



photo by Katie Emmer

## *Trials and Tribulations on the Web Map Path—Rick Koehler*

### Background Info

The State of New Mexico Energy, Minerals & Natural Resources Department (EMNRD) has been using GIS since the late 1980s, with the State Forestry Division and the Mining & Minerals Division being the early adopters. EMNRD began publishing web maps in 2001 using Autodesk MapGuide web-mapping technology, but initiated a migration to Esri's ArcGIS Server (AGS) a few years ago. This article describes the twists and turns on this path; may it prove helpful to those embarking on the same journey.

The general environment for EMNRD's AGS is a multi-tiered assemblage of virtual servers (VMware) with varying resource allocations, for:

- ArcGIS Server itself (currently on v10.1 SP1);
- SDE on another, running a dedicated instance of MS SQL Server 2008 R2 (2012 coming soon);
- Twin dedicated web servers (one for internal AGS applications, one for external public-facing AGS applications), each running MS IIS 7.5, and the Web Adaptor.

### Decision: AGS or AGOL or AWS Cloud?

Welcome to the land of the Luddite. The admission that one is using a local instance of ArcGIS Server, and not using ArcGIS Online, or running some Amazon Web Services

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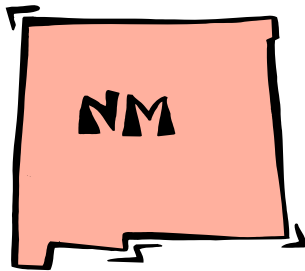
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# The Map Legend

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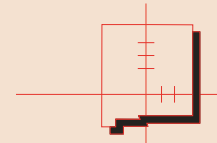
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# NMGIC Fall 2013 Meeting

Agenda	
8:30am	Registration, Sign-in, and Coffee
8:45am	Introduction and Announcements.
9:00am	Dagmar Llewellyn, USDI Bureau of Reclamation
9:30am	John Stomp, Albuquerque Bernalillo County Water Utility Authority
10:00am	Coffee Break and Visit with Colleagues
10:30am	Sleep, Snow Survey Hydrologic Technician, NRCS
11:00pm	Dr. Phil King, New Mexico State University
11:30pm	Lunch (provided)
1:00pm	Kym Samuels Crow, University of New Mexico Pacific sea-surface temperature, convective intensity, and atmospheric water vapor in the tropical Andes
1:30pm	Vince Tidwell, Sandia National Labs Mapping Water Availability and Cost in the Western United States
2:00pm	Break
2:30pm	Dan Krofcheck & Dr. Marcy Litvak, Sevilleta LTER
3:00pm	Leland Pierce, NM Dept. Game and Fish Study and Conservation of Wildlife Under a Changing Climate: Can't do it without GIT!
3:00pm	Wrap-up and door prize drawings.

## NMGIC Fall Workshop

### Getting Started with ArcGIS Online, Scaling to your Organization's needs

October 24th, 1:00pm-4:00pm

Jayson Hagen and Colleen Burke, Esri

Learn from best practices from getting started with your ArcGIS Online Organizational account that will allow you to share and discover geospatial information, and make easy-to-use web mapping applications. See how you can empower your organization with Self Service mapping, making use of the cloud for hosted services and a brief look at Esri Maps for Office. This high level discussion will discuss how to make use of your existing content and making it useful through ArcGIS Online and building upon it with additional applications.

*Hands on workshop, please bring a laptop if possible*

Fees: No additional fee for NMGIC members whose 2013 dues have been paid

Meeting only: \$20 per person

\$15 for students (with current student ID)



## Message From The NMGIC President—Kenny Calhoun

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Fall is my favorite season in New Mexico. Green chile is roasting outside of every grocery store, and hot air balloons distract my morning drive into work. Fall is also the season for new fiscal year planning and budgets for many of us. I logged into a federal website last week to download data and was greeted with a single message, “Due to the lapse in federal government funding, this website is not available.” I thought of my fellow GIS colleagues that may be directly impacted by the shutdown. I was also reminded that so much of what I do for a living is based on the initial work of others. In our industry this is especially evident.

I think that I take these agency services and web sites for granted. I log in on a regular basis whenever I need historical aerial photographs, satellite imagery, land use or stream flow information, soils classes, vegetation, you name it. When these services are not available, I feel like something is being withheld from me. I can’t speak for other states, but the user community that we have established here in New Mexico is great. I can directly contact many of the local and state resources that I have met at the various NMGIC events, or I can download data from the RGIS web site. Having these connections and resources is indeed valuable for my day to day work.

After two years of drought, New Mexico was hammered with record rainfall and flooding this summer. This extreme variation happens to coincide with the theme for this year’s NMGIC Fall 2013 meeting, Climate Variability. This time last year New Mexico was hosting SWUG 2012 in downtown Albuquerque. As a consequence, we did not host the annual NMGIC Fall Meeting and Workshop. The Fall Meeting and Workshop are back this year, and the NMGIC Board of Directors has put together a great line up. I look forward to seeing everyone there.

Sincerely,

**[Kenny Calhoun](#)**

NMGIC, President

GIS Services Manager

***Daniel B. Stephens & Associates, Inc.***



# NMGIC Election Results

2013 NMGIC Board of Directors election. There were four positions open this year. The top four are (in alphabetical order):

**Lisa Arnold**  
**Amy Ballard**  
**Leland Pierce**  
**Joseph Zebrowski**

The election was conducted on Surveymonkey.com, each dues paid member received a custom hyperlink to the poll. A reminder was sent out to those who had not voted approximately one week before the voting ended.

We had a total of 106 members cast ballots. This is up significantly from the recent past. For comparison, we had 57 voters in 2012, 53 in 2011 and 74 in 2010.

The Elections Committee consisted of Monica Faux, Warren Hardin, Erle Wright and myself. Results have been sent to the committee for verification, which is pending. One of the members is a non-essential gov't worker, another is out of town for the remainder of the week. I do not anticipate any objection, as we limited the voting to only dues paid members.

My sincere gratitude to everyone for voting, it was an outstanding slate of candidates!

Kurt B. Wurm [kwurm@nmsu.edu](mailto:kwurm@nmsu.edu)

Election Coordinator

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cloud-based AGS variant, pretty much marks you as a decrepit fuddy-duddy. As does using the term "fuddy-duddy". Might as well cop to having a landline, getting a daily newspaper, watching network TV, and riding a horse-drawn buggy to a one-room schoolhouse. Been there, doing that.

In the distant past, not long after human-like creatures began to seek refuge in caves, NMGIC devoted a meeting to "The Cloud" (May 2011). NMGIC selected this topic because "The Cloud" was still somewhat of a conundrum to its members. Esri came out with its AWS / AGS bundle about one year earlier (May 2010 ?). EMNRD started using ArcGIS Server locally implemented a few years prior (November 2008). All this is mentioned because it demonstrates how **quickly things change in the geospatial business. Whether there are clouds in EMNRD's AGS future depends on which way the technological wind blows.**

Whether we remain with that paradigm is another story, and we certainly won't rule out the possibility of using AGOL - either as a supplement to the current setup, or as a replacement.

### Decision: Geodatabase Type

There are at least two schools of thought regarding the best data source configuration to use as a basis for services: the **"Be Faithful to SDE" school, and the "Local Is Better" contingent. Those who espouse the SDE-based services emphasize SDE's versioning (separate master, editing, for-publication versions) features and general enterprise-level cachet.** Others, including several Esri technical experts (and the Esri Help sections) suggest that it is wisest to go with a local-to-the-AGS-server file geodatabase, to benefit from rapid data access speeds.

**But each API has its drawbacks, too. The incessant spawning of grabby "lock files" creates the main pain when using a file geodatabase, while the delays inherent in a multi-tiered AGS server setup (where SDE is housed on a separate server on the network) seem sub-optimal.** All camps are in agreement that using shapefiles as a basis for AGS services is a bad idea, however tempting it might be (like a comfortable old pair of slippers?).

If one needs to edit a dataset using a web map, that requirement might tip things in SDEs direction. EMNRD currently **doesn't have any web map apps that require web-based editing.** EMNRD settled upon a hybrid approach that **combines SDE with file geodatabases: a local "AGS-only" file geodb for serving static datasets which is a version of a master SDE-based geodb.** The AGS-only version is for publication only, and is maintained in the WMAS84 (Google and Esri basemap compatible Web Mercator Auxiliary Sphere 1984) scheme. Some upcoming applications will require editing capabilities, from remote offices, at which point adjustments will be made.

### Decision: API

When EMNRD made the decision to go with AGS, there were (and are) three choices for a development API for ArcGIS Server: Flex, Silverlight, and JavaScript. Some "trusted insiders", as well as other sources, suggested that Microsoft Silverlight would be the preferred API to use for development, as it was felt that perhaps JavaScript had run its course and that Flex was a dead end. Flash forward to the present, and there's a paucity of Silverlight sites (at least locally in New Mexico), most sites are Flex-based, and JavaScript of course is coming on strong (together with HTML5).

However, "you dance with the one what brung ya" so the early phases of map development have been done in the Silverlight API, with a little Expression Blend thrown in. The AGS SLAPI has been a relatively good choice, as there is the Esri standard Viewer as well as numerous user community-produced free templates, each with a robust selection of widgets and functions. Any API choice should be influenced by the ready availability of in-house coding skills. EMNRD has plenty of developer talent but little to none with Silverlight experience; that meant the behind the scenes heavy **lifting in XAML, XML and most notably C# was to fall to the "GIS staff of one". That "one" soon discovered that Perl Certification and a general disdain for OOP weren't useful in the quest for C# proficiency.**

So, the message is: pick according to your skill set (or that of your organization). Not being a professional coder, I'd rather spend my time doing GIS than trying to decipher someone else's code or trying to figure out how to implement a function in a foreign tongue. For EMNRD, the current plan is to wrap up any existing web map needs with the Silverlight toolset, but begin an evaluation of the JavaScript API (yes, we do have mad JavaScript skillz in the house) by the end of calendar year 2013 (or early 1Q 2014).

## Template Choice #1 and Iterations

Once the Silverlight API was settled upon, EMNRD selected a suitable template, packing a lot of functionality, from the many at the Esri Silverlight gallery pages: a Viewer created and maintained by Ping Jiang of Esri / Philadelphia. That template offered a very nice look and feel, and had most of the desired functions built-in. Several web maps were produced using that template (see below for example). A number of situations lead us to a decision to eventually change though:

- A. Esri released more functionality in their "house mix" of an AGS Silverlight API (AGS SLAPI);
- B. A few "oh no" moments occurred with the template when a newer version was released, but a function was altered without a clear indication of where and why the changes were made;
- C. The template author was apparently instructed to emphasize that his viewer was not the "supported viewer" - that it was a side project (but a da rn good one at that);
- D. EMNRD GIS staff realized achieving proficiency in XML, XAML, C#, and modern object-oriented coding practice was going to be difficult and time-consuming; and that
- E. Using a little outside help would get things moving faster.

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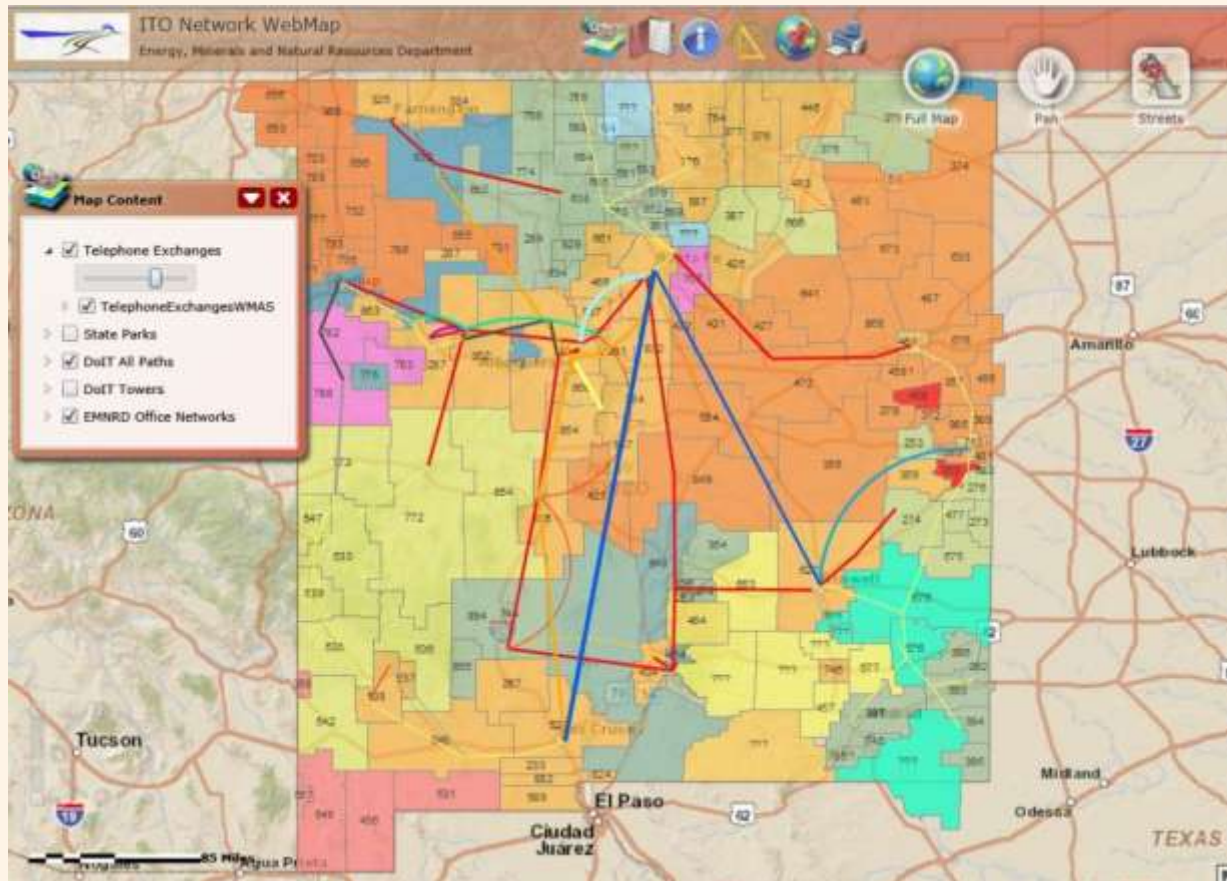
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**GIS Services**



## Trials and Tribulations (Continued from Page 7)

Example of early internal-only webmap:



### Enter the Timmons Group

In the Fall of 2012, EMNRD decided to contract with the Timmons Group (available under GIS Professional Services under State Price Agreement #) to provide:

- An assessment of EMNRD's AGS configuration and implementation;
- "Best practices" and optimization recommendations;
- A "maintainable" SLAPI-based template based upon the Esri standard Viewer but with additional functions and widgets.

The maximum budget for this outside help was \$20K. The server assessment and recommendations were delivered in **September 2012**: EMNRD's basic configuration was a good one, but there were some areas for improvement. EMNRD was quite happy with the Timmons Group's work in relating best practices, helping us plan for the future, and providing EMNRD with a "grade" on various aspects. It was interesting that those areas where EMNRD could improve required additional expenditures which EMNRD was unlikely to be able to afford in the current fiscal climate (such as providing for load balancing and contingencies by purchasing another server license – running dual SOCs). EMNRD has since implemented nearly every recommendation.

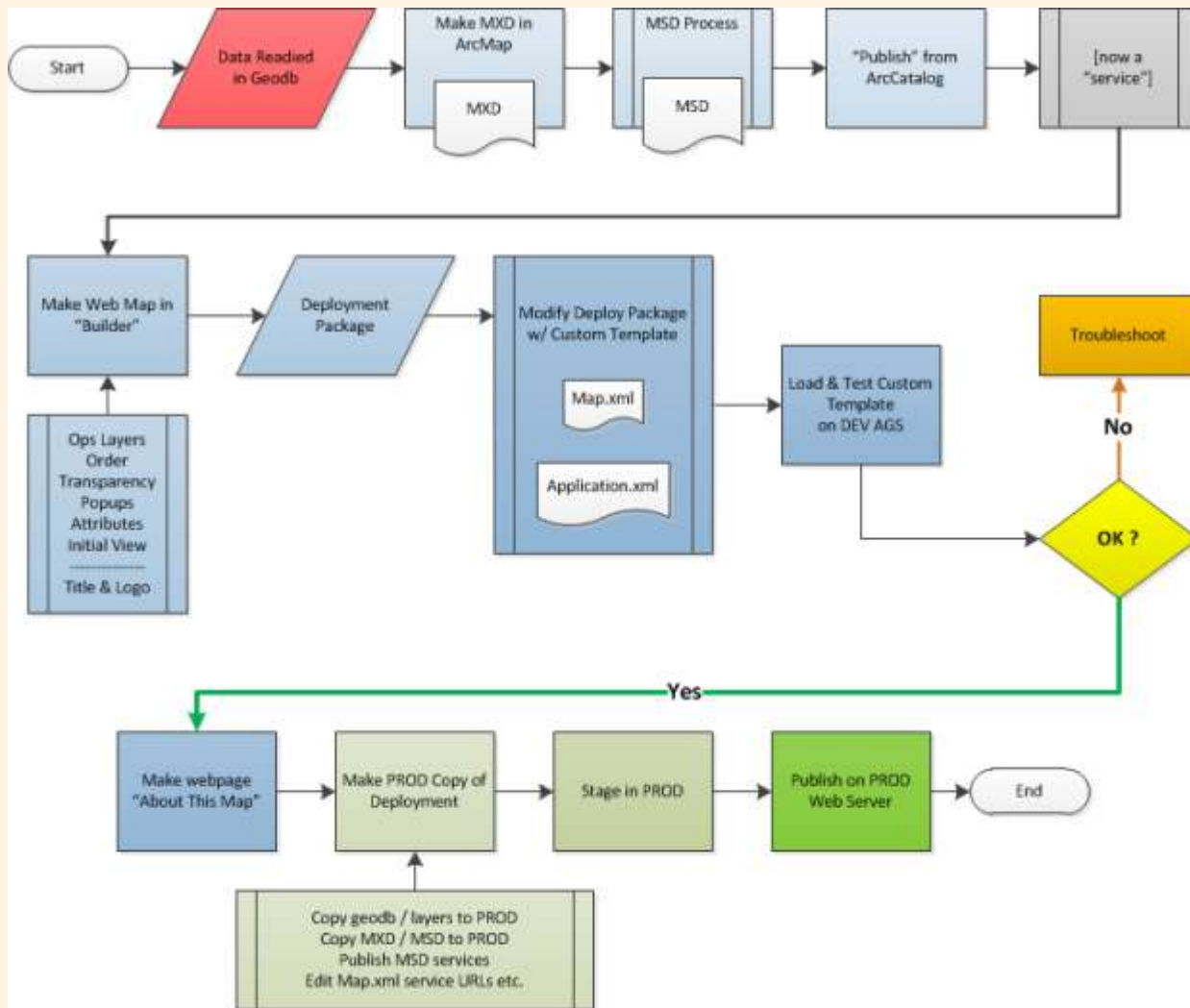
Timmons also provided the required SLAPI template containing the desired functions within the contracted timeframe. EMNRD and the Timmons staff assigned to the project worked to iron out any issues that came up, and had to strike a balance between modifying the code-behind and keeping a high degree of maintainability vis-à-vis the Esri Viewer and any subsequent releases. Part of the contract was to also provide documentation on the deployment process, which certainly is a must-have.



## Post-Timmons Workflow for Authoring

After receiving the deliverables from the Timmons Group and implementing most of the suggested configuration/implementation changes, EMNRD produced a few AGS SLAPI web maps to replace existing MapGuide web maps.

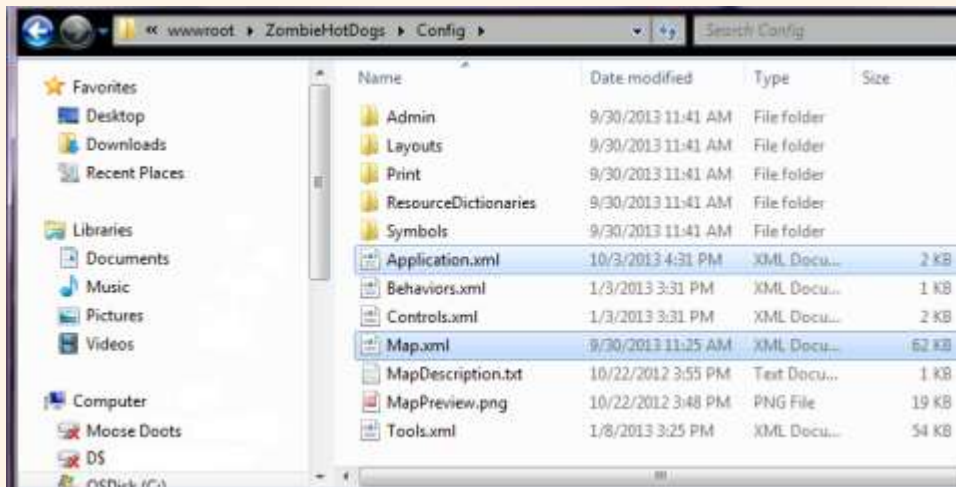
The current EMNRD workflow for authoring a web map using the ArcGIS Silverlight API is detailed in the graphic below. In short, the workflow involves publishing services from a geodatabase-sourced MSD, then using the ArcGIS Viewer for Silverlight Viewer "Builder" to make a draft web map, followed by inserting two key components of that deployment package into EMNRD's custom template package. The two components, Map.xml and Application.xml, replace files in the custom template.



(Continued next page)

## Trials and Tribulations (Continued from Page 9)

The image below shows a typical deployment package for a web map; the entire package averages about 14MB. All the other EMNRD-specific customizations to the deployment are already included in the template, primarily within the Tools.xml file. Most of the map customization is included in Map.xml; Application.xml simply contains the map title and desired logo.



The basic template and the source for each web map are safely backed up in the EMNRD ITO's Applications development team's MS Visual SourceSafe (VSS). EMNRD also uses GIT but VSS seemed the best choice for this particular workflow. EMNRD also uses standard naming conventions for code packages, services and such. But, the situation is always evolving.

It's always good to try and remove potential bottlenecks in a process, and the web map authoring process certainly qualifies. The next section describes attempts to eliminate bottlenecks.

### Automation Or Something Closer To It

EMNRD wanted to streamline the authoring process without giving up certain security aspects. If there were simple typos, symbolization changes, layer-ordering revisions, attribute visibility modifications, etc., the author should be able to make the needed changes without waiting for the official stamp of approval (especially within the Development environment). Having a thoroughly-tested, standardized web map template helps. EMNRD did a thorough analysis of the process, comparing "files changed" (using MS Visual Studio) and so on to ferret out areas for improvement.

In reviewing the workflow, the top line in the diagram above should be familiar to anyone who has used ArcMap to create interactive maps for others, and presents no obstacles. The use of Builder to develop a web map from published services is also pretty straightforward, and can be done at the "Power User" level of user rights with ease. [ *Esri did improve AGS from v10.0 to v10.1 in the area of roles, since they created an intermediate type of user between the "read-only" Users and the "all-powerful" Admins: the Publishers (although the group of permissions automatically assigned to Publishers contains some areas of concern in a locked-down environment).* ]

The deployment package (and the customized package derived from it) can be tested locally on the authors' PC. But, there was the possibility that unapproved or inadequately-tested code snippets might be inserted into the customized

package, a possibility EMNRD wanted to negate. EMNRD also felt a worthy goal was to refine the process to the point where the web author would:

1. Ready their data and create their MSD basis-document, then publish it;
2. **Construct their web map using the Esri Viewer "Builder" by adding their published services for operational layers etc.;**
3. Save the deployment to a specified staging location;
4. **Open a "Web Map Authors" web form in which the author:**
  - a. Identifies the target deployment folder (with Map.xml & Application.xml);
  - b. **Provides a map title, a link to "ATM" section, and selects a logo;**
  - c. **Clicks "Submit".**

**At this time, the automation outlined above is entirely doable but hasn't been put into practice. Since the Custom Template is standardized, the requisite package components could be scripted / programmatically loaded into the proper containers with little need for human intervention.**

## Help? Got help?

A survey of numerous public web maps revealed that many maps offer little information on the purpose of the map, on the component layers / datasets, or instructions on how to use the controls. Disclaimers about map use and data are fairly prevalent, but "Help" and "Why?" seem to be left unanswered. This section and the next describe EMNRD's efforts to address that situation.

The standard template for the SLAPI has a "Help" link in the upper right-hand corner. However, this link (<http://resources.arcgis.com/en/communities/silverlight-viewer/>) opens to the Esri ArcGIS Server Silverlight API Developers section, not to anything that would be of use to the lay person who is trying to figure out how to use the tools and widgets provided. As GIS professionals, we have a great deal of familiarity with typical GIS icons, tools, widgets, techniques provided within our desktop GIS packages or the web maps we develop. But we can't assume the general public is looking at our lovely map through the experienced eyes we possess. Through some in-house user testing - having someone who has never used a web map before - sit down in front of a monitor and be presented with a web map, we discovered an interesting reaction: "OK. Now what? What am I supposed to do?"

All the Zoom-Previous, Pan, ID icons, or Table of Contents with expanding/contracting layer trees are simply a mystery to some folks. Even casual users get baffled by having a profusion of undescribed tools and icons, or by not understanding how to accomplish some basic web map interactions. So, it seemed obvious we should offer basic instructions on the map tools - in a "Help" page section that actually provided ... help ... instead of details on how to download and install the "Extensibility SDK".

EMNRD developed a series of Help pages on the standard map tools and functions, ranging from Map Navigation to the toolbar (with most of the map widgets), as well as a few typical search or inquiry scenarios. This group of linked web pages is available from all maps, and gives the novice user a resource for learning about interacting with web maps. Users are shown step-by-step how to use every function (like the Measure tools), or how to select data and review attributes, etc. Map features such as the "Flare Clustering" technique are also described.

(Continued next page)

The next two images show the Help page and a detail of a typical Help page topic:

### General Map Layout

This collection of pages provides help information on EMRD web maps, including how to use the various toolbars, tools and widgets, navigating around the map, and interacting with the map in general. Please note that the order of the icons within toolbars may vary, and there may be additional functions.

All EMRD web maps typically have the same general layout, as shown in the image below (hover your cursor over the image) - a main toolbar on the upper right-hand corner, along with several links ("About This Map", the EMRD home page, and this "Help" section), map navigation tools at the top left, and a scale bar at lower left.

### Map Navigation

The web maps have a built-in Map Navigation tool that provides the ability to zoom in (see more detail but within a smaller area) or zoom out (see a broader area but with less detail) to view "that" area.

### Map Contents

Here the "Watersheds (HUC8)" layer has been turned on, but since it is completely overlain by the "Polygons layer", no watersheds are visible. The layer "on top" ("Polygons layer") obscures the layer below it ("Watersheds (HUC8)"). To see the layer below, often you must turn off the layer(s) above that overlay it. This situation can be controlled by a number of techniques, including displaying certain polygons with just their outline (hollow inside), using hatching (again, perhaps with a hollow/transparent interior), or by making certain layers partially transparent (which will be shown at the end of this section).

### Map Contents

In this image, the "Polygons layer" has now been turned off, revealing the "Watersheds (HUC8)" layer below. Again, note that the "Points layer", still turned on, is overlaying the watersheds.

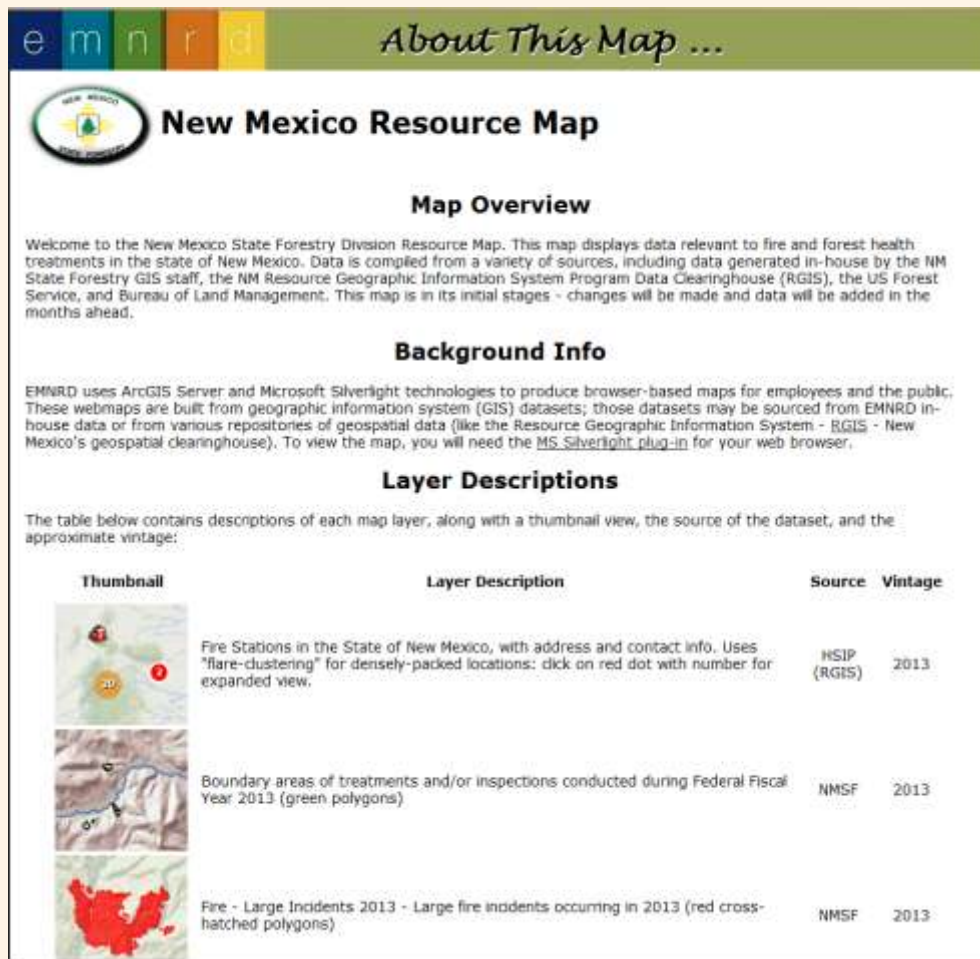


## About This Map

Often the map user is left to decipher what's what in terms of the layers and attributes. EMNRD has decided to always provide an "About This Map" (ATM) link on the web map page. To that end a web page template was created and a procedure developed to ensure all maps would have an "About This Map" section available to the user. The contents of the ATM page have been standardized:

- A. A "Map Overview" summarizing why the web map was published;
- B. General background info ("We use ArcGIS Server with the Silverlight API" etc.);
- C. "Layer Descriptions" of each layer or dataset included in the map (other than basemaps), comprising:
  1. A thumbnail view image of the data at a useful scale;
  2. The layer description;
  3. The data source (in-house, RGIS, BLM, etc.);
  4. The vintage of the data (year of data publication, such as 2012)
- D. Disclaimer
- E. Contact info for map author

It's fairly easy to add content to the template, it establishes a consistent look and feel to all EMNRD web maps, and allows for reuse of layer information across many maps. And, the user has a better idea about the purpose of the web map, how stale the data is, etc.



**New Mexico Resource Map**

### Map Overview




Welcome to the New Mexico State Forestry Division Resource Map. This map displays data relevant to fire and forest health treatments in the state of New Mexico. Data is compiled from a variety of sources, including data generated in-house by the NM State Forestry GIS staff, the NM Resource Geographic Information System Program Data Clearinghouse (RGIS), the US Forest Service, and Bureau of Land Management. This map is in its initial stages - changes will be made and data will be added in the months ahead.

### Background Info

EMNRD uses ArcGIS Server and Microsoft Silverlight technologies to produce browser-based maps for employees and the public. These webmaps are built from geographic information system (GIS) datasets; those datasets may be sourced from EMNRD in-house data or from various repositories of geospatial data (like the Resource Geographic Information System - RGIS - New Mexico's geospatial clearinghouse). To view the map, you will need the [MS Silverlight plug-in](#) for your web browser.

### Layer Descriptions

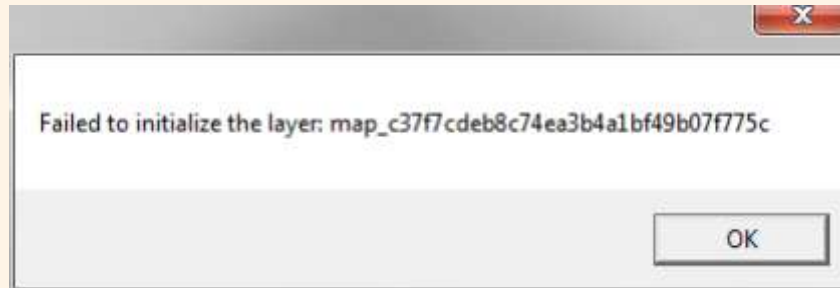
The table below contains descriptions of each map layer, along with a thumbnail view, the source of the dataset, and the approximate vintage:

Thumbnail	Layer Description	Source	Vintage
	Fire Stations in the State of New Mexico, with address and contact info. Uses "flare-clustering" for densely-packed locations: click on red dot with number for expanded view.	HSIP (RGIS)	2013
	Boundary areas of treatments and/or inspections conducted during Federal Fiscal Year 2013 (green polygons)	NMSF	2013
	Fire - Large Incidents 2013 - Large fire incidents occurring in 2013 (red cross-hatched polygons)	NMSF	2013

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### Map layer failed to initialize

EMNRD initially was bedeviled by a recurring error message - the infamous (to us at least) "Failed to initialize the layer: map\_absolutelyincomprehensiblestring". The message typically spawned upon first use of a map during the day.



The error did not crop up when using web maps created using the old v10.0 Wizard (based on JavaScript), but was a frequent occurrence with SLAPI maps. The offending layer would differ, and the error seemed to be order-sensitive, in that point layers (usually loaded last programmatically) were most often the layer in question. Simply refreshing the web page nearly always resolved the situation.

Esri Help and Forums provided non-sage advice: "If you see this error, make sure your server is turned on, the service is running, and the service URL is properly formed in your code." That was the sum total of the collected knowledge concerning this problem and its resolution. "Is your PC plugged in?"

EMNRD asked the Timmons Group about their experience with this (hoping for a fix), and the response was "Oh yeah, it does that sometimes." However, they did recommend staggering the service restart times (so they all didn't try to restart each day at exactly 12:00AM). That helped, slightly.

EMNRD tried creating a script to automatically spawn a web browser early in the AM to launch each map – and then end the instance a minute or two later, in hopes that it would resolve the situation by kludginess (the script would constitute the "first instance of the map" for that day). The script worked fine, but the problem remained.

The Esri SLAPI Developers Forum had this to say:

*At times, initialization of a layer may fail. This may be caused by any number of issues. Some of the more common problems are:*

*URL property is incorrect*

*Service is not available*

*Site that hosts the service needs a cross-site policy file (clientaccesspolicy.xml or crossdomain.xml)*

*Service is secured and requires a token or credentials*

*By default, when a layer fails to initialize, it will not be displayed in a map. To listen for initialization failure, handle the InitializationFailed event and check the exception returned via the layer's InitializationFailure property.*

Good points all, but still not the answer we seek. The problem persists, albeit to a much lesser degree with v10.1 and the latest Esri SLAPI Viewer. So the only conclusion we can come to is "yup, sometimes it does that ..."

### Tracking Maps & Services

With more web maps and more web map authors in the future, there's a need to track services in use and which maps use which services. If you have a number of web maps, each with some services shared with other maps, it can be hard to keep track of all the dependencies when it comes time to fix a problem, shut a service down to change the oil, or

otherwise disrupt the flow. Not all problems are scheduled to occur late Friday night during periods of relative quiescence. Plus, the layer somebody had to have last year might have become orphaned and superfluous this year (or next).

Our dear little friend, the spreadsheet, comes to the rescue. A tracking spreadsheet was created that lists all web maps, cross-referencing all the layers and services they use, for both the Development and Production environments. Spiffily color-coded, and kept up-to-date. All authors and infrastructure types can instantly see the ripple effect of shutting down this service or that service, as well as monitoring which services have outlived their purpose.

## The "make it about one thing" Web Map

Those that have been doing GIS for a long time probably have come to appreciate cramming as much information into an ArcMap document as they can. Layers upon layers at your beck and call, attribute lists that would swamp the Library of Congress – it's a mind-set many of us have.

The web map world has changed things. Not all users are GIS experts, and many express the opinion that "there's too much stuff in here". The new way is the "make it about one thing" web map, trimmed down to a single topic and a minimum of included services. It is a construct mandated in part by the need to optimize the map's speed for loading into the client's browser: the data isn't on the desktop anymore. The situation is similar to having a collection of vinyl in the days of Spotify.

## Now that we're done, time to start anew

Perhaps the title of this section is misleading: with web mapping, you're never done. There's always a new technology being pushed, a new method created that makes your well-planned choices seem obsolete. Sometimes chasing the latest tech trend becomes an end unto itself ... a hamster wheel.

Good luck.

 <p><b>GIS Services</b></p> <p>4870 W McElroy Dr Tucson AZ 85745 520-991-0727, <a href="mailto:info@gisservices.net">info@gisservices.net</a></p>	 <p><b>Capturx</b> Digital Pen for ArcGIS &amp; Data <b>Free Pilot Projects</b></p>	<p><b>Other Products and Services</b> LizardTech Software Intermap-3D Terrain Data TerraGo Software Solutions GeoBlu UAV Sales &amp; Services ikeGPS Solutions GIS Training and Integration Arc2Earth iSTAR 360° Cameras</p>	<p><b>Ricoh 700SE GIS Camera</b> GPS-Ready Camera, Captures Location and Data with Your Images</p> 
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## GIS Jobs and Careers Ebook

As a GIS educator, I'd like to make you and your students aware of a free eBook we are offering entitled "GIS Jobs, GISP Certification and Geospatial Careers." The eBook was compiled from past articles published by Directions Magazine. So far, the eBook has generated nearly 1500 downloads and is available at no charge. The contents of the book include:

**Prepare to Get That Job: 20 Challenging GIS Interview Questions**

**Ten Things to Know about the Geospatial Technology Competency Model**

**New Resources for GIS Job Seekers**

**Geospatial Occupations Q&A – Part One**

**Geospatial Occupations Q&A – Part Two**

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**The Great Debate: To Certify or not to Certify, That Is an Absurd Question**

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**Q&A: Directions Magazine's Special Session on GIS Certification with:**

**David DiBiase, former GISCI President, and Sheila Wilson, GISCI Executive Director**

<http://www.directionsmag.com/images/ebooks/2013/07/GIS-jobs.pdf>

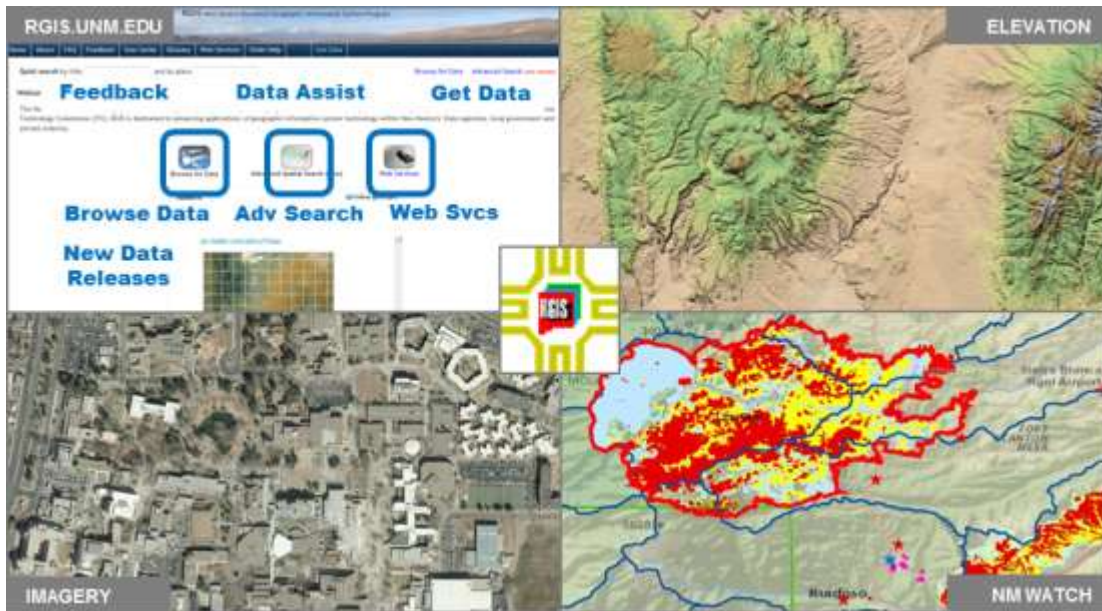


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## Need Data?



## RGIS (Resource Geographic Information System)

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Contact: Laura Gleasner

Email: [lgleasner@edac.unm.edu](mailto:lgleasner@edac.unm.edu)

Voice: 505.277-3622 Ext 230

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



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### Proposal for New Mexico's 1st Ph.D. Program in Geography

The Department of Geography and Environmental Studies at the University of New Mexico and the Department of Geography at New Mexico State University are proposing a new joint Ph.D. degree in geography. The joint UNM/NMSU Ph.D. Program will capitalize on the combined strengths of both geography departments, creating a synergy between UNM's broad expertise in environmental studies (natural resource management, policy, law, conservation, historical) and in GIScience (GIS, remote sensing, geovisualization, spatial cognition, modeling), and NMSU's broad expertise in physical geography (biogeography, land change science, geomorphology, water, arid lands) and applications of GIScience (education, resource management).

The foci for the PhD program is "human and environment interaction," considering interaction from the perspectives of GIScience, policy and law, natural resource management and land-change science. The rationale for a Joint program include (1) there currently is no PhD program in geography in New Mexico; (2) geography and spatial information sciences is one of the top three career areas in the U.S. that requires a graduate degree (US Bureau of Labor and Statistics); and (3) to respond to the Provost's initiative to foster collaboration between universities in New Mexico that leverages different expertise and maximizes utilization of resources. A Joint PhD would bring together the current 9 tenured/tenure-track faculty members in geography and environmental studies at UNM and 6 tenured/tenure-track faculty members in geography at NMSU. This joint program would have considerable benefits to both departments, universities, and the State of New Mexico.

IF YOU ARE INTERESTED IN STUDYING FOR A PH.D. IN GEOGRAPHY, PLEASE EMAIL MARY THOMAS

[maryt@unm.edu](mailto:maryt@unm.edu)

Letters of interest, especially from alumni will help us to demonstrate to UNM and to the State Legislature a need for a Ph.D. program in Geography in New Mexico.





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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**Mining Applications**

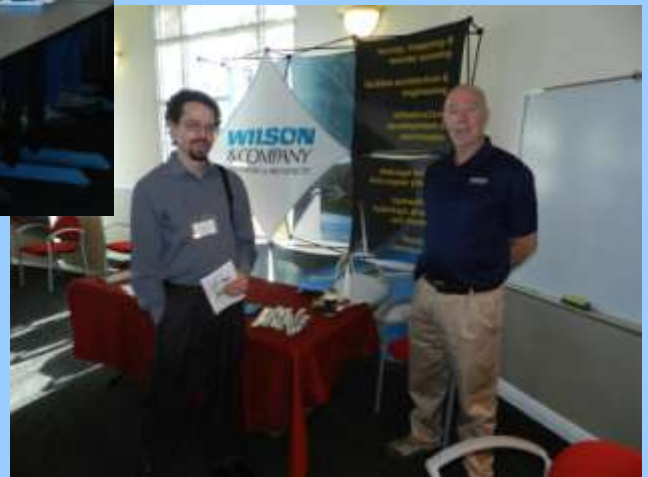
- Terrain modeling and visualization
- Volumetrics for earthmoving and reclamation
- Geostatistical analyses of ore reserves

**Contact:** David Jordan, PE • INTERA Albuquerque • (505) 246-1600 • [djordan@intera.com](mailto:djordan@intera.com)  
Tanya Unger-Holtz, GISP • INTERA Boulder • (303) 652-8899 • [tholtz@intera.com](mailto:tholtz@intera.com)











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

The National States Geographic Information Council (NSGIC) held its annual Mid-year Meeting in Annapolis, MD, from February 24 – 27, 2013. Both Gar Clarke (NM Department of Information Technology), who is the official representative to NSGIC, and Leland Pierce (NM Dept. of Game and Fish), a NSGIC board member, attended. Major topics included Virtual USA, National 3D Elevation program, broadband, Map-21, addressing issues, and State geospatial governance. For more, see the conference archives at: <http://www.nsgic.org/2013-midyear-meeting-archive>.

NSGIC has been active in providing webex opportunities for state representative to come together to discuss important issues. Issues included presentations by Esri on ArcGIS Online, addressing, FirstNet, and addressing.

Lastly, NSGIC will be holding its Annual Conference in Kansas City, MO, from October 27 – 31. Major topics include future federal advocacy by NSGIC, Map-21, Next Generation 911, broadband, GIS and health, and addressing. Look to the NSGIC website for archives from the conference in November ([www.nsgic.org](http://www.nsgic.org)).

For more information on NSGIC,  
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# Integration of Airborne Dust Prediction Systems

## and Vegetation Phenology to Track Pollen for Asthma Alerts in Public Health Decision Support Systems

by Amy Budge and Bill Hudspeth, EDAC-UNM

Changes in our environment can have serious implications for managing and monitoring public health, both locally and globally. By understanding changes in environmental conditions and how they impact public health, we can apply this knowledge to develop early warning and forecasting systems to alert health care professionals of an impending event such as pollen. Figure 1 is an example of a pollen burst produced by *Juniperus ashei* in central Texas. New Mexico's Environmental Public Health Tracking System (NMEPHTS), funded by the Centers for Disease Control and Prevention (CDC) Environmental Public Health Tracking Network (EPHTN), aims to improve health awareness and services by linking health effects data with levels and frequency of environmental exposure.



Figure 1. Pollen burst. Photo courtesy of Robert Stubblefield, Texas Tech University.

NASA's Marshall Space Flight Center has been awarded a four-year project to *Integrate Airborne Dust Prediction Systems and Vegetation Phenology to Track Pollen for Asthma Alerts in Public Health Decision Support Systems*. The concept of this project is to assimilate Earth science data into a weather forecast model that has been adapted to forecast pollen and to deliver output products to NMEPHTS. The project focuses on pollen bursts for four species of junipers in parts of New Mexico, Texas, and Oklahoma (Figure 2).

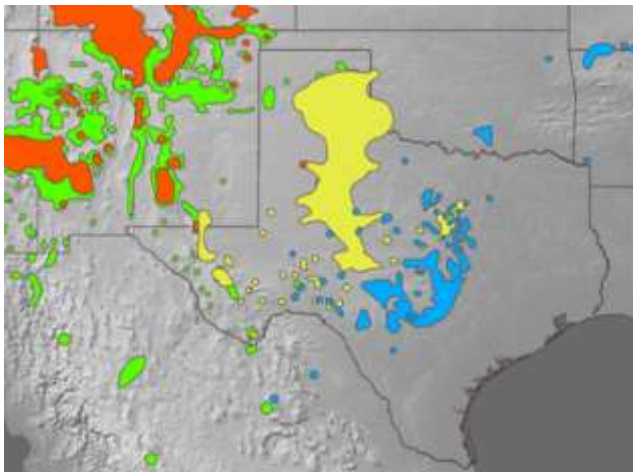


Figure 2. Distribution of *J. ashei* (blue); *J. pinchotii* (yellow); *J. monosperma* (green); and *J. scopulorum* (red). Adapted from USGS *Digital Representations of Tree Species Range Maps*.

(Continued on page 25)





Figure 3. Burkhard pollen sampler

As a component of this project, UNM's Earth Data Analysis Center (EDAC) is developing a web-based decision support system for forecasting pollen concentration data. Designed to meet the requirements of NMEPHTS, the system includes state-of-the-art statistical analysis tools; geospatial visualization tools; data discovery, extraction, and delivery tools; and environmental/public health linkage information. Other project members are mapping pollen emission sources using SWreGAP data; observing and reporting the pollination cycle of junipers from developing cones to releasing pollen; analyzing pollen grains collected by pollen samplers; and using the Pollen Regional Atmospheric Model (PREAM) to produce forecasts of pollen events.

Burkhard pollen ground samplers (Figure 3) were placed in strategic locations during the relative pollen seasons for *J. ashei*, *J. pinchotii* (late fall through late winter in Texas and Oklahoma) and *J. scopulorum* and *J. monosperma* (late winter through mid-spring in New Mexico). Pollen grains collected by the samplers were analyzed by team members at the University of Tulsa. Results of the analyses were sent to the modelers for ingesting into PREAM. Using these analyses and pollen emission source data provided by the image processing team, initial model runs were conducted to produce the first results of pollen forecasts. Model output data are stored in an ascii format for further processing by EDAC to develop products for NMEPHTS. The files contain data values at 3-hour intervals for a 48-hour period forecast as well as latitude and longitude information.

EDAC's post-processing script instantiates an algorithm to ingest data output files, and export a GeoTiff for each modeled output hour in a 48-hour forecast. The ingested text file is stored first in a native Python data object (a list). White space and extraneous header lines are removed, and the data are reformatted as a Python NumPy array, a two-dimensional data structure that represents the grid dimensions of the modelling exercise. These array objects are exported to a GeoTiff, and the relevant data values (timestamp, raster file location, etc.) are written into EDAC's GSToRE geospatial database.

The GSToRE geospatial database is the backbone of EDAC's RGIS and EPSCoR data repositories. The system and infrastructure have been customized to deliver stored data in a wide variety of formats, including source file downloads, WMS, WCS, as well as various vector formats. GeoTiffs created by the post-processing script are stored on the file system. PREAM outputs can be analyzed to generate county-wide statistics (e.g., mean concentration by county for a given time interval), which also are contained in GSToRE. Once data are stored in GSToRE, web map services (WMS) and web coverage services (WCS) can be called to display the data in a web-client.

## Integration of Airborne Dust Prediction Systems

The project is entering its fourth and final year. Team members are verifying and validating the model's performance and have produced early results. Figure 4 represents a visualization of pollen forecast data produced by PREAM. Figure 5 illustrates how the GeoTif products can be used with other GIS layers such as state boundaries, distribution maps of juniper species, and digital terrain data.

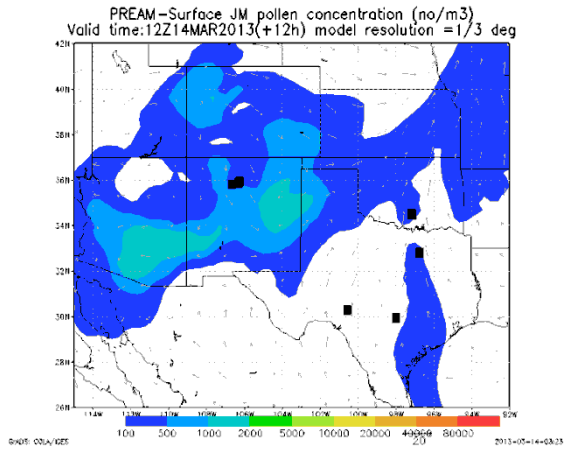


Figure 4. PREAM output of pollen forecast; 14Mar2013 at 12:00Z (5:00 am MST).

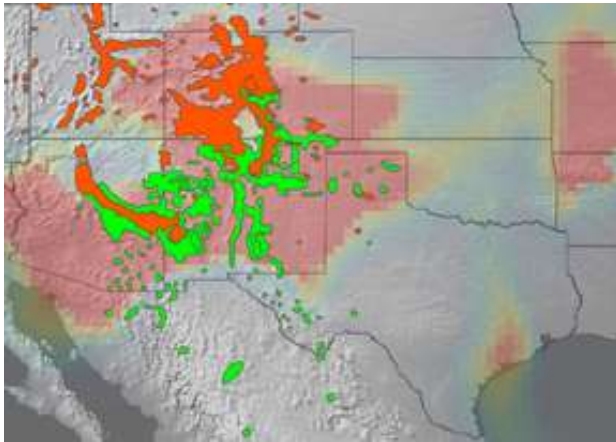


Figure 5. Using GeoTif product for pollen forecast of 14Mar2013 at 12:00Z in a GIS application.

Submitted by Amy Budge and Bill Hudspeth, EDAC-UNM

### **Project Partners:**

Jeff Luvall (NASA Marshall Space Flight Center)

Estelle Levetin & Landon Bunderson (University of Tulsa)

Peter Van De Water (Fresno State University)

Bill Sprigg, Anup Prasad, Slobodan Nickovic, Ana Vukovic, & Goran Pejanovic (University of Arizona)

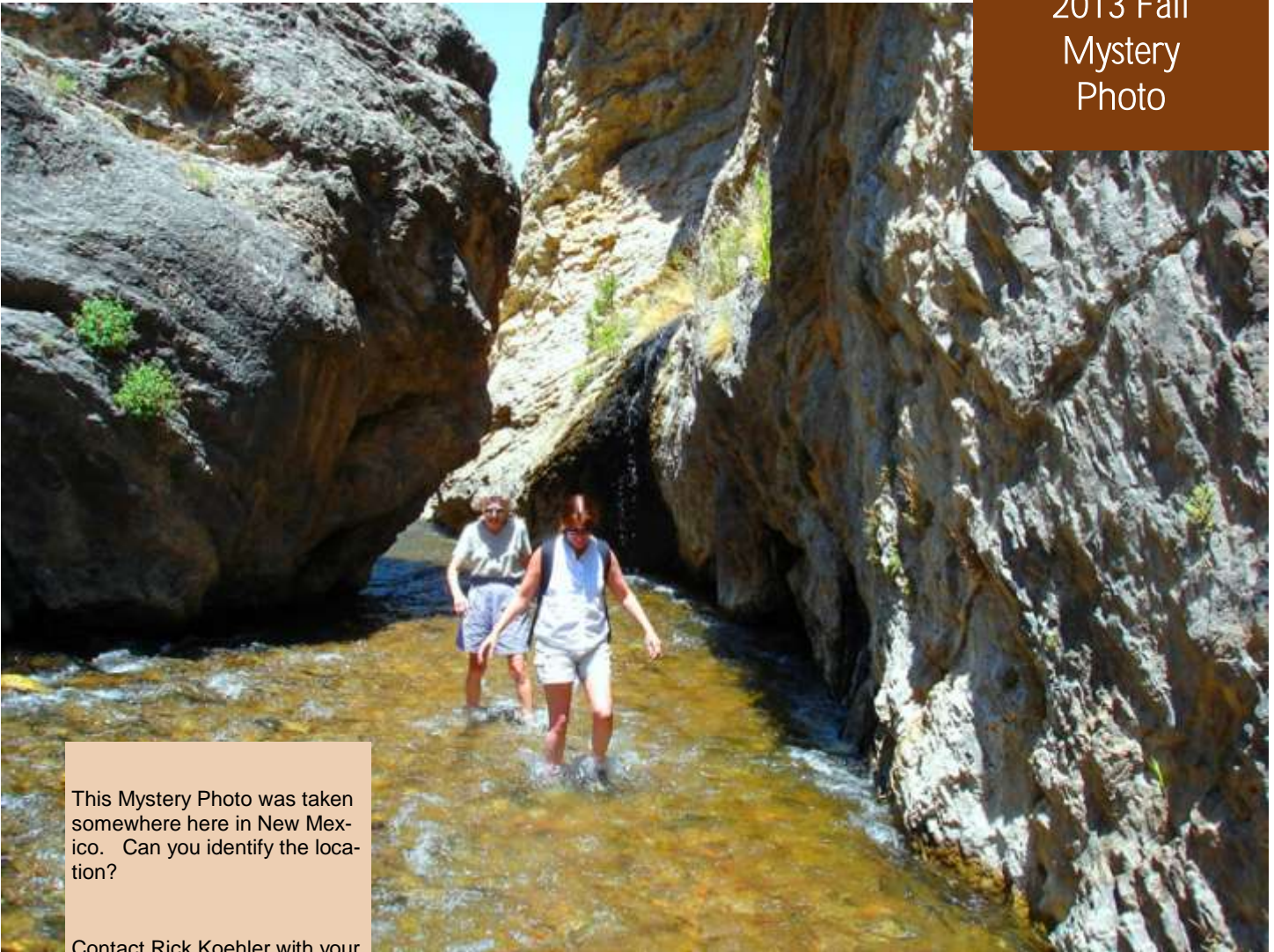
Theresa Crimmins (National Phenology Network)

Orrin Myers (University of New Mexico)

Heidi Krapfl, Barbara Toth, & Ken Geter (NM Department of Health)

Alan Zelicoff (St. Louis University)

## 2013 Fall 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 prize!

**[Rick.koehler@state.nm.us](mailto:Rick.koehler@state.nm.us)**

### From Editors Desk

Greetings Map Legend Readers,

Another issue complete, and I am thankful for the contributions from Amy and a last minute tome by Rick! Without their work this would have been a little thin on exciting real world applications of GIS. Also thanks to our corporate sponsors for helping keep this organization rolling.

I would like all readers to consider submitting something for the Spring issue, as last spring we had no articles submitted and no issue came out. For 2014, we will have a spring issue, and I am going to harp and badger everyone I encounter to pull this off. No article is too small, write a paragraph about a problem encountered or a solution found—this has potential to benefit all our readers and our GIS community. Start thinking now, so when I start compiling the issue in February, we will be ready!

See everyone at the Fall workshop and meeting!

Many Thanks,  
Jason Fink  
[mandoFink@gmail.com](mailto:mandoFink@gmail.com)



## NMGIC Member submitted Websites

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NMGIC Twitter Feed : [http://twitter.com/NMGIC\\_Inc](http://twitter.com/NMGIC_Inc)

NMGIC Facebook : : [http://twitter.com/NMGIC\\_Inc](http://twitter.com/NMGIC_Inc)

A rather disturbing piece on NPR about spoofing the GPS signal. That story was rather brief, but it is based on a slightly longer TED talk by GPS expert Todd Humphrey. He predicts that we will soon have cheap, ubiquitous "GPS dots" with centimeter accuracy that we can use to keep track of the locations of anything we want. And then he explains how you can buy a device right now that creates a protective bubble around you to block GPS signals if you are concerned about location privacy. The really chilling part, however, is that he has built and tested a device that will spoof any GPS receiver and have it display faulty location, unknown to the user. There are obviously vast implications to all of this.

The TED video is 15:46 <http://www.npr.org/2013/09/13/219325617/will-gps-change-our-standards-for-privacy>

<http://www.directionsmag.com/pressreleases/urisa-notes-the-california-supreme-courts-decision-in-orange-county-case/339902>

Interesting article and comments related to the accuracy of GPS with smart phones and modern devices to collect data in the field.

<http://blogs.esri.com/esri/arcgis/2013/07/15/smartphones-tablets-and-gps-accuracy/#comment-4976>

One item, which I grant is about as interesting as watching paint dry, is that the FGDC is working on a new strategy for a National Spatial Data Infrastructure. For more, and you can swipe some language off of this site, see: <http://www.fgdc.gov/nsdi-plan>

Decommissioning of Landsat 5: <http://www.directionsmag.com/pressreleases/usgs-completes-decommissioning-of-landsat-5/335823>

Landsat 8: <http://www.directionsmag.com/channels/government/articles/landsat-8-set-to-extend-long-run-of-observing-earth/332222>

And something you might find of interest: <http://www.directionsmag.com/channels/education/articles/ten-ways-civil-hacking-is-good-for-cities/329834>





**NM RGIS Celebrates Statutory Designation**

The 2013 New Mexico Legislature designated the RGIS (Resource Geographic Information System) Program as the *state digital geospatial data clearinghouse* with House Bill 493, signed by the governor on March 15, 2013. Passage of this statutory designation culminates years of efforts by RGIS staff, stakeholders, and users to gain recognition and permanence for New Mexico’s only geospatial data clearinghouse. The legislation acknowledges the key role that geospatial data play in the continued development of the state’s agencies, economy, and educational and research capacity. It clarifies where the nexus exists for geospatial data activities within the state, while recognizing that there are many participants and stakeholders in the development, management, and use of geospatial data in New Mexico. NM RGIS: [rgis.unm.edu](http://rgis.unm.edu)

The RGIS mission is to develop and expand accessible geospatial information and the use of GIS technology, creating a comprehensive GIS resource for state and local governments, educational institutions, nonprofit organizations, businesses, and the public; to promote geospatial information and GIS technology as analytical tools for decision makers and researchers; and to provide a central clearinghouse to avoid data duplication and to improve information-transfer efficiency.

The RGIS Program acquires, creates, and coordinates the acquisition of statewide geospatial data, develops metadata as needed, and repackages and disseminates, at no cost to its users, information and knowledge that otherwise might not be available or easily accessed, and certainly not from one, consolidated source. To disseminate these data, RGIS develops, maintains, and updates the RGIS Clearinghouse Web application for discovery and access of geospatial data and information that are compliant with national standards and best practices.

The program allows decision makers to take advantage of the cost savings and efficiencies of GIS, a technology that is fundamental to efficient, integrated decision-making on such topics as infrastructure management, transportation system management, assessor data management, economic development, and many others. Recent successes and impacts to the state include RGIS collaborations with agencies at various levels to acquire image and elevation data in response to the Las Conchas wildfire and subsequent flooding in the Jemez Mountains. These data were critical in assessing damage and fundamental to the recovery planning now under way.

GIS classes taught at New Mexico’s schools, colleges, and universities access the RGIS application and geospatial data for in-class instruction and student assignments and for projects that impact a wide range of academic disciplines, including engineering, architecture and planning, economics, geography, etc. Statewide in scope, RGIS serves government, education, research, and non-profit communities.

(Continued next page)



Earth Data Analysis Center (EDAC) at The University of New Mexico (UNM) has developed and managed the RGIS Program and Clearinghouse for 23 years, with the UNM Bureau of Business and Economic Research (BBER) partnering to provide socioeconomic data products. As one of the first data clearinghouses in the nation, RGIS has been the model and data source for other clearinghouses and central repositories.

The RGIS Program/Clearinghouse is one of three core elements in New Mexico's geospatial community, along with the NM Geospatial Advisory Committee (GAC) and NM Geographic Information Council (NMGIC). In this role RGIS maintains strong ties to geospatial organizations through affiliations with the GIS community in the region and nationally, as well as in local and tribal governments and state and federal agencies. As a voting member in GAC, RGIS participates in decisions and activities that drive the state's geospatial efforts and presence. And as a member of GAC, RGIS responds to state and local government at several levels. RGIS staff collaborates with representatives from state, local, education, and business sectors in New Mexico's geospatial community toward the crafting of information for legislators. House Joint Memorial 81 (2011) is an example of this success. RGIS staff met with stakeholders, led working groups, and authored documents to support or to integrate into that memorial. Task Force efforts and the approved memorial formed a basis for the 2013 NM Legislature's designation of RGIS as the state's digital geospatial data clearinghouse. For the 2013 designation, RGIS staff developed information packets for and met with legislators and legislative committees throughout the process of introducing, discussing, and passing HB 493.

A long-standing and public-service program, RGIS has served and continues to serve New Mexico by providing relevant, current, and freely accessible geospatial data, tools, and resources for state, local, and tribal government, education and academia, non-profit organizations, private business and industry, and the public.



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## 2013-2014 GIS Calendar of Events

### GITA

GIS for Oil and Gas Conference Oct 28-30 2013 Houston Tx

### GIS Day

GIS Day , November 20, 2013, "everywhere"

### NSGIC

2014 Midyear Conference, Feb 23-26, in Annapolis, Md

### ASPRS

2014 Annual Conference March 23-27, in Louisville Ky

### NMGIC

Spring 2014 Workshop/Meeting, Date and Location to be determined

### ESRI

International User Conference, July 14-18, in San Diego, California

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Invoicing/Billing Address if different from above:

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Enclosed is my:    Check     Money Order     Make Check or Money Order payable to: NMGIC, Inc.

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*Student:* \$15.00 (Must include a photocopy of current Student I.D.)

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