GIS Notes

Illinois Geographic Information Systems Association

AUGUST 2017

ILGISA President's Report

This year we completed the exciting process of developing a new strategic plan. The ILGISA Board had many deep and thoughtful discussions that led to a new vision. For the next three years, we will focus on strengthening our financial standing, growing our membership, providing unique educational opportunities, raising GIS awareness throughout the state, and improving the value of being a member of ILGISA. We have already been working hard toward these goals. I am excited to see how we progress. To learn more about the new strategic plan and ways you can help implement it, please visit www.ilgisa.org and go to "About Us" under Governance. As always, we welcome ideas from all members on how ILGISA can change in the near future.

We had three regional meetings this year. GIS professionals gathered in Charleston, Chicago, and Dixon. There was so much shared within our GIS Community. If you have not had a chance to attend a regional meeting, I encourage you to set aside a day to attend next year! These are truly great events, you meet wonderful people in the GIS industry, learn how GIS is evolving, and share new ideas and innovations. For one, I learned at the Chicago regional meeting how drones are being utilized in a variety of GIS applications and promise to transform our field. I was very much inspired by the DePaul University students and their creative uses of Story Maps!

Speaking of great opportunities, our annual conference is quickly approaching. Mark your calendars for October 2nd to October 4th. Our conference theme this year will be "Mapping our Future". The conference location will be at the Marriot Hotel and Conference Center in Bloomington-Normal. It will be exciting to explore this new location and there is great content already planned. I look forward to seeing you all there!

With all my heart, I thank our volunteers, the ILGISA Board, Megan Galeher, CM Services, and all who have dedicated their time and effort to make each of our events a success. Our organization truly relies on the efforts of our volunteers. I am thankful to you all and proud to be a member of ILGISA. ■

Very Truly Yours,
Nicole Gattuso, GISP
ILGISA President

Editor's Notes

In our work, we are tasked with three responsibilities: help humanity (in whole, part or individually) 1) to ask geo-spatial questions; 2) find geo-spatial answers; and 3) test the viability of those answers. We have two career responsibilities: 4) master the technology, art and & science of where; and 5) create and give back knowledge and experience.

In this edition we feature members who demonstrate these 5 principles:

Gail, the goal of the 2020 Census is to count everyone once, and only once, and in the right place.

Bill, FirstNet provides a dedicated cellular network for all public safety communications.

Lizzie, never be afraid to ask for help, always keep learning and above all else simplify.

Keisuke, off-line mapping will still play an important role in remote locations and during emergencies.

Justin, Our goal is to better inform and serve the public; this fascinating new technology allows us to meet our objects and then to raise the bar.

Mike, positional accuracy is the final product of detailed drone flight and ground control, planning and competent processing of the geospatial data.

Rich, advancement placement GIS&T is designed to introduce students to the science of where; before they choose a career-path.

I see you as an active member of ILGISA, a 1000+ person association creating and giving back geo-spatial solutions! ■

Jeff Palmer
Acting GIS Notes Editor

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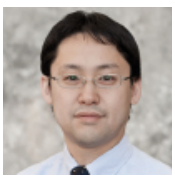

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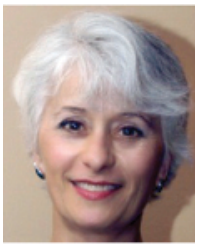
ILGISA Committee Updates



Program Committee Update
What Do You Want to Learn About?
The Program Committee Is Here to Make It Happen

As Shared By: Mary Elliott
ILGISA Program Committee Chair
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This year the Program Committee worked feverishly to organize interesting and informative Regional Meetings. Now our attention is focused on the Annual Conference, to be held in Bloomington-Normal this Oct 2-4. Our goal, as always, is to bring informative, interesting talks to our combined member and non-member audiences. And attendance totaled nearly 200 people for these three local events, exceeding expectations. As we approach the deadline of session development for the Conference, here is a précis of the three RMs that have been held, quite successfully, this year in Charleston, Chicago, and Dixon. Perhaps one or two of these presentations might embolden you to submit your own talk. Or, you may know someone who could speak on one of these or a different topic altogether. Drop us a line at: contact@ilgisa.org with your idea for a talk, or suggestion of someone who might present their own topic. Yes, we encourage participation.

Everybody! Into the pool!

New Initiative for Sponsors!

Making good use of a new initiative, the Committee offered Sponsorship opportunities of these Regional Meetings to businesses. Sponsoring different RMs, Canon Solutions and EagleView's Pictometry each took advantage of their position as the sole Corporate presence to interact with their receptive and targeted audiences. The Committee received quite positive feedback from these companies in their inaugural venture sponsoring these events. Attendees appreciated the chance to talk with these companies about their products and services in a relaxed setting.

The Regional Meetings

In Charleston on the Eastern Illinois University campus at Buzzard* Hall auditorium, the Illinois State Police launched their take-it-to-the-people tour detailing their initiative to develop and implement a Statewide GIS-based cross-agency 911, named NG911. In another presentation, the State Police reviewed how GIS enhanced their ability to respond in major public safety incidents. The Cole-Moultrie Electric Cooperative and Coles County Regional Planning group each use GIS to manage their utilities. Cole-Moultrie highlighted how open-source GIS fit their needs. Coles Co explained how GIS enabled them to clearly map and efficiently maintain their utilities. The city of Decatur illustrated their program to manage assets with Collector. Cloudpoint has a tool that promises to smooth deployment of ArcGIS Pro for your group. An eclectic variety of high-energy lightning talks completed the presentations.

At the DePaul Campus in Chicago, Sponsor Canon Solutions greeted attendees with an intriguing waterfall display of their weather-resistant paper mapping products. In the sessions, the Illinois State Police brought their presentation of their NG911 project to this area's attendees, another stop in their statewide outreach. In their own taking-it-to-the-people tour, the Census unveiled their new program encouraging local address authorities allowing them – the local authorities - to be the ones updating and correcting their city's addresses for the 2020 decennial census. This truly puts the power into the hands of the cities themselves. HERE discussed its employment of geospatial data to respond to current and future mapping needs. Uplift demonstrated their tools ability to collect and analyze UAV data (mustn't call them drones, mustn't call them drones). Students of the University took advantage of the RM to present posters in a range of style illustrating their innovative course work projects. Students also participated in lightning talks, complete with audience participation. Their engaged and enthusiastic synopses of their projects & posters was refreshing, interesting and just plain fun. So was the audience countdown as their time limits

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approached. Two presentations using StoryMap and Map Book demonstrated very different arenas where these tools were used: one a history of Chicago land use by a student; the other how easy it is to digitally enrich Map Books. The day's presentations concluded with a couple of fascinating talks describing the Geographic Society of Chicago and a lushly illustrated tribute to 500 years of 'Modern' cartography.

Forging ties to another agency in the Dixon area, ILGISA partnered with the Blackhawk Hills Regional Council to present the Dixon RM held at Sauk Valley Community College. Expanding their outreach to local professional groups into the Dixon-Sterling area, the Statewide NG911 Project and the Census' Local Address Updates initiatives brought their messages to this audience. Continuing this theme of bringing data and tools to the public, three spatial data businesses presented talks illustrating the usefulness of their proprietary tools in the cadastral and utility fields. Bruce Harris demonstrated their tools for parcels; CloudPoint showed how they have developed a solid GIS for an electric department; and ExteNet Systems revealed their GIS for Telecom. Another interesting talk explained how Grundy County spanned the differences between form-based data and map-based data. The day's final presentations demo'd 2 Apps: DuPage Co's Citizen Reporter App and how that County developed workflow efficiencies through Collector and Web App Builder.

After each of these Regional Meetings, attendees and sponsors were encouraged to submit their comments about the RM. It is impossible to stress how valuable these comments are to the Program Committee. This is one of the main avenues we have which allows us to find out what is of interest to our membership, what topics they would like to learn more about.

There is still time to submit ideas for sessions at the Annual Conference to the Committee! Please drop us a line about topics of interest to you. Include the name of someone knowledgeable about the topic, too, so we have a starting point. Again, our only goal is to develop high-quality sessions for you that are both timely and interesting.

Just do it. Drop us an email about topics at: contact@ilgisa.org

**Buzzard Hall - what a great name! This auditorium is named for Robert G. Buzzard, EIU's third president known for steering the university from a teacher's training school towards general education in the late '40's.* ■

Outreach Committee Update

As Shared By: Robert Spelich
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This year the Outreach Committee has enjoyed active participation by its members in its commitment to serve the ILGISA Board and the GIS community. The core functions and responsibilities of the committee continued throughout the year with new initiatives established along the way. It has been a productive year.

This 2017 edition of GIS Notes, spearheaded by Jeff Palmer and Keisuke Nozaki, was published and from cover to cover contains the high quality and relevant content that the community has come to expect. The Outreach Committee is proud to present this publication that continues to highlight the importance of the GIS profession and the contributions of our members. I would like to personally thank Jeff and Keisuke for another job well done.

2017 also saw a thorough review of the ILGISA website and the adoption of a social media policy that will serve as a guide for current and future Outreach Committee members. In addition, the followers of the ILGISA social media accounts such as Facebook and Twitter saw an increase in interesting and useful posts. My appreciation goes out to our committee members for participating in that effort.

In cooperation with the Membership Committee and the Ad Hoc Data Committee, the Outreach Committee embarked on a new initiative to expand ILGISA membership in the 39 counties not currently represented in membership. This cooperative effort will seek to contact representatives of these counties to introduce them to the association and to its benefits as an educational resource and as a platform for the exchange of ideas. ■

Membership Committee Update

As Shared By: Jason Verachtert
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The Membership committee is working on a few items this year. The first item to be discussed was the ILGISA Map Competition. The Committee decided to make the Map Competition theme a bit more broad in order to gain higher participation. The theme was determined to be "Most Interesting Map." There is both a traditional map category & a web based map category for the competition. New this year, the Committee decided on adding a $50 gift card for the winners of the four different categories as an incentive to encourage more entries. The winners of the "Most Interesting Map" competition will be announced at the Annual Conference in October.

Working on future goals, the Committee has been looking at ways to expand our membership into underserved areas of the state. A list counties that are not current ILGISA members was compiled by an Ad-Hoc Committee. This list will be used to encourage these counties to participate in future ILGISA events, and eventually become members. The Committee is also looking to reach out to GIS users in more of the private sector companies and utilities that operate in the state. Lastly, the Committee is looking at ways to increase sponsorships for the various activities ILGISA undertakes. ■

2020 Census Kicks Off

With the Local Update of Census Addresses Operation (LUCA)

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The 2020 Census Local Update of Census Addresses (LUCA) Operation is underway. The Census Bureau started mailing the LUCA invitation letters and registration forms to Highest Elected Officials, Tribal Chairs, and Governors in July. The Census Bureau also mails a courtesy copy of the invitation letter to other contacts in the governmental unit, to alert them that their Highest Elected Official has received the formal LUCA invitation.

The LUCA operation is a geographic partnership program mandated by the Address List Improvement Act of 1994 (P.L. 103-430). This is the **only** opportunity offered to tribal, state, and local governments to review and update the Census Bureau's residential address list prior to the 2020 Census. Participants may add, delete, and correct addresses on the Census Bureau's address list and update census maps to help ensure a complete and accurate Master Address File for the 2020 Census. The Census Bureau depends on a complete and accurate address list to reach every living quarters and its associated population for inclusion in the census.

It is important to note that an address not included on the Census Bureau's address list for the decennial census, and its associated population, **cannot be added to the census count** after the Census Bureau completes the 2020 Census. Article 1 Section 2 of the U.S. Constitution mandates that the Census Bureau deliver the population counts for apportionment of the U.S. House of Representatives to the President by December 31, 2020.

The value of participating in the LUCA operation is considerable, since the accuracy of the Census Bureau's address list for census enumeration can have a direct impact on governmental unit funding. Most federal and state funding allocations are based on formulas that include population counts. Housing units missing from the census address list preclude enumeration of the population associated with them, which in turn may mean missed funding. **Missed funding lasts throughout the decade, until the next decennial census is completed.**

You can start now to prepare for the LUCA operation, in advance of LUCA registration and subsequent materials receipt:

- q Determine and assemble your local residential address source(s) for comparison against the Census Bureau's address list.
- q Ensure that the address list that you plan to utilize for review against the Census Bureau's address list includes unit designations for multi-unit buildings. The 2020 LUCA operation requires that any addresses within a multi-unit building added to the Census address list include the unit designation. This applies to all multi-unit buildings, including those with just a few units.
- q Download the housing unit and group quarters counts by census tract and block for your jurisdiction from the 2020 Census LUCA website at: https://www.census.gov/geo/partnerships/luca.html

Compare the census counts to your local counts by block to determine whether there are discrepancies. The largest count discrepancies may indicate where your government should first focus review efforts.

If you do not have your local address list geocoded by census tract and census block, you can use the Census Geocoder tool to batch geocode your addresses to census geography. The link to the Geocoder tool is also available on the 2020 LUCA website.

- q Review the group quarters counts by block. Pay particular attention to whether the group quarters are geocoded to the correct census blocks. For example, if there is a college or university with dormitories within your jurisdictional boundaries, review the group quarters block counts to determine whether individual dormitories are geocoded correctly. Although individual addresses are not included in the block counts, the lack of a group quarters count in the appropriate census block may indicate a geocoding issue. Conversely, a geocoding issue may exist if it appears that all dormitories are geocoded to a single block, but should be located in more than one.
- q Review the housing unit and group quarters counts against your counts for areas of new construction, housing conversion, or demolition. Discrepancies may indicate housing units or group quarters that should be added or deleted from the Census list.
- q Review the Census Bureau's digital address list record layout if your jurisdiction plans to participate digitally. How does your address list layout compare to the Census Bureau's address list layout?

The address list layouts for both digital and paper participants are included in the LUCA Information Guide: https://www2.census.gov/geo/pdfs/partnerships luca/2020LUCA_InfoGuide.pdf

Remember, the goal of the 2020 Census is to count everyone once, only once, and in the right place. It all starts with a complete and accurate address list. Here is our time line:

KEY MILESTONES FOR THE 2020 LUCA OPERATION	
TIMEFRAME	ACTIVITY
July 2017	LUCA invitation and registration materials mailed to the Highest Elected Officials, Tribal Chairs, and Governors
October 2017	LUCA training workshops begin
December 15, 2017	LUCA Registration Deadline
February-April 2018	Census Bureau ships LUCA materials to registered participants. Governments have 120 days from the date of LUCA materials receipt to review, update, and return them to the Census Bureau.
February-September 2018	Census Bureau processes LUCA submissions
August-September 2019	Census Bureau delivers 2020 LUCA feedback to participants
April 1, 2010	Census Day

Resources

2020 Information: https://https://www.census.gov/2020census

LUCA: https://www.census.gov/geo/partnerships/luca.html

Geographic Partnerships: https://www.census.gov/geo/partnerships/

Questions?

Email the geography staff in the Census Bureau Chicago Regional Office at Chicago Census, or call us at: (630) 288-9245.

[i]A group quarters is a place where people live or stay, in a group living arrangement that is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in a group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, corrections facilities, and workers' dormitories.

FirstNet and GIS

When Every Second Counts

Bill Springer — Illinois FirstNet Project - System Architect
ILEAS - Interoperable Communications Liaison
Illinois Terrorism Taskforce through a grant with ILEAS

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The title could just as well have been "Emergency Communications and GIS", because FirstNet is a cellular network dedicated to Public Safety communications. It will operate very similarly to the cellular networks you're used to today from all the US carriers, but with major enhancements and improvements to make it "Public Safety Grade".

Some of you may already have heard of FirstNet, it is a Federal government initiative to implement a nationwide Public Safety network. The idea behind FirstNet goes back to the September 11, 2001 terrorist attacks in the US, the inability of Emergency Responders to communicate easily and effectively was noted as a major impediment to response and rescue efforts. Since that time, there have been several major efforts to get a nationwide Public Safety network in place, culminating in the *FirstNet Act passed by Congress in October of 2012*.

The Act is very specific:

- Allocating 20MHz of spectrum in the 700MHz cellular band, a.k.a., Band 14. (This is a LOT of spectrum, and makes a big difference in how the network is operated.)
- Specifying LTE (Long Term Evolution) as the standard for the network, LTE is used worldwide by almost all cellular carriers. (The standards enable a stable technology roadmap, we are currently at 4G with 5G on the way. This also allows the use of consumer-type devices on the network, this can greatly reduce costs.)
- Strict requirements to provide / improve rural coverage all across the US. (Rural areas have historically been underserved by carriers because of Return on Investment (ROI) concerns.)
- Providing $5.9 Billion to assist in building out and improving the network.

Since 2012, FirstNet has been working towards choosing a network provider that could meet their very strict requirements and implement a network that could meet the very demanding needs of Public Safety. Up until now, the use of cellular networks has been somewhat problematic for Public Safety. When they are working correctly, they allow Public Safety to send and receive critical information that is vital for serving and protecting the public, and also providing for responder safety.

However, current cellular networks tend to be somewhat vulnerable to emergency responses and disasters.

One major problem is overloading, where after any large incident, or any large event, so many people try to use the networks all at once. This slows the network throughput to a crawl, and Public Safety is caught in this data "traffic jam".

The second major problem is that in disasters such as tornadoes, the network is degraded by damage to towers and other facilities, and especially by power failures lasting more than a few minutes.

Basically, the cell carriers have lost capacity in the affected areas at the same time demand for their

services has skyrocketed. This in turn affects the ability for First Responders to help the stricken communities at the time they need help the most.

To be fair, all the cellular carriers have been making important advances in hardening their networks to withstand these types of issues. However, FirstNet is accelerating the process. There is no requirement for Public Safety to use FirstNet, they can use whatever network they choose to provide their service. The carriers have taken notice of the project, and have started stepping up their efforts to improve and upgrade their networks to provide similar Public Safety services for similar pricing. This competition benefits not only FirstNet, but everyone else as well. After all, networks with improved capacity and availability benefits every customer on the networks.

The FirstNet network has been designed to provide data, voice, and especially video services to First Responders. The network is required to be high capacity, and prioritize Public Safety traffic. The network is also required to be hardened and ruggedized to be highly available and reliable, so Public Safety can communicate when they need it most.

In January 2016, FirstNet released their long-awaited Request for Proposals (RFP), and after a long process which included a protest that ended up in Federal court, in March 2017 they named AT&T as their partner for implementing and operating the network.

The Illinois FirstNet team relied heavily on GIS information in the time leading up to FirstNet's release of their RFP. We used numerous types of data, in several formats in order to help FirstNet understand Illinois' requirements for Public Safety:

q Mapping of critical infrastructure in Illinois, everything from Police & Fire Stations, to schools & libraries, port & rail facilities, sports venues, critical industries such as refineries, chemical plants, fertilizer plants, hospitals & medical facilities, basically anything that Public Safety may need to respond to, or where they operate.

q Coverage Maps of the current statewide voice Land Mobile Radio (LMR) system, a.k.a., the Starcom21 network. FirstNet and LMR systems are complimentary, using the two together provides a synergy where the result is more than the sum of the parts, making First Responders more efficient in how they respond to the needs of the public.

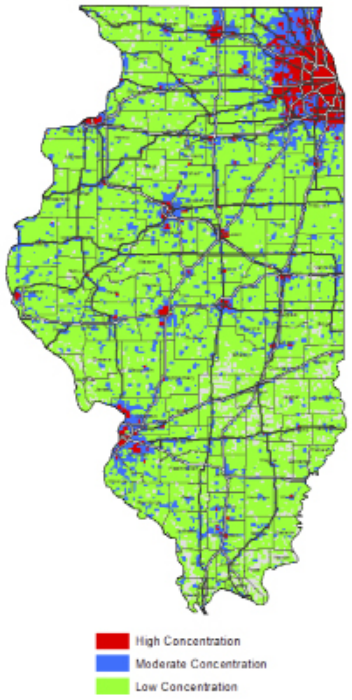
q Maps of incident locations over time from Computer Aided Dispatch (CAD) system. CAD data is very important as we need to make sure the network provides coverage in the areas where it's needed most often.

In 2015, as FirstNet was building their RFP, the put out a call to all the states to submit the types of data described above in order to inform them about the actual needs of Public Safety. In Illinois we had a tremendous response from GIS professionals, we ended up submitting well over 1GB of data used in the development of the FirstNet RFP. The support we received was critical, **we could not have generated the amount and quality of data without the help of the GIS community.**

Currently, as required by the FirstNet Act, states have received their state plans, which describe how AT&T and FirstNet intend to implement and operate the network in their states. After the plans are reviewed, the Governor of each state, including Illinois, must decide whether to either:

Opt-In, in which case, AT&T will implement and operate the network in Illinois. An Opt-In does not obligate the State to any financial, operational, or contractual requirements. There is no requirement to use FirstNet, it is simply another tool in the toolkit that Public safety may or may not use at their discretion.

Opt-Out, in this case, the State agrees to build & operate their own network to FirstNet's specifications. The State will need to provide assurances that they will operate the network for 25 years, and assume all risks, including the financial, technical, and operational risks.



Illinois FirstNet coverage

The Illinois FirstNet team is currently reviewing the State Plan for Illinois in order to make a recommendation to the Governor on the Opt-In / Opt-Out decision. Based on FirstNet's timelines, as defined in the Act, we anticipate that a decision will be made in September 2017.

The FirstNet network will be a huge benefit to Public Safety in that it will allow Public Safety to transfer large amount of critical data, especially in emergencies and disasters, when Public Safety needs to communicate the most.

One of the types of data that is becoming more and more important in emergency response is GIS data.

One thing we are seeing in Illinois is the increased use of GIS in incident response. We are also noticing the increasing number of times GIS professionals are actually working at the incident scene in the field to analyze data and provide just-in-time mapping for use by emergency responders.

And as long as we are talking about emergency communications, high bandwidth over cellular is not quite the same as the high bandwidth fiber network connections we are all used to using in our day to day jobs. One of the things that makes GIS so effective is the use of the cloud, this is one of the advancements in GIS technology that makes it indispensable today. However, cloud-based services are highly reliant on high bandwidth connections to work correctly.

But, when working at an incident scene, bandwidth is most likely going to be restricted, and at a premium, especially when using cellular data (even FirstNet), and even satellite data services. There will be many competing needs for limited bandwidth, including other data and video. One thing GIS professionals should consider when working with GIS at the scene is the necessity to use the minimum amount of bandwidth needed to transfer information. This would include being as self-contained as possible, not relying on cloud connections, and determining the minimum file sizes that need to be sent across bandwidth limited connections.

The ability to analyze geographic data and present it in a visual map format is invaluable. And the ability to provide decision makers this type of information is critical to being able to address the incident or disaster in a timely and efficient manner is priceless. FirstNet is one more tool in the toolkit that can help transfer this critical data to First Responders when and where they need it the most.

When you consider how critical GIS has become in recent years, especially considering how this technology has improved in recent years. 20 years ago, very few emergency responders even knew what GIS stood for. Today, I'm sure they (as well as I) wonder how in the world we ever got along without GIS. ■

For more information:

FirstNet Project Office: 217-531-0499
Illinois specific information on FirstNet:
https://www.illinois.gov/firstnet/Pages/default.aspx
FirstNet on a nationwide level:
https://www.firstnet.gov/
FirstNet and AT&T's State Plans:
https://www.firstnet.com/
Emergency Communications in Illinois:
https://www.illinois.gov/iema/LocalEMA/Pages/Interoperable-Communications.aspx

Gaining Experience Through Doing

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I am the youngest person at our small Telecom company. I was hired to manage their GIS systems when I applied for a completely unrelated job. My name is Elizabeth Jackson and I am the GIS Coordinator for a fiber optics company in Champaign Illinois. I took my first GIS class when I was 17 after learning that there was an actual name for how people made maps that showed things like, "World Population Change", "Real worth of 100$ by state" and the all-important "What do you call a Carbonated Beverage?". The class I took my senior year was a MOOC (Massively Open Online Course) entitled "Maps and the Geospatial Revolution" from Pennsylvania State University through Coursera. My only substantial college education is a "Mapping Technician Certification" obtained from Parkland College. This is a 30-hour certification with a focus in the engineering and surveying applications of GIS.

Traditionally a telecom company would use a AM / FM (Automated Mapping / Facilities Management) system to keep track of their utility data. Our company uses ArcGIS and has had a maintenance agreement with ESRI for 4 years. In that time the GIS position in the company has been filled in a part time capacity by 3 different people, all with varying opinions of how things should be done and most with little experience. You can imagine what kind of state the databases and maps were in.

When I started the set up was as follows: three or four people using ArcMap, ArcGIS for Server and Portal for ArcGIS were on separate machines, running through the same web adaptor. As well as a web maps site that was not attached to the database and so had not been updated in maybe about a year.

Now, going into this I had had no experience what so ever with the "Back End" side of ArcGIS, all my classes had focused on more typical analyst work. Thankfully though the maintenance subscription came with access to Esri's Training materials. Between that, the Server for ArcGIS Documentation and a healthy dose of asking around on the internet, me and the companies database administrator (who had very little GIS experience) managed to figure out a solution to the Web Map issue. It was a simple matter of redirecting the server to the proper database and then republishing all the maps. It took about an hour in total once we figured it out. Meanwhile I was also learning the ins and outs of how to permit for Fiber installation as well as trying to get the ArcGIS Collector app configured with our onsite portal.

This is where I learned that the server and portal should not run though the same web adaptor as well as the difference between feature services and mapping services. It was a very educational time.

When Collector was configured everything was great and I thought that perhaps I could relax, knowing that all the problems with the set up had been solved. Then 10.5 was released.

About a week and half later I emerged from the haze of installation screens and shook my head free of authorization numbers. Everything was set back up, so I turned my attention to the data itself, simplifying mounds of data into a few key feature classes and datasets, adding in domains to streamline field collection and attaching files to handholds so that we could keep track of splice maps.

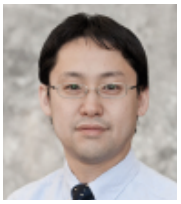
Around this time my Database Administrator told me "So we're going to move the portal and server to their own machines to give them more space." Another week or so was spent figuring out how to set a server machine up from scratch that could support both Server and Portal as well as learning how to set up SSL Certificates.

During this time, I switched our multiple databases for Illinois (1 for each municipality we have business in) to a single database giving each municipality its own dataset that can easily be recreated to allow for expansion. I also took the opportunity to update our Portal website into something that looks a bit more professional, and switch the maps accessed on the portal to mapping services hosted within Esri's Web App Builder allowing for more functionality for others that access the Portal.

Our set up now, nearly a year later, is as follows: Three or Four people use ArcMap, I primarily use ArcPro to do my everyday work and ArcMap on occasion. ArcGIS for Server and Portal for ArcGIS are on the same machine, running through separate web adaptors and our Portal site is used by a large chunk of the company for everyday work. Our Field crews use Collector for ArcGIS to record handhold placement accurately in the field and others use ArcGIS Explorer to view the web maps from their tablets and phones.

If I was to give advice to someone else who were to find themselves in my situation I would say this. Nothing is as hard as you think it is. In this day in age there is a wealth of information on the internet, whether it be Esri's site or Reddit's GIS subreddit. Never be afraid to ask for help, always keep learning and above all else Simplify! Simplify! Simplify! GIS is about presenting data to end users in a way that they will understand. Too much extraneous data just confuses people and makes them see GIS as an arcane system that only a few can truly understand. Some call that job security and in a way, their right. But in my opinion fear of "messing things up" with GIS in the short term leads to a lot more work for the next person that comes along. ■

Recap of ArcGIS User Seminar



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Introduction

The ArcGIS User Seminar was held in many locations in the United States throughout 2017. There were over 100 participants including several ILGISA members in the Westin St. Louis on March 21. Presenters were Mike Rink (Esri Washington D.C.) and Keera Morrish (Esri Redlands). The following topics were discussed for the entire morning: ArcGIS Pro, ArcGIS Apps, ArcGIS GeoEvent Server (Real-time analytics), ArcGIS GeoAnalytics Server, ArcGIS Image Server (Raster analytics), and Insights for ArcGIS.

ArcGIS Pro

Introducing ArcGIS Pro was one of the main goals for this seminar. According to the product life cycle released by Esri), ArcGIS for Desktop 10.5 (ArcMap) will be retired completely in the year of 2022. Even though we still have 5 years remaining, it will have a large impact on GIS professionals. While Esri claims transitions from ArcMap to ArcGIS Pro would be relatively smooth, there are several things we need to be aware of.

1. ArcGIS Pro can import .mxd but maps need to be saved as .aptx. A problem is ArcMap cannot open .aptx. In addition, ArcGIS Pro does not provide a function for exporting to .mxd.

2. Third party software or extensions for ArcMap need to be redeveloped. This may involve a large investment of time and money for GIS users. If the developer for the software or extensions no longer exists, that would be another issue.

3. Python scripts developed for ArcMap may not be fully compatible with ArcGIS Pro, which uses python 3.x.

However, there are great advantages to ArcGIS Pro. Compatible with 64 bit, it supports multiple layouts in one project file and vector tiles. ArcGIS Pro, similar to ArcGIS Explorer Desktop, is more integrated with ArcGIS Online. Esri explains new interfaces for ArcMap users.

Since this paper is not intended to thoroughly discuss functions of ArcGIS Pro, the author would like to share useful resources such as Getting Started with ArcGIS Pro (Esri free web course for 3 hours) and Getting to Know ArcGIS Pro (Esri Press by Amy Collins and Michael Law) for those who may not able to attend lecture-style training.

ArcGIS Apps

After showing two videos: Walgreens and California Governor's Office of Emergency Services, the presenters demonstrated how to configure web applications with Web AppBuilder for ArcGIS and Story Maps. Survey 123 for ArcGIS, similar to Google Forms, facilitates custom form development for field data collection, which can be easily mapped on ArcGIS Online. Operations Dashboard for ArcGIS helps users to organize tabular and map information on a large screen. Collector for ArcGIS assists people with creating and modifying field data on Android or iPhone devices. Drone2Map for ArcGIS processes imageries taken from drones while Insights for ArcGIS provides spatial analysis tools. A key is ArcGIS apps are relatively simple to configure for those who have no or little programming experience and make it easy to share data through ArcGIS Online. Needless to say, ArcGIS Online would be a core for ArcGIS products in the near future. A list of ArcGIS apps is posted on the website ArcGIS Enterprise, recently introduced in 10.5, is the next evolution of the ArcGIS Server and a full-featured mapping and analytics platform. The presenters mentioned that ArcGIS Enterprise also includes ArcGIS GeoEvent Server for

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real time mapping, ArcGIS GeoAnalytics Server for large data spatial analysis, and ArcGIS Image Server for enhanced raster analysis.

Conclusion

The seminar was overall very informative for all levels of GIS users. It was obvious that Esri plans to phase out ArcMap and expects professionals to migrate to ArcGIS Pro as soon as possible. The author predicts there will be debates and confusions between Esri and GIS community. Even for ArcView 3.x, it took several years for users to migrate completely. ArcGIS Online is a great way to share data with the organizations or public. With annual fees, data are hosted and analyzed on the Esri server. It sounds convenient, but ArcGIS Online Subscription Plans may not be affordable for smaller organizations. What if Internet is unavailable or unstable? The author believes offline mapping would still play an important role in remote locations and during emergency situations. ■

Cook County Clerk David Orr's Office - Election Department Leverages GIS and Harnesses ArcGIS Online

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Cook County Clerk Leverages GIS to Track Voter Wait Times and Monitor Election Day Operations

The advent of early voting in Cook County in 2006 ushered in the means for voters to cast their ballot ahead of Election Day. The opportunity to vote early allows voters to vote at a location and a time convenient to their schedule. Early voting has become quite popular with suburban Cook County voters, accounting for upwards of 150,000 to 300,000 voters during even year Gubernatorial and Presidential elections, respectively, and over 60,000 voters for lower turnout odd year Consolidated local elections.

The Clerk's Election Department recently saw an opportunity to map real time line lengths at their 52 early voting sites spread across suburban Cook County. Beginning in 2016, for the Presidential General Election, the Clerk's office leveraged an existing internal mapping application built by the Cook County GIS Department. The application, aptly named Election Viewer, allows Election staff to view political and taxing districts as well as search addresses and zoom in for street level detail. An assortment of other layers, including election precincts and polling locations, as well as other functionality, is available as well. Election Viewer is a JavaScript web-based map application that uses ArcGIS Server map and address locator services. The application was designed using the Configurable Map Viewer open source template (https://cmv.io/) and customized based on the needs of the Election Department. Using the Election Viewer platform, the Clerk's office partnered with one of their election vendors, Votec, and the Cook County GIS Department to produce and host an early vote wait times file that updates every twenty minutes to live map to Election Viewer. The wait times spreadsheet gets updated by Votec and placed on an FTP hosted by the Cook County GIS Department from which a Windows Scheduled Task pulls the spreadsheet. Then, using the latitude and longitude fields, the application maps the records from the spreadsheet. The wait times get displayed based on color coded values. Management are now able to quickly and efficiently see which sites are experiencing long lines as well those sites with little to no wait times.

The success and benefit of early vote wait times live mapping presented the opportunity to live map other data crucial to Election Day operations. The Early Vote Wait Times concept was filtered down to Election Day to map voter wait times at the Clerk's 1,000+ polling locations. Additionally, laptops online and HAAT (Hybrid Activator Accumulator Transmitter) transcribing were mapped at short

intervals (every five to ten minutes) to alert management to any potential poll opening issues or delays. The laptops online file is sourced from Votec and the HAAT transcribe file is sourced from another Election Department vendor, Dominion. Both of these files produced by the vendors include a latitude and longitude for each precinct so they can be mapped to Election Viewer, Image 1.

By bundling all these different datasets into Election Viewer, two matters were addressed. First, four different files that were housed and had to be reviewed separately were brought into a single application for ease of access. Secondly, visualizing the data eliminates the need to comb through the data in attempt to find an answer or piece together patterns. The mapped data provides everything instantaneously in a single glance.

The efficiency and effectiveness of live mapping these datasets has been a great advantage to the department. So much so that for the April 2017 Consolidated General Election, the Clerk's office decided to make the Early Vote Wait Times live mapping available to the public to inform the voters of potential wait times. Now, by visiting the Clerk's website, a voter can view the same map as Clerk staff during the early voting period to better inform them of wait times at the multiple locations. Someone living or working near two sites can make a decision on which site to vote at depending on how long the wait times are at each site.

As the Clerk's Election Department continues to dig into its data to learn how it can be represented in a GIS/ map environment, additional opportunities abound to bring historically tabular data into the visual realm. And the inception of live mapping to the department's operations stands to deliver another exciting means to streamline processes and better inform and serve the public.

For more information please contact Justin Mattson at justin.mattson@cookcountyil.gov

Acknowledgements: Election Viewer came to realization by the combined efforts of the Cook County GIS Department and the Cook County Clerk's Election Department. Furthermore, the live mapping component of Election Viewer would not have been possible without the added effort by the Cook County GIS Department. Special thanks to Votec Corporation and Dominion Voting for providing the data to be mapped. ■

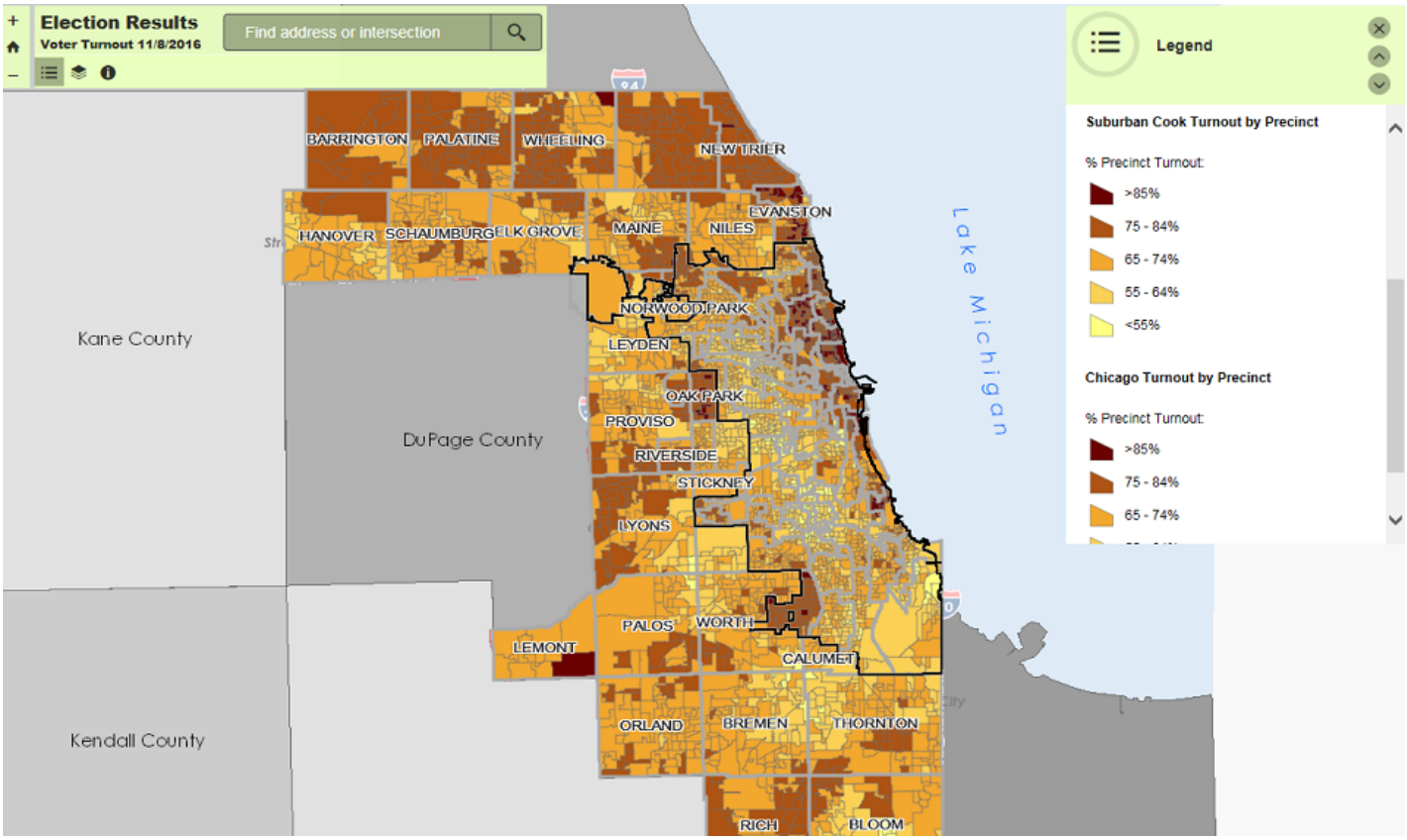
Cook County Clerk Harnesses ArcGIS Online to Bring Interactive Election Results to the Public

Suburban Cook County is one of the largest election jurisdictions in the country housing over 1.5 million registered voters. The Election Department of the Clerk's office administers elections at the federal, state and local levels. Due to the complexity of local year elections when over 1,000 contests are on the ballot, and the high volume of voters during Gubernatorial and Presidential elections, there exists a plethora of data to map.

The Clerk's Election Department produces an assortment of election results maps ranging from the more standard Ballot Cast for Presidential and Gubernatorial candidates, Voter Turnout and Early Voting Turnout, to less traditional offerings such as Election Day Registration, Contested Contests (local elections) and interesting races for US Senate or State Treasurer.

Up until 2015, all these maps were created using ESRI's ArcMap software and many were converted into PDFs for publication to the Clerk's website and Post-Election Report. In mid-2016, the Cook County GIS Department began rolling out newly secured ESRI ArcGIS Online technology to select departments in Cook County, the Clerk's Election Department being one of the first recipients. The Election Department saw this new technology as a great opportunity to springboard into the exciting interactive mapping realm that would allow the voting and general public an opening to dig into its map data beyond the surface of what static PDF maps can offer.

To that end, for the 2016 General Presidential Election the department created interactive ArcGIS Online mapping applications for Presidential Ballots Cast, Pre-Election Ballots Cast, Election Day Registration



Voter turnout, both pre-election day and election day are shown by precinct, for suburban Cook County and City of Chicago.

and Voter Turnout. Each of these applications allows a user to search an address or intersection in Cook County and retrieve detailed results at the precinct level. Two of the applications, Presidential Ballots Cast and Voter Turnout, also includes City of Chicago (a separate election jurisdiction from suburban Cook County) results.

Drawing from the Presidential Ballots Cast app a user can see, for instance, Precinct 39 in Chicago's 19th Ward is blue, and when they click on the map the pop-up will tell them that the precinct voted 93.6% to 6.4% for Hillary Clinton, but they'll see that the next precinct over is red – when they click on that precinct, the 11th in Ward 19, they'll see that precinct went 70.5% to 29.5% for Donald Trump.

April 2017 Consolidated Election results are available as well

And from the Voter Turnout app, Image 2, users can view changes in turnout from precinct to precinct. In Lemont Precinct 12, for example, shaded dark brown, there was 97% turnout, but in the precinct just north, Lemont Precinct 1, shaded a light brown, turnout was nearly 30 percent lower, 69.8%.

This fascinating new technology allows the office the opportunity to meet their goal of better informing and serving the public. The Clerk's office looks to build on these initial ArcGIS Online application offerings in the future.

For more information please contact Justin Mattson at justin.mattson@cookcountyil.gov

Acknowledgements: The Cook County Clerk's effort to provide interactive election results mapping came to fruition through the support of the Cook County GIS Department. Their early offering of ArcGIS Online technology to the Clerk's Election Department proved instrumental in providing the opportunity to showcase detailed mapped election results for a heavily followed 2016 Presidential election. Much thanks as well to the Chicago Board of Elections for providing their election results for incorporation to these applications. ■

Just How Accurate is Your Drone?

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This article introduces the fundamentals of positional accuracy so new UAS practitioners can provide these services consistent with professional standards.

Unmanned Aircraft Systems (UAS) continue to influence the profession of remote sensing and mapping like few things ever have; as such, many new practitioners are buying drones and providing services and data for the first time. Advances in computer technology, global positioning, and miniaturization have all conspired to eliminate considerable "barriers to entry" that have existed. Significantly, much (not all) of the science and art of photogrammetry that has historically been performed by specialists can now be coded on a chip fostering the perception that "anyone can do it". These advancements empower new practitioners to provide a greater array of geospatial services to new and existing markets.

The entire drone system (aircraft, sensors, operation and software) determines the total error.

New practitioners of drone-based remote sensing and mapping systems need to understand the fundamentals of remote sensing, mapping, photogrammetry, and the nature of common products like orthophotography, digital elevation models (DEM), contours, cross-sections, 3D models, and the like. Ignoring the science of these fundamentals is certain to cause considerable pain, financial loss, and may even compromise public safety.

First time users, regardless of age or geospatial experience, typically fly to acquire high quality images, i.e. the upstream side of a bridge after a flood. It isn't until later that the user will task the drone with proving accurate positions, horizontal and veritical, in "pixels" and "point clouds." First-time users are often unfamiliar with the concept of "positional accuracy". They don't know that positional accuracy requirements may be needed or are assumed by the client. Worse, they may trust the drone manufacturer's claims of positional accuracy! Further, they may not know how to discuss positional accuracy with their clients or how to measure the positional accuracy of their products. (I have talked with several practitioners that did not know what "ground control" was or how it's used in measuring positional accuracy.)

Remote sensing professionals know that an "accurate" ortho (or DEM or 3D model) can look identical to an "inaccurate" ortho. Both products are dynamic images with rich detail but the accurate ortho has intrinsic value of "where" - making it suitable for a greater number of uses than its inaccurate twin.

Regardless of the advertising, positional accuracy of an orthophoto, DEM, or other derivative of remotely sensed data is affected by a combination of factors. Though one factor may dominate, accuracy is never effected by a single

Positional accuracy is the final product of detailed flight & ground control planning and competent processing of the geospatial data.

factor. Poor operation of the best drone can seriously corrupt the positional accuracy of the deliverable. Careless or uninformed processing of that data can seriously degrade products produced from great equipment. For example, if a camera manufacturer claims their camera is accurate to two pixels for any given ground sample distance (GSD), the resultant positional accuracy for an orthophoto you produce from that camera is dependent on each of the following factors:

- Camera's inherent potential accuracy (lens & electronics)

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- Stability of the flight
- Quality of the GPS data
- Quality of the inertial system (if the drone even uses one),
- Quality of the mathematically computed DEM used to make the orthophoto, and
- The type and quality of processing of the raw imagery into an orthophoto (this factor alone has several important sources of error).

Each factor contributes some error to the "total error budget" and the ultimate positional accuracy of the ortho. The sum of all errors determines the measurable positional accuracy of the ortho. As this list of error sources demonstrates the fact that the drone uses a quality camera does not guarantee high accuracy of its deliverables.

Understanding accuracy and accuracy standards can set your operations apart from others. You're not alone. The American Society of Photogrammetry and Remote Sensing (ASPRS) is a major "standards body" for this profession. Their updated positional accuracy standards for geospatial data reflect the realities of new sensors and digital data. They are scale and technology independent. That is, they apply to data produced at any scale using any kind of sensor today or tomorrow. Importantly, they are also presented with cross-references to older standards like the National Standard for Spatial Data Accuracy (NSSDA), National Map Accuracy Standards (NMAS), previous ASPRS standards, and the like. ASPRS standards can be used to measure and report any type of geospatial data including orthophotography, DEMs, digital surface models, 3D models, contours, topographic mapping, etc.

High quality, high accurate products will separate your drone-based remote sensing business from others. Unfortunately, the cost of geospatial products is directly related to their positional accuracy. More accurate is generally more expensive. Therefore, it is important to know how much accuracy is needed so costs are not unnecessarily inflated. It is not uncommon for our clients to initially request accuracies much tighter than needed. Their current and perceived applications of the information do not warrant that level of accuracy. A simple example is knowing the location of fire hydrants to within 2 cm. This can be achieved, but a position of this feature to this accuracy would rarely have any practical benefit to city planners and would be far more costly than necessary. Therefore, their "value" to the client would be less.

What level of positional accuracy is achievable using today's drone systems? If using "best practices" with a drone using a metric camera (most drones do NOT have a metric camera), good ground control, and solid production procedures (all very difficult to achieve consistently) the best possible accuracy for orthos would have a root mean square error (RMSE) = 1 to 1.5 Pixels (GSD). Today, these levels of accuracy **have not been demonstrated** flying an unmanned system with a good but non-metric camera or without ground control. More realistic and repeatable accuracies would be 8-20 cm. And much less if good equipment, solid ground control, and good production procedures are not used.

Increasing accuracy comes at a premium. It is important that the practitioner understand what level of accuracy the client requires and what is achievable from their drone

Testing positional accuracy using ground control is always recommended but may not be required for all data sets.

"system". Finally, the UAS practitioner must know what is needed to meet the intended use of the data (often in tension with client "wants"). "Geospatial expertise" is not yet "programmed on a chip". Quality remote sensing products and services are difficult to deliver and require considerable expertise. Understanding this, many drone fliers are choosing to collect data and have established firms like ours produce quality, accurate geospatial products from their data. ■

About the Arthur: Mike Tully is the President and CEO of Aerial Services, Inc. and is based in Cedar Falls, Iowa. Aerial Services is a full service remote sensing, GIS and mapping firm celebrating their 50th year providing professional geospatial services throughout North America. Mr. Tully, CP, GISP is a graduate of Northern Arizona University (BS Forest Management), University of Maine (MS Forest Entomology), and University of Northern Iowa (MBA). We can help you before, during and after you fly. For more information contact Mike at mtully@aerialservicesinc.com

New Proposal for Advanced Placement course in GIS&T

As Shared By: Richard B. Schultz, Ph.D., GISP, C.P.G.
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With funding support from the Geography Education National Implementation Plan (GENIP), the American Association of Geographers (AAG) has developed a proposal for a new Advanced Placement course in Geographic Information Science and Technology (AP GIS&T). All U.S. high schools, colleges, and universities are invited to review the proposal by visiting http://gistcourseproposal.org/. If you know of any high schools who would be able to offer the course, please direct them to this website.

AP GIS&T is designed to introduce high school students to the fundamentals of geographic information science and applications of powerful geospatial technologies for spatial analysis and problem solving. Together with AP Human Geography, AP GIS&T offers an opportunity to engage students in outstanding geographic learning experiences and promote awareness of the many college and career opportunities available in the discipline.

The AP GIS&T course proposal has attracted broad support from prominent scientific and educational organizations, as well as major technology employers such as Google.

For AP GIS&T to become a reality, the AAG needs to collect attestations from 250 U.S. high schools that confirm they have the interest and capacity to offer the course. Similar assurances are needed from 100 colleges and universities that they would be willing to offer some form of credit to students who demonstrate proficiency on the AP GIS&T exam. At this point, 119 colleges and universities and 158 high schools across the U.S. have signed the attestations.

The AAG invites high school principals to consider adding their institution to the list of AP GIS&T supporters by completing the brief attestation form at http://gistcourseproposal.org/. ■

Have questions about AP GIS&T?
Contact the AAG at ap_gist@aag.org.

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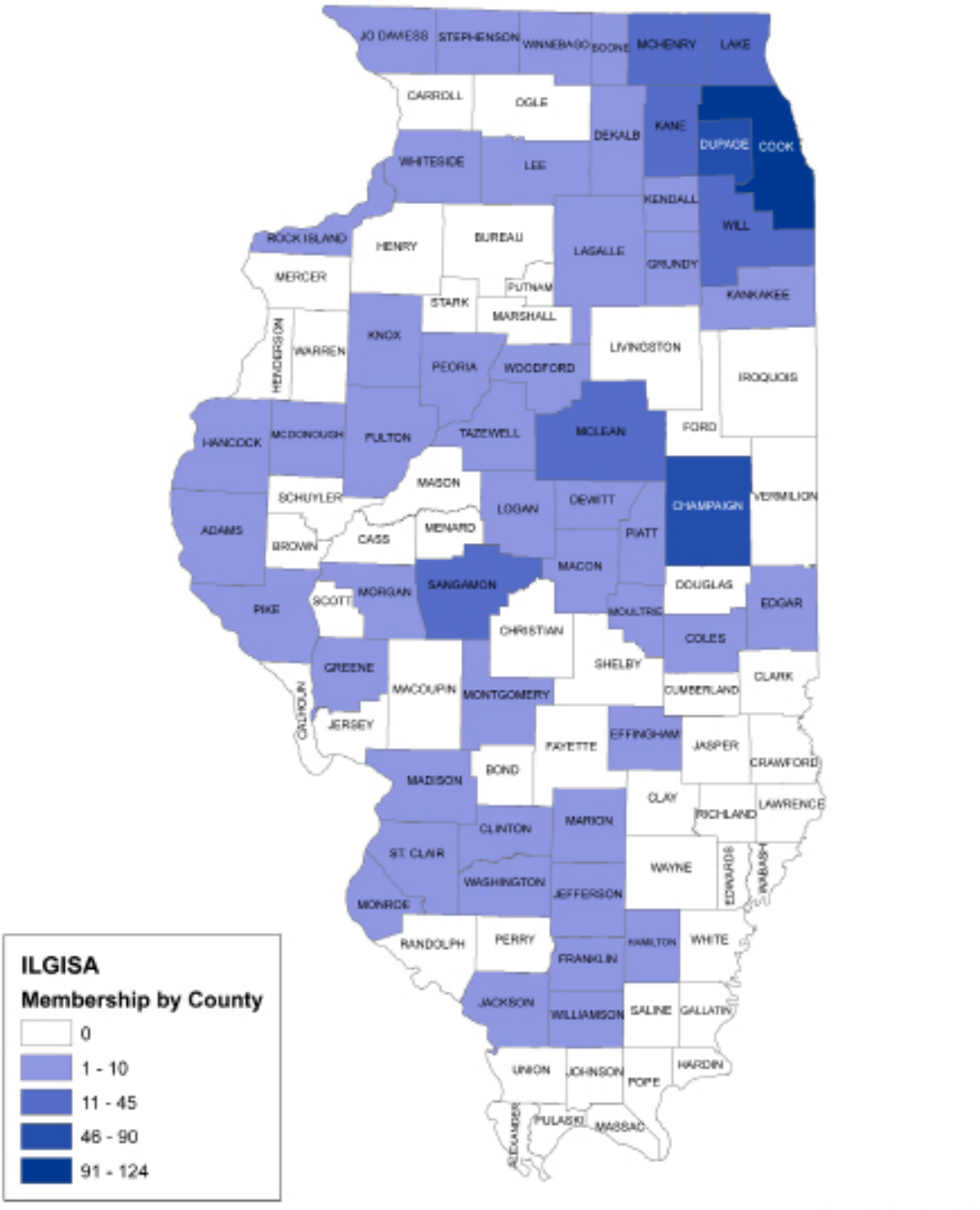

Map Date: 6/30/2017