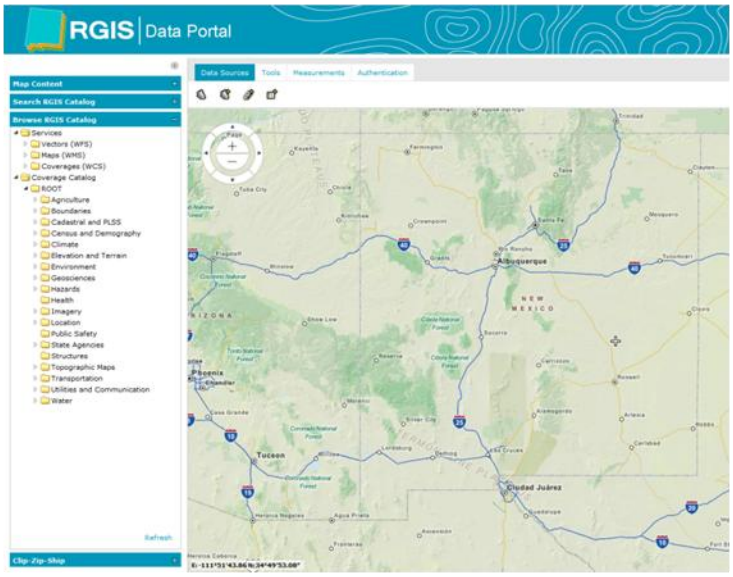
Earth Data Analysis Center (EDAC) develops and enhances NM RGIS. The UNM Bureau of Business and Economic Research (BBER) provides Census and socioeconomic data, and numerous state and local agencies share their data and data services.

Check out our New RGIS Data Portal. We have added **YouTube Video Tutorials** for assistance in using the new features of the new portal.



New and Updated Data

MRCoG 2014 Mosaic and County Mosaics
State Imagery: Mosaics in addition to individual tiles
Historic Aerial Photo Indexes
Landsat Satellite Imagery 2014 County Mosaics
E-911 Roads and Address Points
Updated Boundaries
Wildfire Boundaries, Burn Severity
Livestock, Range Management
CASA (Community Anchor Site Assessment: Public Safety, Schools, Hospitals…)
USGS Earthquakes
FEMA National Flood Hazard Layer
FEMA Preliminary Maps
Updated USGS NHD



New Functions and Tools

Search **RGIS** Catalog: By Keywords, Type, Data Type, Spatial Filter, Availability, Date

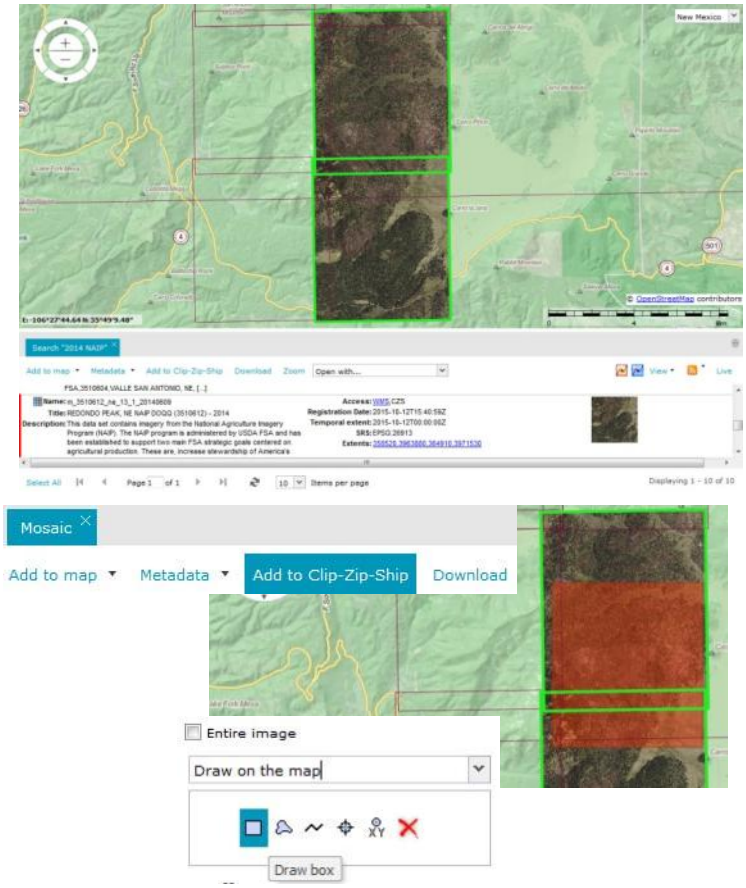
Browse **RGIS** Catalog: By Web Service, Vector Category, Raster Category

Interactive Mapping: Show Extent, Add to Map, Zoom Options, Extent, Add Multiple Layers

Mapping Tools: Identify Features, Measure Distance/Area, Display Feature Classes and Queries, Set Map Scale, Print, Show Coordinates

Download Tools: OGC Web Services, Download (large files) via e-mailed link, Clip-Zip-Ship (for small subsets of raster/image data)

Metadata: Overview, Full Content, Download



RGIS Website: http://rgis.unm.edu

Contact: Laura Gleasner

Voice: 505-277-3622, ext 230
Email: lgleasner@edac.unm.edu

ASPRS Manual of Remote Sensing, Fourth Edition

The American Society for Photogrammetry and Remote Sensing (ASPRS) will have a new addition to their suite of technical publications. The fourth edition of the Manual of Remote Sensing (MRS4) will be published this summer as an "enhanced" electronic product. Stan Morain (Editor-in-Chief), and co-editors Mike Renslow and Amy Budge are compiling and editing material provided by numerous contributors who are experts in various aspects of remote sensing technologies, data preservation practices, data access mechanisms, data processing and modeling techniques, end-user applications of value-added products, and legal aspects such as space policies and space law. These topics are organized into eleven chapters presented in three parts: Part 1 – Systems; Part II – Data Management; and Part III – Applications. MRS4 is unique from previous editions in that it will be available online as a "living" document that can be updated easily in years to come as new technologies and practices evolve. It also is designed to include animated illustrations and videos to further enhance the reader's experience.

Conceptually, MRS4 content expands its scope from previous editions, focusing on new and updated material since the turn of the 21st Century. The first edition was published in 1975 in two volumes totaling 3100+ pages; the second edition, also in two volumes, was published in 1983 with over 2000 pages; and the third edition was presented as a 6-volume set, published over a span of years from 1997-2009 (collectively totally about 4000 pages). All of these editions were published as hard-copy products.

The business model for pricing and distributing MRS4 is being developed by ASPRS headquarters. Details and further information will be announced at a later date.

Good News!

NMDOT Aerial Photography's unit now has an interactive online map that shows coverage of our imagery. This is phase one and **does not** show all of our imagery so don't fret if what you are interested in isn't covered, there is more to come.

Please feel free to send me information on improvement's, changes, adjustments you find to make it easier to use and please pass on to anyone you think might benefit for using this map.

NMDOT Online map gallery:
http://nmdot.maps.arcgis.com/home/index.html

NMDOT Aerial Photography Coverage map:
http://arcg.is/1X7DmDL

Alane Wainwright
NMDOT Aerial Photography
alane.wainwright@state. nm.us

Jessie Rossbach Memorial Scholarship

Since the mid-90s, NMGIC has awarded a scholarship worth up to $1,000 to students in geospatial technology/geographic information science who are attending institutions of higher education in New Mexico. The intent of the scholarship is to support student projects in geospatial technology/geographic information science. This year, the NMGIC Board offered a free one-year NMGIC student membership to all applicants.

After reviewing five very good applications, the Jessie Rossbach Memorial Scholarship was awarded to Jesse Spague. Jesse is working toward a Master of Science GIS with a Computational Science and Engineering Certificate at the University of New Mexico. We look forward to hearing his presentation at the NMGIC Fall Meeting on Agisoft vs. Menci APS Volume Calculations.

Attention Students in GIT...

NMGIC offers a scholarship worth up to $1000 to students working on GIT

programs!!!

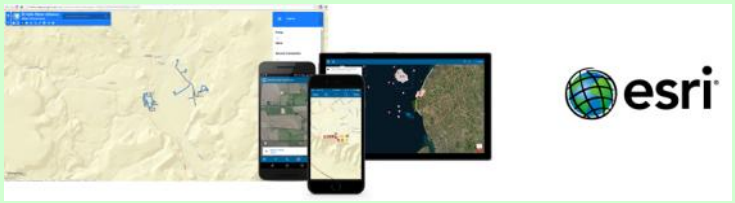
See *http://nmgic.com*

Spring 2016 Meeting Round Up

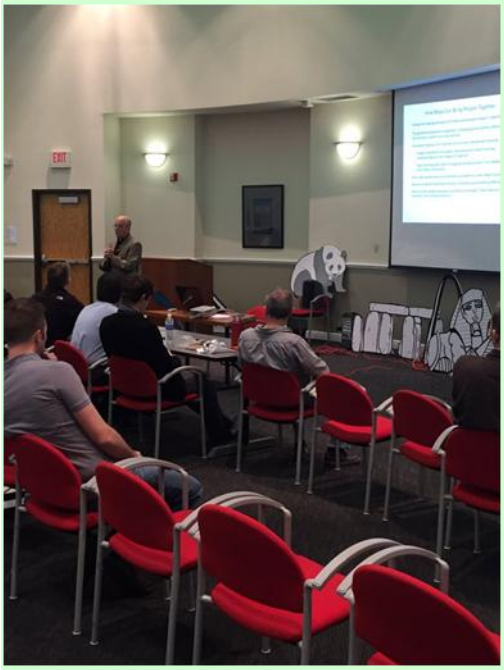
Joe Zebroski

We had another successful spring workshop and meeting this year.

The workshop, entitled "Get your hands on ArcGIS" was presented by ESRI's Brig Bowles and Jon Doherty. We learned the basics of using ArcGIS Online to prepare maps and data for use in ESRI's mobile apps such as Collector for ArcGIS and Explorer for ArcGIS. We also had a great overview of the growing family of ArcGIS mobile apps.



The theme of the meeting was "Geographic Information Systems: Outside The Box." We had a diverse array of speakers covering topics from applications of GIS to social issues to the use of ground-based lidar in variety of industries. Here is a rundown of the presentations.



"How Geospatial Mapping Can Help Address New Mexico's Crucial Social Issues" Dr. Peter Winograd, University of New Mexico.

Geo-spatial mapping and other forms of data visualization can be used to highlight issues and solutions in crime, behavioral health and education in New Mexico.

"The Effects of Complex Land Use Regulation on Commercial Development in the City of Albuquerque" Daren Ruiz, Bureau of Business and Economic Research.

The City of Albuquerque is updating the Albuquerque/Bernalillo County Comprehensive Plan and creating an Integrated Development Ordinance (IDO) to simplify zoning regulations in order to streamline the development process, improve economic development, and protect neighborhoods. The City contracted with UNM's Bureau of Business and Economic Research (BBER) to assess the effects of complex land use regulations on commercial property development. Specifically, does complex zoning cause development to be delayed or abandoned and which zoning combinations are causing issues.

"Understanding and Accessing the Global Demographic and Lifestyle Data" Jon Doherty, ESRI.

ArcGIS includes a living atlas of the world with ready to use maps and layers from Esri and hundreds of other organizations that users can combine with their own data to create new maps and applications. This presentation provided an overview of the Living Atlas, Demographic and Lifestyle Data, and how to access this information using applications like ArcGIS Online, Community Analyst, and Business Analyst.

"Data is Data: Applying Lessons Learned from Film VFX Pipelines to Geospatial Lidar Workflows" Jed Frechette, Lidar Guys.

Ground-based lidar has advanced by leaps and bounds over the last decade. Sensors are collecting orders of magnitude more data than they were a few years ago and the number of specialized software tools has multiplied. Meanwhile, end users are continually finding new ways to use the data and expanding their requirements, while expecting shorter turnaround times and more cost-effective solutions. As a service provider specializing in ground-based lidar data collection and processing, Lidar Guys faces all of these challenges daily. Fortunately we also benefit from working with clients in a variety of fields and have the opportunity to learn from how they operate. The challenges listed above would sound familiar to anyone working in the VFX industry and we have been able to leverage our experience working in that industry on major motion pictures to improve our workflows. Although the details are constantly being refined, our goal is to define a set of internal processes that can be applied to all of our projects, regardless of client or deliverable. Those processes must be efficient, modular, and reliable so that we can cost-effectively deliver consistent results and quickly adapt to changing requirements and tools. This presentation will discuss the conceptual ideas behind the VFX inspired publishing and validation processes that we have adopted to meet these requirements. It will also provide examples of how they have been implemented using our in house toolkit Riveter.

"The Trust for Public Land's Greenprinting Service" Mitchel Hannon, The Trust for Public Land.

The Trust for Public Land's Greenprinting service helps communities make informed decisions about how to grow while preserving character, opportunities for recreation, clean water, environmental benefits, and quality of life. A Greenprint starts with community engagement and leads to computer models and maps developed using Geographic Information System software (GIS). The interactive maps highlight key areas for protection based on residents' own conservation priorities and where possible conservation funding is available. Over the past 10 years, The Trust for Public Land has completed over 50 Greenprints across the nation, including a new one starting in Bernalillo County. This presentation will show how these planning processes have been completed and demonstrate some examples of how communities can use the web based tool to determine the locations for future conservation activity.

"Statewide Wood Supply and Accessibility Analysis", Steve Bassett The Nature Conservancy.

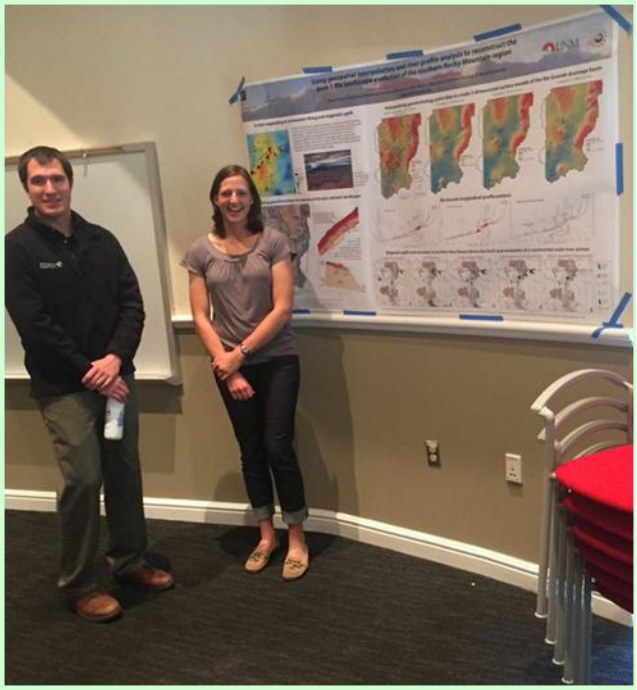
An overview of the data, tools, and methods used in this recently completed downscaled forest inventory and accessibility analysis for the state of New Mexico. This project quantifies timber and biomass on lands not precluded from harvest, additionally the volume of product is summarized for 10-mile travel-distance-zones from 50 communities with existing or proposed mills or other processing facilities.

"Assessing Pavement Surface Distress Condition Using Hyper-spatial Resolution Natural Color Digital Aerial Photography Acquired from A Low-cost Unmanned Aircraft System" Su Zhang, University of New Mexico

The serviceability of roadways primarily relies on pavement surface conditions, and therefore, transportation agencies at all levels dedicate a large amount of time and money to conduct routine pavement surface condition inspection. Hyper-spatial resolution natural color digital aerial photography (HSR-DAP) provides a potential method for collecting pavement surface distress information that can supplement or replace currently-used inspection methods. Using roadway sections located in the State of New Mexico as an example, this research explored the utility of HSR-DAP (3 mm) acquired from a low-cost unmanned aircraft system (UAS), in this case a tethered helium weather balloon, to permit characterization of detailed surface distress conditions. With the help of linear regression and orthogonal regression analysis, detailed pavement surface distress rates estimated from HSR-DAP derived products (orthophotos and digital surface models) were compared to reference pavement surface distress rates manually collected on the ground using standard protocol. The results show that the UAS-based hyper-spatial resolution aerial imaging techniques provide comprehensive and reliable data suitable for detailed pavement surface distress evaluation. These results also open the way for the future application of low-cost HSR-DAP for automated assessment of detailed pavement surface distress condition.

Spring 2016 Meeting Photos

Student poster presentation:



"Using GIS interpolation methods to reconstruct post-5 Ma landscape evolution of southern Colorado and northern New Mexico" Marisa Repasch, Karl Karlstrom, Department of Earth and Planetary Sciences, University of New Mexico, Albuquerque, NM, Matt Heizler, New Mexico Bureau of Geology and Mineral Resources

The Rio Grande-Rio Chama (RG-RC) fluvial system preserves a record of southern Rocky Mountain erosion and sediment transport over the last eight million years. During this time the two rivers have evolved dramatically, undergoing channel migrations, drainage capture and integration events, carving and refilling of paleocanyons, and lake spillovers. Volcanism concurrent with the development of the river system provides a unique opportunity to apply multiple geochronometers to the study of its incision and drainage evolution. New 40Ar/39Ar basalt ages coupled with new detrital zircon and sanidine age population data for fluvial sediments document the birth of the ancestral RG by 5 million years ago, with headwaters in the San Juan Mountains and extending to the Palomas Basin. Geostatistical interpolation and river profile analysis in ArcGIS was performed on these integrated datasets to model landscape evolution in northern New Mexico over the last five million years.

This study highlights the influence of magmatic and tectonic processes on major river systems. These geochronologic data and models reveal that the Rio Grande had its headwaters in the San Juan Mountains at five million years ago, and subsequent rock uplift associated with volcanism drove downward-propagating drainage integration. Results also show that building of the Jemez Volcanic Field altered drainage networks, such that the Rio Chama shifted northward relative to its original position in the landscape. Increased amplitudes of glacial and interglacial periods likely contributed to increased discharge and incision rates during latest stages of river evolution, but tectonic drivers dominate over the five million year time period.

Carol Giffin gave an update on recent happening with the U. S. Geological Survey.

Thanks to all our presenters for contributing to the success of this year's meeting.

NMGIC Social

Veronica Lopez

This year NMGIC decided to try something different and invite members and potential members to a social night of networking and food at a local family-friendly restaurant. The location: Rock & Brews; the food: wings, pretzel bites, cheeses, and salad; the atmosphere: fun and open with patio style seating. Around twenty members attended the event, with five new members joining our organization.

Those who attended enjoyed the event and expressed interest in attending future events. Considered a success even if the wind was a slight deterrent, expect this type of social event to happen on a more consistent basis throughout the year.

One of the reasons we state for joining our organization is for the networking opportunity, and we would like to expand that opportunity outside of the spring and fall meetings. Be on the lookout for an invite to another local family-friendly restaurant in June!

The University of Maine School of Computing and Information Science announces a leading-edge master's degree program in Spatial Informatics. This graduate degree is the online version of the on-campus MS in Spatial Information Science and Engineering degree and accommodates students from wide ranging undergraduate degree backgrounds. Distance students take the same comprehensive graduate course content with the same high-caliber full-time professors as taken by on-campus graduate students.

The program focuses on advancing knowledge about spatial information particularly with respect to concepts needed in next-generation information systems. Emphasis is placed on developing novel concepts and methods in the broad field of geographic information science for sensing, storing, accessing, analyzing, and managing spatial data, and modeling, extracting, integrating, visualizing, communicating and reasoning about geospatial information.

Spatial Informatics is a term used to describe the field of study merging knowledge drawn from geographic information science, information science, cognitive science, computer science and engineering. The program is STEM certified and students build on foundations in computer science, mathematics, physics, geography, cognitive science, neuroscience, artificial intelligence, engineering and related fields to study spatio-temporal phenomena, design intelligent spatial information systems and develop human-centered accessible technologies.

The Spatial Informatics graduate program is designed to meet the growing demand in society for graduates with high-level geospatial technology skills. This student-centered curriculum provides a path for women and men from diverse fields to rapidly transition to information system career paths by providing them with foundation graduate level courses in information systems and geographic information science.

The School of Computing and Information Science also offers a MS in Information Systems (MSIS), dual MSIS/MBA degrees and two graduate certificates in Geographic Information Systems and Information Systems. All programs are offered fully online.

For more information and to apply for the MS in Spatial Informatics or Information Systems or Graduate Certificate in Geographic Information Systems or Information Systems, visit online.umaine.edu/scis or contact UMaineOnline at 581.5858 or email umaineonline@maine.edu

USGS News: Carol Giffin

The USGS citizen science project, The National Map Corps, has reached another major milestone. Just over a year after reaching 100,000 "points", volunteers have more than doubled the number of points collected to support The National Map.

Making Your Mark on a Map: http://on.doi.gov/25639ie

The Open Geospatial Consortium (OGC) and sponsors, U.S. Geological Survey (USGS) and Natural Resources Canada (NRCan), in collaboration with the Arctic Spatial Data Infrastructure Participants, announce a Request for Quotation (RFQ) and Call for Participation (CFP) in the OGC Interoperability Program's Arctic Spatial Data Pilot Phase-2 (Arctic SDP) initiative.

Arctic Spatial Data Pilot Project: http://on.doi.gov/1U9fWIZ

USGS National Hydrography Dataset Newsletter Vol. 15, No. 7, May 2016v

http://nhd.usgs.gov/newsletters/News_15_7a_May.pdf

The General Services Administration has completed the donation or sale of nearly 4,000 excess sets of historic USGS engraved copper map plates: http://www2.usgs.gov/blogs/features/usgs_top_story/usgs-engravings-offered-to-the-public/

Copper Plates Gone (Sort of) http://on.doi.gov/1rC3T0G

For more USGS geospatial news updates, check out the News section http://nationalmap.gov/tnm_news.html of

The National Map website:http://nationalmap.gov/in

NSGIC Update *by Leland J. S. Pierce, NSGIC Board Member*

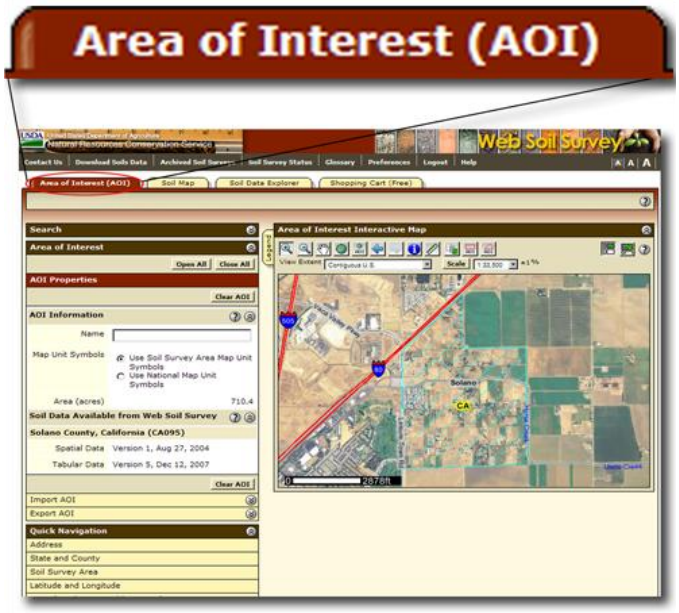
The National States Geographic Information Council (NSGIC) is going through some changes. Long-time Washington DC liaison Bill Burgess-who was far more important to the organization than his title might indicate-has put in his letter of resignation, effective as of June 14, 2016, bringing to a close 23 years' worth of service. NSGIC will soon be hiring an executive director that will fill many of Mr. Burgess's duties. NSGIC will hold its annual, state issues-focused conference in Indianapolis, IN, October 24-28, 2016.

For more information on NSGIC, visit: http://www.nsgic.org

Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

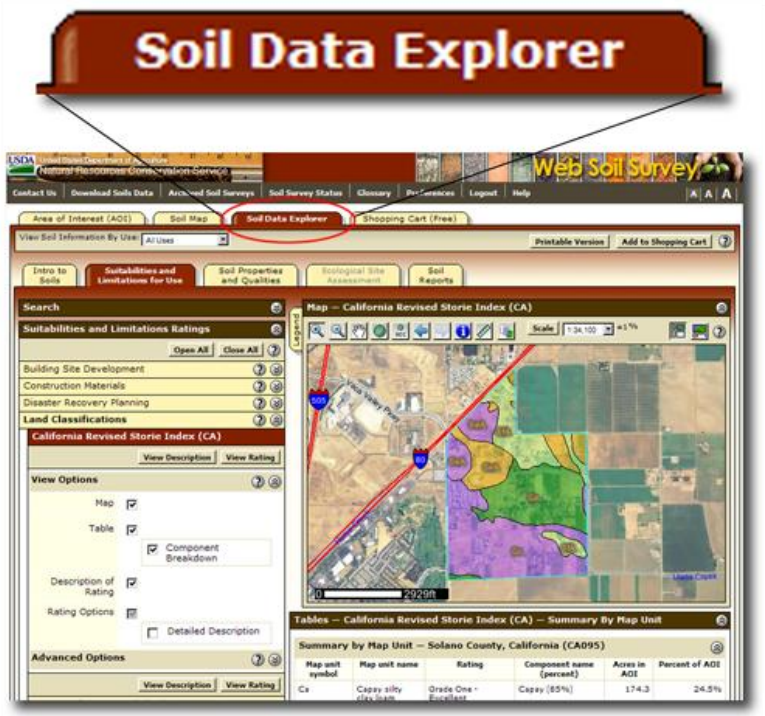
Soil surveys can be used for general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications.

Define Area of Interest.



View:

Explore:



Checkout:

https://gdg.sc.egov.usda.gov/

The Geospatial Data Gateway (GDG) provides access to a map library of over 100 high resolution vector and raster layers in the Geospatial Data Warehouse. It is the One Stop Source for environmental and natural resources data, at anytime, from anywhere, to anyone. It allows you to choose your area of interest, browse and select data, customize the format, then download or have it shipped on media.

This service is made available through a close partnership between the three Service Center Agencies (SCA); Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA) and Rural Development (RD).

Click on the green "GET DATA" button to….get data!

Leland Pierce – New Mexico Chapter of The Wildlife Society's Wildlife Professional Award Recipient

This award is given to an individual who has made significant contributions to wildlife science and/or management in New Mexico. Among other traits, award winners demonstrate exemplary leadership and overcome challenges in the pursuit of improved wildlife management and/or conservation.

Leland has earned this award many times over. He has worked for New Mexico Department of Game and Fish for over a decade. For much of that time, he has been the Department's Terrestrial Species Recovery Coordinator and has developed and helped implement recovery plans for multiple species, including the Gray Vireo and Boreal Toad. Among many other duties, he has coordinated revision of the Department's Biennial Review of New Mexico's Threatened and Endangered Species. Leland recently became the state's amphibian and reptile biologist and has been doing a splendid job filling the enormous shoes that his predecessor, Charlie Painter, left vacant.

In addition to his many activities on behalf of the Department, Leland has served many leadership positions within The Wildlife Society, including president of both the New Mexico Chapter and the Southwest Section. Leland has served at local and national levels of various geographic and geospatial councils and committees. He recently spearheaded the formation of a Geospatial Advisory Committee for the Southwest Section of The Wildlife Society. This committee is an excellent example of Leland's ongoing efforts to bridge the gap between the wildlife and geospatial communities and facilitate integration of geospatial technology into the wildlife management arena. Finally, Leland is always incredibly supportive of everyone he works with, especially students and young professionals.

Many thanks are owed to Leland on behalf of the New Mexico Chapter of The Wildlife Society and all of his colleagues for all of his efforts for New Mexico's wildlife!management arena. Finally, Leland is always incredibly supportive of everyone he works with, especially students and young professionals. Many thanks are owed to Leland on behalf of the New Mexico Chapter of The Wildlife Society and all of his colleagues for all of his efforts for New Mexico's wildlife!

Zack Stauber has recently launched a directory and web map of black owned businesses in New Mexico at http://black.jogerfy.com. He intends to eventually build a complete list of all black owned businesses in the state by crowd-sourcing leads, and he has set up a Facebook page to message with new entries at:

https://www.facebook.com/nmbob.

A mobile friendly web map can be a way for New Mexicans to easily patronize black owned businesses to help grow a thriving black business community, particularly in the wake of the recession of the late 2000's, which impacted people of color the hardest, and from which many have still not re-covered."

NMGIC Awards

Christmas Chile Award - Leland Pierce , for starting the NMGIC awards, and work done for NM Geospatial Community

Leland is a biologist who added GIT to his skill set, landing him a position with the New Mexico Department of Game and Fish as their GIS administrator. Then he returned to being a biologist, and currently serving as a coordinator of terrestrial species recovery programs. Leland became an active member of the (then) New Mexico Geographic Information Systems Advisory Committee, and NMGIC Joining the Board of Directors in 2008 and serving as president in 2009 and vice-president in 2010 and 2011. Leland remains keenly interested in bringing stakeholders together to foster the common good, whatever the industry involved, and sees geospatial technology as a magnificent program for facilitating this. He is an avid writer and painter, gets out in the wilds as often as possible and most certainly watches too many sports.

Green Chile Award - Jason Fink, for long time support of NMGIC and production of the MapLegend

Jason Fink worked in the GIS field with the City of Albuquerque for 25 years, until retiring in 2012. Having held many different roles during his tenure at CABQ, including work as a GIS technician, Application Developer, and GIS Coordinator, he has a diverse set of experiences relevant to being a NMGIC board member. In addition, he has worked with the GIS community as a NMGIC member since the mid 1980's, served as a representative on the NM Geospatial Advisory committee starting in 2002, and helped with organizing the Southwest User Group Conference in 2007 (was it really that long ago?). Jason has a Bachelor of Arts in Environmental Design (1986) from the University of New Mexico. He continues to be involved in GIS as current NMGIC board member, in addition to pursuing his lifelong interest in guitar building, beekeeping, and playing music.

Red Chile Award - Shirley Baros for Contributions to NMGIC, GIS, and Geospatial Education in New Mexico

Shirley Baros is the executive director of the Earth Data Analysis Center (EDAC) at the University of New Mexico. She also serves as the director of the RGIS Program the State Digital Geospatial Data Clearinghouse. Outside of the day-to-day bureaucracy, her interests include applied geospatial technologies, related emerging technologies and furthering the development of collaborative IT data sharing frameworks. In large part, she attributes her successes to EDAC's culture of embracing diversity – of people they encounter, of challenges they accept, and most especially, diversity of thought.

Wheeler Peak Award – Rick Koehler for Lifetime service to NM Geospatial community.

Exemplary public servant as the Geospatial Coordinator at the State's Energy, Minerals, and Natural Resources Department (EMNRD), Rick revived the New Mexico Geospatial Advisory Committee (GAC) and served as its Chair several times. Rick has contributed inordinate time, energy, knowledge, and wisdom to a number of statewide geospatial governance, technology, and data initiatives and collaborations. He also served several terms on the Board of NMGIC in a variety of positions and was instrumental in planning and facilitating a number of Southwest User Group meetings.

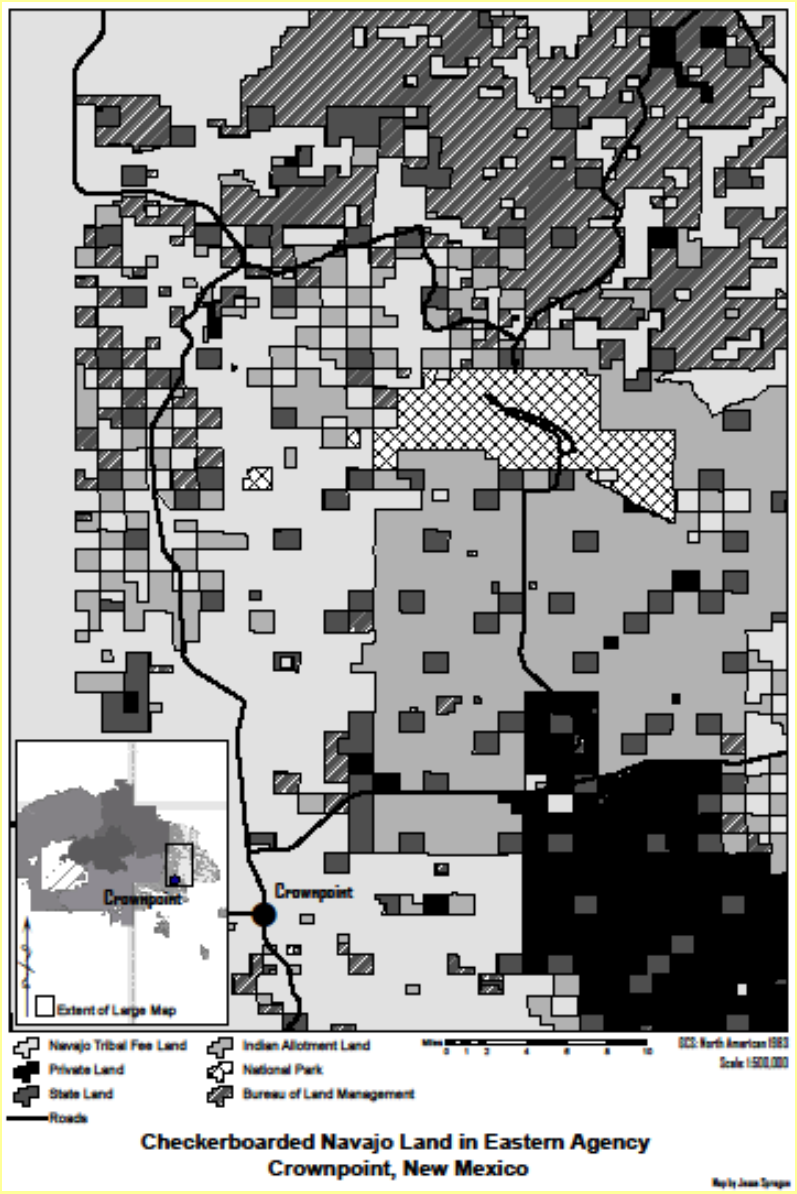
GIS Maps included in Book: *Indian Cowboys* Jesse Sprague

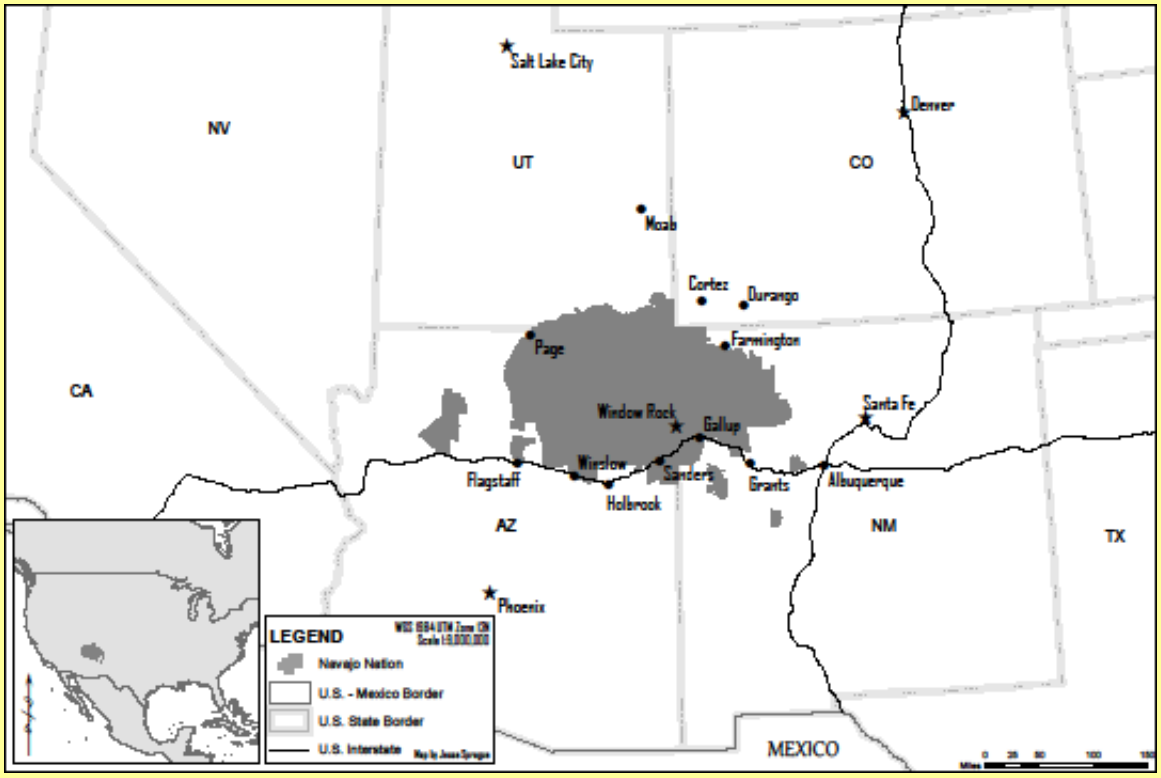
My name is Jesse Sprague, I am a recent addition to the GIS department as well as the GEM lab here at UNM. I work with high spatial resolution remote sensing and Structure from Motion Software.

This semester I assisted Dr. Kristina Jacobsen, a Professor here at UNM, with three maps for her book. The text discusses the effect Navajo Reservation geography has on dialects and musical traditions.

The book title is *Indian Cowboys: Navajo Country Music and the Politics of Language and Belonging*, and it's coming out in early March, 2017, with the University of North Carolina Press (series: Critical Indigeneities, series editors: J. Kehaulani Kauanui and Jean M. O'Brien)

This was a fun project to help with as I learned a lot about the impact the 'checker boarded' land jurisdiction in western New Mexico has on the ability to develop infrastructure or enforce law in the region. Also contributing to the thrill was the fact she contacted me one week prior to her publisher's deadline. All in all, I think they turned out great.




Salt Lake City
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Gallup
Santa Fe
Flagstaff
Winslow
Sanders
Grants
Albuquerque
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Navajo Nation
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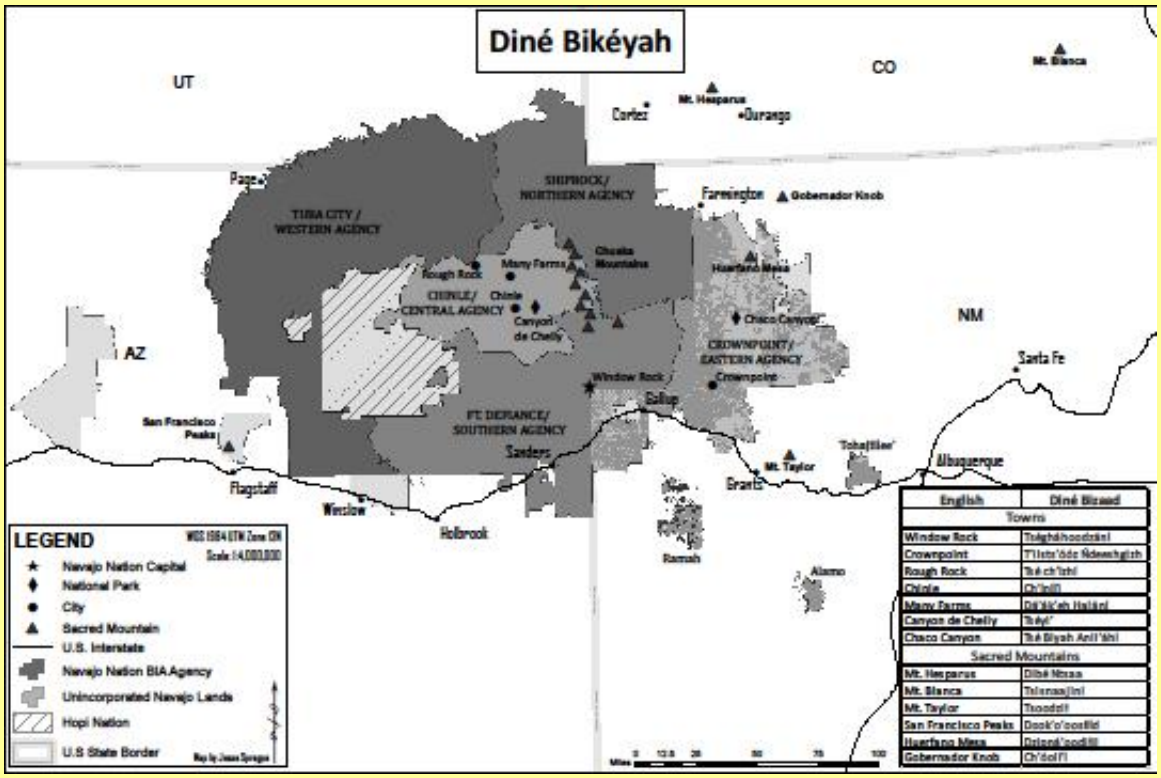
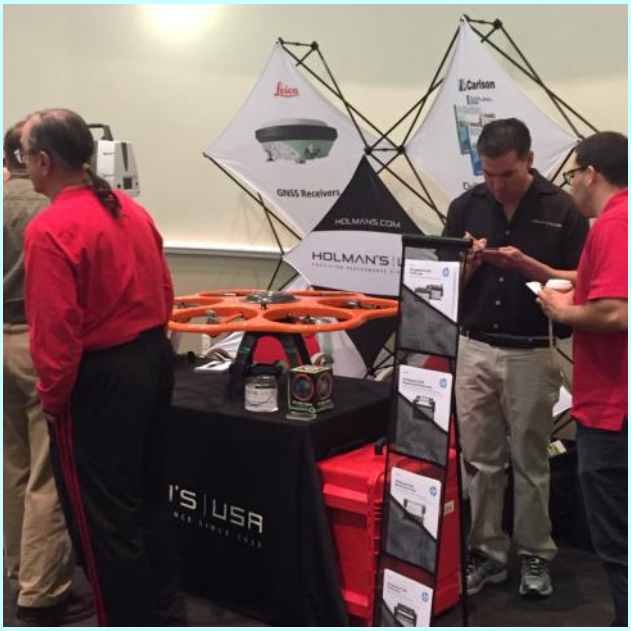
U.S. State Border
U.S. Interstate
MEXICO

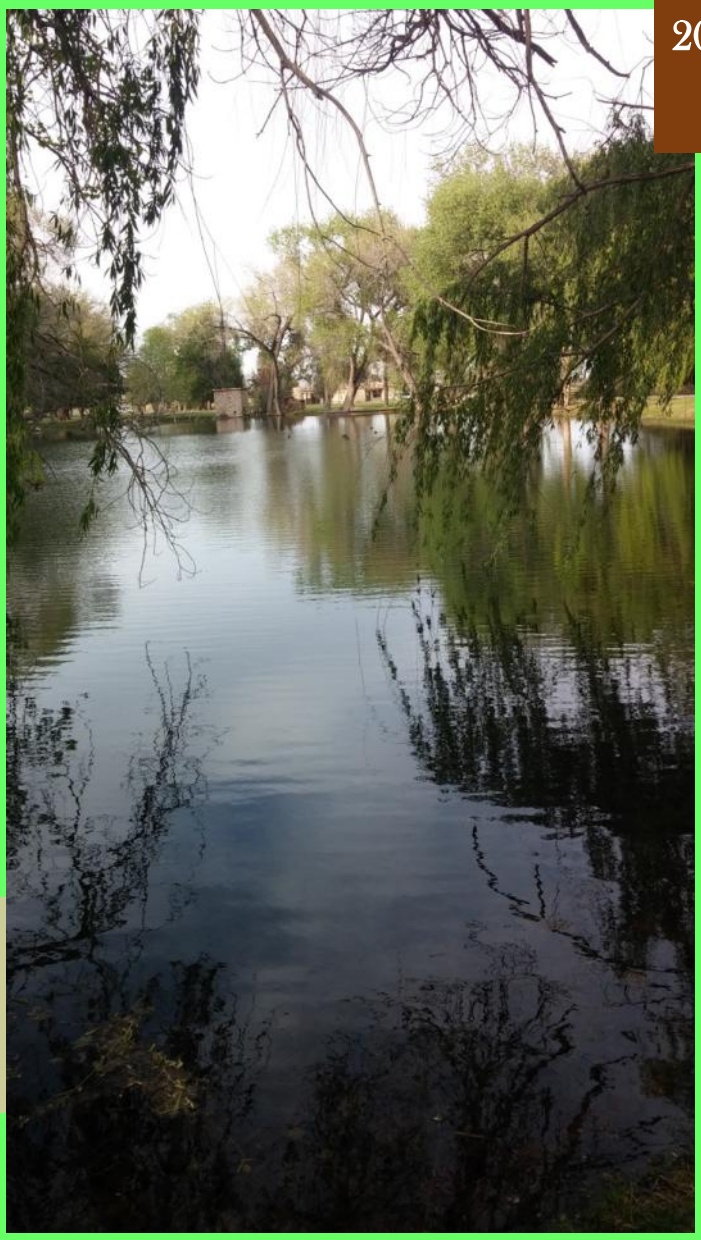

Diné Bikéyah
UT
CO
Mt. Blanca
Cortez
Mt. Hesperus
Durango
Page
SHIPROCK/
NORTHERN AGENCY
Farmington
Gobernador Knob
TUBA CITY /
WESTERN AGENCY
Rough Rock
Many Farms
Chuska
Mountains
Huerfano Mesa
CHINLE/
CENTRAL AGENCY
Chinle
Canyon
de Chelly
Chaco Canyon
NM
AZ
CROWNPOINT/
EASTERN AGENCY
Crownpoint
Santa Fe
Window Rock
Gallup
FT DEFIANCE/
SOUTHERN AGENCY
San Francisco
Peaks
Sanders
Mt. Taylor
Tohatchi
Albuquerque
Flagstaff
Grants
Winslow
Holbrook
Ramah
Alamo
LEGEND
Navajo Nation Capital
National Park
City
Sacred Mountain
U.S. Interstate
Navajo Nation BIA Agency
Unincorporated Navajo Lands
Hopi Nation
U.S State Border
English
Diné Bizaad
Towns
Window Rock
Tségháhoodzání
Crownpoint
T'iists'ózí Ndeeshgizh
Rough Rock
Tsé ch'izhí
Chinle
Ch'inílí
Many Farms
Dził Ná'oodilii Halání
Canyon de Chelly
Tsé Yaní
Chaco Canyon
Tsé Biyah Anií'áhí
Sacred Mountains
Mt. Hesperus
Dibé Ntsaa
Mt. Blanca
Tsisnaasjíní
Mt. Taylor
Tsoodzil
San Francisco Peaks
Dook'o'oosłíid
Huerfano Mesa
Dził Ná'oodilii
Gobernador Knob
Ch'ool'íí

Spring Meeting Vendors



Spring Meeting Vendors

2016 Spring Mystery Photo



This Mystery Photo was taken somewhere here in New Mexico. Can you identify the location?

Contact Rick Koehler with your answer—win a cash prize!

From Editor's Desk

Greetings Readers,

Submissions for this newsletter was fantastic, thanks so much for giving me great content to work with. I know that the our statewide community loves to see what others are doing out there, so keep the stuff coming. I will be starting the Fall issue before ya know it!

Jason Fink
mandoFink@gmail.com

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