Science AMA Series: I'm Brian Tomaszewski, Geographic Information Systems (GIS) researcher at Rochester Institute of Technology here to talk about using mapping to aid in the aftermath of disasters. AM

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Abstract

Hi everyone, I'm Brian Tomaszewski and I am a researcher and assistant professor interested in how GIS can help with disaster management – for example, humanitarian crises resulting from war, or in the aftermath of a hurricane – and I am the author of the textbook Geographic Information Systems for Disaster Management (learn more about me here). I have recently worked at the Za'atari Refugee Camp in Jordan, which is home to more 80,000 refugees of the Syrian Civil War, as part of a National Science Foundation (NSF)-funded project to map resources and infrastructure at the camp. I have also conducted refugee research in Rwanda. Things happen so quick in the aftermath of a disaster that there can be a lot of miscommunication and mistakes and I aim to use mapping to help with more effective disaster response and decision making. Ask me anything about ways in which mapping can be used to help us better respond to or even prevent disasters. I will be back at 11 am ET (8 am PT, 3 pm UTC) to answer your questions, ask me anything! Edit: Hi everyone, Brian Tomaszewski here, let's get started! I'll be answering questions through 1pm! Edit: 1:10pm -Wow thank you so much to everyone who participated and for all of your insightful questions. I have to sign off now but I really enjoyed talking GIS with all of you. I encourage everyone to check out the resources and links mentioned today and get more involved in the GIS and disaster response communities. Have a good weekend! - Brian T.

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BRIAN_TOMASZEWSKI R/SCIENCE

ABSTRACT

Hi everyone, I'm Brian Tomaszewski and I am a researcher and assistant professor interested in how GIS can help with disaster management – for example, humanitarian crises resulting from war, or in the aftermath of a hurricane – and I am the author of the textbook Geographic Information Systems for Disaster Management (learn more about me here). I have recently worked at the Za'atari Refugee Camp in Jordan, which is home to more 80,000 refugees of the Syrian Civil War, as part of a National Science Foundation (NSF)-funded project to map resources and infrastructure at the camp. I have also conducted refugee research in Rwanda. Things happen so quick in the aftermath of a disaster that there can be a lot of miscommunication and mistakes and I aim to use mapping to help with more effective disaster response and decision making. Ask me anything about ways in which mapping can be used to help us better respond to or even prevent disasters.
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Hi, and welcome to /r/science.

A lot of people really have no idea what GIS is or what benefits it can bring to a wide range of issues. What is your your quick and easy explanation of GIS and it's benefits for the layman?

In situations where hours can be crucial, how do you strike a balance between getting the maps and data where they're needed as fast as possible and having the information they hold be as accurate as possible?

Finally, what current and future GIS related technologies hold the most potential for major advancements in the realm of disaster management?

IceBean

Hello, and thank you for your question. I did like the response of thinking of GIS as a mix of Photoshop and excel. However, that assumes that people know what Photoshop and excel are. The saying that GIS is maps in computers, although perhaps overused, is still effective. I have to try to use an analogy of saying that the way a typewriter was used for writing, GIS is used for map making. This could even go off into a philosophical discussion about what exactly GIS is or is not. For example, is google maps on your phone a GIS? In some sense it has a lot of the components of the information system that

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comprises GIS and is often use as a definition of GIS, or a combination of hardware, software, people, data, knowledge, and networks. In my institution, I am the only person doing GIS in a computing college so I cast a somewhat wide net when describing my field and say that it is google maps on your phone, the GPS in your car, as well as specialized tools. For better or worse, that seems to be effective and many people refer to my field simply as 'Geo' as this is what google uses to describe their spatial oriented services and what most people are familiar with.

Your second question is a very good one and unfortunately is not very easily answered as it is a recurring problem that may never be effectively solved. Although disasters can be generalized, there can be huge difference that can introduce different nuances in terms of the balance of collecting data and accuracy. Perhaps the best approach is good planning that is in place before the disaster strikes. For example, having datasets that are accurate and up to date, staff that are trained on how to use the software and the data, and actively are using the software and data before the data disaster strikes.

For your final comment, this was actually a question I posed to many of the interviewees in my CRC Press book. The take from any of them were increases in web services for better data access and sharing, through the advocacy for GIS in disaster management and drone technology. As an academic, I am personally interested in developing serious GIS-based games to improve spatial thinking skills of a wide range of people that may be involved in disaster management from the common citizen to the high level disaster decision maker (see: https://www.youtube.com/watch?v=-bG1dfnQT2I) and wearable technology for better interaction with geographic information.

Thank you again for your comment and I hope I answered your questions, even if partially

Which GIS program do you prefer?

infectYO

This is a bit of a broad question as different GIS programs are applied to different circumstances. On the topic of disaster management, you would use different GIS programs for different phases of the disaster management cycle. For example, in disaster planning you might use a desktop GIS tool like Esri ArcMap (http://www.esri.com/) or an open source tool like QGIS (http://www.qgis.org/en/site/) for building spatial datasets, developing evacuation plans and generally any tasks that that requires a higher level of the analytical capability and data management.

When a disaster then occurs and response activities began, this is not the time for trying out a complicated new software that's never been used. Thus, more lighter weight tools may be relevant for real time Data collection such as the open data kit collect platform (https://opendatakit.org/), google maps on a smart phone, or various web GIS platforms such as ArcGIS online and google maps for sharing geographic information with diverse groups of disaster responders who may be in different locations and even in different time zones in the a case of an international disaster response like was seen recently in Nepal. Recovery and mitigation might use a mix of both desktop, web, and mobile GIS tools. For example, during a recovery, field assessment teams might use a tool like ArcPad on a Juneau Trimble GPS device for detailed data collection on debris removal, sending this information to a Back Office analytic team that would generate maps and information products to inform the recovery. Mitigation, in turn, might also require more analytic power of GIS for developing physical and social vulnerability models they can be used to predict potential effects of a disaster and reduce risk.

Basically, when considering which GIS program to use, it is important to consider the tasks that will be accomplished with the tool, the level of commitment and resources the person or organization using the tool is able to make to investments in the tool, the type of data sets that are available and relevant to tasks and also what types of data might need to be created using methods such as GPS Data collection or digitizing aerial photos are other approaches. In terms of financial cost, commercial GIS tools such those offered by companies like Esri may seem a bit expensive but offer the reliability of the commercial company that supports them which can be very useful if problems occur. Open source

equivalents exist for every commercial GIS tool is available, but with the open source, often comes a more technical level that users of the programs have to be aware of in order to fully utilize them to accomplish tasks.

What about out of control wildfires? The Valley fire spread so quickly, are you able to map it and predict the fire path?

malnourishedfarts
Yes, wildfires can be mapped using a variety of techniques such as aerial reconnaissance or more so these days drones, see: http://fireaviation.com/tag/uav/

There has been a lot of research done on trying to predict fire paths. Often, the terrain characteristics are examined as well as fuel load, wind speed, and other factors relevant to a fire. This is a paper from almost 11 years ago where the researchers were focusing on determining when to tell people to evacuate based on wildfire spread:

http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9671.2005.00237.x/abstract

I suggest you start with this paper and then use a tool like google scholar to follow the citation trail forward in time to get a better sense of the current state of the art on this topic

You might also find this of interest:
http://www.fs.fed.us/psw/topics/fire_science/craft/craft/Resources/Fire_models_tools.htm

First, thanks for all the work you do in this field.

It's obvious that photogrammetry has value in situations like these. Do you employ oblique aerial mapping such as the Pictometry product. Also, do you use LiDAR imagery in your disaster recovery processes and, if so, what role does it fulfill? And as a follow-up, what about using drones as an aerial platform versus manned aircraft? [Former mapping publication editor here]

zacdenver
Hello, thank you for your comment. To preface this response, I must say that I'm not an active disaster management professional, rather, I am an academic researcher. Thus, I personally do not use particular datasets or products for disaster response am ideally work. That being said, yes, Pictometry is very vital. Pictometry has a whole business segment devoted to emergency response, law enforcement, and any other field where real time situation awareness through imagery is vital. LiDAR as well is also very important. Colleagues of mine at RIT used LiDAR to track building damage during the 2010 Haiti earthquake https://www.rit.edu/news/athenaeum_story.php?id=47371

The datasets are increasingly becoming more important for building damage assessment.

Re: your follow-up: Yes, I think drones are going to become more and more important. There have been very interesting activities in the humanitarian space in this regard. I recommend you check out the blog of Patrick Meier if you're not familiar with him already http://irevolution.net/ He has been very active in advancing research and practice on the use of UAVs for humanitarian assistance in terms of code of conduct, training, practice and more.

Thank you again for your comments and questions

I work in Haiti and I know after the earthquake maps were a big deal. The region was poorly mapped to start with especially the shanty town regions that were hardest hit. Maps were essential for rescue work as well as getting supplies to survivors. But they were slow in

coming, hard to make, and hard to disseminate.

How do you map a region after a disaster when even real time satellite images might not reveal everything? For example, a bridge might still be there but damaged so heavily it would be unsafe to drive over. Or, in the case of war, that bridge might simply not be safe for certain ethnic groups. It seems like you'd need a team on the ground.

And how do you then effectively get those maps to the people that need them? Smart phones?

firedrops
Hello, and thank you for your post. Haiti 2010 was the first real success story for the open street map team, which is a topic that has also been asked about in this forum.

If you haven't seen this, check out:http://hotosm.org/projects/haiti-2

https://vimeo.com/9182869

Thus, I think the way to map regions that are poorly mapped in the first place after a disaster strikes, even with very good satellite imagery, is the use of either volunteers like open street map or the standby task force (see previous posts where I discussed the stand by task force) that are willing to do data creation or specialized groups. In regards to this latter comment, there is a group based out of the UK called map action. They work often with United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) to set up on site, real time mapping capacities and can work within the UN System in terms of security such as a bridge that would be unsafe to drive over or even a armed conflict that's happening alongside a natural disaster. Take a look at their website (http://www.mapaction.org/) and their many excellent projects are examples of this and thank you for your comment.

Welcome,

What would you say to a skeptical nation to convince them of the value provided by your work and how it will improve what they are trying to accomplish in the wake of a disaster?

Thank you for your time.

adenovato
Disasters happen in places. They affect our neighborhoods and our daily life. Maps and geographic information systems (GIS) are invisible technology. For example, when you wake up in the morning and have your first cup of coffee, maps are used to control the power grid for your coffee maker. When you get in your car and drive to work, the road, train, or whenever way you travel are all managed using maps and underlying geographic information databases. I think many people are not aware of how mapping/GIS is a part of daily life. Thus, better advocacy for GIS and disaster management can bring public awareness to the enormous societal and scientific benefits GIS can provide. For example, there have been major educational research efforts to advocate for improving spatial thinking skills which have been proven to enhance science, technology, engineering and mathematics (STEM) education. GIS is a critical support technology for building spatial thinking skills, and disasters make an excellent case study for spatial thinking given the inherently spatial nature of disasters. If more citizens were aware of the spatial dynamics of disasters, we could potentially lessen the impact that disasters bring. For example, thinking about how a river floods in relation to where one builds a house. In terms of improving what people try to accomplish in the wake of a disaster, there are many benefits. Maps provide the physical embodiment of situation awareness, or keeping track of what's happening where and when and by whom. Thus, better use of mapping technology can improve coordination amongst response teams, lead to faster response, and ultimately save lives. In my research, I've seen that there's still much to be done for incorporating mapping and spatial thinking into all levels of disaster management. If you read my book, the interviews I conducted with disaster management practitioners ranging from county officials were I live in upstate New York all the way to the international level with

the United Nations all support this position. For the average citizen, map reading skills that can be developed with GIS are equally important for coping with the disaster response. For example, if the power goes out and smart phones/GPS are no longer available, being able to use an old fashioned paper map is a valuable skill they can be used for finding basic resources such as food, gasoline, and social support networks. In fact, in official U.S. Disaster preparedness website (http://www.ready.gov/kit) recommends keeping local maps in a disaster preparedness kit along with common things like first aid kits, flashlights, water and food.

Hi! I'm an environmental science undergrad looking to specialize in GIS. I have always had a twisted obsession with disasters. How did you break into your field? Do you have any recommendations for books to read on the subject? Thanks so much for being here!

Trumpet_Jack
Although I'm not engaging this activity to promote my book, my text book published by CRC press in fact has extensive advice on getting into the field of GIS for disaster management: https://www.crcpress.com/Geographic-Information-Systems-GIS-for-Disaster-Management/Tomaszewski/9781482211689 A summary of things to consider too - make efforts to learn more information technology skills in addition to whatever your domain application as. For example, take classes and computer programming, databases, web development and so forth. Plenty of people can learn how to use a desktop GIS tools like ArcMap to do basic mapping. However in a much more competitive job environment, the additional skills focused on technology will make you stand out. Look at job listings like these: http://www.gjc.org/cgi-bin/listjobs.pl to see what people are looking for and craft your education to develop the skill sets needed for jobs you are interested in. If you are interested in disasters in general, get involved with volunteering with groups such as GIS Corps (http://www.giscorps.org/). Join the mail groups like the CrisisMappers to keep up to date on latest developments with technology in disasters all over the world.

Also, get involved with local disaster planning efforts such as those offered by the Red Cross

Edit: just a heads up that this a reposted reply because I was advised I needed to remove a link in the original post for it to display. Thanks!

I work at the local government level in a coastal community and we utilizes GIS nearly daily for aerial images and a few mapping features (parcel identification/information, topography, overlays). I'm curious what your recommendation on using GIS after a hurricane are. What purpose do you suggest GIS is used for at the local level? It's not something we have the manpower to delineate the shoreline or map every wetland in town. What are some small things that could be helpful?

Beaun
Hello, thank you for your note. I think for the scenario you're describing, GIS can be very important for a public outreach and communication about disaster recovery efforts. I don't know if this is something that you already do. However, hurricane Sandy from 2012 can point to some interesting examples. Take a look at this image:

https://www.fema.gov/media-library/assets/images/69835

I really like this for several reasons. The NYC GIS team created a very large and simple map that residents could use for planning housing recovery. They used a simple color coded, sticker placement approach that was very easy for people to use and required zero computer skills. I think in your case for a small department with limited resources finding ways to be creative about advocating for using GIS like the image shown above to be very helpful for both hurricane recovery and risk reduction

Dominica, in the Caribbean was recently devastated by storm Erika; I visited the island before it happened and fell in love with the place. I am also a GIS professional involved in search and rescue. How can I use my GIS skills to help the island? Thanks

Y-mir
Hello, and great question. I think what you describe is a very common and good phenomenon we are seeing in the last few years. As the intensity of disasters increase and are made visually apparent through news media and social media and so forth, it is s generating an outpouring of people that generally want to help and get involved. Digital humanitarianism is one approach for getting involved, I recommend you look into groups such as:

http://blog.standbytaskforce.com/

http://www.giscorps.org/

In the case of Dominica in particular, it would be useful to try and find out who exactly is helping with the response to that disaster. It has been the case in the past that people with a lot of very good will either purposely or inadvertently circumvent the existing mechanisms that exist for helping with the disaster response and in fact become more of a barrier to the process than an asset. For example, I did a quick google search and found this link https://sta.uwi.edu/news/releases/release.asp?id=1468

Thus, you might do something similar and find out who specifically is getting involved and offer your services to them. Be realistic in what you can provide for what they need and show how you can work as part of a team and support existing efforts as opposed to just doing your own thing. This ultimately that will lead to your bigger goal of wanting to help out

What are your thoughts on the Humanitarian OpenStreetMap Team? What do you think they are doing well? Where do you think they could improve?

flippmoke
I think they're great organization that has provided a vital role in the broader spectrum of data for international disaster management. I think they are doing well in terms of creating spatial data for unmapped parts of the world and also being proactive about creating maps before a disaster strikes as opposed to the more typical reactive approach. I honestly don't know enough about their operations to suggest any improvements so will pass on replying to that question. Thanks again for your comment.

Do you still have to use paper maps or has technology replaced them completely?

Pm_me_your_fun_bagS9
Paper maps are indeed still very important. Beyond basic issues such as lack of electricity or Internet that prevent the use of digital maps in certain cases, there's also the issue of training and capacity. I mention this in the context of my research in Rwanda and other developing countries where they simply do not have access to computers, smart phones and other technology we take for granted in the United States.

For example, this is a picture of a refugee Camp I took in Rwanda and represents the state of the R in mapping in this particular camp which supports over 20,000 people. Imagine a small town of 20,000 people being only management paper maps, but that is the reality a lot of cases: Imgur

What are your methods for collecting and publishing information in near real-time?

SapperInTexas
Recent developments in mobile computing, drone technology, and web Services have been advancing this area.

Esri's GeoEvent Extension has been an interesting development: http://www.esri.com/software/arcgis/arcgisserver/extensions/geoevent-extension

this is a good article on drones/GIS: http://droneanalyst.com/2014/10/28/gis-biggest-little-drone-market-world/

Also, although not a red hot topic like it was a few years ago, crowd sourcing and mapping is still viable way for collecting information and real time with the caveats that come with crowd source information in terms of reliability and accuracy. One particular platform that is good in this regard is the crowd map platform https://crowdmap.com Thank you again for your comments

What kind of hardware do you use fire disaster response? Especially if you had to just pack up and go to a site and begin coordinating gis there.

splargbarg
I don't know if responding to a fire requires any special equipment in terms of GIS. Ideally, the location where the fire is happening, and especially a very large fire, had a mobile GIS capacity. For example, where I live in Monroe County in upstate New York, they have a GIS vehicle that can be used for providing mapping hardware during a disaster or other type of event such as a large crowd gathering during a concert or sporting event

http://www2.monroecounty.gov/gis-Technology.php#Truck

Hello Mr. Tomaszewski,

I work as a GIS Tech for my local government and we just had a HIPAA training session yesterday. After realizing that security is very critical when handling sensitive data I am left wondering what kind of situations might pop up concerning personal health information in emergency situations.

My question is, what kind of hurdles pop up with data management and security in disaster situations? Obviously efficiency is key but with sensitive data being so tantalizing to less than savory characters, what kind of precautions have to be taken in these situations?

Thank you for your time!

Napalmradio
Thank you for your question, an interesting one I had never considered before. I think health information that would be relevant in emergency would include medical histories and any other factors that may be relevant in terms of evacuating people. For example, when evacuating people out of their regular living environments, it will be important that the location where they're being sent to is aware of their medical conditions. Though not related to health, there is a lot more work in security and sensitive data that has to be handled in terms of infrastructure during disasters. For example, the Homeland Security Infrastructure Program (HSIP) (http://www.geoplatform.gov/blog/homeland-security-infrastructure-program-hsip-public-domain-services-geospatial-platform) was created to develop databases on critical infrastructure in the United States after the 9/11 terrorist attacks. Information on critical infrastructures is not something that is always publicly available as this is very sensitive information, however, it may need to be accessed in real time during a disaster. Thus, items such as memorandums of understanding (MoUs), and data sharing agreements need to be in place before a disaster strikes in order to make sure these sensitive data sets are made available at the right time to the right people. Thank you again for your comment

What GIS software platform do you think is the best when responding to crisis situations? I had

applied for a volunteer position in Africa about a year ago assisting WHO in mapping and modeling the spread of Ebola and was rejected due to a lack of experience with ArcGIS online despite a high proficiency in ArcGIS Desktop.

DrDiscoPhD
Hello, it's really hard to say which one is the best as there's so many factors to consider. The best advice is just a look across the open source and commercial tools, and look closely at job descriptions and what they want. That is surprising that they would not hire you because of lack of experience with ArcGIS online when you have a lot of ArcGIS desktop. Keep in mind, the people that are looking to hire or use you as a volunteer may not actually know anything about GIS and are simply going off of what someone else told them. Don't let this discourage you, and keep with it, as volunteers are important. Thanks your question and good luck

Thanks for doing this AMA! I'm glad someone else realises the potential of GIS in disaster management. I'm currently doing research on locating socio-economically vulnerable people and how this might effect them in a flood hazard setting. Just wondering if you could recommend any sources about this topic?

Also what would you say will be the next technological breakthrough in GIS?

eletricmojo
hello, building social vulnerability models using GIS is an important topic. Here's one particular place you can start:

http://webra.cas.sc.edu/hvri/products/sovi.aspx

I think increased use of drones in wearable computing will be the next technological breakthroughs in GIS. I would also be curious to see more how 3D printing will affect GIS. For example using 3D printing to create maps and haptic interfaces for blind people

- **what are some procedures you have for amassing the data sets you'd need in a timely manner?**
  - **how do you even identify what will be useful? or do you shotgun out requests for data**
- **do/can you incorporate realtime data like social media posts into the mix to help with decision making**

salmonlips
Hello, thank you for your question. These are pretty broad questions that are not quickly and easily answered in a forum like this. As I had stated in another post, although I'm not here to promote my textbook, I recommend you review that text or other basic books on GIS to answer your questions. For example, there are many procedures for amassing data that include utilizing existing data sets and creating new data, both of which are big topics onto themselves. Usefulness of data is relative to the task at hand. Depending on the situation, you may not necessarily shotgun the requests unless you are dealing with a situation where there's absolutely no data and such an approach might be useful. See previous posts on incorporating social media and volunteered geographic information. One example I mentioned was crowdmap.com

I'm an undergrad student currently on a project about artisanal fisheries vulnerability to climate change. I'm trying to use fishing dependence and potential hazards (hurricanes, sea-level rise, climate variability) in fishing communities inside the Gulf of California to provide a vulnerability value, our main focus is to build a map to allow for climate change adaptation plans and better policies for this communities. What is a basic GIS tool I have to learn? Are you involved in

methodologies including UAVs? Thanks for doing this AMA :D

Juancarlosmh
Hello, that is great that you are getting into GIS! I would recommend that you start with a commercial GIS tool like arc map, the student version of which you can download from here if your school does not have copies of GIS.: http://www.esri.com/software/arcgis/arcgis-for-desktop/free-trial

I have been doing more work with UAVs.They are becoming a valuable tool for collecting data that can be hard to access. For example, existing satellite imagery such as Landsat may not be of a spatial resolution relevant to something like artisanal fisheries. Thus you could potentially use a drawing to collect imagery of a fishery and then put that imagery into a vulnerability model created with the desktop tool like arc map. Best wishes with your GIS studies and thank you for your question

Thank you so much for doing this! I'm a student in Geography, emphasizing in GIS. I'm more interested in resource management, though I don't know where I'll end up. What advice would you have for someone who's just getting started, and wants to stay competitive? I'm attempting to learn Python, but its really pretty hard.

ganzas
Hello, I would recommend you see the post I made to/u/Trumpet_Jack above as my reply to that post also answers a lot of your questions. I can certainly appreciate that learning python is very hard. I remember distinctly when I learned computer programming for GIS many years ago and did not have any background in programming. The best advice here is just stick with it. Your knowledge of programming in python will only serve to advance your career in direction and will make you stand out from the crowd when applying for jobs. Good luck!

Is there a role for lower technology solutions like balloon/kite mapping or Field Papers for mapping refugee camps?

alesman
Hello, very interesting question. Yes, I think there is a role for low tech solutions in refugee camps. I think if the people that organize refugee camps are willing to consider these options and have the capacity use them, they can provide a vital information source. I know that in Jordan, they have been looking into using field papers. They also have the benefit of having a dedicated group for mapping in that camp through commercially available satellite imagery. In Rwanda where I've also done a little work with refugee camps, they do not have a dedicated group for camp mapping and so broader issues of geographic information capacity building, many of which could potentially be covered using low Tech Solutions.

Woo, go GIS! I'm a GIS Analyst myself working in public health research. Also my cousin is a prof at RIT! :) I actually blog about GIS, and I would love to write about your AMA and your perspective on the field's evolution. Feel free to PM me if you'd like more details!

Anyway here are my questions: What do you think are currently the biggest problems with GIS education, specifically at the university level? What advice would you give to younger people using GIS in research? Would you say you're more of a cartographer or analyst?

rakelllama
Thank you for your question and enthusiasm for GIS. I think the current biggest problem with GIS education at the university level is lack of awareness of what GIS can offer for multiple disciplines. Some of the ideas of spatial thinking that I discussed earlier today become relevant. For example, numerous disciplines have spatial perspectives ranging from information technology to anthropology. I think too often GIS is simply seen as a technology tool and not as a way of viewing the world in terms

of spatial thinking. Additionally at the university level, I would like to see more GIS in computing departments and as the topic of education unto itself and not as a tool for something else. I am fortunate in that my institution I am in an information sciences and technologies department and in keeping a GIS perspective. However, this is quite rare with GIS more often being used as a tool for some discipline such as environmental science.

Advice I have for younger people using GIS and research is to keep an interdisciplinary mindset open, be willing to spend time learning technology skills such as computer programming that can advance your research, and always do literature searches to see what other people have already done and that you can draw upon. I really don't consider myself a cartographer or analyst. When I was in the private sector, I described myself as a GIS programmer/analyst. When I went to graduate school and earned my Ph.D. from Penn State, I developed the perspective of being a geographic information scientist, and this is more of the label I like to use to describe myself now as I am interested in fundamental research questions related to geographic information. RE: your blog I'm happy to talk more. You can use the link in my bio above to contact me. Thanks!