Surface Matters
What Arizonans are doing with geospatial technology
Newsletter of the Arizona Geographic Information Council

Planning and GIS at the Top of the World

Career decisions can take a person far afield. This story concerns the work of a transplanted Arizonan who has gone about as far afield as one can go.

Erika Green used to work at the Arizona State Department of Commerce. Already possessing a Master of Planning degree from the University of Arizona, she decided to go through the GIS program at Phoenix College, then went to ASU and earned her Master's of Advanced Studies in GIS. Armed with these credentials, she decided to look for a more challenging position. Her search landed her in Barrow, Alaska, the most northerly town in the United States, where she now works as a Community Development Planner for the North Slope Borough Planning and Community Services Department. She is in charge of the Community Planning Division with a staff of six GIS and two planning personnel. She started this job in May of 2010.

What does any of this have to do with GIS in Arizona? Nothing. But it's such a dramatic departure that it's worthy of exploration. Plenty of Arizonans know how spatial technology is applied in the desert or the woods, but how is it applied on the frozen tundra?

A couple of obvious questions present themselves. Where the heck is Barrow, Alaska? And what's up there that requires planning and mapping? Well, Barrow is as far north as you can go and still be in Alaska. What's up there are seven villages, plus the town of Barrow, plus the Prudhoe Bay oil and gas drilling area, all spread across 89,000 square miles of open tundra. This area is only 22% smaller than the whole state of Arizona, but it's very sparsely inhabited. Imagine lopping off the top quarter or so of Arizona, then populating what's left with a mere 7,300 people. That's the situation.

The North Slope Borough is the political entity responsible for this huge expanse. A borough is much like a county, but not exactly. The distinction is fuzzy. Barrow is the county seat (or borough seat, in this case), with a population of about 4,500 people. The villages are Inupiat Eskimo villages with populations ranging from about 250 to just under 1000. All of the villages are remote and can only be reached by aircraft and/or boat. The Borough provides electric, water, sewer, and trash pickup services to each of them. Their economies are based largely on the subsistence hunting, fishing and whaling traditions of the Inupiat people, which presents special challenges to land planners and other officials. The primary goal of the borough government is to provide modern services while maintaining the conditions that will allow the traditional Inupiat way of life to continue.

In 2006 a borough-wide comprehensive plan was completed. It called for a separate plan for each of the seven villages. Community Planning staff have been visiting the villages to get the residents' input on how they would like their communities to develop. These plans look five, ten, and even twenty years into the future, which will help with long-term land use planning

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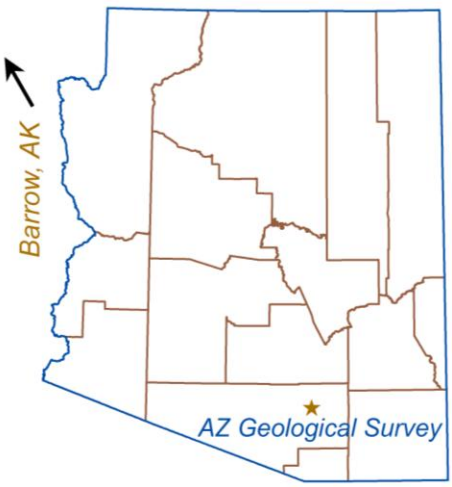

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and resource development. This is a large project, and the planners are tackling it three villages at a time to keep it manageable.

The Planning Department is also involved in capital improvement projects. When the planning personnel travel to the villages, they talk with the public about what projects the residents would like the planning commission to consider, how to fill out project requests, how to get studies done, and how to coordinate with the local public works divisions in their towns.

Planning, of course, is a broad, long-range effort, but other departments within the Borough, as well as village governments and citizens, have more immediate needs. That's where GIS comes in. The GIS staff is responsible for mapping assets and properties throughout the region. Demand for maps is high and the need for new ones is constant. Requests come in from all directions and it's a ceaseless challenge to keep up with them while attending to the usual work of maintaining data and working on long-term projects.

One of the more critical projects is creating electric utility maps for each of the villages. One member of the GIS staff has that responsibility. He has data in CAD format that were created by a contractor in 2000-2005. He's converting them to GIS and sending the resulting maps to someone in the field who verifies everything. The maps come back marked with corrections and the data are updated. The winters are extremely harsh (the borough is above the Arctic Circle) and it's vital that personnel in the villages have accurate maps of the electrical system in case the power goes out.

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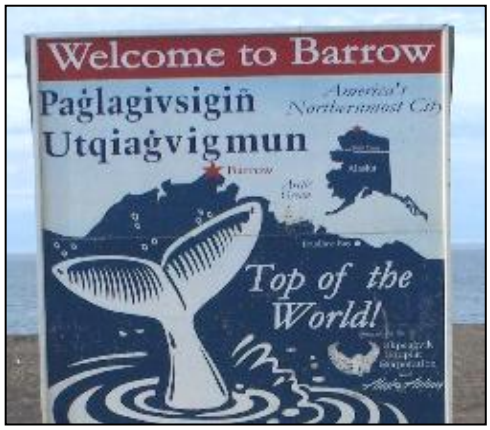

Members of the intrepid Planning & GIS team in Barrow, beneath a map of the borough and its villages.

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Previous issues of Surface Matters are available on the AGIC web site.

Surface Matters is the quarterly newsletter of the Arizona Geographic Information Council. It is written for those who want to stay in touch with the vision and activities of AGIC and with the continuing growth of GIS in Arizona.

Your comments about this publication are always welcome. Please send all correspondence to the editor.

Readers are invited to submit articles that they wish to be considered for publication. The author retains all copyrights. Please let the editor know if the article has been published elsewhere.

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The Community Planning Division is also responsible for mapping land parcels and assigning addresses. Many of the map requests are from property owners looking for information about their property. Because of these and other requests, the GIS staff is planning to build a mapping service on the Borough's web site. The software for this has recently been purchased and the work is slated to begin soon. The aim is to have accurate parcel data available so that citizens can find their property and print their own maps. This would make the process much more efficient for the public and would free up a great deal of time for the staff.

One of the more popular maps is the Camps & Cabins map. People own private cabins and camping platforms along several of the rivers that flow through the borough. They are accessed by boat in the summer and snowmobile in the winter. For the past four summers one of the GIS staff members has been going out by helicopter to get accurate GPS coordinates of these structures. This is not only worthwhile for the owners, but also for the Borough Search and Rescue Division. These cabins are on the tundra, which is largely monotonous and lacking in landmarks, so GPS coordinates are of great value.

In addition to making mundane things like tax maps, GIS personnel plot the locations of oil spills, tundra damage and other mishaps that occur as a result of oil and gas drilling in the Prudhoe Bay area. The Planning and Community Services Department employs four inspectors who fly out to the oil and gas fields to look for spots that require remediation. Having recently been trained on new GPS equipment, they take the coordinates of sites that have sustained some kind of damage. In one case, a large object fell off the back of a truck and gouged a 90-foot scar in the tundra. A company that causes such damage is required to mitigate it, because the tundra is very slow to repair itself naturally. When the inspectors bring back the data, these locations are plotted on a map.

Working in the extremely remote Arctic brings other difficulties. One is the high cost of everything. It's very expensive to send staff members to training. Since Barrow is at the extreme northern tip of Alaska, it takes an entire day of travel just to get to the lower 48 states. Airline tickets and hotel rooms add up quickly. If a plotter or other piece of office equipment breaks down, someone from elsewhere in Alaska, or somewhere else in the country, will have to be flown to Barrow to fix it. A further example comes from the Camps & Cabins map. GPS points can only be gathered in the summer; winter temperatures often reach 40 below and the sun doesn't rise for several months. Such conditions severely limit helicopter travel. Also, the pilots won't turn off the engines when they're on the tundra no matter what the season. Imagine trying to fund a GPS survey that includes the cost of having a helicopter standing by with its engine running the entire time you're in the field.

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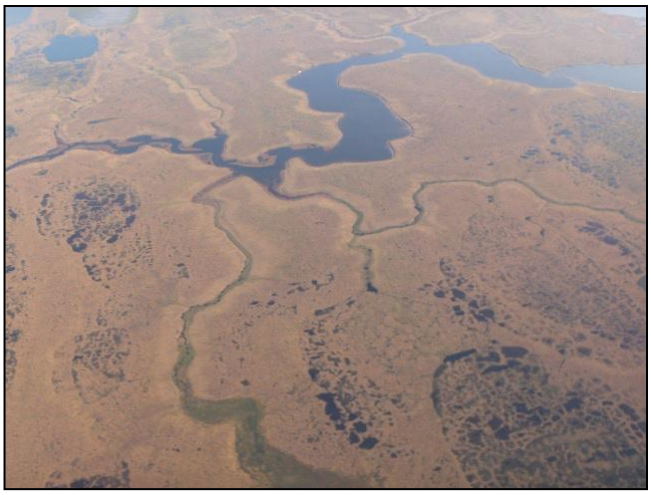
A popular map of the North Slope Borough. It's written in both English and Inupiaq, the native Eskimo language of the region. The borough is nearly 650 miles across and contains six state plane zones!



The tundra as seen from the window of a Boeing 737.

The tundra at ground level. The North Slope Borough has 89,000 square miles of this.

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This article began by pointing out that the new GIS chief in Barrow recently moved up from Arizona (specifically Phoenix). As it happens, another of the recently hired GIS staff, Jeffrey Utter, also came up from Phoenix. Meanwhile one of the senior staff, Dave Logan, who has been there for fifteen years, originally came from Albuquerque. It seems an odd coincidence that so many Southwesterners have wound up doing GIS in Barrow. The geospatial allure, however, is not restricted to outsiders who move to the Arctic. This fall marks the beginning of the third year in which Barrow High School is offering a GIS class. One of the students, Charmaine Hingada, has recently finished an internship with the Community Planning Division and is currently working full-time as a GIS technician.

Whether you begin in the searing southwest or the frigid north, the pursuit of spatial technology can bring many adventures, and may lead you, quite literally, to the ends of the earth! ◇

At the ends of the earth, you might find tourists.

A U.S. Geodetic Survey monument *in situ*, properly emplaced and doing its duty in Barrow.

The editor of *Surface Matters*, wearing a stylish AGIC T-shirt, on assignment in the Arctic.

Contributors

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Charmaine Hingada, North Slope Borough Planning and Community Services Department
GIS Technician

David Logan, North Slope Borough Planning and Community Services Department
GIS System Analyst

Jeffrey Utter, North Slope Borough Planning and Community Services Department
GIS Systems Programmer

For More Information

North Slope Borough
www.north-slope.org

City of Barrow
www.cityofbarrow.org

Inupiat Heritage Center
www.north-slope.org/departments/planning/IHCsite/index.html

Team Members in Photo
From left to right: Dave Logan, Jeffrey Utter, Erika Green, Tommy Nageak, Katuk Pebley, Doreen Lampe, Qaiyaan Aiken
Photo taken September 28, 2010

Coordinates of Barrow, AK
71° 17’ 44” N Latitude
156° 45’ 59” W Longitude

Arizona Geological Survey: Offering a Wealth of Resources through its Bookstore, Library, and Online Services

Michael Conway

Fifteen years ago, if you were in the market for a geologic map or report you headed to the nearest university library, or to a US Geological Survey or state geological survey office. No longer. Earth science agencies, societies, and non-governmental organizations are putting more and more of their geologic products online in free downloadable formats – pdfs, jpgs, tiffs, or GIS shapefiles – while using social networking venues like Facebook, YouTube, and Twitter to showcase, promote, and distribute geologic products.

The Arizona Geological Survey (AZGS) is skating down the digital distribution pathway, too, while still maintaining our bookstore and geoscience library in downtown Tucson at 416 W. Congress. Our bookstore delivers AZGS geologic maps and reports, the Down-to-Earth popular geology series, and US Geological Survey products, including 7.5 minute topographic quadrangles for Arizona – all 1935 of them. Under the direction of AZGS Director Lee Allison, store inventory expanded over the past several years to include a bevy of natural history and popular geology books, hiking maps and field guides, and mineral, fossil, and rock field guides.

Another addition to our bookstore: GIS data for our Digital Geologic Map and Digital Map series products, with geodatabases, shapefiles, metadata, technical reports, and browse graphics.

This past summer, the *Downtown Tucsonan* newspaper visited the AZGS bookstore and said, "… has everything for those who love the great outdoors, from topo maps to coffee-table books." The AZGS State Map and Bookstore is integral to AZGS's mission to inform Arizonans of the state's geologic setting by making geologic reports and maps accessible to both geoscientists and the public alike.

The Arizona Geological Survey bookstore.

AZGS Geoscience Library The AZGS Geoscience Library comprises more than 15,500 volumes, most of which are specific to the geology, hydrology, geophysics, geologic hazards, and soils of Arizona. In 2009, benefactors donated more than 100 earth science texts, 65 theses and dissertations, and hundreds of aerial photographs of southern Arizona. AZGS's aerial photography archive offers thousands of images, the indices of which are scanned, georeferenced, and queried via GIS.

Besides AZGS geologic products, 20% of the AZGS library stacks are filled with US Geological Survey professional papers, bulletins, circulars, water supply reports, open-file reports, and geologic maps.

Periodicals, the lifeblood of science literature, are available for nearly 100 titles. This includes *Economic*

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A student from Pima Community College searches the AZGS library shelves.

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Geology (beginning with vol. 3, 1908); *Transactions* – American Institute of Mining and Metallurgical Engineers – with 260 volumes beginning in 1871; and *Geological Society of America Bulletin*. Other popular periodicals include: *Journal of Geophysical Research, American Mineralogist, Paydirt, Geology, The Mountain Geologist, The Mineralogist, Arizona Mining Journal, Geotimes*, and *Earth*.

Other hard-to-find materials on AZGS library shelves: Arizona Geological Society fieldtrip guides, University of Arizona Geodaze series, and New Mexico Geological Society guidebooks. To top it off, there are modest collections of geologic maps and reports for neighboring states – California, Nevada, Utah, New Mexico, Wyoming, and Mexico.

The Digital Face of AZGS While our storefront and library maintain conventional hours of 8:00 to 5:00, Monday through Friday, AZGS is available 24/7 at www.azgs.az.gov. The Survey's web philosophy is simple: provide people with the map services and information they need to decipher and appreciate Arizona's marvelous geology. And it's working. Nearly 10,000 people avail themselves of our web products each month.

The web site is loaded with dozens of reports on Arizona's mineral resources: gold and gold prospecting, industrial minerals, breccia pipe uranium deposits, helium, manganese, molybdenum, and salt and evaporite deposits. At the "Geothermal Potential in Arizona" web page, you'll find 45 AZGS reports on geothermal resources, including a summary report, "Geothermal Energy in Arizona – Final Report."

Our online resources for geologic hazards range from arsenic to volcanoes, with individual web pages dedicated to seismicity, earth fissures, slope failure, floods and debris flows, radon, swelling and shrinking soils, and more.

Other online features include:

- AZGS publications catalog
- Bibliography of Arizona geology – with 13,000+ citations and a robust search engine
- AZGS map services with the Geologic Map of Arizona
- Arizona Oil and Gas Conservation Commission web page
- *Arizona Geology* – the news magazine of AZGS
- State Geologist Lee Allison's popular "Arizona Geology" blog
- Earth Fissure Center & Interactive Earth Fissure Viewer
- Online publications

The web site continues to improve as new features are added. One immediate goal is to upload 40 years of *Fieldnotes* and *Arizona Geology* newsletters. In winter 2010, we hope to launch a dedicated e-commerce site to provide for round-the-clock purchasing of AZGS inventory.

AZGS Document Repository – 24/7 Geologic Data Distribution Since 1915, AZGS and its predecessors have published hundreds of geologic reports and maps. The older reports are largely out of print and difficult to find, with access limited to the AZGS Geoscience Library or to geoscience collections at Arizona's three universities. Newer publications are available at a modest price through the AZGS bookstore.

The sale of publications provides revenues for preparing new products, but restricted access to geologic materials limits their usefulness. For the past several years, we've struggled to find a remedy to this problem. One solution: build an online publications page. We did and it works moderately well, but the result is a list of hard-to-search titles and associated pdf files.

Our Geoinformatics team of Steve Richard, Section Chief, Wolfgang Grunberg and Ryan Clark, struck on a more robust solution: an online AZGS document repository. Using open-source, Drupal content management system software, they are building the Arizona Geological Survey Document Repository. As Wolfgang Grunberg notes, "The repository is built around core values of discovery, access, intellectual credit, and preservation." The AZGS Document Repository has just recently been launched. It is initially being populated with geologic maps and reports, and plans are to increase its offerings quickly.

In Conclusion.... AZGS is charged with providing geologic material at little or no cost to our Arizona constituents. We take that charge seriously. The days of mailing out bulletins for 25 cents are gone. But with an integrated model of storefront, public geoscience library, and online document distribution, we continue to meet Arizona's need for inexpensive, readily available geologic maps, reports, and data. ◇

For More Information

Arizona Geological Survey
416 W. Congress St. # 100
Tucson, AZ 85701
520-770-3500
www.azgs.az.gov

Geoscience Information Network
http://usgin.org

Geothermal Data Network
www.stategeothermaldata.org

On the Digital Horizon: the Geoscience Information Network & National Geothermal Data System

Michael Conway

Arizona has become a global leader in digital data integration and those capabilities will soon be available to geoscientists, state and federal agencies, and the public.

Imagine for a moment you, a GIS analyst, are part of a research team engaged in seeking a site for a geothermal power plant in central Oregon, western Nevada, or maybe south-central Arizona. Imagine further that the team's geoscientists and engineers pegged you as the go-to guy for all spatial data resources – georeferenced geologic maps, thermal isopach maps, well-hole logs, down-hole temperatures, local and regional geothermal gradients – the whole shebang. Success or failure rides on your ability to discover and deliver reams of diverse and relevant data from a whole host of independent sources. Good luck!

This would be a formidable task for anyone, but on the digital horizon appears a glimmer of light. In collaboration with the U.S. Geological Survey and the Association of American State Geologists (state geological surveys), the Arizona Geological Survey is constructing a distributed, interoperable Geoscience Information Network (GIN) to enable discovery, evaluation, and access to a nationwide gaggle of geoscience data. GIN is supporting the Western Regional Partnership's GIS Mapping Application to make thousands of GIS layers from 15+ federal agencies available to Arizona agencies and others.

But GIN is only one half of the equation – the discovery and evaluation half. First, there has to be something to discover.

Enter the National Geothermal Data System (NGDS). With Department of Energy support – to the tune of $22 million – the Arizona Geological Survey is shepherding a nationwide effort to help create, deploy, and populate a national, sustainable, distributed, interoperable network of state geological survey-based data providers that will develop, collect, serve, and maintain geothermal relevant data.

Both GIN and NGDS are in their formative stages. But with the stakeholders and funding in place, it won't be long before the tools and data resources show up on the desktop computer of our erstwhile geothermal exploration team. ◇

STATE GEOTHERMAL DATA

USGIN

AGIC 2010 Education and Training Expo

The AGIC 2010 Education and Training Expo will consist of a one-day event held at the Glendale Civic Center on Friday, November 19th. This will be an exposition style forum that will be divided into two separate, yet adjoining areas to accommodate on-going presentations in one area, and on-going exhibitor booths in the other "technology" area.

Given that this will be a one-day event with seven 45-minute presentation slots, focused presentations will be given, as opposed to user-solicited ones for the most part. Two presentation time slots will be used for "lightning talks" which allows each speaker 10 minutes to present on the specified topic.

Learn about developments and challenges in a rapidly changing industry and share your own insights into the world of GIS. Explore vendor exhibits and network with GIS professionals from across the state. Participate in the poster gallery or web map contest to showcase your latest project. We look forward to seeing you at AGIC 2010!

Pima County 13th Annual GIS Fair

On Friday, November 5th, 2010, Pima County will be hosting the 13th Annual GIS Fair. The theme is "New Horizons in GIS" and the format will be a luau type atmosphere.

The GIS Fair is a great opportunity to come see how your local government and other agencies are utilizing GIS technology to work more efficiently, solve problems, make better decisions for each other and the community at large.

Popcorn, games and prizes will be ongoing throughout the day, along with lunch. Businesses and eateries have provided great gifts that will be given away at random drawings all day long, with a grand prize at the end of the GIS Fair.

The Fair is open to all! Come celebrate GIS with us!

AGIC Roundup

● The Administrative and Legal Committee drafted new bylaws for AGIC. The changes within the draft were designed to put the council in line with language in the current statute. Two major changes were made to the bylaws. These changes affected Article 3 and Article 4. Article 4 reflects changes to how the membership is formed. Article 3 changes "Board" to "Council." Other changes included changing the Secretary's office to Treasurer, the State Cartographer's Office is given more responsibility for administration, quorum is defined and some guidelines for the responsibilities of each council member are defined. The newly drafted bylaws were adopted at the August meeting of the AGIC Board (now the Council).

● State Cartographer Gene Trobia met with the Governor's Office to discuss the membership of AGIC. All of the council members need to be reappointed this year. Members will be appointed for 1-, 2-, or 3-year terms and thereafter for 3-year terms. Each member will need to reapply to remain on the council.

● AGIC has registered with the National States Geographic Information Council (NSGIC) as a State Council Member. Each member of AGIC is now considered a member of NSGIC.

● AGIC President Jana Hutchins and Vice President Keith Larson attended the NSGIC 2010 Annual Conference in Minneapolis, MN, to participate in national activities and represent AGIC. The conference took place September 12-16.

● Out of 34 seats within AGIC, eight are currently vacant. The agencies needing to fill these vacancies are:
Arizona Department of Administration
Arizona Department of Commerce
Arizona Department of Transportation
Arizona State Parks
Arizona Association of Counties
Maricopa Association of Governments
Northern Arizona University
U.S. Bureau of Reclamation

Calendar of Events

NORTHERN ARIZONA GIS USER GROUP
WEDNESDAY, NOVEMBER 3
1:00-5:00 PM
FLAGSTAFF MEDICAL CENTER
MCGEE AUDITORIUM
1200 N. BEAVER ST. (BETWEEN THE MAIN HOSPITAL ENTRANCE AND THE PARKING GARAGE)
http://tech.groups.yahoo.com/group/NAGIS_Users

AGIC EXECUTIVE BOARD MEETING
THURSDAY, NOVEMBER 4
10:00 AM – 12:00 NOON
MARICOPA ASSOCIATION OF GOVERNMENTS
302 N. 1ST AVENUE, PHOENIX
NORTHWEST CORNER OF 1ST AVE. AND VAN BUREN STREET
2ND FLOOR, SAGUARO ROOM
http://agic.az.gov/board/calendar.htm

PIMA COUNTY 13TH ANNUAL GIS FAIR
FRIDAY, NOVEMBER 5
9:00 AM – 2:00 PM
201 N. STONE AVE
CITY/COUNTY PUBLIC WORKS CENTER
BASEMENT, CONFERENCE ROOM C
TUCSON

AGIC 2010 EDUCATION AND TRAINING EXPO
FRIDAY, NOVEMBER 19
GLENDALE CIVIC CENTER
5750 W. GLENN DR
http://agic.az.gov/agic2010/index.html
http://www.glendaleciviccenter.com

TUCSON GIS COOPERATIVE
SECOND FRIDAY OF EACH MONTH
PUBLIC WORKS BUILDING
201 N. STONE AVENUE, TUCSON
NORTHWEST CORNER OF STONE AND ALAMEDA
BASEMENT, CONFERENCE ROOM C
http://cms3.tucsonaz.gov/giscoop/gis-cooperative