

Esri News

for Health & Human Services

Summer 2013

Improving Rural Clinical Outreach with GIS

Gundersen Health System Provides Tools for Outreach Clinic Decision Making

To say Gundersen Health System depends on in-depth information and solid relationships would be an understatement.

Based in La Crosse, Wisconsin, the organization consists of a 325-bed teaching hospital with a level II trauma center and nearly 50 locations—affiliate hospitals, regional clinics, behavioral health clinics, vision centers, pharmacies, air and ground ambulances—all spread across largely rural western Wisconsin, northeastern Iowa, and southeastern Minnesota.

"For more than 20 years, we've been doing outreach," said Robert M. Trine,

Gundersen's senior vice president for strategy. "And we've developed relationships with independent doctors throughout our three-state area."

For years, Gundersen has been working to integrate Esri technology into its outreach services. The health system seeks to provide leaders and planners with visual map and data displays that aid decision making on the placement of new outreach services and to assess the business performance of existing sites.

"From a senior leadership perspective, mapping is obviously a visual tool, and

it's very helpful in getting people on the same page around certain topics that are geographically dependent," Trine said.

Gundersen's prototype GIS outreach is helping the health system respond to rural health care needs, further enhancing the health system's capability to deliver the best-quality, least expensive care.

"Decision analytical tools are becoming invaluable to health care organizations," explained Deb Rislow, RN, MBA, CIO and vice president at Gundersen Health System. "A system that integrates our internal, as well as multiple sources of external, data—one relevant to our growth strategy and our ability to utilize that data in a graphical format—has been invaluable to senior leadership. IT investments in such systems will continue to expand over the next several years."

Tough Geography, Economy, and Competition

A key motivation has been strong competition from other health systems to establish clinics in small-town locations. Surrounding Gundersen are the likes of the Mayo Clinic, the University of Wisconsin, the University of Iowa, and the Marshfield Clinic.

"If you're not delivering the best care and working toward zero mistakes, you're not going to survive in a highly competitive region like this," observed GIS specialist John P. Gabbert. "The Gundersen



↑ Gundersen Health System's 325-bed teaching hospital with a level II trauma center in La Crosse, Wisconsin. A new in-patient mental health unit and biomass boiler sit in the foreground.

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by Shannon McElvaney

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Location: The Seventh Vital Sign



From My View . . .

Christina Bivona-Tellez

Esri Health and Human Services Industry Solutions Manager

"Mom, I don't feel well. Maybe I shouldn't go to school today."

If your mom was like mine, she probably took a long, hard look at you, reached up and felt your forehead, then—after a moment or two if she had some doubts—would pull out a thermometer.

This was the key to revealing if I really was sick or just faking—putting on a show to avoid school and hoping I could fool her. Children have it much easier today. Back then, we were subjected to having a hard glass mercury thermometer thrust into our mouths—or worse—by anxious mothers. Nowadays, the oral thermometer has been replaced by ear thermometers or even devices that are attached to your skin to provide a reading within just a few seconds.

Still, the ability to validate if something is amiss is critical, and we rely on it across the world.

Temperature is considered one of the cardinal "vital signs"—a key reading to determine if someone may be fighting an infection—along with heart rate (pulse) and rate of breathing (respiration). In the past decade, they've added two new ones: pain level, evaluated at a scale of 1–10, and BMI, or body mass index. Taken together, these provide an overall picture of a general state of a person's health.

Guess what? We have added a seventh vital sign, location. Yes, who would have thought? And why is that? Slowly we are coming to understand that where we live, go to school, and work does have an impact on our overall health. So individually and as a neighborhood and a region, we no longer can ignore this as a major factor for health.

Today, we have additional research to validate the concept of geomedicine that Bill Davenhall introduced in his TEDMED presentation in 2009. Let's consider why, suddenly, location has been embraced as a key factor for overall health.

Look at some of the following recent findings: the infamous stroke belt in the Southeast is well known, but did you know that if you relocate from there to another region of the country, you still may have a higher risk for stroke? A study done at the University of Alabama looked at 24,544 people, black, white, aged 45 and older, who were part of a national study that considered geographic and racial differences in the incidence of stroke. Of course, you'd expect someone who spent their entire life there to have a greater risk for stroke. But how startling to learn that if a person lived in the stroke belt during their first 12 years or between the ages of 13 and 18, the risk of having a stroke was 22 percent higher even if they moved after that! African Americans saw a bigger difference for ages 13 to 18, the increase in stroke risk being about 33 percent, compared to 15 percent for whites.

This certainly raises many more questions, but it gives credence to the notion that not only where we currently live impacts our health but where we have lived in the past—especially in childhood—also impacts our health. Researchers at the University of Washington and the University of Seville in Spain have speculated that there is "increasing evidence of a link between stroke and a broad category of environmental factors such as air pollution, environmental tobacco smoke, metals, pesticides, and many

others." Again, this raised more questions for researchers yet is something we cannot ignore while waiting for answers.

For one, the link between air quality and health is gaining more attention. Recently published research is advancing the link between exposures to particulate air pollution emitted by vehicles, urban heating, and coal-fired power plants and low birth weight babies. For adults, research has shown that exposure to air pollution increased the risk of atherosclerosis, or hardening of the arteries, which increases the risk of heart attack and stroke.

"It's not just air, water, or infections," says Dr. Jack Wennberg of the *Dartmouth Atlas*. "The density of medical practitioners of various types makes a major difference in your access to health and social services, the likelihood of a correct diagnosis, chances for successful medical outcomes, and ability to receive affordable and timely care."

So when will we embrace a more inclusive view of health evaluations? Can we add just one more variable—location? If so, could we also include the location of our work, our school? Can we stretch a bit further and embrace where I was born and where I grew up and all the other places I spent time?

Perhaps if we add current location—and places we've been over a lifetime—into our overall analysis of health as another key variable, we may gain critical insight otherwise hidden.

"To be forewarned is to be forearmed," teaches the Bible. So it is with our health: Armed with information about potential medical conditions, we can modify these risks and hopefully stay healthy.

ethic in its Norwegian Lutheran roots is to treat people like family, and you must be efficient, too."

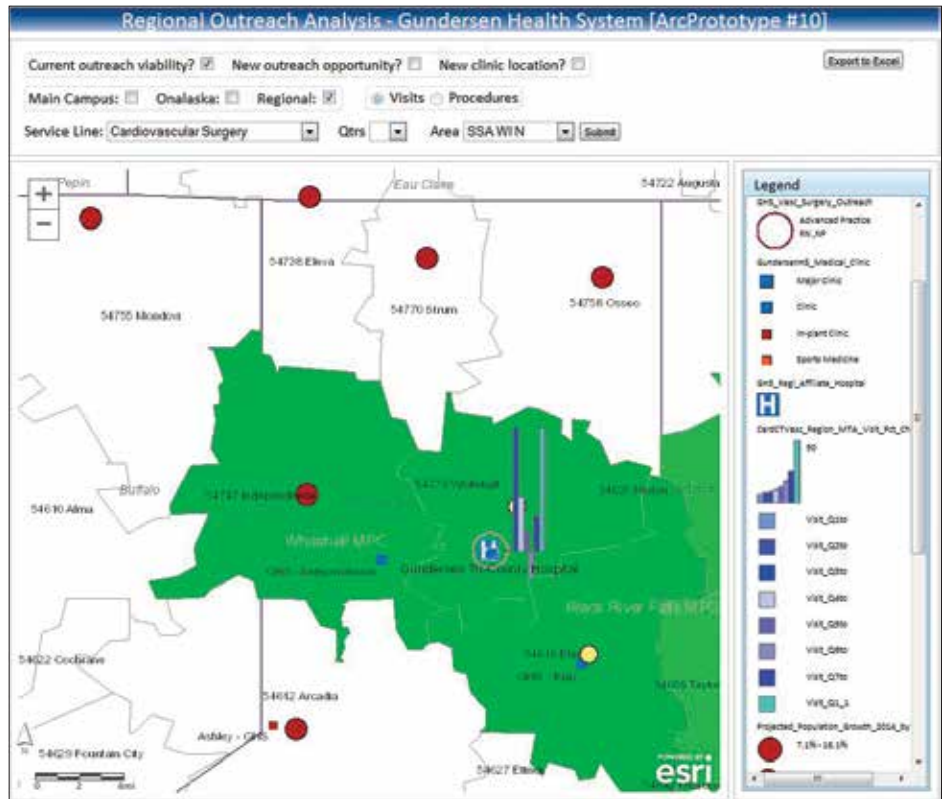
According to Trine, cost-effective placement and use of outreach providers has become especially crucial in this era of declining health insurance reimbursement. Commercially insured patient populations dwindle as more retiring baby boomers apply for Medicare. Also, high unemployment has forced millions nationwide to seek government insurance such as Medicaid.

Another key factor is distance, Trine observed. Gundersen—like any large regional medical center—needed to identify and address the geographic access problems faced by patients living in rural locales far from services, a critical factor in a life-threatening emergency.

"In this cost-challenged industry, there's a need to get better at making those decisions so you don't duplicate services," Trine said. "You need to carefully pick locations for brick-and-mortar that facilitate access for this geographically dispersed population."

Gabbert described the region as a rugged island on the prairie. "It's not easy to get anywhere off the main roads," he said. Rugged terrain created a need for outreach liaisons, who—nearly three decades ago—made contact with general practitioners seeking to refer more complex cases. "And those RN experts are still at it today. They began creating awareness of the need to communicate with the local physicians and to understand the markets," Gabbert said.

It's not quite as simple as in urban areas where it's pretty obvious where the hospitals and clinics should be, said Trine. "You have to think a little bit more deeply in terms of what's being covered and where are the gaps in service," he said.



↑ Gundersen Prototype Outreach Analysis Map Server Screen Shot Showing Percent Changes in Quarterly Outreach Visit Activity, Annual Patient Volume, and Project Population Growth in a Two-ZIP-Code Affiliate Hospital Service Area

Implementing the project

To guide its GIS projects, Rislow decided early on that the GIS would need to interpret patient, create datasets, perform analysis, automate the analysis, and have built-in modularity that would extend to other projects.

Her thinking was that ArcGIS geospatial technology would help maximize finite resources with visual analysis of clinical demands and answer operational questions, leading to better allocation of resources.

"The combination of geography and strong competition created the need to understand what's going on. And maps are the way," Gabbert explained.

In 2011, initial success prompted a decision by Gunderson officials to build their prototype system into a full-fledged IT project focused on regional outreach decision-making. According to Trine, the system, which includes ArcGIS for

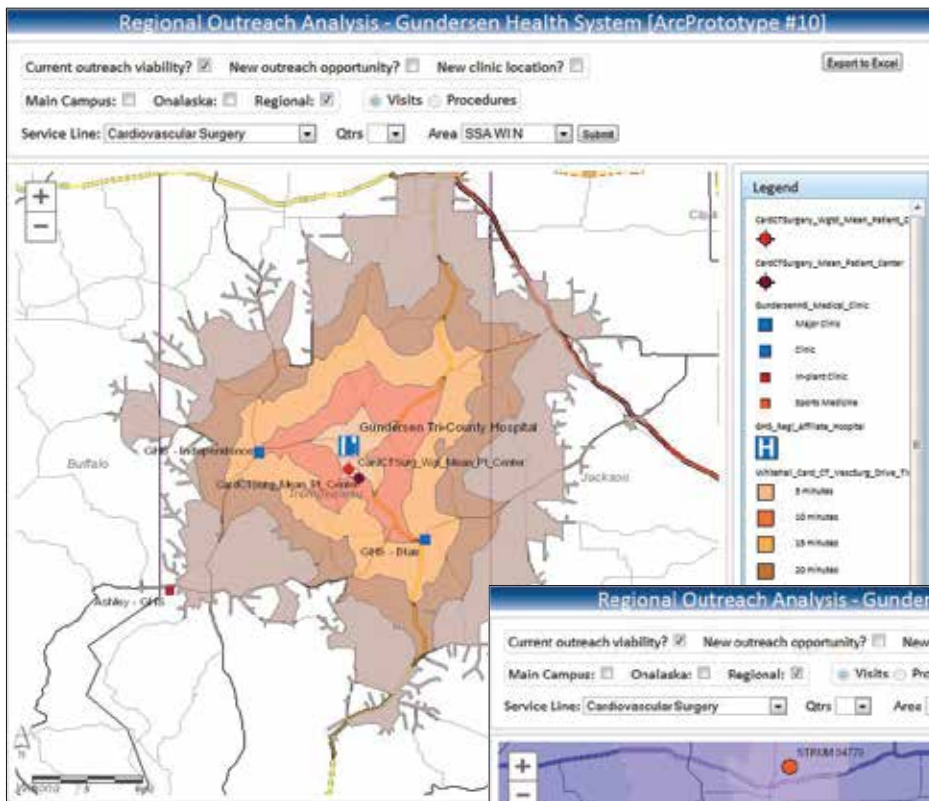
Desktop, ArcGIS for Server, and Esri Business Analyst, had to answer three basic questions:

- Is the current outreach location viable?
- Where are good regional opportunities for new outreach?
- Where are the best potential clinic or service sites?

The answer to each question depends on how well rural outreach clinics serve patients close to their homes, Gabbert said. The GIS measures performance (i.e., number of patient visits, types of procedures, and patient charges).

At present, the system is still in prototype, but is slated for its first operational release in mid-October with a leadership review meeting scheduled for late October-mid-November.

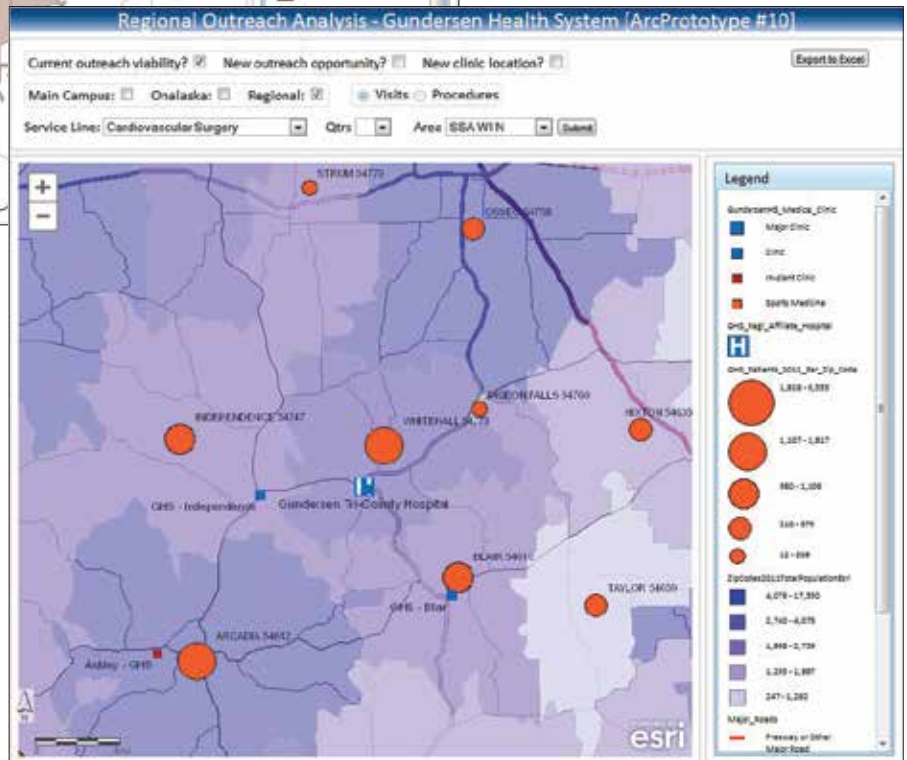
"We use our GIS to create static maps continually while we're developing this application," said Gabbert. However, as the GIS nears fully operational status, this



↑ Prototype Extended Average Patient Drive-Time Rings to Gundersen Tri-County Hospital and Clinic in Whitehall, Wisconsin, in a Three-County Region with Rugged Terrain

workflow increasingly will shift from static maps and query-output spreadsheets toward Intranet mapping and exportable data tables, he said. Ultimately, the GIS project promises a less expensive, quicker, automated self-service data and mapping system for the use of Gundersen's end users—from the CEO and operational VPs to administrative directors and department chairs of individual specialty service lines.

ArcGIS will enable them to access graphically pleasing displays and easy-to-find data that will aid in identifying outreach gaps where new providers should be placed; in assessing clinical and business performance of existing sites, and in improving the planning and delivery of overall health care for rural patients.



↑ Prototype View of Whitehall, Wisconsin, Area, Total Population (2011) with Patient Population per ZIP Code

For further information, contact John P. Gabbert, Gundersen Health System, at JPGabber@gundersenhealth.org.

Visit www.gundersenhealth.org.

"In this cost-challenged industry, there's a need to get better at making those decisions so you don't duplicate services. You need to carefully pick locations for brick-and-mortar that facilitate access for this geographically dispersed population."

—Robert M. Trine, Gundersen Health System Senior Vice President for Strategy

Esri on the Road

Association of State and Territorial
Health Officials
September 18–20, 2013
Orlando, Florida
www.astho.org/t/event.aspx?eventid=7599

2013 Health 2.0 Silicon Valley 7th Annual
Fall Conference
September 29–October 2, 2013
Santa Clara, California
www.health2con.com

ISM IT Solutions Management for
Human Services
October 6–9, 2013
San Diego, California
www.aphsa-ism.org/Home/home_news.asp

Wennberg International Collaborative
October 16–18, 2013
Hanover, New Hampshire
<http://wennbergcollaborative.org/index.php>

Save the Date

Esri Health GIS Conference
When: October 14–16, 2013
Host: Esri
Where: Hyatt Regency, Cambridge,
Massachusetts, USA
Web: esri.com/events/health

Plenary Speakers

- David C. Goodman, MD, Dartmouth University
- Kathryn Kulbicki, Westat
- Kathy H. Kliebert, Secretary, Louisiana
Department of Health and Hospitals

Highlights

- Be able to learn and discuss what others are
doing with GIS in your industry.
- See the latest updates on Esri technology.
- Learn from members of the media how health
is being impacted and portrayed in 2013.
- Take a tour of Harvard University and see its
GIS Operations Site and map library

Inquiries

E-mail healthgis@esri.com.

Health and Human Services SAG Award Winners Announced at 2013 International UC

The winners of the HHS Special Achievement in GIS (SAG) Awards were announced at the 2013 Esri International User Conference in July:

United States Winners

- State of New Mexico Children Youth and Families Department and the
New Mexico Department of Health
- Johns Hopkins University, Center for a Livable Future
- Center for Applied Research and Environmental Systems (CARES)

Winners outside the United States

- Research Center for Health—Niger
- Vesterguard Frandsen (EA) Ltd—Kenya

"Congratulations to 2013 SAG Award Winners," says Esri Health and Human Services industry manager Christina Bivona-Tellez. "May their excellent work continue to inspire, promote, and support health throughout the world!"

Special Thanks to Our Sponsors

Special thanks go to our sponsors for bringing together Health and Human Services attendees at the Special Interest Group (SIG) breakfast held on July 10, 2013, in San Diego, California, at the Esri International User Conference.



Creating Healthier Urban Landscapes

City of Toronto planners and developers are using powerful new visualization tools, allowing them to prototype greener cityscapes that mitigate the unhealthy impact of urban heat. So-called urban heat islands—mainly large stretches of asphalt lacking vegetation coupled with waste heat from air conditioners and automobiles—are yielding to environmentally responsible “green building” encouraged by Toronto’s seven-year-old Green Development Standard.

In 2006, the City of Toronto introduced its Green Development Standard: a two-tiered set of performance measures and supporting guidelines related to sustainable building for public and private development. The standard encourages the implementation of “green building,” the practice of creating structures in a way that expands on traditional design principles to incorporate environmentally responsible and resource-efficient processes.

The initiative sets forth new criteria for developers and planners with an aim to promote sustainable urban design that enhances and contributes to the surrounding environment. Among the many planning considerations, it introduces a requirement for green roofs to be installed in all new buildings over 3,000 square meters as well as a goal to double the city’s urban tree canopy.

Implementing these standards on a local scale can be complex and challenging. This is where the concept of geodesign comes into play. Geodesign is a framework for understanding the complex relationships between human-designed settlements and the changing environment, to quickly adapt existing communities and build new ones in a sustainable manner.

The concept was recently applied to assist with the practical implementation of Toronto’s Green Standard by Dr. Rob Feick, a professor with the University of Waterloo’s School of Planning in collaboration with Professor John Danahy from the University of Toronto’s Centre for Landscape Research. As part of a GEOIDE National Centre of Excellence Project, they used GIS to develop a multiscale approach for visualizing the impacts of urban heat islands, identifying



↑ Toronto, Canada’s Healthier Urban Skyline.

potential cooling strategies and revealing opportunities for renewable energy.

Mitigating the Effects of Urban Heat

An urban heat island (UHI) is a portion of a metropolitan area that is significantly warmer than its surrounding areas. The main cause of this phenomenon is the modification of the land surface by urban development that uses materials that effectively retain heat. Waste heat generated by air conditioners, automobiles, and other sources can act as a secondary contributor. As population centers grow, greater areas of land are modified, which generally leads to a corresponding increase in average temperature.

Urban heat island impacts are of grave concern in the City of Toronto. Over the past decade, urban development has intensified in the city, leading to an increase in population and energy usage. Correspondingly, vegetation has been incrementally replaced by asphalt and

other high-albedo (reflectivity) surfaces. The city’s medical officer of health now regularly issues heat alerts to at-risk populations.

“Urban heat islands can greatly impact the health and welfare of residents due to a degradation of air quality, particularly for vulnerable citizens such as the elderly,” said Danahy. “Luckily, through powerful visualization tools, we can prototype what is possible and equip planners and developers with the information they need.

To assist with the mitigation of urban heat on a regional scale, research groups led by Feick and Danahy collaborated in the analysis of two urban substudy areas. The first focused on Toronto’s downtown core including 19th-century tree-lined neighborhoods, and the second encompassed suburbs including Mississauga and Brampton along with a large industrial area that surrounds Pearson Airport.

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Creating Healthier Urban Landscapes continued from page 7

Infrared Landsat satellite imagery calibrated by Natural Resources Canada (NRCan) was combined with GIS and CAD planning datasets along with orthophotography, photogrammetric data, and lidar. This made it possible to examine the relationship between land cover, urban form, surface material types, and relative hot and cool areas.

3D building models were created using ArcGIS for Desktop and draped with heat maps revealing temperature values across land use and cover types that could be easily discerned through color gradations. A temperature surface was also mapped in 3D to produce a terrain perspective in which hotter and cooler areas are distinguished by texture. This allows users to readily identify patterns in data across the entire city.

Leveraging GIS, multiple scenarios could be tested with relative ease. For example, through a GIS-generated map view, users can select a building for analysis and determine the effectiveness and related costs of retrofitting that building in accordance with green standards. Users also can identify major contributing factors to the urban

heat island effect, such as large paved surfaces, and simulate the impact of mitigation measures.

Information derived from this analysis can be leveraged by developers and urban planners to answer questions that are paramount to complying with Toronto's Green Standard. For example: Does the area in question already have a significant tree canopy, or is greater investment required? What represents an optimal urban surface type for mitigating heat effects? Are traditional tree-lined streets as effective at providing cooling effects as areas with fully closed urban forest canopies, such as parks?

"Leveraging 2D and 3D spatial information technology provides the visualization required to put broader climate change research into practice," said Danahy. "Powerful analysis capabilities make it possible for local planners and decision makers to investigate alternative climate change scenarios, meaningfully compare mitigation measures, and communicate effectively with key stakeholders."

In the near future, 3D models will be replicated using Esri's CityEngine to take advantage of parametric functionality

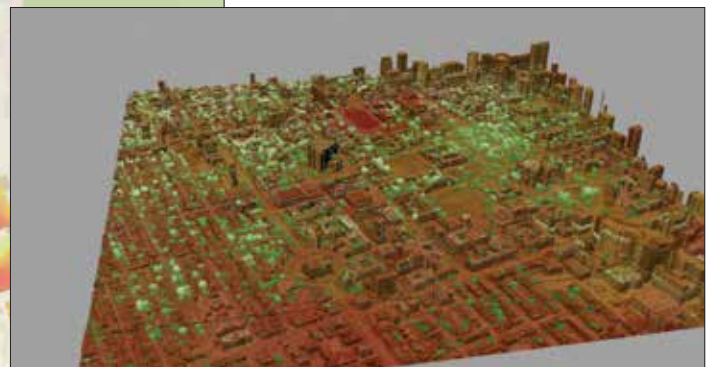
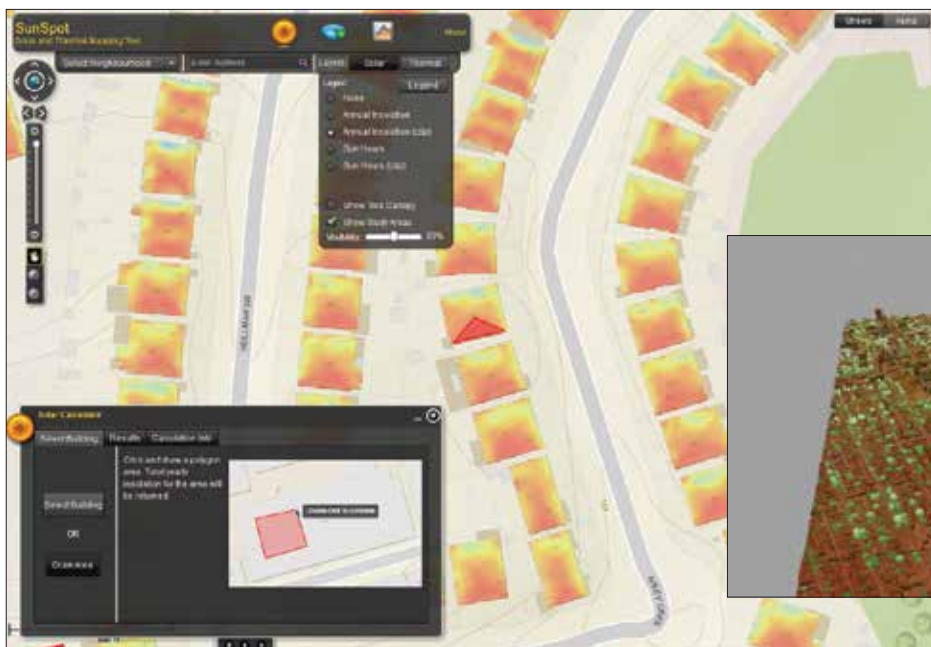
that allows building features such as height, roof form or age, and related modifications to be adjusted on the fly.

Identifying Clean, Renewable Energy Opportunities

Solar Photovoltaic (PV) is a method of generating electrical power that converts solar radiation into direct current electricity using semiconductors. In 2009, the Green Energy Act permitted the Ontario Power Authority to introduce Feed-in Tariff (FIT) and Micro-FIT programs that enable property owners to receive substantial revenue streams for generating PV power.

Many technical and economic factors come into play when exploring the feasibility of solar panel installation for a home or business. For example, installation constraints related to maximum roof weight allowance, loading, and slope must be understood alongside implications related to regulatory approvals such as building permits and zoning bylaws. Local factors specific to a property also come into play such as shading from nearby buildings and trees, roof aspect, and obstructions including chimneys. These variables determine the feasible size of a PV array as well as the return a property owner can expect over time.

To assist with this analysis, Feick and graduate student Andrew Blakey of the University of Waterloo developed



↑ Lidar-based modeling of roof slope and aspect help users derive estimates of solar panel revenue and carbon reductions.

↑ Hot areas are correlated with urban form, and detailed vegetation models are created using lidar data.

an easy-to-use online visualization tool known as SunSpot. The ArcGIS Viewer for Flex application integrates relevant datasets so that site influences on residential solar energy potential can be accurately identified and evaluated.

The application leverages lidar building models, existing building footprints, 3D terrain, and vegetation data to showcase detailed building characteristics and roof structures. ArcGIS for Desktop Solar Analyst tools were used to create solar energy rasters that encapsulate the impacts of daily and seasonal shifts in the sun's angle, variations in elevation, building roof orientation, and shadows cast by topographic features. The impact of mature tree canopies was also measured to identify areas unsuitable for solar PV installation.

"This type of analysis often relies on neighborhood-level averages, which can result in an underreporting of the geographic variations in rooftop solar

potential," said Feick. "By visualizing 3D landscapes through a GIS-generated map view, we're able to drill down to a level of detail where we can accurately identify variances across individual rooftops."

Built using Flex Viewer, SunSpot maps out solar potential for approximately 34,500 buildings in Toronto. Monthly solar rasters were created so that users can view seasonal variations in electricity generation. The app can be leveraged to determine the most feasible roof area for PV installation as well as to estimate financial returns from the Feed-in Tariff program. Users can also calculate carbon savings that accrue from the reduced production of electricity from large-scale natural gas generation facilities. Once estimated solar potential is determined, an index-based score system can be applied to make building-to-building comparisons within the study area.

"One of our main objectives is to reduce the cognitive load for our users," said Feick. "Multiple integrated datasets and photorealistic 3D renderings of vegetation and buildings enable us to communicate highly complex information in a fairly simple way."

The SunSpot tool will soon be publicly available so that Toronto-based residents can explore solar PV potential and land cover-urban heat variations within their own neighborhoods.

For further information, visit www.toronto.ca/planning/environment/greendevlopment.htm

A Fresh Look at Community Health Using ArcGIS Online

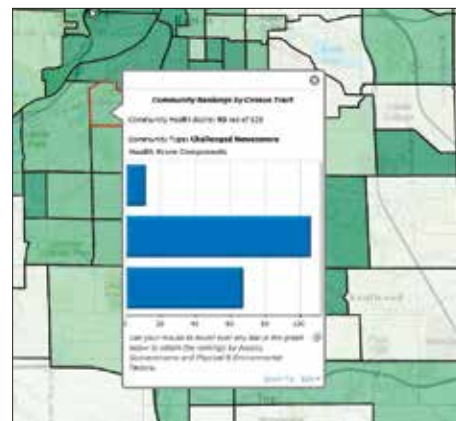
PolSci Students Create Community Health Score Website

In the fall 2012 semester, the students of Political Science 310—Health Policy at Grand Valley State University (GVSU), Allendale, Michigan, set out to think about the overall health of their community in Kent County. As a researcher and associate professor in the School of Public, Nonprofit and Health Administration, Stephen Borders, PhD, recognized the need to prepare students upon graduation for complex challenges like a community assessment. ArcGIS Online provided the powerful mapping visualization tools, and SAS Enterprise Guide On Demand offered the seamless integration of statistical analysis to make such a project possible.

Borders therefore redesigned this upper-level course to focus on the application of problem solving by guiding students in the creation of knowledge and skills. These changes culminated in the creation of Community Health Score (www.communityhealthscore.org)—a collaborative student effort that analyzes and ranks the health status of each of Kent County's 128 census tracts.

Components of the Project

In creating a model for the course, the project was guided by two seminal achievements in visualization and community health analysis. First, in the



↑ Community Health Score Pop-up Menu

book *Patchwork Nation* and website (www.patchworknation.org), Dante Chini and James Gimple recognized the problems of the now ubiquitous Republican red and Democratic blue maps of America's counties. The maps represented what they construed as a gross oversimplification of the United States. The authors developed a more detailed

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Volunteers with GIS Skills Support American Red Cross

By Evan Lue, GIS Project Lead, American Red Cross Los Angeles Region

American Red Cross chapters with mapping teams are few and sometimes require mapping by volunteers rather than employees. The SoCal Red Cross GIS Project is working with National Headquarters and other chapters to build the organization's capacity for geospatial visualization and analysis.

The American Red Cross is part of a humanitarian effort and joins nearly 180 national societies with one of the most recognizable symbols in the world.

But to assume that the Red Cross at the local level makes frequent use of GIS is only partially correct.

There are chapters that use mapping software to aid in their mission to provide relief, and National Headquarters (NHQ) has a geospatial technology unit that can create a wide range of maps in different formats at the request of chapters, regions, divisions, or other NHQ departments. The geospatial technology unit maintains a number of mapping and hazard websites to share steady-state and response-specific PDF map products. ArcGIS Online for Organizations is used for situation-specific interactive maps, and ArcGIS Viewer for Flex is configured as the Red Cross Common Operating Picture platform. During a large disaster, NHQ creates and distributes mission-critical maps to support the Red Cross response and relief effort, which is always started by the chapter.

Nevertheless, local chapters with staff mapping teams are few in number and sometimes rely upon volunteer mappers. The SoCal Red Cross Project is an example of such a local nearly-all-volunteer effort. This group is working with NHQ and other chapters to build



↑ The Red Cross has prepositioned over 80 containers across Los Angeles County alone, each with supplies to support the potential activation of a nearby shelter. GIS can help sheltering and logistics managers determine which neighborhoods might be more likely to rely on these containers while considering population density and transportation networks.

the organization's capacity for geospatial visualization and analysis.

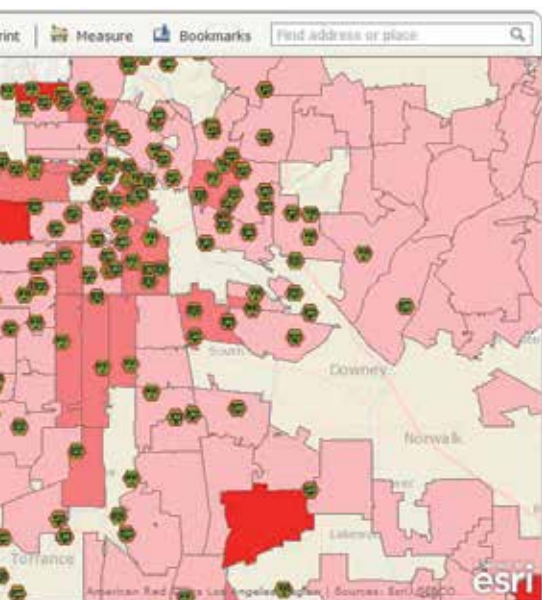
Recently the geospatial technology group at NHQ entered into an enterprise license agreement (ELA) with Esri to provide ArcGIS for Desktop to local chapters that have the capacity to use it. The ultimate goal is for all chapters to use the organization's GIS capabilities in some way, either by building their own teams and creating their own GIS data or by having a group of chapters collaborate together to build their collective GIS capacity and capability through shared resources.

A Program for GIS Volunteers in Southern California

The SoCal Red Cross GIS Project began in 2009 with a partnership between the Los Angeles and San Diego Red Cross chapters. Los Angeles had just begun mapping its resources, and a connection was quickly made between the effort and a similar one happening in San Diego. Both had the same idea, and both were

being organized by volunteers. Realizing the opportunity to merge their efforts, resources, and GIS talent, the two chapters began framing their GIS operations in the broader context of Southern California as a whole. Soon after, the group grew to include members from all their neighboring chapters.

The American Red Cross is only able to provide its services and fulfill its mission through the work put in by its many dedicated volunteers. In the same way, the SoCal Red Cross GIS Project is possible only through volunteer contributions. One of the greatest challenges at the outset (and still is) has been finding volunteers with skill sets that meet the organization's GIS needs. Following the advice of a local university professor, the Red Cross looked to college students for interns and volunteers. A partnership between the San Diego chapter and the Viz Lab at San Diego State University led to the development of a central website and hub for the project's GIS maps and data products. Today, the program is



↑ Layering the locations of Red Cross preparedness education events over disaster responses allows outreach planners to see which communities might be best targeted for future classes. Some areas of Los Angeles where the Red Cross has provided disaster relief (redder polygons) may benefit from increased exposure to preparedness education (green markers).

entirely volunteer-run and plays a role in the Emergency Disaster Response team, and much recruiting is done through universities.

How GIS Has Aided the Mission

After starting the project in Southern California, the benefits of GIS for the organization quickly became apparent. Operational uses include the ability to find the nearest shelters, logistical assets, or partners to disaster incidents. For example, a Disaster Action Team (DAT) responding to a late-night apartment fire may determine that the affected client's immediate need is a place to stay for a night while he or she comes up with a recovery plan. Premapped partner information can tell the DAT responders where the nearest lodging partner is located. If multiple people are affected by the incident, the nearest potential shelter that meets the situation's needs would be located instead.

While GIS has an obvious role in disaster operations, its largest roles for Southern California chapters include planning and storytelling. The Disaster Response

team in Los Angeles long knew that the incidents to which it responded were not happening in the same areas where communities were requesting emergency preparedness outreach. GIS moved that theory firmly into the fact category. After mapping the locations of disaster responses and layering them with outreach events, it quickly became apparent that there were communities getting little outreach but seeing more disasters. The addition of volunteer density by neighborhoods showed a similar trend: people who spent time volunteering for disaster relief came from areas that saw fewer disasters. Having graphical evidence of these trends helps determine where the organization may want to prioritize outreach and volunteer recruitment.

Bringing GIS to More Chapters

Today, with the GIS resource firmly in place at local chapters, the next steps for the SoCal Red Cross GIS Project is to publicize the resource and help chapters get started. The program in Southern California is among the chapters that, already having some experience with developing a GIS team, are helping NHQ's geospatial technology unit accomplish this.

These are no small tasks, as many chapters will need to utilize their volunteers in order to put a team together. Everyone knows that GIS requires some amount of training, including those who know they want to do it but never knew how to start. This is where the volunteers come in, some of whom have GIS skills but never before had an opportunity to put those skills to use within the organization. There are Red Cross volunteers who have GIS skills that go with their passion for humanitarian aid and disaster relief. Unfortunately, these volunteers may lack an opportunity to contribute their skills in their local chapters. Our hope is to get the word out to both chapters and volunteers. Whether it's a chapter employee or a volunteer who attempts to initiate a GIS program, we want them to know that support from other chapters and NHQ is available.

In the case of the SoCal Red Cross GIS Project, many growing pains were experienced, including security/privacy concerns, data dictionary interoperability between chapters, and data collection and sharing. Many of these growing pains were unavoidable given some unique characteristics of the organization, but they can be avoided by other chapters through shared experiences. After all, the purpose of a Red Cross GIS community is to give chapters an opportunity to add a spatial understanding to their operations while keeping them from reinventing the GIS wheel.

An example of a lesson that will be shared immediately with any budding local GIS team is that its efforts need to be publicized within their chapter to gain office-wide awareness and acceptance. The group in Southern California has developed a memo that a local disaster services manager can sign and distribute. It announces the new effort and what it means for data managers. At an early stage, it is important for people to know what datasets are being mapped and by whom, along with the privacy measures to be put in place. As small a step as this may seem, it is not immediately obvious, and many chapters have identified this as a barrier to successfully rolling out a GIS program.

As the Red Cross continues to build its GIS community, volunteers become more and more important in developing the standards, technical documents, and workflows that will provide spatial awareness in both planning and operations.

If you're interested in volunteering in any capacity, please contact your local Red Cross chapter or visit www.redcross.org.

The Veterans Health Administration Leverages the Power of Geospatial Technology and New, Innovative Methodologies to Improve Veterans' Access to Health Care

Located in Gainesville, Florida, the Planning Systems Support Group (PSSG) is a field unit of the Veterans Health Administration (VHA) Office of the Assistant Deputy Under Secretary for Health (ADUSH) for Policy and Planning. Its primary mission is to assist US Department of Veterans Affairs (VA) planners in improving veterans' access to health care via the application of advanced GIS tools and geospatial analysis. The goal: to turn geographic information into the strategy needed to optimize VA resources and provide the right services to the greatest number of veterans.

The PSSG is the primary source of geographic data and analysis needed to evaluate access and to plan new sites of care. Using data from the VA Site Tracking System (VAST) and the enrollee travel time file, PSSG computes drive time to the nearest VA primary, secondary, and tertiary site of care for more than eight million enrollees.

PSSG data and services directly support the VA Enrollee Health Care Projection Model used to develop estimates for approximately 95 percent of the VHA medical care budget. Also, this model is required for all new VA site planning. In addition to VHA strategic planners, past PSSG clients have included the White House Health IT Task Force, the Indian Health Service, the Presidential Advisory Council on HIV/AIDS, and numerous VHA program offices and Veterans Integrated Service Network (VISN) offices.

[illegible]

← Geographer
Chris Richmond
of PSSG
created this
map showing
location-
allocation
analysis in
action to
assist the
Readjustment
Counseling
Services (RCS).

accomplish this by allowing planners to visualize how decisions regarding their facility locations spatially relate to the residential locations of veteran beneficiaries. The ADUSH GIS Planning Portal is a handy starting point for VA planners to identify access gaps in geographic coverage and how to best allocate existing and future resources for our veterans.

Since mid-2011, PSSG has been applying advanced location-allocation analysis, a feature of ArcGIS software, to assist planners who are contemplating where to best locate new facilities. Analyses conducted by PSSG have assisted numerous planners and high-level stakeholders in estimating the future impact of site openings and closings given certain criteria and projected data. The group would like GIS technologies to be considered the “tool of choice, to help visualize choice” within VA.

The PSSG supplies VA offices with VISN and national maps and Health Care Planning Model (HCPM) maps. In addition to these tools, PSSG oversees the development of a Geographic Access Report that provides county- and market-level summary data for primary care, acute care, and tertiary care, using the end-of-fiscal-year geographic access summary data.

Regardless of the task, project, or initiative, PSSG strives to help veterans and those who serve our veterans to better “visualize choice” utilizing GIS technologies and methodologies.

For further information,
contact Kevin Willis at kevin.
willis10@va.gov or visit
esriurl.com/kevinwillis.



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and thoughtful typology, categorizing the country into 12 distinct community types.

Through a process called principal component analysis (PCA), *Patchwork Nation* provided a model for the project in which the students developed a health typology.

"PCA is frequently utilized as a data reduction technique to discover patterns within multiple variables that can be difficult to detect otherwise," Borders observed.

The second component of the project was inspired by the University of Wisconsin Population Health Institute's County Health Rankings (www.countyhealthrankings.org).

The rankings are designed to assist communities in creating solutions, making it easier to be healthy. County rankings within each state are based on key health and socioeconomic variables. When possible, many of the indicators in the GVSU project were modeled on those developed by the rankings, Borders explained. The key difference is that he and his class seek to provide clues about the health of the communities within Kent County, developing rankings and community types for each of the county's 128 census tracts.

Classifying the Communities

"Although most students taking the course had little or no experience with GIS, the design and ease of use of ArcGIS Online gave each student an opportunity to contribute to the project," Borders said. Using data, primarily from publicly available sources such as the US Census's American Community Survey, Esri Business Analyst, and select vital records data, he created a master shapefile from an extensive list of variables selected by the students. The shapefile was loaded into ArcGIS Online, where each student created an individual account, joining the Community Health Score group.

According to Borders, students experimented with the data, working with ArcGIS Online and SAS Enterprise Guide, exploring relationships between

variables that seemed to most affect public health in Kent County. For example, the students created scatterplots and correlations to better understand how socioeconomic variables such as poverty and educational attainment are related to prenatal care access.

After working with the data, the class made recommendations to include in the PCA model. PCA reduced the broad set of indicators into a more manageable five-factor solution—each factor grouped by the common characteristics it exhibits. The students then developed a name for each community type that summarizes its essence:

- **Decidedly Disadvantaged:** Our most vulnerable communities, primarily urban, are characterized by high levels of poverty, minorities, transportation barriers, and poor access to prenatal care.
- **Burgeoning Challenged Newcomers:** Although most residents are white, these communities have the highest proportion of Latinos, with nearly half of the households with children under 18.
- **Convenienced Common Laborer:** Mostly suburban communities with the highest numbers of working residents yet most do not have well-paying jobs.
- **Fortunate Fringe:** Our most affluent, suburban communities that are overwhelmingly white with high per capita incomes and level of educational attainment and low levels of single-female-headed households with children.
- **Emptying Nests:** Communities with large swaths of aging baby boomers where the grown children have moved out on their own. The communities are more likely to have households with seniors and the least likely to have children under 18, with about 15 percent of households comprised of seniors living alone.

Scoring the Communities

Defining the five community types was instructive by adding new understanding to the complexities of Kent County communities. Yet, it also left the students

with little information about how to prioritize community needs, Borders explained. The solution: using a similar approach to the county health rankings, the students developed a series of rankings for each census tract. That turned the Community Health Score into a weighted composite measure, developed from three domains that impact the health of the community: Access to Care (40%), Socioeconomic factors (40%), and Physical and Environmental factors (20%).

"By seeing the results at a more granular level, we improved identification of areas likely to suffer from health disparities," said student Ashley Miller, who led the project scoring efforts.

The students also calculated scores in SAS Enterprise Guide and created powerful visualizations by embedding those maps into the website for each of the three health domains. Most notable among the visualizations are embedded maps that feature pop-up menus, providing additional analysis for each community, Borders said.

Pop-up Menu

The methodology was developed from class discussions, a careful review of the literature, and the clear documentation on the County Health Rankings website.

"This comprehensive approach forced the students to consider that community health includes the social determinants as well as a system of hospitals and health care providers," Borders said.

For further information, contact Stephen Borders, PhD, MSHP, at borderss@gvsu.edu or by calling 616-331-6569.

Geodesign: Case Studies in Regional and Urban Planning, by Shannon McElvaney

This book features case studies in geodesign—an emerging concept in landscape and land planning in which designers use geospatial tools that support rapid evaluation of design alternatives against the probable impacts of those designs. Geodesign presents several case studies that exemplify key steps, processes, and technologies crucial to the advancement of geodesign.

Reviewer

Thomas Fisher is dean of the College of Design at the University of Minnesota.

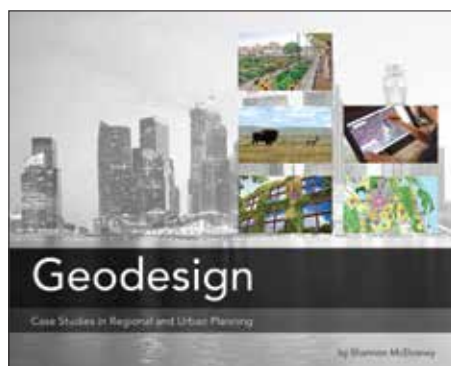
No method of addressing our era's unprecedented social, environmental, and economic changes holds as much promise as geodesign, which uses geographic information systems to develop data-rich solutions to the grand challenges we face—including how to improve environmental and human health.

A recently released book, *Geodesign: Case Studies in Regional and Urban Planning* (Esri Press) by Shannon McElvaney, offers one of the best available overviews of this new field. McElvaney provides us with a range of fascinating examples of how geodesigners are transforming our world with this tool.

McElvaney highlights the transformational or game-changing effects geodesign can have on a range of fields, including many that fall under the general subject of health. In much of the book, he demonstrates the way in which geodesign can help us improve the health of the environment, but these methods can have a positive impact on human health and economic health as well.

At the very beginning of the book, he makes a compelling case for geodesign. Weaving together a brief history of how we have thought about human habitation of the planet, he shows why—as Jack Dangermond, Esri founder and president, puts it—“designing with nature, or geodesign, is our next evolutionary step.”

McElvaney then uses the conceptual framework developed for geodesign by Carl Steinitz, emeritus professor at



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Harvard University, as the basis for assessing the diverse case studies that follow.

These applications range from selecting the best development sites in the city of Asheville, North Carolina, to envisioning alternative futures for Cape Cod; from forecasting the impact of climate change on protected species in Yellowstone National Park to assessing sustainable development alternatives for Singapore; from creating a new sustainable university in Kuwait to visualizing the social and environmental impacts of future land-use decisions in Florida; and from turning abandoned, foreclosed land into recreational and agricultural green space in Los Angeles to anticipating the flood hazard of sites in Southern California.

In each of these case studies, McElvaney includes a critical discussion of geodesign and a useful list of lessons learned.

So many of the major public health challenges that we face—“heart disease, diabetes, obesity, asthma, depression, and traffic-related injury,” as McElvaney enumerates—benefit from the holistic analysis and synthesizing power of

geodesign. The R2G-LA project, for example, shows how GIS enabled the selection, design, and development of pocket parks in Los Angeles to have a maximum effect on a range of public health problems that can arise, especially among youth, in impoverished communities.

Geodesign can benefit the economic health of communities as well. McElvaney highlights talks from the first three geodesign summits, where conference speakers argued for social equity and gave examples of how their use of this technology has helped them “focus on bottom-line benefits that make the best use of available resources,” as Matt Ball of Vector1 Media put it. Good design always does more with less, and the same holds true for geodesign.

The value of this book goes beyond that of informing GIS professionals about new uses of this technology. It will prove invaluable to decision makers and insightful to anyone concerned about the future of our planet. As McElvaney says at the end of the book, “To create a sustainable future will require innovation on a scale and at a rate never seen before, and geodesign can help.” The globe, in other words, has become the greatest design problem of our time, and geodesign offers a means of dealing with it at a scale commensurate with the challenge.

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