

Underserved Communities in Mississippi Strategies for Assistance

February 2011

This document was prepared as a product for the Federal Geographic Data Committee's CAP Grant, *Enhancement of the MS GIS Strategic Plan for Underserved Communities*.

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Introduction

This report is one of the products of a Federal Geographic Data Committee's CAP grant *Enhancement of the MS GIS Strategic Plan for Underserved Communities*. The project was designed to collect the information needed to develop a strategy to close the geospatial technology gap between the "have" and "have not" communities by identifying the "underserved" communities in Mississippi and to develop a strategy to improve their current situation. This effort was designed is complementary to the Mississippi Remote Sensing and GIS Coordinating Council's (Council) 2010 Strategic Plan.

The term "underserved" does not imply a failure to provide services, it is more of an indication of an under utilization of geospatial technologies. The author's are uncomfortable with the terms "underserved" and "digital divide" and feel that a term such as *spatial capabilities* of an organization would be a better descriptive term. For the purposes of this report the term "underserved" will be retained for consistency with the grant description but the reader should be aware that the authors see a continuum of the use of spatial information that spans from the use of hard copy maps, through mapping technologies such as CAD to the use of geographic information systems (GIS) and that there is a proven path that can be followed to take ever increasing advantage of the use geospatial data.

The benefits to local governments of geographic information systems (GIS) technology, which uses location as a basis to organize and analyze information, are extensive, but to reap these benefits GIS technology needs to be fully utilized throughout an organization. Underserved communities may have little to some access to some GIS data sets and may even be using automated mapping for a few departments. It needs to be recognized that having access does not necessarily require that they maintain all components of the technology in-house.

A fundamental goal of any state GIS program is to minimize the duplication of effort and to maximize the use of GIS technology and data to the benefit of the state. To fully achieve this goal all communities need a ready pathway to participate in the full utilization of geospatial technologies. This document provides a description of the extent and degree of geospatial underserved communities in Mississippi and some approaches to addressing the geospatial needs of those communities to realize the full benefits of GIS technology.

Purpose and Benefits to the State

An inventory Mississippi's geospatial assets of state, local and federal agencies made it possible to characterize underserved communities in Mississippi. Criteria were developed to describe underserved communities as well as an

assessment of the issues these communities face in becoming an integral part of Mississippi's geospatial infrastructure. The National States Geographic Information Council (NSGIC) GIS Inventory (RAMONA)¹, in conjunction with the Mississippi Geospatial Clearinghouse² and Mississippi Automated Resource Information System (MARIS)³, were used to collect and manage the inventory of available information. Maintaining the inventory will be an essential component of Mississippi's overall strategic planning effort because it provides a sustainable base line of information that can be used to monitor progress of the state's geospatial strategic plan. The inventory is an open system that can be managed by a state designated official and it allows the entire user community to provide submissions and updates for their respective organizations including the public and private sector.

One of recognized shortfalls of the Ramona system is its ability to capture metadata that follows the current FGDC standards. This is remedied by providing either an online link to existing metadata or attaching a metadata document to the county or state that contains the standardized metadata. This approach reduces duplicative data entry and resolves the access to standardized metadata issue.

To maximize the benefit of GIS technology across the state, Mississippi will need participation from local, state and federal agencies. A maintained inventory of geospatial assets will provide Mississippi with a monitoring tool to identify areas of need, to track progress toward full participation and to identify and utilize assets and reduce duplicative activities. For the State of Mississippi, having a complete understanding of the state's GIS resources that are readily accessible will improve the ability to manage future expenditures and resource allocation, identify sources of support for local agencies without GIS programs, and better deliver educational and technical support resources.

What and where are the underserved communities in Mississippi?

Underserved communities, in the context of the GIS technology and this project, are county level government entities which are not able take full advantage geospatial technology because their capabilities of supporting this technology are challenged. This is not to ignore the needs and challenges faced by municipalities but the cities and incorporated areas often work closely with the counties with the exception of the larger urban areas. As the inventory is maintained and developed over time municipalities should be added to the analysis.

¹ NSGIC GIS Inventory, Internet, 2011, <http://www.gisinventory.net/>

² MS GIS Clearinghouse, Internet, 2011, <http://www.gis.ms.gov/Portal/>

³ MARIS, Internet, 2011, <http://www.maris.state.ms.us/>

The underserved counties are mostly rural with populations of less than 35,000. Some are able to address their *minimal* business requirements using a variety of mapping technologies, including manual mapping, but their information and data assets are not structured to allow these assets to be integrated and provide them with the benefits of an enterprise technology.

Typically these counties do not have staff that is trained in GIS software, do not have in-house information technology support, and do not maintain internal servers for database management. In many cases the computer hardware, software and operating systems that is used in the underserved counties is one or more generations behind the currently available platforms and they typically do not have a planned technology upgrade program. These communities often rely on hard copy products more than their counterparts and even though they may have automated mapping technology (CAD) they rely significantly on the technical support of vendors.

Characteristics and Criteria for Identifying Underserved Counties

The level to which a county was geospatially accomplished, and hence the degree to which it was considered underserved, was assessed by evaluating four business areas that included: *the geospatial capability of **address** data*; the degree to which ***parcel mapping*** used geospatial technologies; the degree to which ***GIS*** technology was utilized in an organization; and *the **GIS technical capability*** of the organization. There are varying degrees of implementation within each “level” providing different opportunities to the counties as well as a corresponding degree of support or assistance to take full advantage of the technology. The following provides a brief description of these business areas and what is typically found in communities that do not have enterprise systems.

Addressing is used by 911 and is associated with emergency response and has been around since the 1970's. The data are often in a digital format and consists of street names and address ranges. Sometimes automated dispatch systems are being used to assist with the visualization of call locations. In communities that would be considered *have's*, the addressing systems use or are supported by GIS technology that provide numerous advantages for routing and on-vehicle technology. This contrast sharply with the underserved communities that typically rely on vendor generated address files and do not make their own updates to the digital addresses or road centerline data. Error reporting is often a hard copy processes (see Table 1). Even when they are in a digital format they are less than compatible with GIS for a wide variety of reasons that range from technical to procedural and organization policies.

Parcel mapping tends to be the area where GIS technology first occurs in a county. It is used in the Tax Assessor's office for parcel mapping, real estate inventory management and over time it becomes a tool for integrating different business operations. There are degrees of parcel mapping capabilities that can

exists in local government that provide different opportunities for taking advantage of spatial data technology. There are still counties in Mississippi that manually map their parcel data but most counties utilize CAD technology in one form or another. In the underserved communities, vendors often do the mapping and provide either hard copy or a finished digital copy to the county. Some counties have non-GIS based automated mapping in-house and outsource portions of the mapping on an as needed basis. The maps maintained in these non-GIS mapping environments, typically AutoCAD or Microstation, can be converted to a GIS format but the quality of the exported files is dependent on the spatial accuracy of the original conversion from hard copy maps to CAD and the subsequent maintenance of the digital maps. There are sometimes issues related to coordinate systems and projections as well as map sheet based systems that create a separate file for each map sheet that makes it difficult to construct a single countywide parcel database and GIS database.

GIS utilization is divided in three levels. There are nuanced differences among and within these levels that provide for subcategories. Three categories were used to identify progress towards the full utilization of GIS in Mississippi counties.

Developed GIS: There are eighteen counties (18) that have or are in the process of implementing GIS. Generally these counties are also maintaining street centerline data, purchase orthophotography, and once a parcel layer has been developed, they tend to develop master address files that support 911 as well as other county business operations.

Non-GIS computer mapping or Computer Aided Design (CAD): There are a considerable number of counties, fifty-three (53) that are using CAD technology for mapping and are working with vendors to assist them with the technology. There are approximately twenty-five (25) of these fifty-four counties that have vendors publish their digital CAD parcel data on the Internet for public query and viewing.

Manual mapping: There are ten (11) counties that were identified as having no digital mapping. These counties are among the most rural with the fewest amounts of development activities.

Table 1 GIS Utilization in Mississippi

GIS Utilization	Counties	Percent Counties	Parcels**	Percent Parcels
Developed GIS*	18	22%	761,048	41%
Non-GIS mapping (CAD)	53	65%	931,426	51%
Manual mapping	11	13%	145,434	8%
Total	82	100%	1,774,724	100%

* Three counties began their parcel conversion in 2010

** Parcel counts based on 2009 DOR annual report

Table 2 County population and technology used for parcel mapping.

Parcel Map Maintenance Technology	Average	Median	Min	Max	County Count
GIS Counties	83,386	49,980	10,755	247,631	15
GIS + Conversion	73,725	40,398	10,755	247,631	18
Converting to GIS 2011	25,423	25,732	15,291	35,245	3
CAD	26,736	21,661	7,981	81,913	53
Manual	18,901	14,422	1,612	48,175	11
	Total Counties 82				

Table 2 shows the technology that is being used in counties in Mississippi and the range of population of the counties.

GIS Technical Capability is a measure of the capability of the county to develop and sustain a GIS operation. It is not possible to simply buy the technology and expect success. There needs to be available resources, organizational willingness and the necessary skill sets in the organization to support the GIS operation. The authors found that non-GIS mapping technology and GIS technology were compatible and interoperable within the same office. It was observed that several counties were successfully implementing strategies of automated mapping in CAD environments and are converting those maps into a GIS compatible format for more robust analysis. The availability of on-line parcel maps with query functionality from twenty-five CAD counties is one example of how this is happening. It is essential to recognize these mixture technologies and to work this into the strategy for addressing the needs of the underserved communities.

Table 3 Levels of GIS expertise

GIS Technical Capability	Description	Example
Viewer	View maps to address a business need	Field work: Maps provided to identify sites for data collection (address ranges), data collected and provided to data manager to update files
Reporter	View files and create reports	Able to utilize a structured application for search and query and produce reports and print maps
Analyst	Manage software to manipulated data sources	Higher level user that can combine data files in new ways for customized reporting and mapping
GIS expert	Collect and integrate data, manage data structures and data integrity	Trained GIS manager or technologist can construct new data sets and manage GIS databases.

Table 3 uses a combination of GIS utilization, parcel mapping, addressing and GIS technical capability to describe the degree to which an organization is considered underserved. Again these are not hard and fast boundaries and the levels are only used as indicators to help define the level of assistance needed as well as identifying opportunities to build to improve the technical infrastructure in these counties.

Table 4 (this is listed as Table 3 on the next page) on the following pages provides a breakout of the different levels of GIS technical capabilities that were observed at the county level. It is assumed that all communities could utilize GIS technology but the level of expertise that is needed in-house can reasonably range across the following levels: viewer, reporter, analyst and GIS expert. The degree of support provided by external sources and within an organization varies accordingly.

Table 4 Level of County Underserved Status

Level	GIS Utilization	Parcel Mapping	Addressing	GIS Technical Capability
1	Manual Mapping	Manual mapping in-house	Manual or outsourced	Limited
2	Manual Mapping	Out source digital map creation, hard copy maps provided to organization	Manual/outsourced Manual or outsourced	Limited
3	Non-GIS computer mapping	Outsource all mapping	Manual or outsourced	Viewers
4	Non-GIS computer mapping	Non-GIS mapping in house, outsource mapping during peak periods	Manual or outsourced	Reporters, analysts and non-GIS mapping experts
5	Non-GIS computer mapping	All non-GIS mapping in-house except for special projects	Partially automated	Analysts and non-GIS mapping experts
6	Developed GIS	GIS Outsourced	Partially automated	Analysts and non-GIS mapping experts
7	Developed GIS	Parcels internally managed, GIS outsourced GIS exports	Automated addressing data used, maintenance outsourced	GIS experts and analysts
8	Developed GIS	Internally managed	Digital files available	GIS experts
9	Developed GIS	Internally managed	Managed in GIS	GIS experts

The indicators for underserved communities are in the red colored row (1); the yellow colored rows (2-6) are underserved in transition and the green colored rows (7-8) are developed and not underserved.

Based on the inventory conducted for this project Mississippi's counties were classified according to their level or degree of underserved status. All nine levels were not used in the initial classification of the counties because of insufficient information for the status of the addressing systems, which will require a more detailed analysis. Figure on shows the location of the counties in the state.

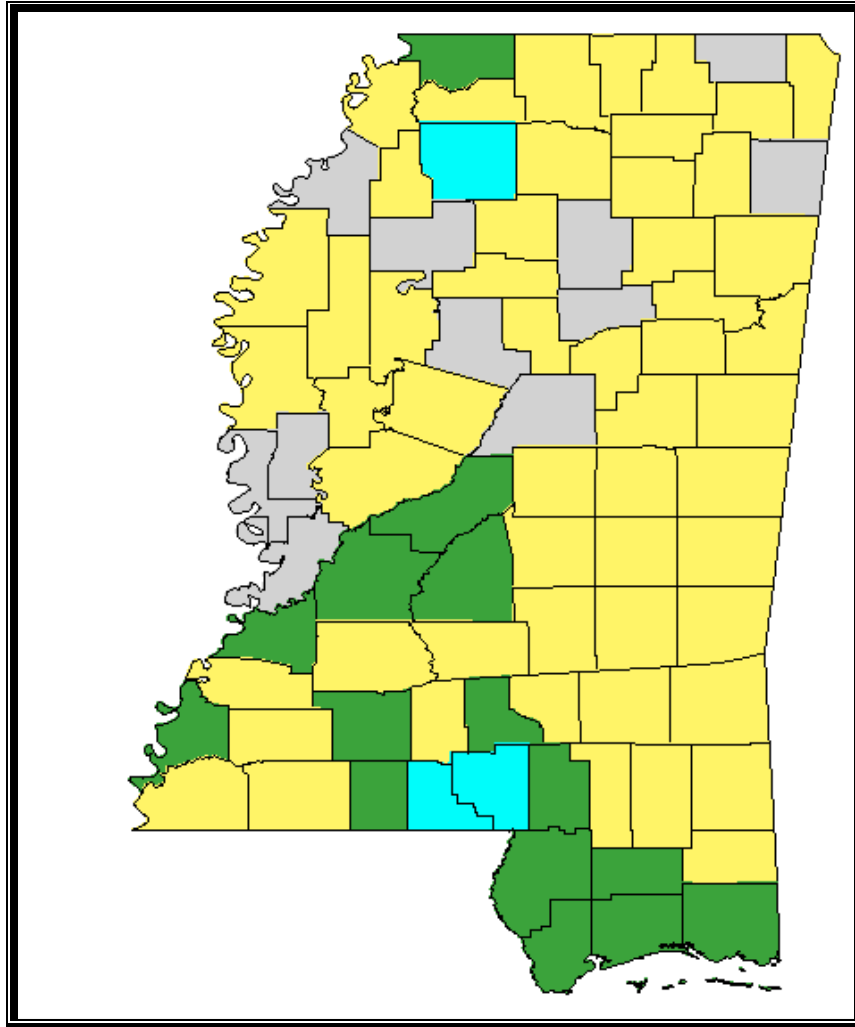


Figure 1 Parcels and Underserved Communities. This maps illustrates the distribution of counties with digital parcel data; Green – GIS mapping (15); Teal - in the process of converting to GIS (3); Yellow – using CAD to manage their parcel maps; Gray – manually maintaining their parcel maps.

Political Consideration

The cost of adopting full GIS capabilities can be significant and a full implementation of GIS requires a complete reorganization of an institutions business operations. When an office or department moves to upgrade to GIS technology there is a need for funding that is outside of the regular budget. This requires that the budget request goes to the County Commissioners. One of the first questions the Commissioners ask is “Can you meet your business needs without the GIS?” Often the answer is yes and the request for funding is no. Thought should be given to a strategy that involves smaller steps rather than requiring an organization to make a “giant leap”. Some examples of small steps for organizations to take that will allow them to more readily reap the benefits of GIS technology include creating spatially accurate CAD mapping files, structuring CAD data so they can be more easily

exported into GIS format, and providing external web based services for viewing, reporting and analysis. All of these would provide direct benefits for the counties as well as Mississippi's state GIS program.

The levels of underserved status are only used as indicators of progression. Developing pathways to successful implementation is the opportunity in Mississippi. Given the tight and limited budgets and the need for political will in local government to support a local GIS program, the strategies for development and service need to recognize these realities and expect incremental progress not wholesale conversion.

If the non-GIS counties can convert their data into shape files and link the mapped data to the attribute data are combined with the counties that have full GIS capabilities there are 68 counties that represent 92% of the parcels that have digital maps that could be published in a format that is usable in GIS. It is understood that there is considerable variation in the accuracy of the data and a qualitative assessment will need to be completed, never-the-less it is reasonable to assume that there is a considerable amount of digital data that is available in Mississippi that can be brought into a GIS environment.

This picture represents a large untapped potential for Mississippi's GIS Program. The size and need of the underserved communities should not be viewed as an overwhelming obstacle that can not be overcome, but rather as opportunity to move Mississippi into the upper tier of states that are taking advantage of GIS technology as an enterprise system and the advantages that it can provide. Bringing the underserved counties along and expanding the utilization of existing data will increase the efficiency of decision-making in Mississippi and identify opportunities that result in cost avoidance and costs savings.

Assistance to Underserved Communities

Objectives

- Assist counties with migration from non-GIS based mapping toward the use of enterprise GIS technology.
- Provide counties with access to GIS data and applications needed to support their business operations.
- Provide framework data available from Mississippi's geospatial infrastructure.

Challenge and Strategy

Benefits to Communities

- Improved efficiency
- Cost avoidance
- Staff development

Benefits to the state

- Utilization of locally collected and maintained data
- A broad based GIS community
- Increased efficiency in government
- Improved emergency response
- Expand clearinghouse data holdings

Assistance

- Technical and Educational Support
- Data collection support
- Providing data that exists to the County
- Build a statewide GIS Community
- Access to Technology
- Demonstrate benefits

Limitations

- Political will
- Institutional will
- Finances
- Coordination

Types of Assistance

The types of assistance will evolve over time. Funding is always an obvious need but there are many things that can be done with existing resources.

Points of Consideration

Before assistance is provided to any organization both the County and the providing organization should reflect on these points.

- Ideally assistance should be part of local government's strategic plan. Each county should develop a strategy for moving themselves up the ladder. Support for county strategic planning could include access to a designated state level expert and/or a template for a county strategic plan that could be completed by the county.
- As a part of any assistance the local government should sign on to the project with clearly identified roles and responsibilities. They should also have some required inputs to make sure all parties are contributing to the efforts.
- Projects will need to be customized to the capability of the local governments.
- Recognize the different capabilities of each government entity, meaning that some organizations would be best served to be *viewers* or *reporters* of the technology while others are positioned to maintain some level of *GIS expertise* in-house.
- Recognize that for some communities it will be more effective to utilize or build capability at the regional or state level or through a vendor than try to implement it at the local level.
- Improving or providing technical capability to regional organizations or a state service center may be a cost effective approach for supporting local governments.

Projects

The following are some examples of projects that could be a part of the plan to support the underserved counties.

Inventory of spatial data assets

Maintaining the GIS inventory is critical to monitoring local government activities and identifying opportunities for cooperative efforts. Using NSGIC's GIS inventory provides an inventory and management tool that is readily available. This tool includes an option to capture planned data collection activities. Although the Mississippi Department of Environmental Quality (DEQ) has built a portal to track planned projects, the NSGIC Inventory provides a tool that tracks existing and planned data activities.

Spatially enabling communities

With seventy one (71) counties having parcel data in a digital format, evaluating and exporting that data into a GIS format would allow the Planning and Development Districts as well as the other regional agencies and state agencies to have a data set that greatly helps the local governments meet business needs where they could see

direct cost savings. Projects of this nature would include addressing, audits of billing services, emergency response and more. ⁴

Providing supporting data

Parcel data provides intelligence to orthoimagery products and other data sources. Providing local governments with a package of available framework data sets would expand the utility of the parcel data layer. Currently MARIS provides a spatial data package for each county. This data could be reviewed and improved as identified by the local governments data needs in their strategic plans.

The importance of technical services

Technical services could be provided by MARIS, the Geosystems Research Institute, regional and state agencies/institutions to mentor the underserved communities. This would include providing educational opportunities as well as technical consultations to assist them through the morass of technical decisions that they will need to improve their geospatial infrastructure. This could also include developing standard hardware specifications, sample requests for proposals for data acquisition and data publishing questions or concerns.

Improving the spatial quality of CAD maps

CAD maps have the capability of being spatially accurate representations that can be exported into a format that can be incorporated into a GIS. Over fifty of the counties in Mississippi do their mapping in a CAD environment. Providing them with the knowledge and assistance to create more spatially correct maps will be a major step forward to making their existing CAD maps ready for export into a GIS format or for conversion into a GIS environment.

Conversion of CAD Maps to GIS

Most of the mapping the CAD counties or has been associated with the vendor community. It would be reasonable, both in time and costs, to have this data evaluated for utility according to spatial accuracy and if it meets the necessary quality standards it can be exported into a format that can be used in a GIS. This would provide a very valuable update for the State agencies as well as enabling local governments to have access to GIS products.

Hardware and Software

There are programs supported by GIS vendors to provide hardware and software to underserved communities. The Council should work with these companies to identify county and city governments that would profit from these grants. Having a county geospatial strategic plan is essential part of evaluating the readiness of a local government to benefit from this opportunity.

⁴ Nancy von Meyer and David Stage, *State of Mississippi, Benefits Vignettes for Geospatial Strategic Plan*, December 2010

Moving to a GIS environment

Each county should be evaluated to assess what level of GIS the county should strive to implement. Should they fully implement a GIS environment, maintain staff and the software licenses or would it be better to have a scaled down operation? Can the local governments purchase or even obtain GIS licenses from Enterprise License Agreements. Several states have gone to this approach and are able to provide local governments with current versions of GIS software at no cost to the county. The county in turn provides the data sets they maintain at no cost to the state. It needs to be recognized that only the “less underserved” communities are able to benefit from this arrangement.

The state and the counties should look carefully at the options in consultation with the private sector to evaluate the most cost effective strategy. The state’s engagement in the process is important on two points, first it helps state agencies understand what needs to be done and secondly it helps the counties understand how the locally generated data is a benefit to the county and to state agencies.

Conclusion

Underserved communities, in the context of geospatial technology, refer to those organizations that are not able to take full advantage of GIS as an enterprise and integrating technology. Four business areas were identified as being indicative of the geospatial capability of a local government: the degree to which **parcel mapping** uses geospatial technologies; the geospatial capability of **addressing** system; the degree to which **GIS** technology is utilized in an organization; and the **GIS technical capability** of the organization.

The authors recognize a continuum of spatial technology that ranges from hard copy maps, linear referencing systems, CAD and GIS and that there is a progression of readiness to use each of these technologies as well as a path through these different systems to the use of GIS as an enterprise system. It is important to understand that there is more than providing hardware and software to a local government in the creation of an enterprise GIS and there are limits as to what some communities can achieve. Many of the underserved communities would be best served if they were simply the product recipients of GIS technology and the management of the technology took place at a “regional center” where managing the business operations of several small governments would be cost effective. Taking small steps to position an organization to take advantage of the assets that they have is a valid approach. The authors have found in the project as in others is that parcel mapping is typically where GIS first begins to institutionally take root at the local government level. Fifty-three of the counties in Mississippi are using CAD technology to manage their parcel mapping. In many cases these data can be exported into a format that can be used in a GIS. Currently there are eighteen of eighty-two counties in the state that use GIS that represent 42% of the parcels in the state. If the digital non-GIS

mapping data from the other fifty-three counties could be exported to GIS, and the authors recognize that there are challenges here, it would represent 92% of the parcels in the state which would be above the national average of 82%. There is much that can be done to enhance the export process and product that would provide immediate GIS capability to the local governments as well as the state. A strategy of small wins by improving the readiness of counties to use GIS technology is a reasonable, cost effective and doable strategy for Mississippi.