2015

Arizona GIS User Survey

State Cartographer's Office

Arizona State Land Department

4/22/2016

Table of Contents

Introduction

Throughout the summer and fall of 2015, the State Cartographer's Office (SCO) conducted a survey of statewide Geographic Information Systems (GIS) users and stakeholders. Invitation to participate was provided to all those registered on the AGIC-L listserv, and through regional meetings with geospatial professionals around the state.

Over 115 people responded, and answered questions about their business, their spatial information management, the Arizona Geographic Information Council (AGIC), and the priorities of SCO.

While this definitely was not a scientific sampling, the results provide excellent baseline information which we can look back on, and can use to mark progress.

The survey's design used branching methods, allowing people with varying levels of GIS expertise to contribute, as appropriate. Respondents could choose to only answer the questions on Statewide Vision/Focus needs, or add secondary questions on Partnerships and Collaboration, or add the tertiary questions on Spatial Data Management.

To keep the survey from being painfully long, a maximum number of questions anyone could see was capped at 30. Most questions were presented in check-box, drop-down list, or multiple-choice formats for ease of use and for consistent answering options. Some response options could not be pre-formatted, and required a text-box. In those free form responses, the passion for GIS really showed, as long and very detailed answers.

Comments indicated that most were able to get through the survey in a relatively short time, but some found it a bit tedious.

A large majority of participants indicated that they would be willing to inform future surveys once a year, or more. Feedback on the question formats and time spent in the survey will, hopefully, allow us to improve any subsequent additions.

SCO is most grateful for the time and consideration respondents gave to this effort.

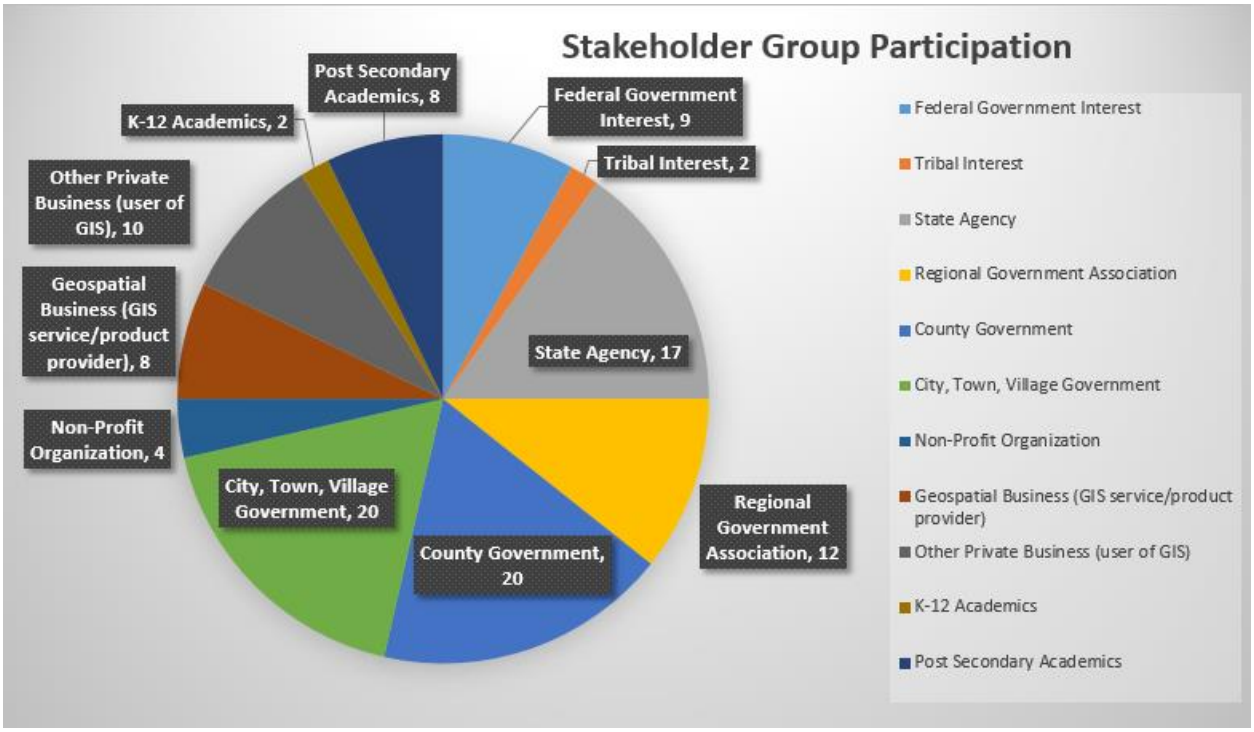
Curtis Pulford
State Cartographer

Summary Observations

- Broad survey participation: With strongest representation in the Municipal, County, Regional, and State Agency sectors. Surprising interest in the survey from the Business sectors. A need for better outreach to, and more engagement with, Tribal and K-12 communities.
- Business Driver listings demonstrate why GIS should be more valued in moving our state forward. Emergency Response; Economic Development; Land Use Planning and Zoning; Transportation, Agriculture, Demographics, Capital and Socioeconomic Planning efforts, are among many other items listed as benefitted by GIS.
- A shift in delivery - from traditional hardcopy presentation maps, displayed on an easel or wall - to dashboards and interactive Web mapping tools that put the information into everyone's reach.
- Data Custodianship which is dependent on both in-house and external partners.
- A trend toward fewer Data Use Agreements, and toward more Publicly Accessible data and service delivery.
- Some of our data might be at risk. 44% of data custodian respondents indicated that backups are not a big concern.
- External collaboration is extremely important to eventual business product delivery.
- We all seem to work with multiple partners - Fed, Tribal, State, Regional, Local, Business, and Academia, among others - for access to spatial information. The Counties, followed by State and Local government sources are the most widely used.
- Support for AZGEO is very high, but system improvements are recommended. Metadata Creation, Reporting, and Help Documentation were, by percentage, in need of the most help. More data from all of the in-state provider groups was also seen as helpful/desirable.
- Less than 50% of those taking the survey pay attention to, and participate, in the Arizona Geographic Information Council. Less than 35% feel that their sector is adequately informed by AGIC.
- People believe that the State Cartographers Office should place highest importance on Geospatial Data Sharing; a Geospatial Information Clearinghouse, and; Geospatial Data Repository activities.
- 81% felt that compiling the survey results would be helpful, and another 18% indicated that it might ('Time will tell'). 90% of respondents said they would be willing to do similar surveys annually or more often ('as needed').
- 'Outside the box' GIS opportunities should be investigated with: Schools, Realtors, Utilities, Consultants, Red Cross, Mining, Auditors, Academics, Commercial Business and many others.

Respondents

The first section of the survey collected information about the general geospatial sector affiliation of the respondents. As shown below, the distribution was similar to the kind of participation numbers we see at conference events. And as we've understood for some time, we need to do more work to engage Tribal interests, and the K-12 community.



Group Specifics

Specific questions were then asked once people identified with a particular sector. The questions for each sector were somewhat different, and specific to that scope of geospatial. Of note in these specific questions were the following:

- Federal Government Interests
  - *Amount of AZ served by your office?*
    - 33.3% - The entire state
    - 66.6% - Other (answers included specific parks, forests, etc.)
- Regional Organizations
  - *Specialties? (more than one choice possible)*
    - 83.3% - GIS
    - 83.3% - Transportation
    - 58.3% - Demographics
    - 41.7% - Economics
    - 41.7% - Community Planning

        - 33.3% - Environmental
- Non-Profit Organizations
    - *Areas served by your office?*
        - 100% - State of AZ focus
- Geospatial Business (GIS service/product providers)
    - *Areas served by your business?*
        - 75.0% - Multiple states (including AZ)
        - 12.5% - State of AZ focus
        - 12.5% - Other
    - *Business specialties?*
        - Application Development, Data Services, Custom Cartography
        - Market Studies, Master Planned Communities, Multifamily
        - Software (Imagery & Lidar Compression), DEM, Satellite Imagery, UAS, Digital Pens, GIS Cameras, GIS Training
        - Mapping, Surveying and Construction Equipment & Supplies
        - Consulting
        - Education
        - Imagery, Photogrammetry, Mapping, LiDAR, Hosting, Historical 3D Reconstruction
        - Application Development, Imagery Capture
- Private Business (user/leveraging GIS)
    - *Spatial Data and Application uses within your business?*
        - 100% - Raster data - Aerial photography / elevations / LiDAR
        - 100% - Vector data - Boundaries, paths, locations and areas
        - 80.0% - Spatial analysis and reporting
        - 70.0% - For Business cartography - Illustrating offices, products, service areas, or plans
        - 40.0% - Location guidance - Fleet routing, equipment controls, directions
- Post-Secondary Education
    - *Institutional Position?*
        - 30% - Educator
        - 20% - Academic Staff
        - 10% - Student
        - 40% - Other (answers included: research, development, author, etc.)

Internal Operations

In this section of the survey, we wanted to better understand business drivers, strengths, and any challenges that might influence or affect wider collaborations.

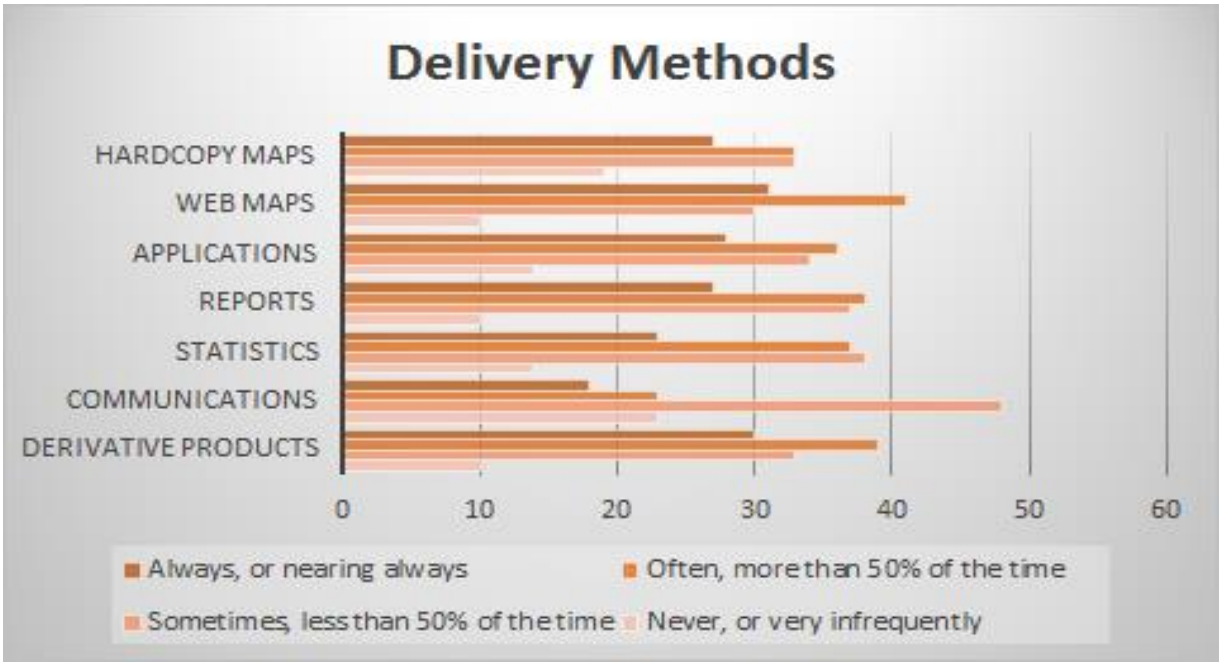
Business Drivers

It is very difficult to get simple answers, for something as complicated as business drivers. As would be expected, the responses were anything but simple. For these reporting purposes, some shortening and parsing of responses was necessary. The results are shown below, in a word cloud which emphasizes relative importance (phrase frequencies) by font size.

Delivery

How do operations use GIS to deliver on the previously identified business drivers? We inquired regarding use of the following:

- Hardcopy Maps
- Web Maps
- Applications (that enable users to interact with data)
- Reports (based on GIS analytics)
- Statistics (analytics delivered as spreadsheets, ratios, etc.)
- Communications and Trainings
- Derivative Data Products (GIS analytics delivered to some other business intelligence product)



It should be no surprise that Web mapping has overtaken hardcopy/printed maps. Applications are also widely used to deliver business value.

Successes & Challenges

The survey tried to discover where meeting needs and delivery had proved to be worthwhile or challenging, through some open text format questions. Like the question on business drivers, it was impossible to provide canned answers through checkboxes or drop-down lists.

The survey revealed that folks are extremely passionate about their programs. Many answers were quite long, and very detailed. For reporting in this document, any personally identifying information was removed, and we shortened many responses to key concepts.

The original questions read as follows:

- **What is your organization's best success story recently?** (Did GIS help with business efficiency, economics, public safety, health and welfare, education, etc.)
- **What is your organization's biggest challenge in delivering optimal geospatial services?**

The most common themes used to describe GIS Success Stories included elements such as; *improved solutions, cost savings, decision support, improved delivery, increased visibility,* and *greater public awareness*

Words used to express Challenges to more achieving successful GIS practice included: *budget limitations, limited resources, data sharing, data availability, data silos, business software integration, staffing, funding,* and *support.*

An abridged listing (removing sensitive of identifying information) showing most of the successes and challenges answers can be found in Appendix A.

Spatial Data Management

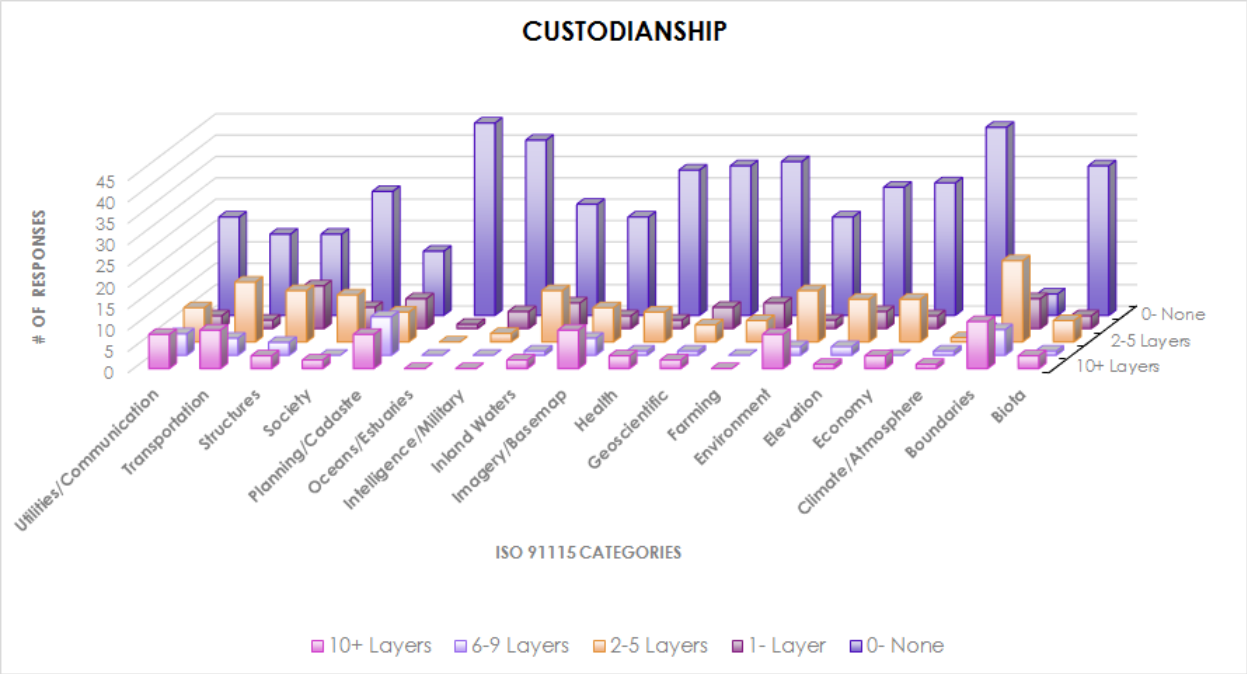
The survey collected information about custodianship, sharing, and archival practices. This included: The data categories for which the organizations were actual data custodian; Their ability to share this data with others, and; How they archive through the data lifecycle.

Custodianship

This question defined 'custodianship' as: *"referring to data that your organization creates and maintains for business purposes - and for which you are considered the owner"*.

Data themes/categories we inquired on came from the International Standards Organization –ISO 91115 – Geospatial Metadata Standards.

The standard classifies geospatial data in nineteen different categories including: Biota, Boundaries, Climate/Atmosphere, Economic, Elevation, Environmental, Farming, Geo-scientific, Health/Human Services, Imagery, Inland Waters, Intelligence/Military, Oceans/Estuaries, Planning/Cadastral, Societal, Structures, Transportation, and Utilities/Communications.



The graphic illustrates how organizations specialize in business specific spatial data needs, and typically rely on others to be the custodian of those other layers needed to show (map) relationships.

The numbers varied slightly for each category, but about 45-50 responses were obtained for each category. Boundaries, Land Divisions, Structures and Transportation themes show the highest levels of curation. This is logical considering these layers are often managed separately at local, county, regional, state and federal levels.

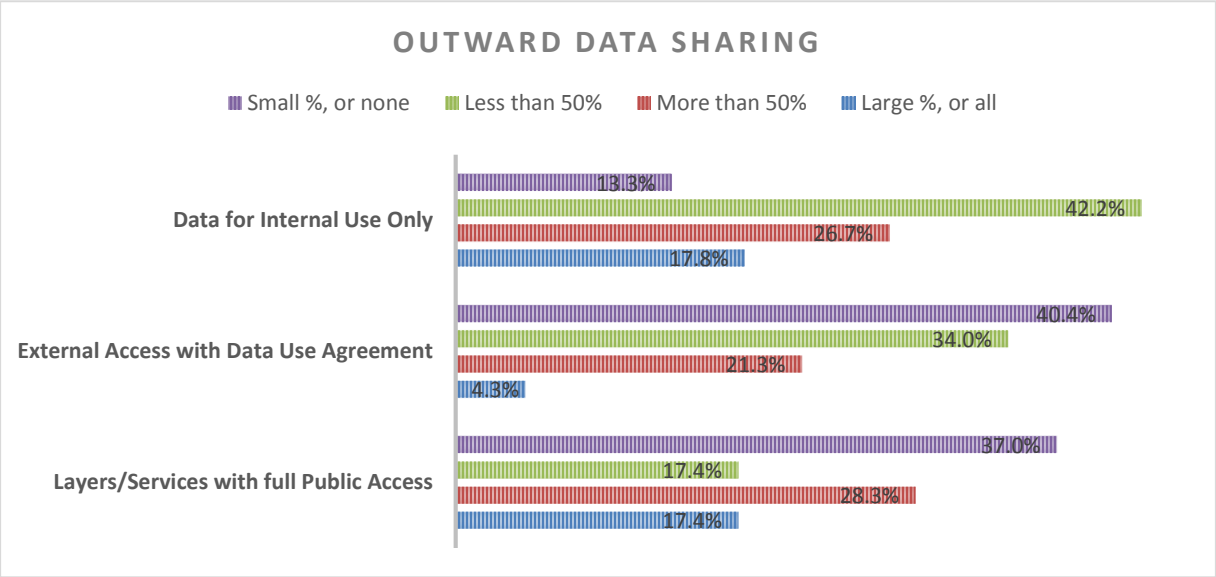
The dark purple columns in the back row, show the layers that respondents Do Not maintain. We see here that a majority indicated that their organization is not the actual custodian responsible for daily updates and maintenance.

An associated question asked respondents about: *"layers others expect you to maintain, but which your organization did not create"*. Answers included: Imagery, Fire District Boundaries, City boundaries, Streets, Zip codes, Precinct boundaries, Elevation, Digital Raster Graphics, Roads, Addresses, and Schools.

The answers show that most GIS is dependent on both in-house and external data custodians.

Sharing

A question about Outward Data Sharing was presenting to allow some generalization about the many layers and services that organizations keep and distribute. Options were presented to indicate Layers/Services with **Full Public Access**; those with some **Data Use Agreement** necessary, and; those meant for **Internal Use Only.** The matrix provided choices, shown as approximate percentage, of Layers/Services shared using those methodologies.



Looking at the Layers/Services with full public access, we see that 37% indicated close to zero public access for their Layers/Services. On the flip-side, adding the reddish and bluish bars, almost 46% indicate that most of their Layers/Services are openly accessible.

We might suspect that a broader sampling would produce different totals, but in this survey the respondents said that less than 25% of their layers are normally shared through a Data Sharing Agreement.

Considering how much we rely on other custodians in producing complete GIS packaging, this seeming direction of fewer Data Use Agreements, and more Publicly Accessible resources is bound to improve our efficiency and productivity.

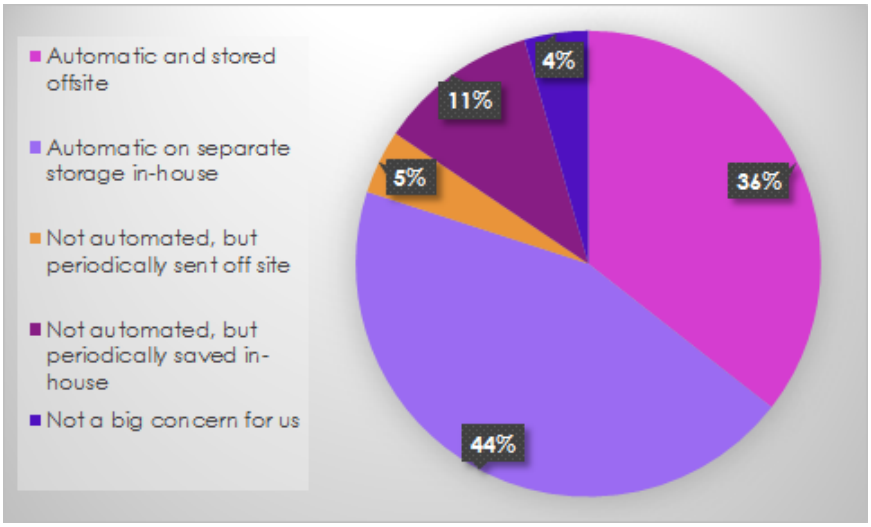
The Archival Record

When data, and particularly spatial data, moved into the computer age many years ago, the flat-file cabinets, used to store changes as map revisions, went away. Looking forward, say 20 years from now, we can assume that historians will want to map our GIS data changes over time. To do this, they will need to find out about the history of our electronic spatial data.

The next questions in the survey were designed to understand if electronic spatial data is being archived, and how the changes are being registered.

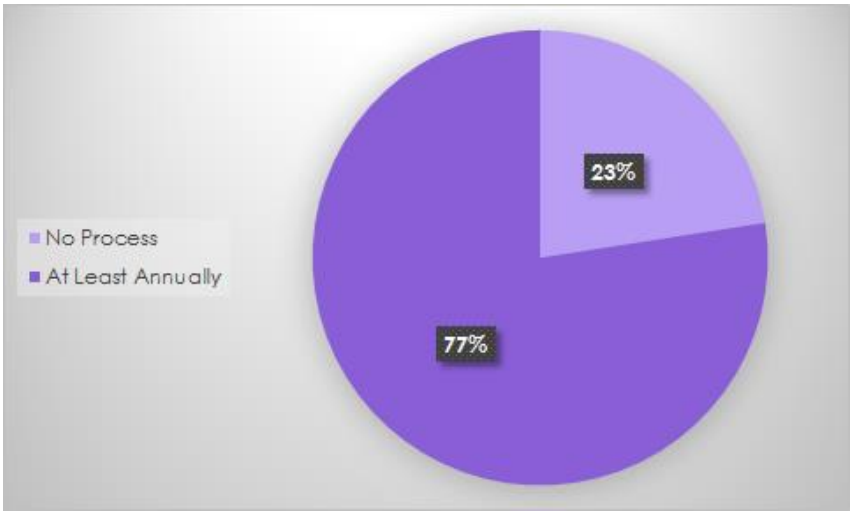
Backups

How are backups handled. for the spatial data you are custodian of?



Change

How are changes and edits to your custodial data accounted for over time?



It is noteworthy that 44% of the survey respondents indicate that Backups of data, for which they are custodian, is “Not a Big Concern for us”. What happens then, in a catastrophic database failure, to the current and historical record? Future consideration should be given to how we might make backups easier, or automated, perhaps through AGIC/AZGEO?

External Collaboration and Partnering

External collaboration IS necessary for good maps, services, and other geospatial products.

Few maps or GIS products are created entirely from internal data. Internal data meaning - layers and data which you both create and maintain. More frequently, custodial business layers are analyzed in comparison to, and illustrated as maps with, supporting layers from external sources.

This section of the survey sought to understand how much we rely on external sources, whether the data partnering is bi-directional, and if there are derivative benefits to data accessibility

Collaboration

For this question, we asked users to provide a best guess on how much reliance is placed on external data in order to produce GIS maps and business products.

A scale of 0 -10 was used to indicate reliance on external sources. Zero (0) would represent no need for outside data, and ten (10 would be saying that GIS products use all external data.

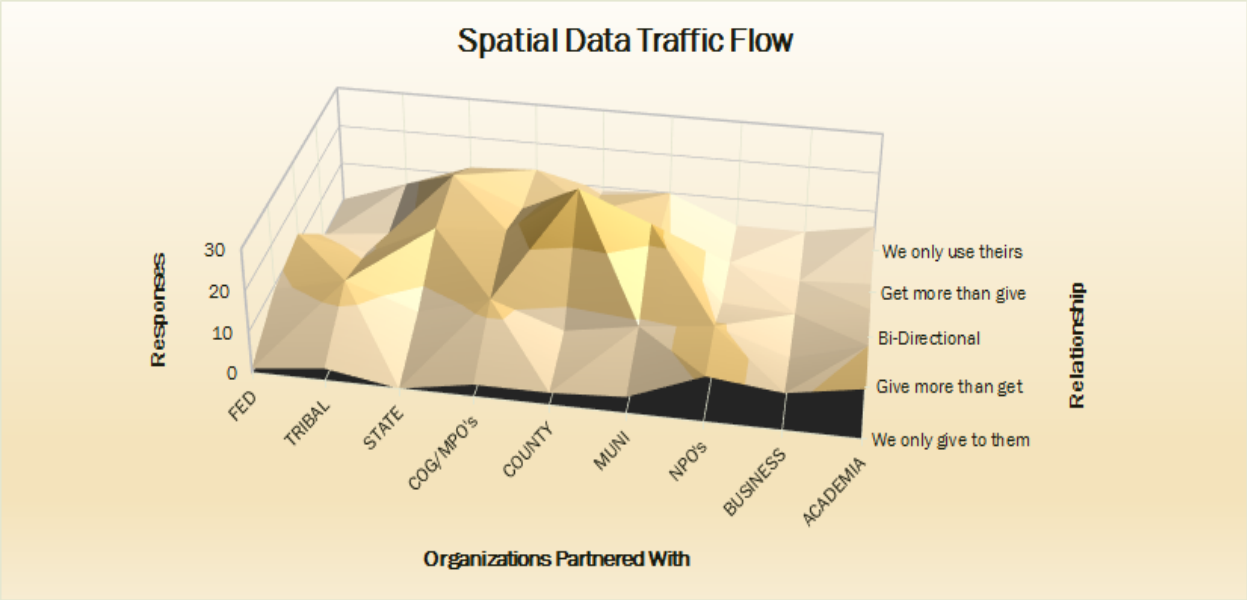
The graph shows that the average, and trend, is toward the high side, demonstrating how important collaboration across agencies and organizations is to our GIS mapping products.

Partnering

The survey shows that GIS maps and products are the result of both good internal data layer stewardship and relationships with other custodian partners. But who are our partners?

The next question sought to understand this, by presenting choices regarding who we work with, and whether we get mutual benefits from these data sharing relationships.

The survey asked people to classify their data sharing relationship with the following custodian types: Federal, Tribal, State, Regional, County, Municipal, NPO's, Business, and Academics. Users could select one option to indicate if the arrangement was mostly give, mostly take, bi-directional, or somewhere in between.



This graph shows a largely bi-directional flow of data. Almost every sector peaks toward the middle (indicating give and take). As might be expected the County data, followed by the State and Local government sources, are the most widely used - but all other sectors also show value to our state collective.

Beyond Daily GIS – Unusual/Unexpected uses of our GIS products

To further emphasize the broad relationships that GIS can be part of, the survey asked users to note if any unusual or unexpected uses of their products might be noteworthy. Below are some of the responses:

- Annual **homeless census count**
- **Computer gaming** companies have requested our data on roads and parcels
- Feeding GIS analysis results to **SQL Cubes** for analysis and reporting.
- **Genealogical community** realize that historic maps provide insights about our ancestors.
- GIS assisted in developing a better way to **inventory graffiti activity** to help the Police track and understand activity and define hot spots.
- Potholing data is used to create **reimbursements**.
- Public safety
- **School Events** make community members aware of how physical addressing impacts public safety.
- Utility data are used as property accounting assets by **Finance**.

- We share permitting and floodplain data to be **accessed on another department's site**.
- Youth Conference, Infant / Family **Health and Wellness Fair**

AZGEO – The state's geospatial information repository

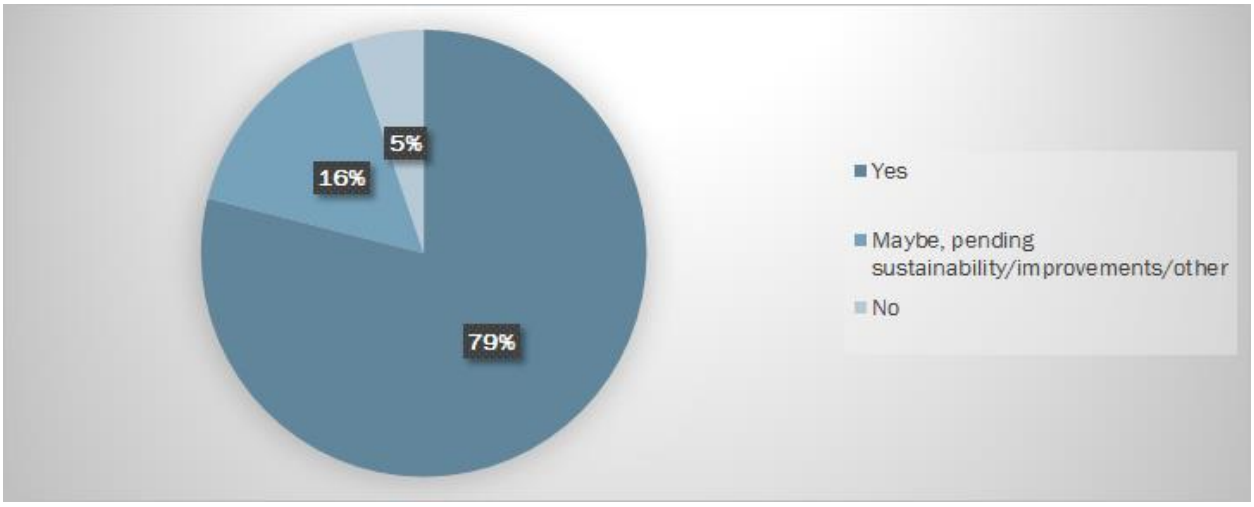
"The mission of AGIC is to coordinate the development and management of geographic information in Arizona."

"AZGEO is designed to provide GIS users with links to Internet map services, FGDC compliant metadata, and geospatial data downloads."

In this section the survey attempted to understand whether the relatively new AZGEO is considered a good idea, and sought to learn from actual users regarding what functions of AZGEO they feel work best, or may need improvement.

Support

Does your organization support the use of a state geospatial information clearinghouse – like AZGEO?



Additional Explanations (for NO/Maybe answers):

- Open the catalog for harvesting, harvest metadata from other sources (i.e. federate the catalog)
- Do I contribute financially or otherwise, that would be no. Do I philosophically support the mission? Absolutely.
- We are not currently using AZGEO to share our data or to consume other's data, but conceptually support the use of this type of a portal.
- Just buried working on building internal data and provide services.
- Some improvements would need to be made before we can become a regular user of the data provided here. For example, we need assurance that the data is current, reliable and complete for our needs.
- Not in my purview or ability to send data to AZGEO

AZGEO Improvement Considerations

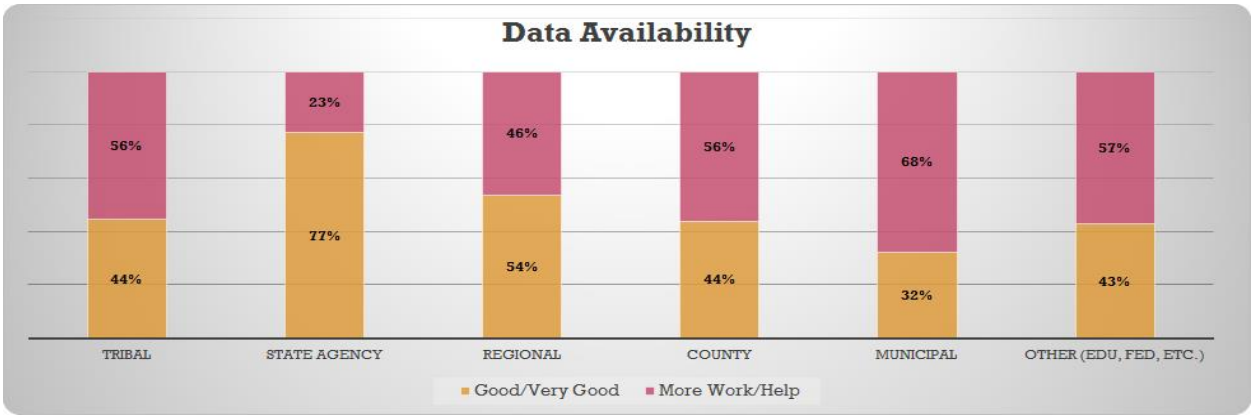
To understand what improvements would help users, a question listed characteristics of the system, and allowed classification of these as Very Good, Good, OK, Needs Some Help or, Needs Major Help. For this report, after trying other options and to help the graphic more clearly represent pros and cons, we have grouped responses as Very Good/Good or as Needs Some Work/Needs Major Help.

Metadata Creation, Reporting, and Help Documentation were, by percentage, in need of the most help. As seen in the numbers, not everyone answered the questions, and in many cases the respondents did not feel that had sufficient experience with AZGEO to rate particular features. For example: 21% of responses indicated N/A for Data Discovery, and that number rose to nearly 56% N/A for Reporting.

The responses received are still very helpful in planning for improvements to the system, some of which are already underway. Future measurements, through a more specific user survey, may be considered.

AZGEO Data Needs

We next queried users on whether they hoped to see more data available, in AZGEO, from particular provider groups.



The Data Availability graphic indicates that respondents would like to see more data from all of the in-state provider groups. Fortunately, the amount of data available through AZGEO is growing every week. Around the time the survey was conducted there were 160 contributed services and datasets in AZGEO. At this writing there are now 269.

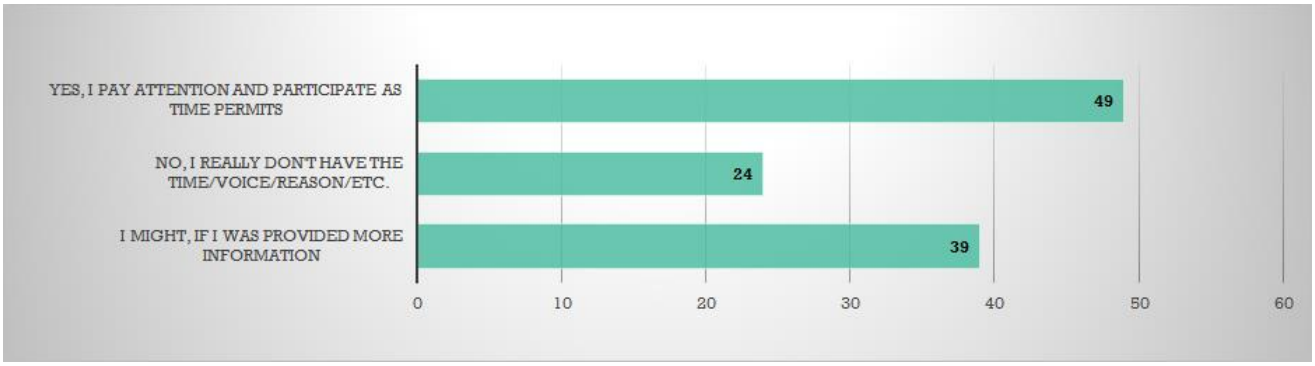
Statewide Vision and Focus

How should AGIC and SCO should operate, how we might evaluate this survey, and what we should prioritize as key strategic planning issues.

AGIC and SCO Communications

Regarding AGIC, the survey inquired on whether respondents participate in the dialog – either in meetings or by following and commenting in the AGIC Listserv.

AGIC Participation

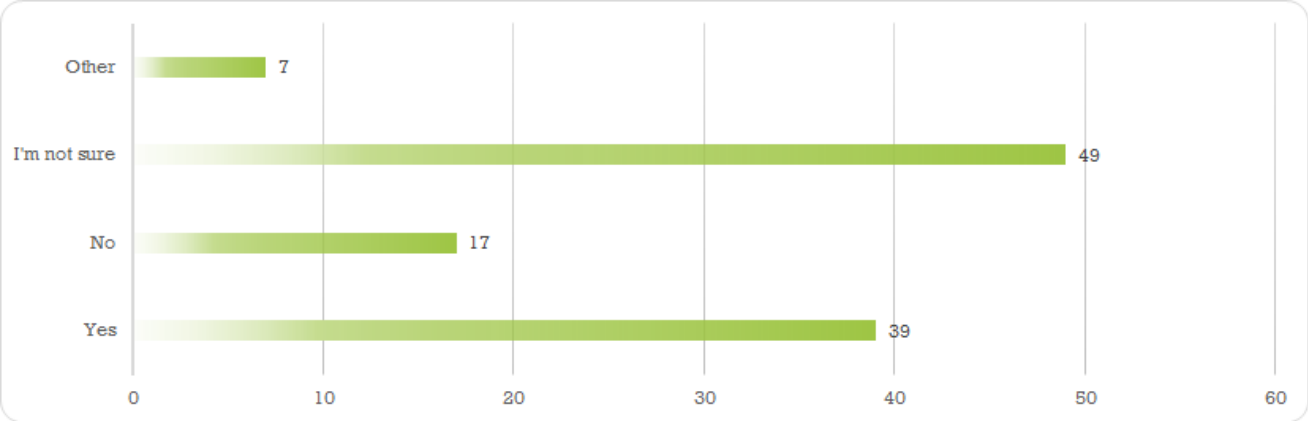


Comments (if No, or wanted to explain further):

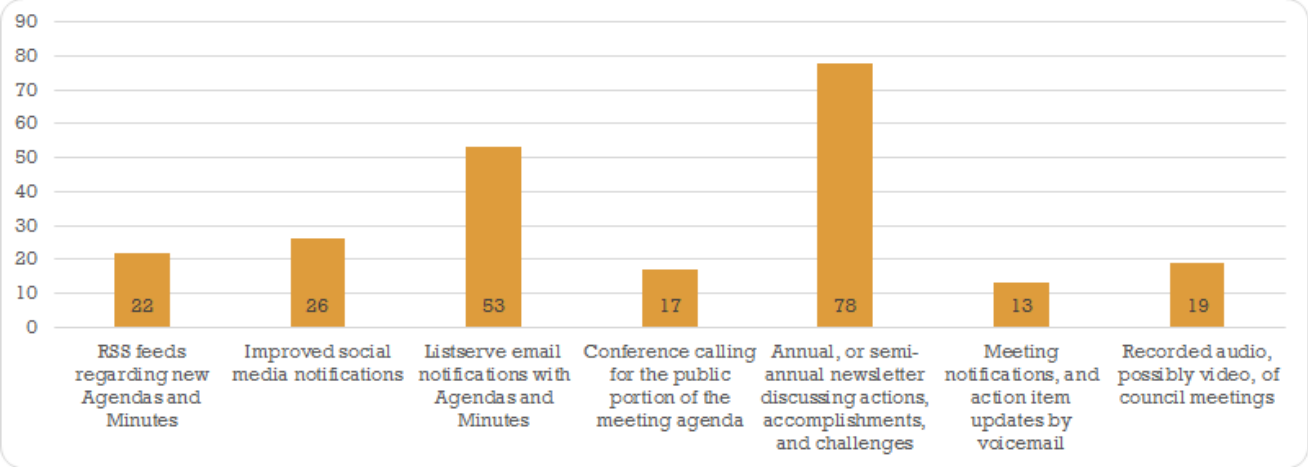
- I am just trying to learn how to use the site now.
- Don't really have the time.
- AGIC is primarily geared toward GIS professionals, and I work with teachers
- Don't have time for committees and meetings.
- I pay attention to the AGIC Listserv, but have not provided any input.
- To me, there is a perception of increased fragmentation between entities that should be involved in greater collaboration.
- I follow and read the listserv, but do not chime in.
- I am not the one in my organization to participate in such groups.
- I don't have much time and the meetings are far.
- I would monitor, but barely have time for internal (agency).
- I have limited time to participate.

AGIC Communication

Question 1: ***Do you feel your stakeholder sector is communicated to adequately by AGIC?***



Question 2: ***Would any of the following help improve AGIC communications to your stakeholder sector?***



Something appears to be missing when 66 out of 112 say, in question 1, that they don't believe or are unsure if their stakeholder sector is communicated to by AGIC. AGIC has recently reformed an Outreach Committee, which meets monthly, and will try to improve communication mechanisms, as suggested by users in question 2.

SCO Responsibilities

As a very small Office, SCO juggles many requests in addition to facilitating AGIC meetings and managing AZGEO infrastructure, data, and services. To understand what the community would like SCO to prioritize, we asked respondents to indicate which of the listed, statutory responsibilities, SCO should first focus on.

Question: *Of statutory SCO responsibilities, where should the Office prioritize efforts?*

Respondents were given these answer choices:

- Of High Importance
- One of the More Important
- One of the Less Important

- Of Minimal Importance

112 people answered these questions. Their answers are sorted below by averaged scoring prioritization.

	High	More	Less	Minimal
Geospatial Data Sharing (policy, best practice)	**65**	43	4	0
Geospatial Information Clearinghouse	**64**	43	5	0
Geospatial Data Repository	**58**	45	9	0
Coordinate Public Land Survey System and Cadastral databases	39	**49**	22	2
Develop Standards and Specifications on GIS data and systems	35	**54**	20	3
Geographic Information Systems	31	**39**	35	7
Investigate grants, contributions and appropriations	21	**49**	32	10

Highest scoring selections indicated with color

Responses showed that all 7 items are considered very important. The three that were most highly prioritized were Data Sharing (policy, best practice), Clearinghouse, and Repository.

Because of this prioritization, SCO is already working through AGIC Committees on collaborative efforts to document the inhibiting data sharing policies (in Admin & Legal Committee), develop best practice recommendations (in Data Committee), and to promote and publish proactive solution concepts (Conference, Outreach Committees).

AGIC and SCO have also partnered in efforts that benefit AZGEO (Clearinghouse, Repository), by acquiring high performance servers and committing to their long-range upgrades and sustainability.

Work in the other four areas, shown in survey to be slightly less of an important priority, is also ongoing. Details can be found on the AGIC and SCO websites.

Question: ***Are there other particular items you would like the SCO to investigate of act on?***

The answers were provided in the form of free-form text. As such they cannot be measured against one another for priority. Many answers represented the particular needs of a specific business area. They are not shown below. Those that related to priorities listed above, and those which seemed to have some commonality that could be important to larger, statewide, communities, are listed below:

- Continued improvement of the geospatial clearinghouse is of highest importance to researchers.
- I would like to see more county data available. Our work would be a lot easier if we could find information in the repository.
- Statewide geocoding system for free use. Shared multiagency boundary sharing/data generation.
- Need help with Data Organization and education regarding data stewardship
- Providing GIS support services for agencies without resources.
- Grants
- Map services of state-wide or, at the very least, the data layers themselves

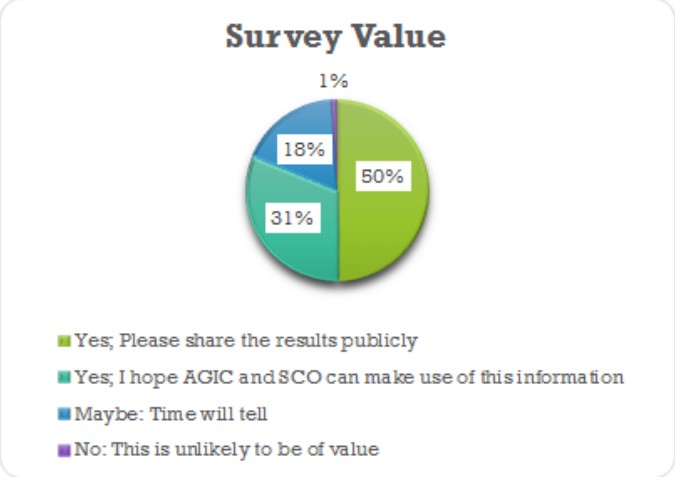
- Standardize the data and coordinate the updates of the data.
- More coordination and data standards, sharing agreements, etc.
- Service to tribes for NG911 and road centerline data.
- Web Mapping Service access to clearinghouse data.
- Imagery/Elevation Acquisition Coordination. An avenue for cost sharing.
- Accuracy of tribal boundaries and national monuments on tribal lands.

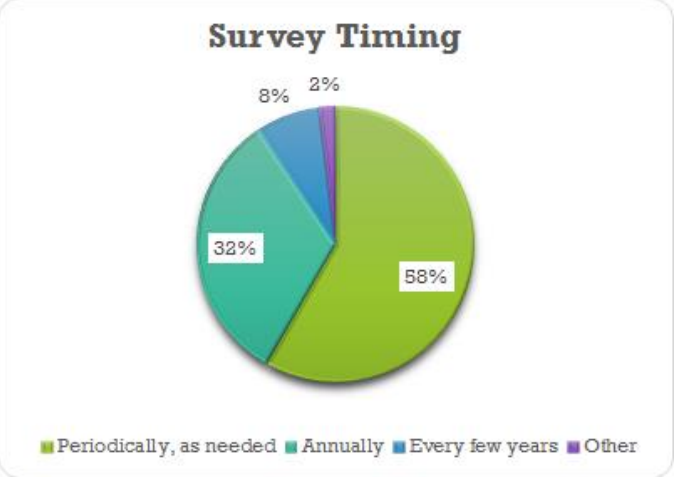
Survey Value and Timing

These questions were designed to help us understand whether participants saw this survey exercise as valuable, and something which should be repeated.

Question 1: ***Do you feel that compiling results of this survey, and publishing, will be helpful in identifying Gaps/Patterns/Needs?***

Question 2: **If you answered Yes or Maybe above; How often would you be willing to provide input?**





Responses showed that 81% thought that the results of the survey would likely prove valuable. 18% wanted to wait and see, and only 1% thought there was no obvious value.

Responses also showed that 90% would be willing to participate in this form of information gathering, once a year – or more. 8% thought that every few years would be best, and 2% believed that some other timing should be used.

Closing Questions

The survey ended with questions regarding how we should better promote the benefits of GIS, and who we should engage with to do that.

Question 1: ***Which non-traditional, non-GIS specific, businesses or professional organizations should be taking advantage of (our) spatial data?***

Question 2: ***(Do you have) Other 'Outside the Box' ideas for expanding GIS in ever-tightening economies?***

This question gave respondents a free form text field to submit fresh ideas. As with the previous text answers, many were long and passionate.

An abridged listing (removing sensitive of identifying information) showing the key thought from those answers can be found in Appendix B.

Conclusions

It might amaze those outside of the GIS community, how much we rely on, collaborate, and share with one another to achieve our business objectives. We have common passions, gripes, and goals - and work on those as a collective for the betterment of our state interests.

The 2015 Arizona GIS User Survey will help us to show patterns and objectives, worth considering, as we plan for the future. Often our needs and objectives, which might be difficult to justify as solitary groups working with GIS, can became a little better quantified, and qualified, through examination and explanation by a larger community of users. Additionally, having statistics can usually present a stronger argument over opinion.

The many local meetings and face to face time with stakeholders amplified the messages, helped us understand your operations, and were a good way to start talking about how we all work outside the organization.

We will also take the commentary received, and apply some focus to future surveys – adding focus to the details and processes that are clearly most important.

This year's survey was not a complete inventory of all user's opinions. Improving participation would be helpful. Future efforts will need to promote the benefits of more complete survey participation from certain stakeholder groups, and the varied members within each organization.

AGIC and SCO should examine the survey findings and target selected items for action within their 2016/17 work plans.

Appendix A – Successes and Challenges

Successes	Challenges
• An application to ***assist*** in ***understanding*** childhood literacy issues • ***Analysis*** of data for Stations location ***planning*** • Assets ***inventory*** and management, integrated GIS, web mapping, general ***plan*** and ***planning*** • Began working with other local government agencies to serve and develop ***partnerships*** • Biggest success is in diverse departments and users were hearing (positive) ***feedback*** from. • ***Collaboration*** with multiple in-house and external data sources ***support*** (federal) reporting requirements. • ***Consolidated*** data from various data sets into one ***solution*** for data retrieval • Consuming GIS datasets from city, county, and state GIS datasets • ***Coordinating*** with departments to deliver GIS ***solutions*** that far exceeded their expectations - ***enabling*** them to do their work ***faster***, more accurately, while ***saving*** cost/time. • Created several applications that use GIS data with external content management systems • Creating a routing application for inspectors. • Creating multiple web applications for ***decision support*** • Creating online maps that are ***available*** to the ***public*** • Creation of road network and address point datasets • Data analyses, leading to ***better practice***s. • Deploying a mobile field inspection application to ***enable*** the creation of corrective work orders. • Developed cultural resources database management system that links project management to place. • Developed demographic map viewer • Dramatically ***increased*** our ability to ***provide*** the ***public*** with accurate timely information. • Every real estate transaction is a ***victory*** for GIS. • ***Expanded*** the reach of GIS to a larger and more varied group of consumers.	• (***size*** of cities/counties/state, leads to) challenges related to ***data size*** and ***accuracy***, mobile technology ***solutions***, and ***delivery*** of services. • (without ELA) Ability to focus on newer technologies due to ***licensing restrictions***. • A stable ***database*** - traditional dba's don't always ***understand*** the spatial component of a GIS ***database***. • ***Access*** to common ***datasets***. • Basemaps provided by (vendors) are horrid. • ***Budget limitations*** • Challenge to keep GIS ***updated***. • Constrained with ***limited resources***. • ***Data*** not readily ***accessible*** through GIS. Historic ***data*** should to be hyperlinked to GIS ***data***. • Datum & projection issues; ***data accuracy*** and ***completeness*** • Demand is greater than ***Resources***; ***Funding*** • Developing guidelines, standards, and practices to govern ***data sharing*** and ***licensing***. • ***Education*** of GIS software and applicability. • Establishing an ***Enterprise***-Wide GIS with full ***infrastructure*** and securities. • Failing to communicate & ***share data*** between governments. Even within departments • Failure of the highest levels of management to fully ***understand*** GIS capability. • Financial ***limitations*** • ***Finding*** the ***time*** to learn the tools and having ***resources*** to use them. • Fragmented and inhabiting ***silos***. • FREE ***access*** to the latest aerial imagery. We do not have a ***budget*** for premium aerial imagery ***data***. • Gathering ***authoritative data*** sources

Successes	Challenges
• ***Expanding*** GIS ***services*** throughout departments and outside agencies has proved to be our greatest achievement yet • ***Facilitate*** and better ***enable*** multi-agency ***decision***-making regarding travel policy. • Gathering the data, assimilating it into a GIS system and generating maps and exhibits to ***demonstrate*** "real" problem areas • Geocoding address list to map their travel routes • Geospatial data ***discovery*** and ***delivery*** in federated web-based system • Getting our zoning information from paper to GIS • GIS ***helps*** our organization ***allocate*** resources to ***provide*** excellent ***service*** to our customers. • GIS is used for locating ***citizens*** requesting emergency ***response***. • GIS is used to place voter's in their proper districts • GIS ***support*** for regionalized Computer Aided Dispatch • ***Helped*** several entities ***improve*** their operational efficiencies • ***Helping*** the city find investors for development projects • ***Helps*** our organization operate complex systems as well as help us ***plan*** the resources required to supply those systems. • ***Helps*** our organization ***understand*** the market and political implications of the ***decision*** making process. • GIS to help ***plan*** spatially and then export into a spreadsheet that calculates the footage and dollar amount made in each year of the schedule. • Identifying impervious surfaces to be used in establishing a storm water utility fee. • Identifying system deficiencies or poor practices, and ***demonstrating solutions*** to them. • ***Improve***ments in Address Mapping result in being widely disseminated. • Incorporating maps with residential appeal data processes.	• Getting ***updated*** information from all of the stakeholders involved • Helping people ***find data*** and use it • Historic Mapping (Specifically any ***data*** prior to 2005) • ***Integrating*** our multiple endeavors into a linked ***data*** structure that can be ***accessed*** through GIS • ***Integration*** of CAD and GIS ***data*** • ***Integration*** with software that use SOAP. • Internal ***education*** regarding the use and ***application*** of GIS • ***IT support***... • Keeping up with ***changes*** in technology and the ***changes*** in ***data***. • Lack of free ***access*** to statewide ***data***. • Lack of ***interest*** in, or ***knowledge*** about GIS; using online tools like GoogleEarth to produce a "good enough" solution. • Lack of ***knowledge*** of GIS capabilities and benefits from management and employees. • Lack of ***manpower*** and ***funding*** • Lack of ***resources***. • Lack of ***staff*** and salary issues. • Lack of ***staff time***, experience and ***training*** • Lack of ***strategy*** and ***communication***. • Lack of vertical ***integration*** has led to challenges in ***maintain***ing a high ***quality*** while trying to parse ***data*** to multiple levels. • Letting the others know what services we can offer them • ***Limited*** in-house GIS ***personnel***. • ***Limited resources*** such as ***personnel***, GIS ***staff*** (GIS experts). • Maintaining sufficient ***staffing*** to engage every project. • Making sure that we are putting out current information for the community.

Successes	Challenges
• ***Increased effectiveness*** and ***reliability*** of ***response*** to wireless 911 calls • ***Increased*** the offering of web applications for use by the ***public*** • Integration of ***solutions*** for site and threat vulnerability ***assessment*** • Integration with enterprise systems. • Interactive Map Viewer is used frequently on a daily basis by Realtors, Land Owners, Land Buyers, Land Title Companies, County Appraisers, County/City ***Planning*** and Zoning Technicians, and 9-1-1 PSAP personnel. • Mapping current and past capital projects is a great tool for ***citizens*** to see the latest and how their tax dollars are being used. • Maps used to ***allocate*** funding toward strategies to better coordinate early childhood ***services***. • Operations and maintenance of utility systems • ***Prioritization*** of infrastructure replacement. • ***Provide*** maps in Guidebook, PDFs on our website, and interactive maps for our members and users • ***Provided*** a fast easy way for the ***public*** and agencies to look at their communities and make ***decisions*** based on the data • ***Public visibility*** • Publishing, ***educating*** about the georeferencing of historic maps • Range ***Analysis*** • Representing the "big picture" allowed us to work towards finding ***solutions*** • Servicing ***public*** inquiry, increasing ***efficiency*** and ***transparency*** • Serving as a tool to ***enhance*** operations and ***improve decision*** making. • Special Achievement Award for our ***outreach*** to schools. • Survey of infrastructure from 2001 through 2011 gives placements that can be used to QA other geospatial data.	• Microsoft Silverlight has become a deprecated ***application*** framework • Misalignment -GIS Program is in a branch on the business side, rather than ***IT***. • Navigating through ***security*** settings and documentation seems to take more ***time*** than actually producing output. • Networks • New releases of ***applications***. • Not enough ***staff***/ vacant ***positions***. • Not enough ***time*** in the day • Obtaining ***quality*** GIS ***data*** that can be used with high confidence • Overcoming culture and habits of doing things "the way they've always been done". • Overcoming ***data silos*** and better ***distribution*** of GIS ***resources*** to the public. • Overlap and conflict of GIS duties between ***I.T.*** and Engineering. • Projections and use with consultants. • Reconciling different ***database***s with GIS is an ongoing struggle • Roadblocks in getting GIS ***data*** from various government agencies • Shifting the paradigm from ***silos*** to a ***support***ed ***infrastructure***. • Slow ***development time*** on ideas and innovations. • ***Staffing*** to ***support***, develop and ***maintain*** services, and to manage ***data*** holdings • ***Staffing***, ***funding*** / pay scale. Turnover, retirement. Adapting to ***change***. • Stakeholders, with dissimilar ***datasets*** for their own purposes • ***Support*** for on-going ***maintenance*** and management.

Successes	Challenges
• The development of a Dashboard allowed professionals, ***decision*** makers and the ***public*** to quickly and clearly ***learn*** about the status of AZ communities • The transition to a MSAG utilizing physical addressing has ***improved*** upon our emergency ***response*** system. • Tracking and Mapping during Search and Rescue Missions leading to the location of lost or injured subjects • Using GIS data to better ***prepare*** small-business owners before they start their business which will help an owner to ***save*** time and money. • Using GIS to analyze flooding complaints and historical problems • Using GIS to develop E 911 ***services*** • Using GIS to help foster care agencies better ***recruit*** for more foster families in the state, allowing more children to be placed with families • Using GIS to obtain research grants. • Utility ***Coordination*** (Work Orders, Locating, modeling) • Various departments find their own uses for the (spatial) data and seek out GIS as a ***solution*** • We couldn't do what we do, at the level of professionalism we do it, without GIS. • We have achieved great success in working with other departments • We have ***helped Public*** Safety GIS • We hear 'we're using the data set just about every day' from our clients. • Web ***enabling*** our Utilities to do work in the field, ***saving*** travel time and paper	• Technical and ***resource limitations*** (financial and man-power). • The ***cost*** associated with the ***acquisition*** of geospatial products, because there are no ***cost-sharing*** opportunities. • The GIS interfaces with other ***enterprise*** business systems are dependent on "certified" versions. • The ***maintenance*** of current ***data*** with minimal ***staffing*** and providing advanced GIS services. • The ***misunderstanding*** of what GIS can be used for, and ***changing*** perspectives, to show the Analytical Capabilities now available. • The speed at which the software and technology are evolving • The ***silo*** structure in our (organization) makes the process very slow and inefficient. • The work is dependent on state ***funding*** • To have the latest and greatest software...we are 2 years behind in ***license maintenance***. • Very little (***authoritative***) GIS is being used, defaulting to Google or Microsoft Mapping. • We are short in ***staff***, i.e. needed to finish collect and ***maintain data***, ***train*** people and build web maps. • We live in an ever ***changing*** world, and ***real time*** information is the goal. • With ***limited resources***, implementation is moving slowly. • Workload and ***staff*** to handle low level requests preclude ***staff*** from fully utilizing their skills to move GIS initiatives ahead.

Appendix B – Outside the Box Ideas

- We're wasting time and resources on inefficient approaches in our legacy systems.
- Adding to AZGEO so users can directly store their data and services from their GIS and online. Save the state of the viewer and data on a per profile basis
- AGIC should provide some standards or guiding principles for data so each smaller entity can contribute to a larger state-wide data layer effort.
- AZGEO can become the hub to the distribution model (even if it doesn't host the services but merely the tags to the services).
- Communicate, so agencies know where to find the services/data.
- Consider (alternative vendors) GIS software to save money
- Emphasize GIS as an integral part of the emerging fields of Informatics and Big Data.
- Encourage schools to use the K12 Site License and get free accounts through ConnectEd initiative
- For municipalities that do not singly have a GIS program that could share a county or the state GIS expertise and ArcGIS software/servers to provide interactive mapping specific to their local needs and data.
- Getting the word out to younger generation and explaining what GIS really is
- GIS is the solution for 'ever-tightening economies', but the challenge is that it displaces other transitional and embedded systems, so it takes time to mature.
- Having and developing a common framework to publish information and having good metadata to help users not hurt themselves is essential.
- I think getting all the state and local economies to work together is an important first step. It would be great if every state and local agency found access to data important enough to participate.
- I think we need to be rethinking our overall GIS strategies. Too much of our approach is shaped by what (vendor) offers in their GIS products/services and we need to take a step back and ask what we really should be doing.
- If possible, develop a platform that allows AZGEO users to create interactive web maps for their organizations – where all data and security would be handled from AzGEO.
- Investigate light-weight delivery of data, like GeoJSON.
- Look at the best state(s) and then look at Arizona and see what the core difference is. Is it legislation? Is it appropriations? Etc? Then focus efforts on that primary issue.
- Mentoring in schools.
- More emphasis on end users
- Open Source GIS software for those that cannot afford corporate GIS software.
- Process various agencies data together to identify tax revenue.
- Promote the importance of GIS at all legislative levels in order to insure that GIS meets the public needs.
- Public-private partnerships
- Right now, there is a lot of overlap in agency data maintenance. It would be nice to have one data owner maintain a layer and distribute to all other agencies to avoid duplication of efforts.

- Share positions and technology with those unable to afford GIS This includes shared data at one funded location.
- Sharing authoritative web services.
- Show the ability of GIS to unify disparate data sets and sections of an organizations through the common characteristic of where.
- Show/highlight investment opportunities from vacant land to businesses.
- Smaller businesses and non-profits have a need for GIS but lack funds to purchase software. It could benefit them by providing outreach opportunities that could highlight GIS resources that are free or low-cost.
- Use GIS to chart economic pathways and futures.
- We need to deliver better access to mapping services - the technology is there (AZ GEO) to promote data sharing through managed data services that public entities could share easily.