An Assessment of Best Practices in Seven State Parcel Management Programs

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Prepared for the FGDC Cadastral Data Subcommittee

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Introduction

The goal of the FGDC Subcommittee for Cadastral Data (Subcommittee) is to support the development and maintenance of digital parcel data nationwide through standards and partnerships to support local, state and national applications and decisions making. The end product of this effort is to provide the user community with published parcel data that includes a representation of the parcel geometry and a small subset of the local assessor's attributes and comparable attributes for public lands. Ideally this published parcel data would be updated regularly (at least annually) with the intention of meeting business needs ranging from regional emergency preparedness, economic development, land use planning and use authorizations at the federal level.

A recent national survey conducted by the Subcommittee found that nearly 100% of the assessment data files have been automated and approximately 68% of the parcels have been converted to a digital format but conversion appears to be occurring mostly in urban areas[1]. With 80% of the people living on 20% of the land this leaves large portions of the less densely populated areas without digital parcel maps. But this situation was not uniform; the Subcommittee found that States that had implemented parcel management programs were able to achieve nearly 100% conversion of their maps into a digital format. The survey also found that nearly all of the nation has automated parcel attribute information in the form of local assessment or tax billing information sometimes called CAMA (computer aided mass appraisal) databases.

Recognizing the importance of state administered programs for achieving complete parcel conversion, maintenance and publication nationwide, the Subcommittee initiated an evaluation of seven state parcel management efforts (Alabama, Arkansas, Florida, Montana, North Carolina, Tennessee and Wisconsin) for best practices that could be transferable to other states. The goal of this effort was to identify a set of best practices for implementing statewide parcel management programs.

The stated objectives were to:

1. Identify the business drivers for the state parcel mapping and publication programs.
2. Characterize the evaluated states demographically and geographically.
3. Identify the components of a statewide parcel conversion and publication program.
4. Identify the benefits and challenges of state parcel mapping programs.
5. Document the cost of conversion and funding options.
6. Develop a parcel management program business plan template.

[1] This is from an upcoming publication that documents the update to the 50 states parcel inventory completed in 2005.

This study looked at successful state parcel programs in seven states to develop guidance and a business plan template that could be used in other states to establish or refine their programs. It relies on previous reports and standards to define the components of a state parcel management program. This study did not evaluate or review the requirements or standards for the assessment attributes or CAMA data since that is defined by state law and state and local custom and practice.

Seven states (Alabama, Arkansas, Florida, Montana, North Carolina, Tennessee and Wisconsin) were chosen based on their geographic distribution and identified successes in parcel data development and program management. The state cadastral contact in each state was interviewed and is the primary source for the information in this analysis. These states were characterized according to population, geography, program begin and end date, funding and sources, managing agency, program components, publication results and implementation strategy. Profiles were created for each state and the information was compiled into a matrix that lists the principle characteristics of the programs (see Table 1). The findings were categorized and compiled into six major subject areas.

1. Business Drivers
2. State Characteristics
3. Program Characteristics
4. Funding
5. Implementation Strategies
6. Benefits and Challenges

Within each of the subject area subtopics were identified and a list of *Key Points* were develop that represent a synthesis of the principle issues or important topics from all the programs that were evaluated. In some cases the key points occurred in each program while in others they were unique but noteworthy. Where it was deemed valuable additional discussion is provided.

Utilizing this information a template was developed to create a *Parcel Management Business Plan* within a state. An outline of the template is provided the appendix to this document and a separate publication was developed that goes into more details.[2].

[2] FGDC Cadastral Data Subcommittee, *A Parcel Management Program Business Plan,*, February 2006, Internet, http://www.nationalcad.org/data/documents/Parcel-Mgt-Prog-Business-Plan-v1.pdf

A Comparison of State Parcel Management Programs

State	Alabama	Arkansas	Florida	Montana	North Carolina	Tennessee	Wisconsim
Population	4,500,000	2,692,090	16,000,000	900,000	8,050,000	5,700,000	5,400,000
Area	50,750	52,068	53,927	145,552	48,000	41,219	54,310
Parcels in state	2,600,000	2,016,500	9,000,000	1,000,000	4,421,000	3,600,000	3,500,000
Density (person/sq mile)	88.7	51.7	296.7	6.2	167.7	138.3	99.4
Persons per parcel	1.7	1.3	1.8	0.9	1.8	1.6	1.5
Avg. Parcel Size in Acres	12.5	16.5	3.8	93.2	7.0	7.3	9.9
Metes and Bound (MB) or PLSS	PLSS	PLSS	PLSS	PLSS	MB	MB	PLSS
Program begin date	2000	2002	1998	1997	1970's	2000	1989
Program end date	2008	2008	2005	2003	~2000	2007	On-going
Per cent converted at the beginning of the program	UK	0	48%	10%	0%	0%	UK
Current status of conversion	80%	10%	99.50%	99%	95%	75%	83%
Cost Share (State/County)	75/25	Technical/ Staff	75/25	75/25	NA	75/25	~30/70*
Funding Source**	A, L, C	A, C	A, L, C	A, L, C, R	C, L*	A, L, C	R, C
Managing Agency	DOR	DOR & Info Tech/GIS	DOR	DOR & Info Tech/GIS	Admin -> Econ -> State	Finance Admin & Comptroler	WLIB -> Admin
Centrally manage data acquisiton	Yes	Yes	Yes	Yes	Yes	Yes	No
Centrally compile data	Yes	Yes	Yes	Yes	No	Yes	No
Central Database	Yes	Yes	No	Yes	No	Yes	No
Internet Distributed Network	No	No	No	No	Yes	No	No
Counties	67	75	67	56	100	95	72
Counties participating in program	67	73	67	48	100	38	72
GCDB	No	Yes	No	Yes	No	No	No
Small-scale Orthoimagery Program		Yes	No	No	No	No	Yes
Large-scale Orthoimagery Program	Yes	Optional	Yes	Yes	Yes	Yes	Ad Hoc
Local Assessors	Elected	Elected	Elected	Civil Servants	Elected	Elected	Electected (95%),
Other							Strategic Plan
* A recording fee is collected by the county. Seventy percent is retained by the county							
and thirty percent is sent to the state for the conversion program. Counties can apply to the.							
state for grants.							
**Funding Source							
A = Agency							
L = Legislature							
C = Cooperative							
R = Recording Fee							

Table 1 A comparison matrix of states by characteristics and program components

Findings

State Characteristics The seven states programs that were evaluated were all at different phases of implementation; some were in the early phases and some had achieved essentially 100% conversion and considered themselves in maintenance. The characteristics of states also represented a range of demographic and geographic characteristics. The population size varied from sixteen million (Florida) to 900,000 (Montana) and although they were approximately equivalent in size (median = 52,068 sq. miles, average = 63,689 sq miles) the density ranged from an average of 3.8 acres per parcel in Florida to 93.2 acres per parcel in Montana. The program start dates of the programs began as early as the 1980's and as recent as 2002. Start dates were indicators of implementation strategies, the two states that were the earliest starters, North Carolina and Wisconsin, have mostly distributed system without centralizing or compiling the data. The states that initiated their programs since 1998 tended to centralize their data more and the latest starters (Arkansas, Alabama, and Montana) have central compilation built into their design. These three states were also the least densely populated states, measured in persons per sq. mile where the median density of all seven states is 1.6 persons/sq. mi. Montana is the least densely populated state (.9 per/sq mi.) and it has the most centralized organizational structure for data management. Arkansas (1.3 per/sq. mi) includes publication of the data from the Arkansas Geographic Information Office's web site. Alabama (1.7 per/sq. mi) is creating a thin client sever with the central database being updated directly from the local assessor's office.

Business drivers for funding parcel conversion have conceptually changed over time although the end product is the same, uniform and accurate parcel boundary files. The first programs were conceived of in the 1970's and 80's and their efforts were focused on building a land information system that was inclusive of all layers, parcels being one of them. The programs that have started since the late 1990's were specifically designed to meet the business needs of the local government assessor's office and to improve the auditing capabilities of the state agency that has oversight responsibility of the local assessor's operations. This shift seems to have occurred because of the availability of supplementary data layers (orthoimagery, soils, hydrography, etc.) and improvements in technology that make parcel conversion cost effective within existing budgets. The downstream benefits are now secondary to the programs that are responsible for developing and managing assessment databases.

Program components can be divided into two parts, *data acquisition* and *implementation*. *Data acquisition* includes parcel conversions and supplementary data that is needed to ensure accuracy of the parcel boundaries, this includes aerial photography, orthoimagery, geodetic control, densification of the corners of common control, hydrography, transportation and soils data. The *implementation* components consist of standards, training and education, and in some cases hardware and software. Standards are essential for developing a uniform parcel coverage; training, education, and technical support are critical for developing a maintaining a technically proficient staff. Some states provided

hardware and software while some didn't, depending upon the ability of the communities to provide the technology.

The following is a list the principle *components* of most recent programs.

- Involvement of the agency that is responsible for oversight of local assessors.
- A grant program designed to meet local assessor's business needs.
- Standards for all data acquisition (parcel boundaries, publication data, imagery and control).
- Training and technical support.
- Publication standard to provide public access to a subset of the assessor's parcel data.
- Funds for a grant program to leverage resources.
- The encouragement of cooperative activities by the grant applicants.
- Program oversight to ensure adherence to standards by the local government and the vendors.

Standards that were uniform and acceptable to the assessors and the user community were the foundation of all seven programs and a prerequisite for cooperative funding. Uniform mapping standards within the grant program made cooperative funding relatively easy and did much to encourage other regional, state, and federal agencies to supplement available funding. The contributing agencies either benefited through a data exchange or because the agency needed to acquire the data as a part of its own program needs and was willing to coordinate its efforts with the state to improve the overall quality of the data. For example in Alabama NOAA coordinated its data acquisition of control points for its height modernization program with the statewide aerial photography effort to which improved the accuracy of the ground control and meeting its own business needs. In Florida the Suwannee River Water Management District (SRWMD) contributed funds to the FL Department of Revenue's corner densification to improve the accuracy of the parcel data for some of the counties in their district. Both cases are representative of the types of cooperative efforts that can occur if the state's program meets the business needs of all communities.

Publication and integration of data into regional or statewide data layer is designed to meet regional business needs, particularly those of emergency response, economic development and land use planning. There are two components, the publication of a subset of the data from the local assessor and the compilation and integration of this data into a regional or statewide coverage. Where standards have been followed in the parcel conversion the publication from the local assessor is relatively easy. The level of difficulty to compile and integrate this data at the state level is dependent on in the implementation strategy and institutional arrangements in each state.

Funding sources varied across all of the states. The programs that began in the early 1980's had large legislative programs that were directed towards creating a land information system in the state that included all data layers. As the cost of technology data acquisition dropped, the ability to acquire data for the more rural communities as happened in Florida or to initiate statewide parcel conversion efforts as in Arkansas came

within reach of existing budgets. Arkansas serves as model for making progress on limited funds with its two phase approach: Phase 1 is the creation of a point database that provides spatial analysis capabilities to existing data which leads to Phase 2, the creation of parcel boundary file

Outsourcing is viable for data acquisition and digitization when 1) it is not reasonable for local or state governments to maintain technical expertise and 2) the contracted services could be easily separated from the agencies business processes. In these cases outsourcing data acquisition provides and excellent opportunity for cooperative efforts when standards are used that meet the needs of the community at large. Aerial photography and orthorectification are typically outsourced and there are many other examples of cooperative ventures for imagery acquisition. Parcel conversion and boundary file maintenance tend to be outsourced in the less densely populated communities because the small workload does not justify the needed staff expertise.

Benefits cited by the program managers of the states included:

- The conversion of maps to GIS improved the tax rolls by the account for every foot of land.
- Statistics used to determine equity do not take geography into account. With GIS it is now possible to spatially stratify sampling and improve equity.
- Statewide programs with a centralized grant management level the playing field for the vendors allowing the best firms to effectively compete for contracts.
- Publishing parcel data through the web reduces the operational costs in the local assessor's office by reducing calls and office traffic because information can be retrieved from web and reducing complaints and objections to tax assessment because of improvements to equity.
- Today conversion is much less expensive because of improvements in the technology and the availability of supporting data (imagery, control, and soils data).
- The benefits to other organizations is considerable as demonstrated in Montana and Florida where the number of applications that utilize parcel data increases yearly.

Challenges still exist but they are surmountable. Program managers identified two issues.

- The use of technology in smaller counties is always a challenge because of the lack of technical expertise.
- Training and technical support is an on-going process to maintain technical expertise and to ensure adherence to standards. .

A conversion effort requires leadership from the state. The programs must be customized to meet the state and local government business needs and address the issues specific to the states institutional arrangement. Institutional readiness is essential to moving a program forward. Having the pieces in place from established standards that are acceptable throughout the user community to having a funding mechanism in place has allowed states to argue a convincing case to potential fund sources and take advantage of windows of opportunity.

What's Next

The purpose of establishing a *State Parcel Management Program* in a state is to facilitate implementation by: 1) assisting those communities that don't have the resources or technical expertise to spatially enable their parcel database and to assists in the publication of parcel data where it already exists; and 2) to expedite the creation of a cadastral NSDI by encouraging the acquisition of financial assistance and cooperative ventures from the beneficiaries of the local assessors parcel data by ensuring them that the standards being followed and the data being published will meet their business needs.

The following section, *Summary of Practices by Subject Area*, provides a detailed discussion of the six subject areas. Appendix A provides a template for state's to use as a model to develop a parcel management program or to document an existing program. Examples of how states have implemented various components have been provided where it was appropriate.

Summary of Practices by Subject Area

Business Drivers:

The principle business driver for the older programs was the establishment of a land information system (NC and WI). The more recent programs are focused on the business needs of the local assessors and state equalization or assessment functions. In five of the states the agency that has oversight of the local assessor assumed responsibility for conversion (AL, AR, FL, TN & MT). The creation of a multi-purpose cadastre has become secondary to modernizing the local assessor's office..

Business Requirements:

Key Points:

- Property assessment has become the primary business driver for the creation of digital parcel maps.
- The principle business requirements for the local assessor and the state assessment agency is for 1) the more efficient property assessment for local assessors, and 2) the ability of the state to ensure that there is a fair and equitable assessment of property values.
- It can be argued that in addition to the efficiencies that digital parcel data brings to the assessment community, the parcel layer used as a base map is the most information rich database with the broadest utility to local, state and federal agencies

Assessors and Equitable Assessment

Key Points:

- Equitable assessment is a principle business driver for any tax assessment oversight agency.
- One of the principle benefits of parcel conversion is that it provides a comprehensive inventory that accounts for 100% of the taxable land. As a result the conversion process acts as an audit and validation for tabular tax and assessment records.
- Automated parcel maps lend themselves to improving equity by providing the ability to analyze value and assessment characteristics visually.

Uniformity and equity of assessment is the principle objective of tax assessors. One of the benefits of spatially enabling the parcel attributes with an automated parcel map is that it accounts for 100% of the taxable land that provides an auditing capability that is not available by the tabular tax roll alone.

State Characteristics

Seven states were chosen that were represent a range of characteristics so that the observed trends that emerged from the data can be used to help other states determine an appropriate strategy. The first relationship that became apparent was between population density and implementation strategies. The less densely populated an area, the more likely it was that the data would be centrally managed at the state level. This makes sense in terms of economy of scale and the inability of small communities to retain the technical expertise needed for conversion, maintenance and the publication of the data. None of the states examined indicated an issue with these smaller communities as end users of the digital parcel maps. A second observation was that the more recently a program was established the parcel conversion effort was being driven by the agency responsible for the oversight of local assessors to improve efficiencies for the local assessors daily business needs and the audit capabilities of the oversight agencies. This was due to improvements in technology that have significantly reduced the cost of parcel conversion.

State Population Size and Geography:

Key Points

- The population density has implications for the conversion and maintenance strategy that a state uses.
- Less populated states tend to be more centrally managed.

The urban or rural nature of a state was measured using the population size, area and number of parcels to determine population density, the persons per parcel and the average parcel size in acres.

State	Population in Millions	No. of Counties	Area in square. miles	No. of Parcels in Millions	Density (person/sq mile)	Persons per parcel	Avg. Parcel Size in Acres	Distributed (D) or Centralized (C)
Florida	16.0	67	53,927	9.0	296.7	1.8	3.8	D
North Carolina	8.1	100	48,000	4.4	167.7	1.8	7.0	D
Tennessee	5.7	95	41,219	3.6	138.3	1.6	7.3	C
Wisconsin	5.4	72	54,310	3.5	99.4	1.5	9.9	D
Alabama	4.5	67	50,750	2.6	88.7	1.7	12.5	C+
Arkansas	2.7	75	52,068	2.0	51.7	1.3	16.5	C+/D
Montana	.9	56	145,552	1.0	6.2	0.9	93.2	C+
Average	**6.2**	**76**	**63,689**	**3.7**	**121.2**	**1.5**	**21.5**	

Table 2 States ordered by population size demonstrating a tendency to centralize the data in the less populated states.

The greater the population density the more likely it is that local governments will independently develop their own parcel map conversion programs. States with smaller population densities find it easier to centralize operations because of the economies of scale and the cost and availability and retention of GIS expertise.

Program Characteristics

The program characteristics describe the elements or components of the state parcel management program. These characteristics look at the management agency, supporting data sets, management and training, and oversight and strategic planning. The components in this section were considered essential when model parcel management program was developed.

Managing Agency:

Key Points:

- Most local assessors are elected officials which means that they control the local assessment programs and they often must be individually convinced to participate in a parcel mapping program.
- Inclusion of representation of local governments and the agency responsible for oversight of property assessment is essential to the success of any parcel management program.

Recently established programs are either lead by or directly involve the state agency that is responsible for property assessment and taxation. The two programs that were launched in the 1980's (Wisconsin and North Carolina) had a broader focus on environmental and community planning that include parcel mapping while later programs are focused on spatially enabling tax roll data. The more recent programs are focused on parcel mapping to support the local and state taxation and assessment systems and not a multi-purpose cadastre. Further more, most local government assessors in the states examined are elected officials (six of the seven states in the study). This gives them a certain level autonomy and often these officials must be convinced of the business need and advantage of participating in any program.

Supporting Data

Key Points

- Supporting information (orthoimagery, geodetic control, hydrography, roads, corners of common control and soils data) is essential for parcel conversion and for the local assessor to optimize the use of parcel data.
- Standards were required for each of the supporting data layers to ensure community wide use and to encourage cooperative ventures.
- The agencies that are the stewards of the supporting information are usually willing to enter into cooperative ventures if the standards for data acquisition by a parcel management program meets their business needs.

Aerial Photography and Orthoimagery: All seven states had some sort of large-scale orthophotography program in progress. The requirements for parcel mapping are 1 foot or better imagery in the urban areas and 1 foot to 1 meter in the rural areas, depending on the severity of terrain. State, federal and regional agencies have a great need for this imagery and by pooling their resources with local governments many efforts have been able to acquire a superb product with an update cycle of one to five years. Arkansas and Florida both have statewide orthoimagery programs that allow local governments to use these funds as a base resource to acquire larger scale imagery.

Geodetic control: These data are another component that can be worked into a conversion program. Alabama's efforts include the acquisition of orthoimagery. To improve the accuracy of their ground control by coordinating imagery acquisition with NOAA's height modernization program and improving the accuracy of their ground control. Florida's Water Management Districts and Department of Transportation have provided cooperative funding with the counties to improve the accuracy and increase the density of the ground control. The Wisconsin program includes geodetic and other control as a foundational element for parcel mapping.

Hydrography and Transportation: These themes have been recognized as essential reference themes to support parcel mapping. The standards, conversion and publication for these data are covered by other programs and are not addressed in this report except to recognize that in many areas these themes are an important part of a comprehensive land information system. Because water and roads are typically visible in the orthoimagery, they were not specifically identified in this report.

Corners of Common Control (PLSS): The corners of common control include survey systems that define the framework for parcel information. Most notably the corners and areas of the Public Land Survey System (PLSS) are in this grouping. Additionally corners of common control include subdivision boundaries, visible features and other control points that register parcel information to the ground.

Soils Data: The soils data are the agricultural soil polygons that provide soil type and soil characteristics. The soils provide the basis of value in rural areas and are often essential for generating and validating assessed values.

Management and Training:

Key Points:

- Management includes the oversight of parcel mapping programs through data standards, assuring data quality and timely delivery of products and the continued maintenance of parcel maps once they are converted or collected.
- Training is an essential component since parcel mapping is often a new technology in the local assessor's office. Some states balance the need for training by providing relatively easy to use or thin client easier to use map products for local assessors.

Oversight and Strategic Plans:

Key Points:

- Strategic plans at the state and local level improve confidence in the use of grant funds and the likelihood that outside agencies will participate in cooperative ventures with these grant programs.
- Cooperative assistance from outside programs is more likely if there is oversight in the form of grant management that ensures the use of standards and consistency in product deliverables.
- Program measurable achievements are more easily documented with planning and oversight that measures completion and successes. Two notable examples are Montana's ability to capture benefits and costs of their program from measurable achievements and Wisconsin's use of an annual survey to measure progress toward a completed goal.

Funding

Funding is essential to a parcel management programs because the costs of conversion, although a one time expense, is considerably more than the on-going business operations. Although funding essential it is preceded by a well defined business needs and important and well thought out implementation strategy that ensures success and encourages cooperative ventures..

Cooperative Ventures:

Key points:

- Cooperative ventures are more likely to occur where there is a supporting infrastructure; an official state program, the adoption of accepted standards and the ability to ensure the implementation of those standards through a grant process.
- Supporting data (aerial photography, orthoimagery, geodetic control, corners of common control, hydrography and soils data) is frequently managed by other organizations. Standardizing this data to meet the needs of the broadest user community facilitates cooperative ventures.
- Grant programs can increase cooperative ventures by favoring those activities in the grant applications.

Funding and Resource Requirements:

Key points:

- All seven programs have a sound institutional infrastructure to manage and distribute funding.

- Recording fees are a logical revenue source because the money is used to support and improve the efficiencies of those same business transactions.
- Grant funds are used as a leveraging tool. Wisconsin estimated that $229 million dollars was expended in Wisconsin between 1991 and 1999 for the collection, maintenance and dissemination of land information by local, state, and federal agencies and private utilities. During this same period $63 million dollars was invested in lands record modernization.
- Grant programs levels the playing field for vendors. Overcharging for services is reduced because counties are able to compare costs in similar counties. Furthermore it also avoids the problems of vendors underbidding to "get a job" and then being unable to perform the work.
- The cost of parcel conversion of paper maps into a digital format is approximately $4.75 to $6.00 per parcel.
- The cost of supporting data is separate from this cost of digital conversion.
- Much of the supporting data already exists in many states.

Outsourcing:

Key Points:

- Generally, data acquisition and parcel conversion lends itself to the outsourcing when: 1) it is not reasonable for local or state governments to maintain a particular expertise; 2) the technical processes can be easily separated from the business processes; and 3) a level of technical expertise is maintained in the agency to provide technical oversight of the product..
- Outsourcing provides opportunities for cooperative efforts when standards are used that meet the needs of the community at large.

Funding issues for the less populated communities are always sited as the reason that technology can not be implemented. Providing funding in and of itself will not guarantee success. Additional factors need to be considered. Observations indicate that technology such as GIS are not readily adopted in less populated areas because: 1) theses areas may not have the personnel with the expertise to apply the technology; 2) they do not have the work load to justify retaining that level expertise on staff; and 3) they are able to adequately provide services to their local constituency without additional technology. Overcoming these hurdles require outside support from the state or other agencies that are able to provide the technical expertise and oversight and pool multiple communities into an economically viable body. Outsourcing of certain aspects of the workload can occur through government entities as occurs in Montana and Tennessee or they can be outsourced to private vendors as usually occurs in aerial photography and the creation of orthoimagery. Where this does occur, economies of scale become readily apparent from state and regional agencies that have a need for a consistent regional database to develop cooperative programs to address these needs. Aerial photography and orthoimagery is a good example, many states are have adopted large-scale imagery acquisition programs to meet state, regional and local needs.

Standards and Contract Management

Key Points

- Before GIS technology many states had developed standards for their CAMA database and some had developed parcel mapping standards.
- Standards should be adopted for parcel mapping, data publication, aerial photography, orthoimagery, geodetic control, corners of common control, (PLSS or other official grid systems) hydrography and soils data)
- A publication standard should be adopted based on the Subcommittee's Standard.
- Training and technical support are required to implement standards.
- Centralized contract management of grant programs is required to ensure adherence to standards.
- Providing software to local governments to replace legacy systems can greatly facilitates the implementation of standards.

Implementation Strategies

The general trend for parcel conversion in most of the programs meant the creation of accurate boundary information tied to a property description. The Arkansas effort is noteworthy because it viewed the conversion as a two step process. The first phase was to spatially enable the parcel attributes in the CAMA files by establishing a point for each parcel record on a map and the second phase was the creation of parcel boundaries and polygons. Acquiring coordinates for parcels allowed the county to spatially enable their CAMA database as quickly as possible allowing the county allowing the assessor's office to have an operational system that could meet eighty per cent of their spatial business needs. This strategy is worthy of consideration where budgets are limited or skill sets for maintenance are just emerging.

Program Age and Implementation Strategies:

Key Points:

- Parcel conversion efforts have become more efficient and much less expensive per parcel with improvements in technology.
- Early programs focused on building land information systems that included parcel data. More recent efforts are focused on the business of assessment and state oversight.
- Standards for CAMA (parcel attributes) are set by the state oversight agencies.
- Many states had hard copy parcel map standards that laid the ground work for GIS.

Early Programs: North Carolina began its modernization program in the 1970's with legislation in an effort to create a unified land information system. Standards were developed that provided the foundation for parcel conversion in the 1980's and 90's. The programs were adjusted with improvements in technology. Wisconsin began its program in the 1980's with legislation to establish the Wisconsin Land Information

System which was funded with a recording fee that was implemented by the legislature. The program was managed by the Wisconsin Land Information Board whose stated objective was to direct and supervise the Wisconsin Land Information Program through the development of strategic plans and the implementation of standards.

Later Programs: The more recent programs began in the late 1990's when the cost of technology and data acquisition dramatically decreased. What was financially prohibitive in 1990 became financially feasible within existing budgets. These later programs took advantage of the opportunity according to their ability. Florida had a well established aerial photography program that was easily expanded into an orthophotography program and include parcel conversion. Arkansas is one of the more interesting efforts because with relatively little money ($30,000 per county) they have begun spatially enabling the CAMA databases with point mapping and orthoimagery to move the counties from not having or using any maps to GIS users in just a few years. Alabama is similar to earlier programs in that a state agency is pushing a statewide effort for conversion with funding from the legislature. The difference is that because of the changes in technology they are creating a thin client database in which all of the data can be centrally collected and managed. Montana and Tennessee have been able to take over the responsibility of conversion at the state level.

Point Data as the Beginning of Spatial Database:

Key Points:

- Spatially enabling existing parcel database by acquiring point data for a parcel is an effective method of rapidly providing a county with spatial GIS capabilities.
- Point data is a reasonable strategy for counties with low population densities and minimum funding.

Spatially enabling a parcel database by acquiring point data for parcels is an interesting strategy for the first stages of conversion. Arkansas used this approach to bring their parcel data on-line with a shoe-string budget. Prior to the introduction of this program some of the counties in the state weren't using maps for parcel assessment. The Arkansas program has two phases, Phase I the CAMA database is spatially enabled by acquiring coordinates on parcels using recent orthoimagery. These desk top site visits are done at the local level by the assessors that are familiar with the properties. Coordinates are captured from imagery and stored in a spatial database that is linked to the county's CAMA database. This spatial database provides most of the functionalities that one has with a parcel boundary file which can be used while the counties are creating parcel boundary files in Phase II. The program began in 2002 and by the fall of 2005 seventy-three of seventy five counties were participating in the program, sixteen counties had begun Phase II, and five counties had provided data to the state GIS publication site

Arkansas can be considered a rural state with a population of approximately 2.7 million and an average parcel size of 16.5 acres compared to Florida, the most populated state, whose average parcel size is 3.8 acres per parcel. Funding for the program has come from the Arkansas Assessment Coordination Department (AACD) that has oversight responsibility of county assessment. There awareness of GIS and its utility to the agency and local governments came about because of the Arkansas Geographic Information Offices (AGIO) outreach effort. Now with a small amount of money, approximately $15,000 per county with another $15,000 in available data, mapping and publication standards have been put in place and implementation has begun. This puts Arkansas in the position of quickly building a standard statewide parcel boundary file like Montana.

Benefits and Challenges

The benefits and challenges were generally uniform across all of the programs. Of particular interest is that each program identified the need for training and technical support for the more rural counties in addition to difficulties with retaining personnel. This could be the reason why the states tended to centralize the data acquisition and management at the state level in the less densely populated areas.

Benefits:

Auditing and oversight

- The process of parcel conversion serves as a detailed audit of assessment databases.
- The conversion of all maps to GIS improves the tax rolls because it accounts for every square foot of land. Double assessments and missing acreage were routinely found in the conversion process typically in counties that had poor legal descriptions. A county assessor in Florida was able to find 8000 acres that were not on the tax roll as a result of parcel conversion..
- Improvement of Equity: Statistics, which are used to determine equity, do not take geography into account. Market areas have been created but they are not located. With GIS it is now possible to geographic stratified sampling.
- In Florida the tax roll analysis is the responsibility of the FL Department of Revenue. The agency savings have been numerous with the availability of digital parcel data
    - FDOR appraisers do not have to return to the office they can carry all of their files and data for analysis into the field.
    - If the uniformity of the tax roll is poor, the sample for determining equity must be larger. Digital parcels improves uniformity, you can do more with less money and reduce the number of appraisers in the field.

Cooperative efforts and grant programs

- Grant programs with a funding infrastructure:
    - Provide confidence in the product.

- The contract infrastructure makes its easy for other agencies to supplement grants for counties where they have an interest. For example adjoining county to U.S. Forest lands.
- Centralized data supports a central access point to information.
- Decreases the cost of title insurance.
- Decreases the cost of flood mapping and flood insurance because of the accuracy of the data.

Contract management

- Because of the oversight provided by the FL DOR Mapping and GIS section, the state has been able to document expected performance levels for parcel conversion and orthoimagery. This has done much to level the playing field for vendors ensuring that the responses to Request For Proposal's are reasonable and qualified vendors are selected. Overcharging for services has essentially been eliminated because counties are able to compare costs in similar counties.

Data and Technical issues

- Uniformity of data allows oversight agencies to better evaluate the fairness and equity of property assessment.
- Core data that is a product of the program is required to follow guidelines; this improves consistency and accuracy of the data allowing applications to be easily built upon the parcel data base layer.
- Technical issues have been addressed through standards and guidelines created by granting agencies and promulgated through the parcel management program.

New programs

- Late entrance into the parcel conversion offers several advantages:
  - The technology is more user friendly.
  - Support data aerial photography, orthoimagery, geodetic control, corners of common control, hydrography and soils data is much more widely available.
  - Data acquisition is orders of magnitude less expensive to acquire.

Public access to parcel data

- On-line web applications create a high interest from the user community.

Reduce the cost in the local assessor's office.

- Operational costs are lowered in the assessor's office because:
  - Calls are reduced because if the data is web enabled.
  - Office traffic is reduced allowing employees more time to for assessment work.
  - Complaints and objections to tax assessment are reduced because of the improvements in assessment equity.

Rural areas and parcel conversion.

- Outsourcing the parcel mapping in low density communities, either to a centralized agency or to the private sector, is a viable alternative. The assessors send the necessary documents to the contractor and receive converted parcels in return. They are then able to utilize the database for the daily business operations.

Utilizing the parcel data in other applications

- GIS applications that use parcel data expand yearly. (MT and FL) include
    - Economic development
    - Emergency response planning
    - Flood plain mapping
    - Land use planning
    - Permitting
    - Resource management planning
    - Many others
- Parcel data brings value to other data sets by putting resource information in the context with landownership. For example large public holdings can be seen with private lands.

Challenges:

Training and technical support to the smaller communities

- The use of technology in the smaller counties is always challenging because of the lack of technical expertise.
- Training is an on-going process.
- The biggest challenge was the level of training that need to be provided and selling the idea.
- Attrition: The mapping person is not making much more than minimum wage in many counties and turnover has become a big issues.
- Outsourcing conversion: There is a need to recapture the knowledge that 1) is not gained if conversion is outsourced, and 2) turnover of personnel

Publication and Access

- Parcel data that has been collected without standards or guidance will be more difficult to combine into a consistent and standardized publication data set across jurisdictional boundaries
- The incremental additional cost of publishing an integrated parcel data set could not be quantified because of variations in implementation strategies.

Appendix A:
Parcel Management Program
Business Plan Template

The following is outline of the major components of the business plan. A brief description is provided for each step and links are provided to appropriate documents and standards. A separate document has been prepared with a more detailed descriptions and examples. The complete *Parcel Management Program Business Plan Template* can be found at http://www.nationalcad.org/data/documents/Parcel-Mgt-Prog-Business-Plan-v1.pdf

1 Managing Agency and Contact Information
2 Program Overview
3 Participants
4 Parcel Data Inventory
5 Supporting Data
  a Aerial Photography and Orthoimagery
  b Geodetic Control
  c Corners of Common Control (PLSS)
  d Hydrography and Transportation
  e Soils
  f Stewards
6 Training and Education
7 Status of Phases
  a Phase 1 - Parcel Data Initial Collection and Conversion
  b Phase 2 - Publication
  c Phase 3 - Integration
8 Contract Management
9 Hardware and Software
10 Funding Strategy
11 County Contribution
12 Strategic Planning