Wisconsin GIS Inventory
2009 Report on County GIS Data Systems

May 2009

Additional products of this report not included in this document and available per request or at www.doa.state.wi.us/WLIP:

- *Appendix B: Individual maps from report*
- *Summary table of results*
- *Power Point presentation*

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Introduction

The intent of this report is to provide a structured view of county-based GIS capacity in Wisconsin through an inventory of GIS data assets, technical capacity, and management practices. The report is based on self-reported statistics using the *Wisconsin GIS Inventory* tool with answers provided by representatives of Land Information Offices (LIO's) in each county. The *Wisconsin GIS Inventory* – an online survey system composed of the core GIS inventory profile along with a Wisconsin-specific profile - was used to fulfill an annual survey requirement for the Wisconsin Land Information Program (WLIP) for both the 2008 and 2009 grant years.

In the structure of the report, there is an attempt to quantitatively assess the completion status of Foundational Elements, a set of WLIP-specific programmatic categories further defined later in this report. Countywide plans for land records modernization are a WLIP requirement and must address each of the Foundational Elements. In order to develop, implement, and maintain a countywide plan for land records modernization, counties are enabled to retain real estate recording fees and apply for WLIP grants. The grants and retained fees have totaled $129 million since the WLIP's inception in 1989[1]. The WLIP uses base budget grants as a redistributive mechanism which provides some level of equalized opportunity for records modernization and digital maintenance resources across the state, but disparities are still visible and may require more strategic investment if seamless data is required for priority initiatives in coming years.

In view of the original Foundational Elements, the report also provides some suggestions or consideration for updating semantics or refining definitions as future progress is measured. One reason for interweaving this discussion is to, if necessary, provide better performance metrics for completing key land information databases statewide. Additional reasons for this discussion are to provide better critical data comparison across state boundaries and to better align with some federal program criteria related to status of GIS Framework Data and applications and associated funding opportunities through which to leverage that completion status. Two examples of this type of alignment include the federal *Imagery for the Nation* initiative and the recently re-introduced *Flair Act* (HR 1520) in the U.S. House of Representatives calling for a nationwide parcel map.

Another advantage of this report, founded on a consistent, annual online data collection system (*Wisconsin GIS Inventory*), is that this view can be updated and automated based on refined online data collection, providing a better measure of progress over time. Equally important are current activities within state agencies that seek to integrate best available local GIS information for standard agency use. These programs can utilize this information for assessment of data quality and preparedness for integration activities including targeted partnering for select data updates or completion efforts.

In the past, the progress and status of Land Information Program activities has been addressed in such reports as *Land Information Modernization Activity in Wisconsin: Impacts, Status and Future Tasks (1990-2000)* by the former Wisconsin Land Information Board's (WLIB) Strategic Assessment Task Force as well as in a legislative report submitted by the WLIB and Office of Land Information Services at the sunset of the WLIB in 2003. This report is timely in providing a 6-year update and 20-year perspective on some of the tangible data production, distribution, and sharing activities as a measure of resource-enabled

[1] About $100 million has been through retained fees and $29 million in grants since 1990. The funding disparity has been large with total individual county funding ranging from $15 million to only $0.5 million. These figures do not include the additional dollar retained (for each real estate instrument recorded) beginning in 2001 for provision of land information on the internet, including records related to housing.

production and maintenance of priority geographic information for highest-demand local applications.

As with any survey methodology, there is bound to be missing information, but several efforts were made to foreshadow the use of the information to garner majority participation and validate the results presented here. A detailed description of the *Wisconsin GIS Inventory* tool and implementation procedure is included in Appendix A of this report. The intent is to continue to refine this information which will provide more accurate and timely assessments based on the utility of these initial findings. There will also be efforts to incorporate better municipal, regional, and state agency information as appropriate.

GIS Data Development Summary

Through the WLIP annual survey requirement and the use of the *Wisconsin GIS Inventory* system, all 72 Wisconsin counties reported on their county systems, policies and data production activities. In addition they answered a series of "State Questions" which had been developed in 2007 through analysis of the past WLIP annual survey in order to sustain and update key pieces of supplementary program assessment information (not included in the core survey.)

From purely a data perspective, counties reported on over 1800 discreet GIS data layers (datasets) that make up their core geographic data "systems," of which 1450 datasets are inventoried as complete, implying complete coverage and ability to distribute. The *Wisconsin GIS Inventory* system divides data into Framework Data and Other Data categories which were utilized for general reporting - while leaving the comparison of this categorization to the WLIP's Foundational Elements for later in this report. From this perspective, the total number of datasets would give a simple average of 25 datasets per county, with 20 classified as complete. The median values for these numbers are significantly lower, however, (22 total/ 18 complete) indicating that there are some highly successful counties with lots of datasets pulling up the average. Dividing data records into Framework and Other Data shows that indeed there is a wide disparity between the number of listings for Other Data, but there is a strong correlating average for Framework Data listings *with counties identifying an average of nearly 14 priority GIS datasets, of which 10.5 are complete.*

Data Summary	*Total* GIS Data Records	*Complete* GIS Data
Framework Data Ave./County	13.4	10.7
Framework Data Median {2:27}	14.0	10.5
Framework Data Records Total	962.0	772.0
Other Data Ave./County	11.6	9.5
Other Data Median {0:80}	7.5	6.0
Other Data Records Total	838.0	682.0
GIS Inv. Ave. Records/County	25.0	20.2
GIS Inv. Median #/County {2:106}	22.5	18.0
Total County Data	1800.0	1454.0

Table 1: Comparison of GIS Data Record Totals, Averages & Medians (March 9, 2009)

The two bar charts in Figures 1-2 further illustrate the variation in data assets inventoried across counties while also showing a fairly consistent baseline around 15-20 datasets.

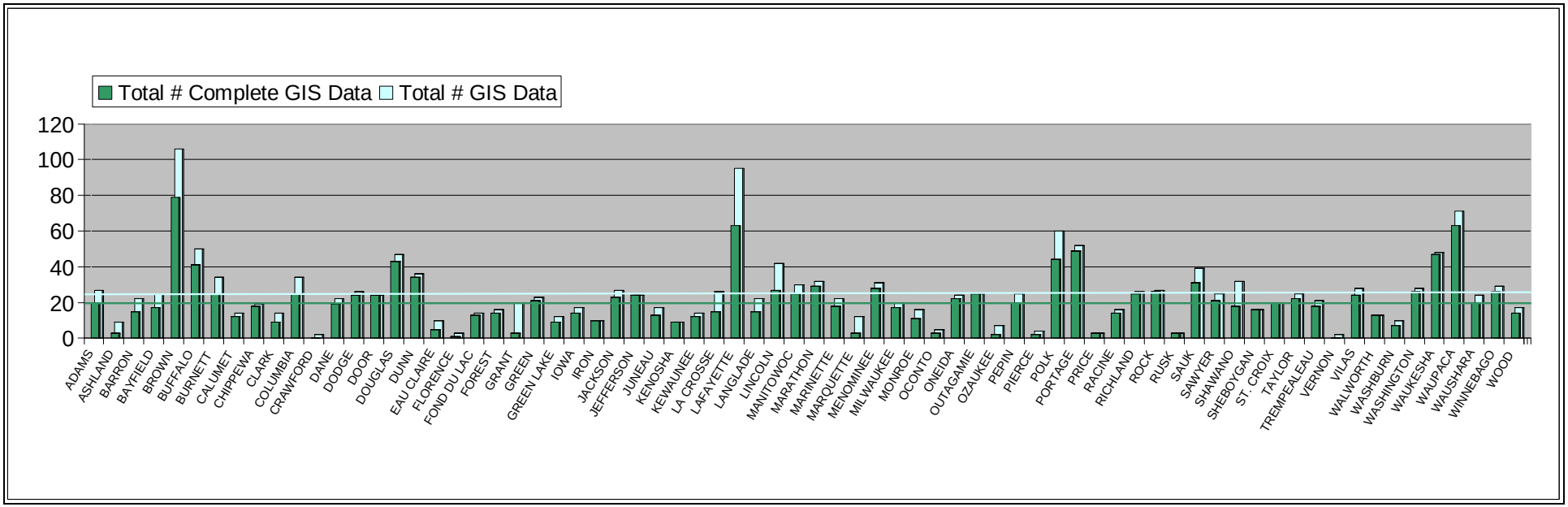

Figure 1- Total County GIS Datasets Inventoried

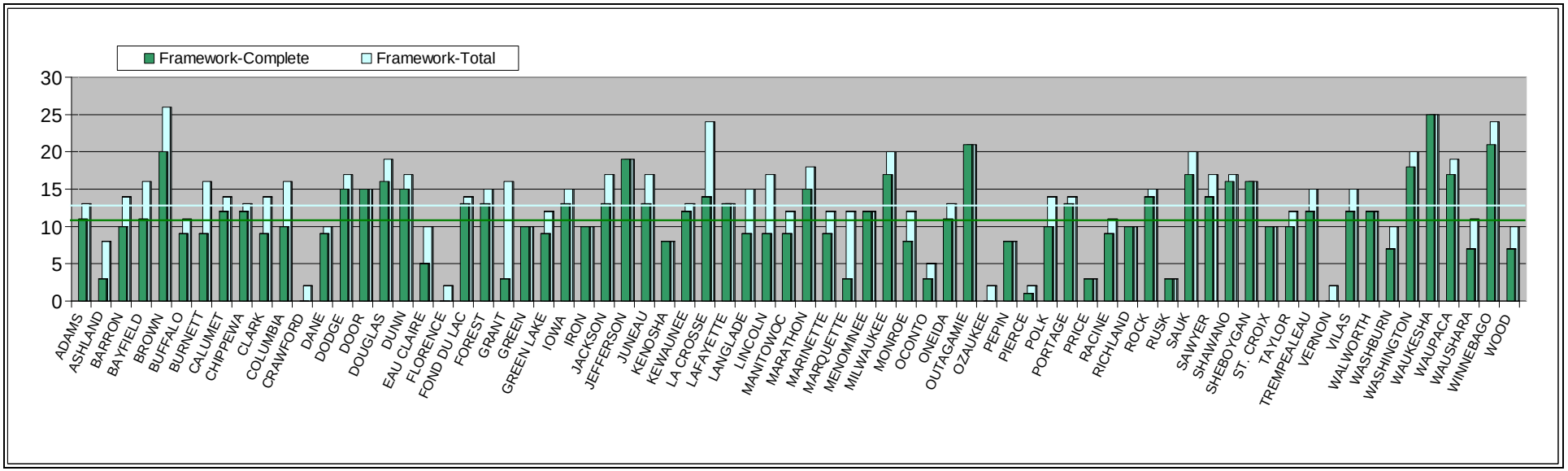

Figure 2 - Framework County GIS Datasets

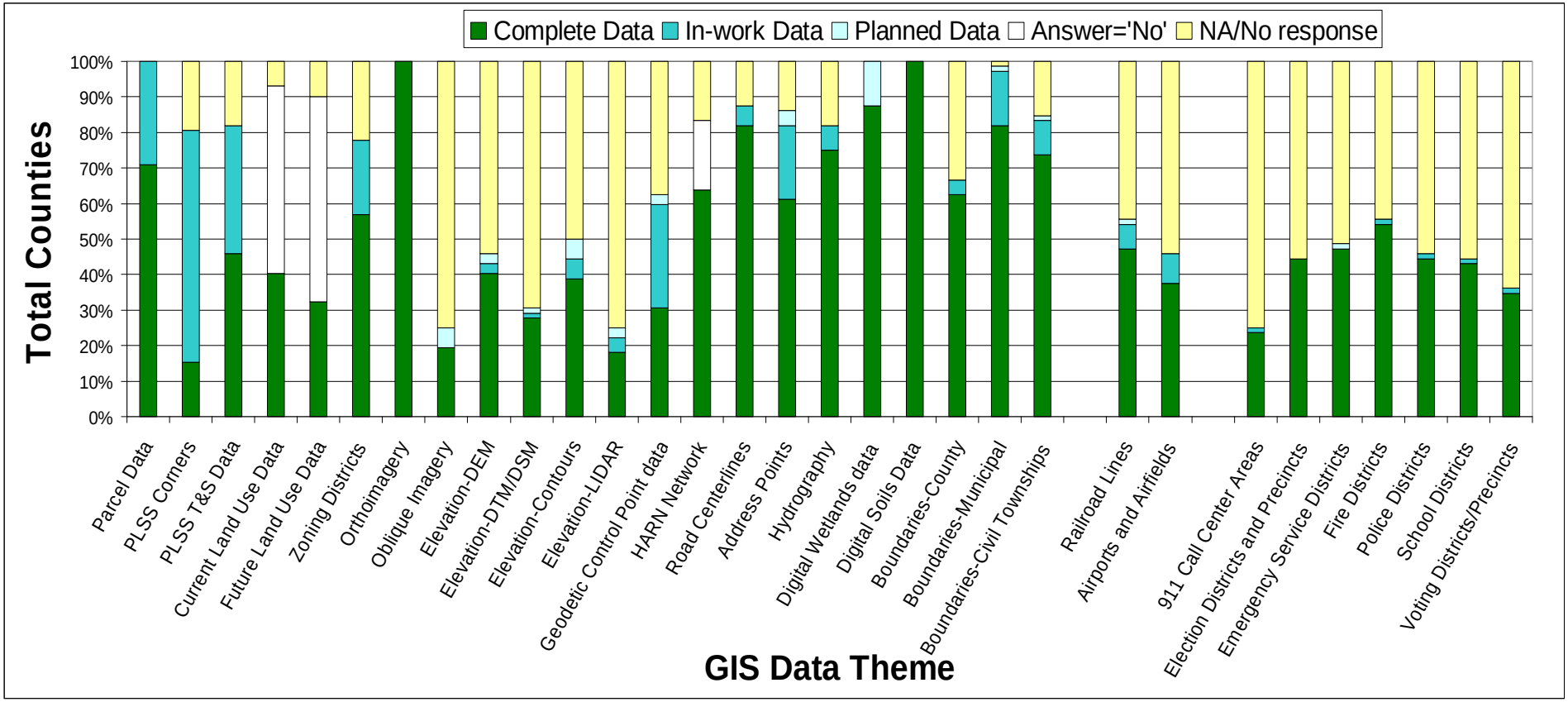

Figure 3: Total Counties Completion Status of GIS Data Themes

These 10-14 baseline GIS datasets, whether we call them Foundational or Framework, are typically those in highest demand and with the highest priority for maintenance and application. Further exploring trends in these data will help identify consistencies as well as disparities in data development and improve understanding of needs for uplift and integration.

Foundational Elements vs. Framework Data

Originally, the Wisconsin Land Information Board identified eight Foundational Elements – five technical and three institutional - against which to measure progress and set goals for the program. These elements were identified as:

- Geographic reference frameworks including digital orthophotos
- Parcels
- Soils
- Wetlands
- Zoning
- Institutional arrangements
- Communication, education and training
- Public access

In the late 1990s, seven more elemental categories were added including:

- Parcel administration
- Election and administrative boundaries
- Street address and street network systems
- Land use mapping
- Natural resources
- Database design
- Infrastructure and facility management

Some of these elements are well-defined and have supplementary status reports already in existence which are referred to in addition to what is reported here. Still others (particularly in the second list) are less well-defined and as such are more difficult to find existing measures of establishment. The *Wisconsin GIS Inventory* places emphasis on Framework Data categories, as defined by the Federal Geographic Data Committee. These defined categories were created in the 1990s to facilitate access by federal programs to often needed base geographic information. Framework Data categories are listed in the table below with a comparison to Foundational Elements.

Framework Data Categories	WI Foundational Elements
Geodetic Control	Geographic Reference Frameworks
Orthoimagery	Geographic Reference Frameworks
Elevation	Geographic Reference Frameworks
Cadastral Information	Parcels, Parcel Administration, Zoning, Land Use Mapping
Transportation	Street Address and Street Network Systems
Hydrography	Natural Resources, Wetlands, Soils
Governmental Units	Election and Administrative Boundaries, Infrastructure and Facility Management
	Database Design, Public Access & Inst. Agrmt

Framing of GIS Data and Policy Status Snapshots

The remainder of this report digs deeper into the Framework Data categories and Foundational Elements listed above with brief useful status updates based on GIS inventory survey data. In all cases, there is recognition that presence/absence is only a beginning measure and a weak overall indicator of consistency in data quality or accessibility for interoperable exchange. Where appropriate, a reference is made to additional survey data that begins to outline these quality measures including GIS data scale of compilation as well as de facto standards that may be in use by counties with respect to data models or policy and distribution mechanisms. For each section then, the applicable categories are listed: Foundational Element(s); Framework Data category; production status/quality statistics (when available); and related activities pointing to drivers and opportunities, as well as any other timely information worth noting. Reduced resolution map graphics are included in the narrative for noting statewide trends with full page versions available in Appendix B.

Status Report Table of Contents

Parcel Mapping & Parcel Administration

Foundational Element: Parcels & Parcel Administration
Framework Data Category: Cadastral Information

Parcel mapping might be said to lie at the heart of county GIS operations as mapped representation of the land ownership and tenure fabric upon which other data layers depend (e.g., land use, roads, addresses, and zoning) and are maintained with respect to parcel boundaries. The sheer many-handed nature by which parcels are locally defined, zoned, assessed, transacted, taxed, and reported asserts this theme's central nature to the business of land information and GIS technology. Wisconsin has a long history and large investment in the successful completion of a digital cadastre, or parcel-mapping base, supporting more accurate decision-making with regard to individual parcel ownership and rights.

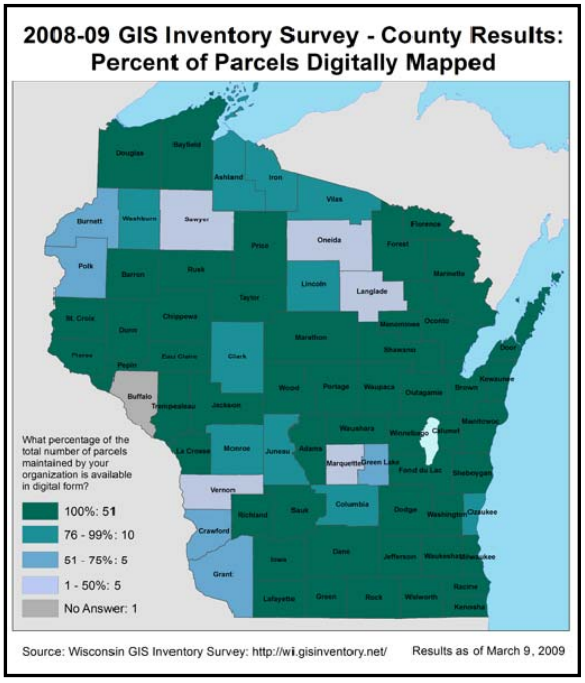

Figure 4 - Digital Parcel Mapping Status

Statistics:

- 51 counties reported complete digital parcel mapping.
- 10 counties > 75% complete
- 5 counties 50-75% complete & 5 counties < 50% complete
- 71/72 counties reported maintenance of 3.2 million parcels (excluding 15 or more municipalities & tribal areas) of which 92.6% are digitally mapped.
- 57/61 counties or 90% reported a compilation scale of 1:4800 (1in=400ft) or better.
- Referencing a 1999 WLIB Cadastral Mapping Content Standard: interpretations varied yielding uncertain data. When relating to a more recent federal content standard, 22/69 or 32% identified with this standard.
- Compared to previous studies, while percentage progress toward 100% completion by number of parcels averages +3.5%/year over the last 10 years, the current 5-year average drops down to +1.8%/year indicating a slowdown in progress toward 100% completion.

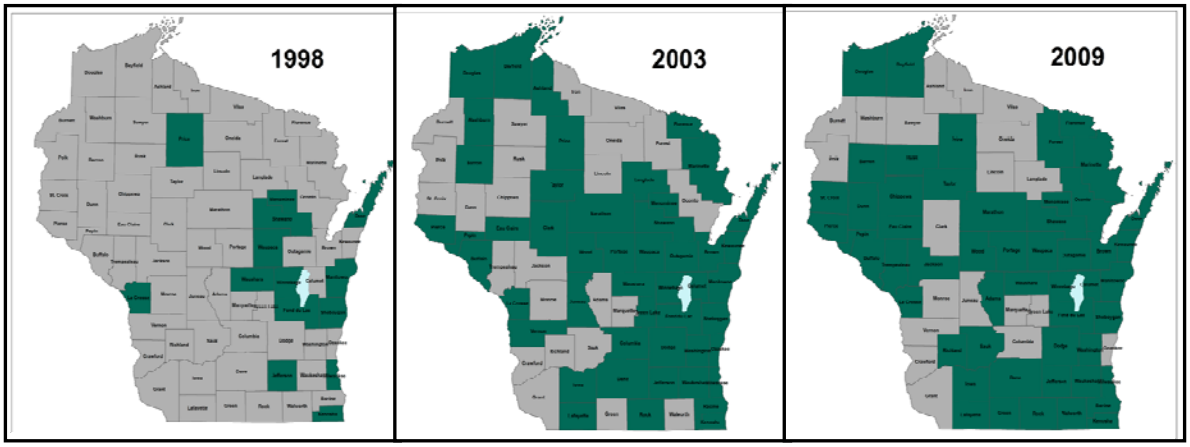

Figure 5 – Counties with 100% digital parcel mapping (1998, 2003, 2009)

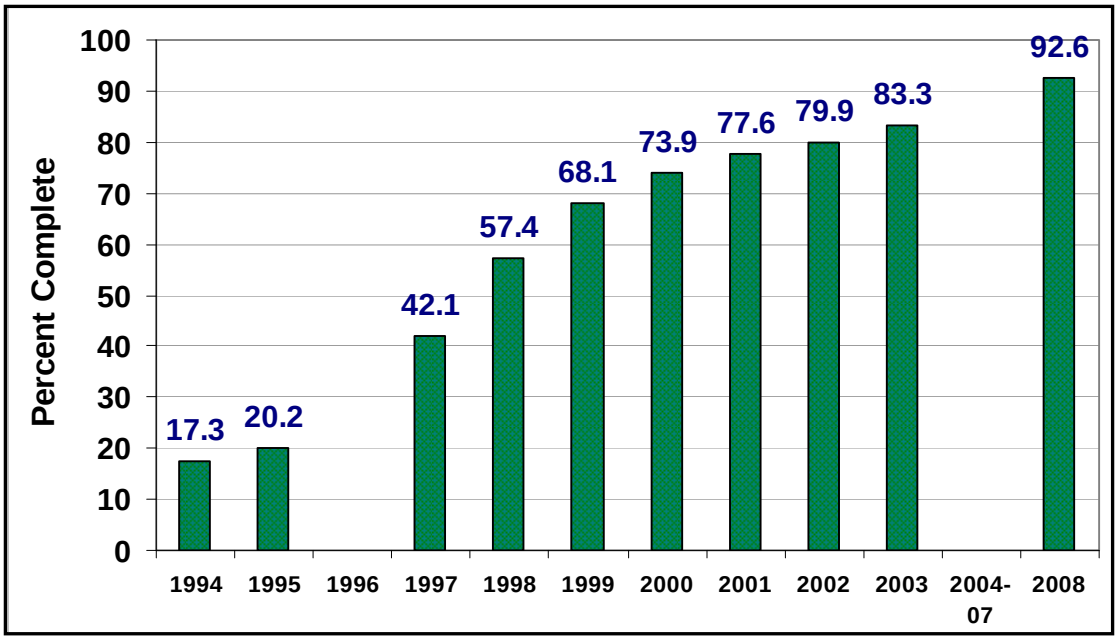

Figure 6 – Statewide percent digital parcels maintained by counties (1994-2008)

Related Activities: The Wisconsin Land Information Association initiated a Parcel Data Modeling Task Force in 2007 to inspect spatial database model commonalities and best practices, as well as current standards efforts. In March 2009, co-chairs of this task force met with DOA Geographic Information Office (GIO) staff to relate their findings to state GIS Data Repository goals. In March 2009, the Flair Act (HR 1520, co-sponsored by Rep. Kind) was re-introduced in the U.S. House of Representatives containing language related to a nationwide parcel map.

Public Land Survey System (PLSS)

Foundational Element: Parcels & Parcel Administration, Geographic Reference Frameworks
Framework Data Category: Cadastral Information

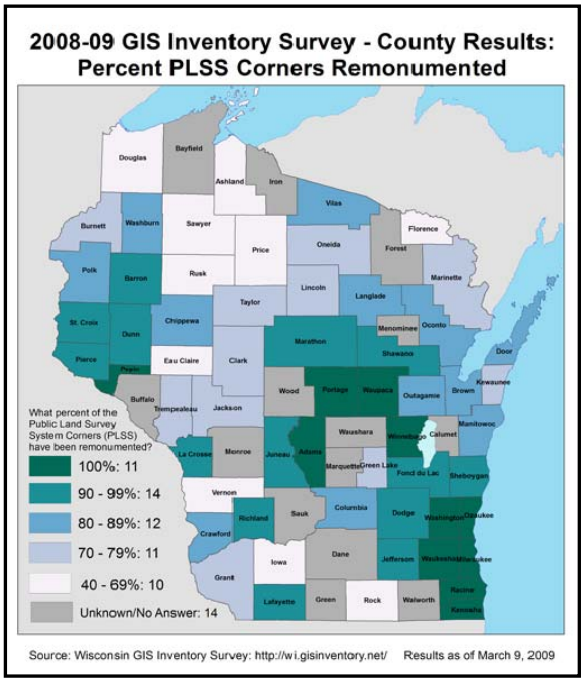

Figure 7 – Percent PLSS corners re-monumented

Access to quality in-ground survey control and evolving GPS positioning technology has facilitated much work across the state in recovering, re-monumenting and/or collecting high quality local coordinates on corners of the Public Land Survey System (PLSS) that, by and large covers the entire state and creates the fabric in which parcel information is situated. The WLIP recognized early on that quality PLSS data would augment quality development of other land tenure and boundary layers that depend upon PLSS definition as well as provide a quality measure of accurate parcel mapping. PLSS positioning was identified as key to both Geographic Reference Frameworks and Parcel Mapping Foundational Elements.

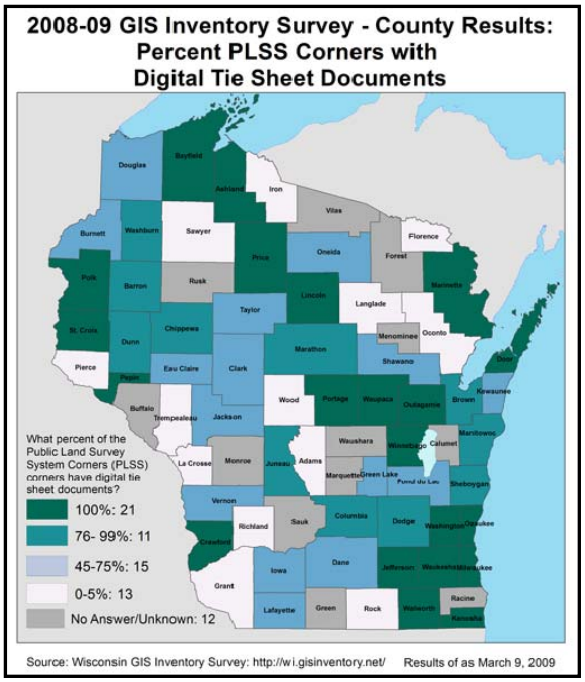

Figure 8 – Digital PLSS Townships & Sections

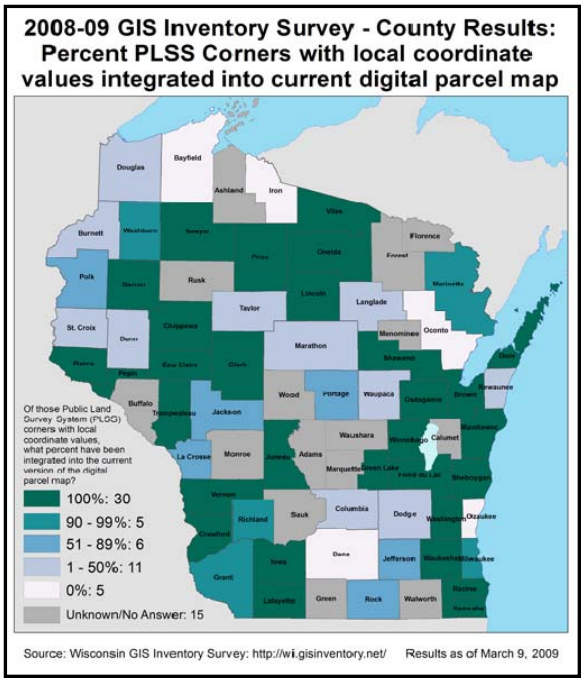

Figure 9 – PLSS Corners with Local Coordinates

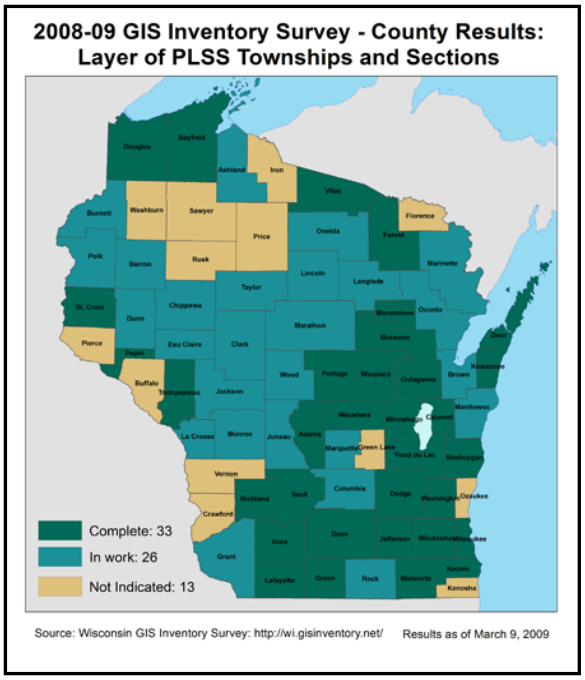

Figure 10 – PLSS Townships and Sections

While many counties report complete or in-work PLSS data layers, the quality of coordinates present in these data, automation of paper survey records and integration of quality corner measurements in subsequent parcel mapping all help qualify the overall accuracy and "modernization" of these data.

This section of survey information needs further refinement and validation with the land surveying community - the following statistics were collected from 58 counties:

- 11 counties reported "complete."
- Another 26 report 80-99% complete, indicating half of all counties > 80%.
- 50 counties reported inventory of 163,675 section corners, of which 123,180 or 75% have been re-monumented.
  {County-by-county average across 58 counties is 81.5% complete.}
- 51 counties reported that over 86,000 or 49% of corners have been assigned local coordinates tied to their primary geodetic network.
  {County-by-county average across 57 counties is 58.1% complete.}
- Independent of State Questions on section corners, 33 counties reported "complete" PLSS township and section data layers, with another 26 "in work."
- 51 counties reported nearly 115,000 corners or 65% have digital tie sheet documents
  {County-by-county average across 60 counties is 67.2% complete.}
- 49 counties reported nearly 110,000 corners or 62% have been integrated into local parcel map dataset, but this question contains some ambiguity and needs re-wording.
  {County-by-county average across 57 counties is 73.3% complete.}

Comprehensive Planning, Land Use, and Zoning Information

Foundational Element: Land Use, Zoning
Framework Data Category: Cadastral Information

Comprehensive plans

- Adopted: 27
- Estimated in progress: ≥36

The Comprehensive Planning Law (s. 66.1001, Wis. Stats.) enacted in 1999, sometimes referred to as the "Smart Growth Law," defines the minimum nine elements of a comprehensive plan. The law includes a consistency requirement that states, beginning on January 1, 2010, if a town, village, city, or county engages in zoning, shoreland zoning, subdivision regulation, or official mapping, those actions must be consistent with that local government's comprehensive plan. All of the county governments, except for Milwaukee County, engage in one or more of the above-listed land use regulations. According to the Wisconsin Department of Administration (DOA), 27 counties have adopted comprehensive plans as of March 9, 2009 and an estimated 30 more counties will adopt comprehensive plans before 2010.

A minimum amount of maps are required for a comprehensive plan, such as maps for current and future land uses, as well as agricultural soils, wetlands, and floodplains. Many of these maps fall into the Framework Data or Foundational Elements categories.

Survey question - access to plans online:

- "Is there Internet access to land use and/or comprehensive plans and maps for your community or jurisdiction?"
  - Yes: 43
  - No: 25
  - Unknown: 4

Nine of 27 counties with an adopted comprehensive plan reported that it was not available online. An Internet search found eight of nine of those counties' plans could be located online, most often on a regional planning commission website. The DOA makes a table of received plans available online with web links.

Twenty-seven counties that have not adopted comprehensive plans reported having land use plans available online. Upon a review of the web links listed by these counties, it was discovered that most of the links listed were to draft comprehensive plans which have not yet been adopted.

Survey questions - current and future land use maps:

- "Does your organization maintain a digital map of current land use for its jurisdiction?"
  - Yes: 29 (40%)
    - 10 of 27 counties with adopted comprehensive plans responded "yes"
  - No: 38 (53%)
  - Unknown: 5 (7%)

- "Has your organization created a digital future land use map for your jurisdiction?"
  - Yes: 23 (32%)
    - 16 of 27 counties with an adopted comprehensive plan responded "yes"
  - No: 41 (57%)
  - Unknown: 7 (10%)

Land use mapping, for both existing and future land uses, is a Foundational Element. The majority of counties answered "no" or "unknown" as to whether their organization maintains a digital map of current land use or created a digital future land use map.

Although a comprehensive plan must include current and future land use maps, 17 of 27 counties with an adopted comprehensive plan do not maintain a digital map for current land use and 11 of the 27 counties with an adopted comprehensive plan had not created a digital map for future land use. Existing and future land use maps could be combined with many other Foundational Element map layers, such as zoning, digital elevation models, orthophotography, soils, wetland, administrative boundaries, infrastructure, and facility management layers, for a wide array of purposes.

There may be several explanations as to why counties do not maintain/retain digital maps of current and future land uses created in the comprehensive planning process. For example, counties often hire consultants who create the maps and then give static copies to the counties as products of the planning process. It is also worth noting that several regional planning commissions maintain regional current land use maps. The high number of "no" and "unknown" responses may be due in part because some of the respondents filling out the inventory survey were focused on the GIS layers that the LIO maintains, while the current and future land use layers may be the responsibility of another county department.

On the other hand, some counties that answered "yes" may have only PDF copies of maps, which are not functional in GIS software programs.

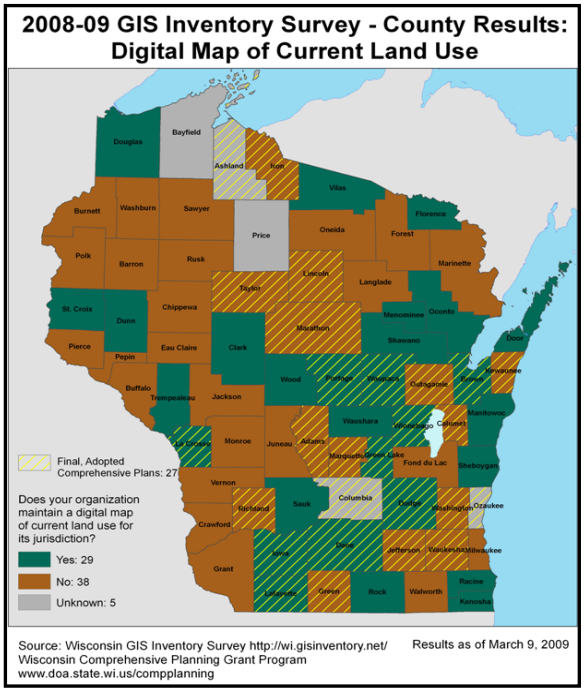

Figure 11 – Digital Map of Current Land Use

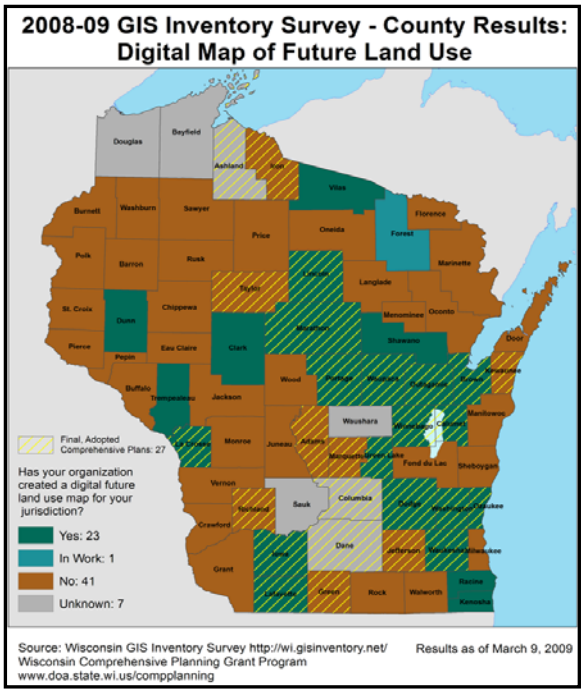

Figure 12 – Digital Map of Future Land Use

County zoning and zoning mapping

Zoning is the most recognizable form of land use regulation because it regulates what land uses are permitted in specific locations. In Wisconsin, towns have either adopted county zoning, exercise their own town zoning, or have no zoning. Zoning is a key tool to implement a comprehensive plan for many counties and, according to the Comprehensive Planning Law, their zoning must be consistent with their adopted comprehensive plan beginning January 1, 2010. According to the DOA's 2008 Wisconsin Local Land Use Regulations and Comprehensive Planning Status Report, 57 counties exercise county zoning.

County Zoning:

- Yes: 57
- No: 15

Zoning Map Layer:

- Complete: 41
- In Work: 15
- Not Indicated: 16

Zoning map layer

Zoning mapping is a Foundational Element. If a digital zoning map is not maintained, a zoning layer cannot be easily combined or laid over other maps from the comprehensive plan, such as current and future land use maps. Combining the zoning map layer with the future land use map layer can help in checking for consistency between zoning and the comprehensive plan.

The opportunity to list a zoning map layer is in the Other Data section of the inventory survey, in which counties listed a wide range of layers from school districts to snowmobile trails to legislative districts. Many of the respondents from counties that exercise county zoning did not list a zoning map layer, therefore phone calls were made to individual counties to ask whether the county did indeed have a zoning map layer. The phone calls to counties indicated that the more counties have zoning map layers than reported in the survey.

It makes sense that counties without county zoning would not maintain a county zoning map layer, especially if the towns do not have town zoning either. On Figure 14 counties with no zoning and no zoning map layer indicated are shaded tan.

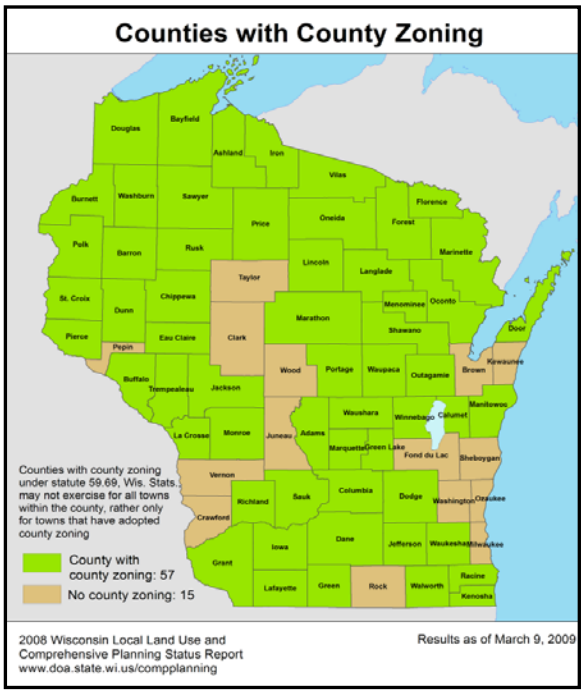

Figure 13 – County Zoning

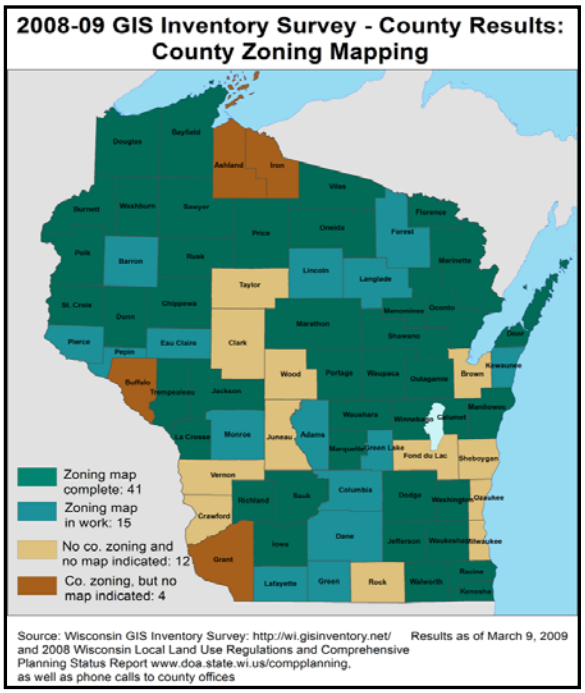

Figure 14 – County Zoning Mapping

Survey question – legal standing of digital maps/GIS files:

- "In your jurisdiction, do digital maps/GIS files have legal standing for ordinance enforcement?"
  - Yes: 18 (25%)
    - 15 counties with county zoning responded "yes"
  - No: 38 (53%)
  - Unknown: 14 (19%)

This question was included in the State Questions section of the survey. This question may have been difficult for respondents to ascertain because the definition of "legal standing for ordinance enforcement" may have been unclear to some.

Increasingly, digital data are playing a role in coastal setback amendments and coastal zoning enforcement. Coastal counties have a higher rate of "yes" answers.

From the zoning perspective, 15 of the 18 counties that responded "yes" as to whether their digital maps/GIS file have legal standing exercise county zoning, which is to be expected. However, 42 of the 57 counties that exercise county zoning did not respond "yes."

Most parcel maps are not considered to have legal standing. Parcel maps are the basis for all maps that have to do with land uses, including zoning. However, it is questionable as to whether the digital zoning maps would not be used for ordinance enforcement for some respondents that answered "no."

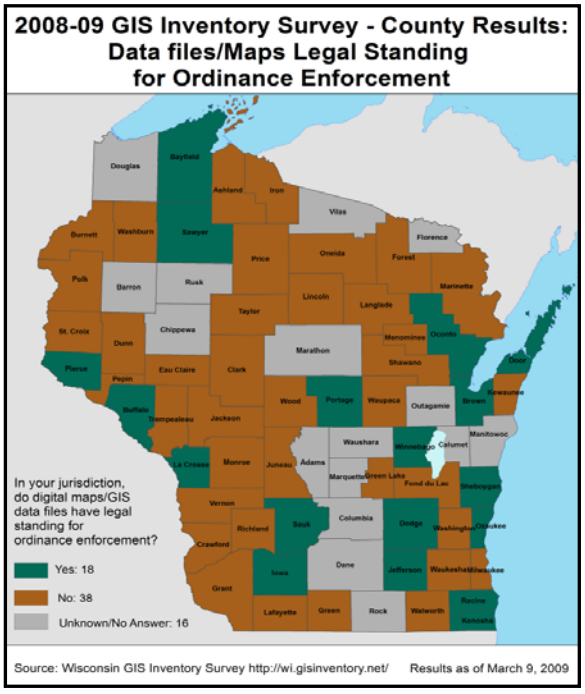

Figure 15 – Data files/Maps Legal Standing for Ordinance Enforcement

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Orthoimagery

Foundational Element: Geographic Reference Frameworks
Framework Data Category: Orthoimagery

Statistics:

- 100% county-based coverage
- 4-5 year iterative planning cycle for many counties
- > 15 counties indicated "planned" imagery in 2010 – the actual number is suspected to be 2-4 times that number.
- Oblique imagery is rising in popularity, as well as in current and future investment.

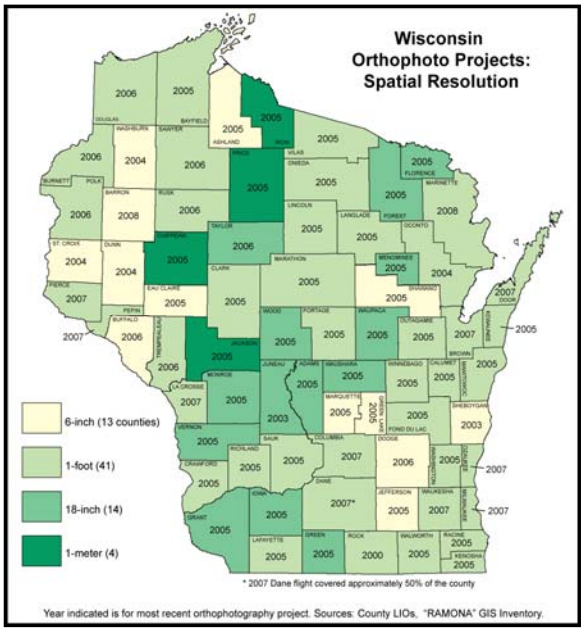

Figure 16 – Orthophoto Spatial Resolution

Related Information:
With little ambiguity, it is clear that 100% of Wisconsin counties have invested in locally-funded orthoimagery sometime over the last 15 years – in some cases, in 4 or 5-year iterations. This aerial imagery rectified to ground control for integration in GIS systems has great value in collection, registration, and quality assurance of other foundational GIS layers.

Though all counties do invest in this product, there is still significant variation in the product type (black and white vs. color) and scale/resolution of the imagery acquired (see Figures 16 & 17).

In 2008, WLIA sponsored an Orthoimagery Task Force, tasked with investigating common needs and potential momentum for a statewide imagery flight in 2010. That task force has since finished its report, and without a state-level champion, the Wisconsin Regional Orthoimagery Consortium (WROC) emerged under the leadership of Regional Planning Commission staff across the state. Current information on that effort may be found on the Consortium's website.

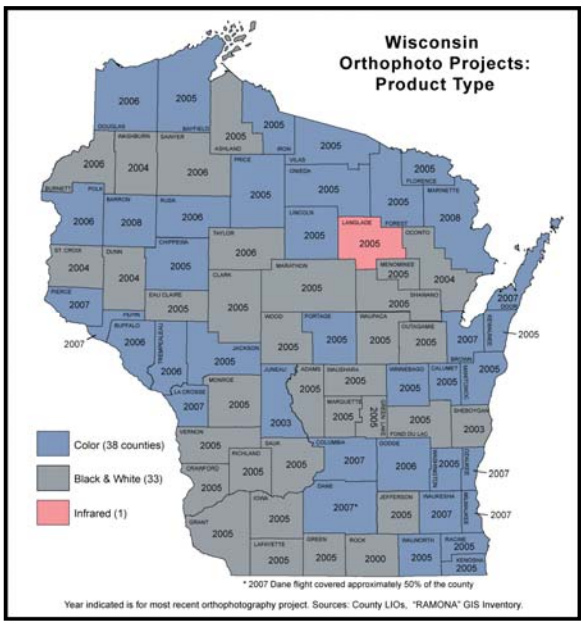

Figure 17 – Orthophoto Product Type

Further diversity in investment in this area is seen in the recent interest and acquisition of oblique aerial imagery – often valued by police and emergency response applications. The primary producer of this imagery is Pictometry Corporation and past communications with them in addition to inventory results indicate 14 complete or partial coverage (Brown, Dane, Door, Fond du Lac, Jefferson, Kenosha, La Crosse, Milwaukee, Outagamie, Ozaukee, Racine, Rock, Washington and Waukesha) in addition to 4 planned acquisitions in 2009 (Bayfield, Burnett, Douglas, and Washburn).

Elevation

Foundational Element: Geographic Reference Frameworks
Framework Data Category: Elevation

Elevation data in GIS format comes in a variety of formats and can be difficult to determine status in development, depending on intended applications. Specific discussions with the Department of Natural Resources and their needs for elevation data for applying to floodplain map modernization demonstrated a need for more in-depth information on the lineage (source and time period) as well as verifiable accuracy of elevation products in order to evaluate potential use.

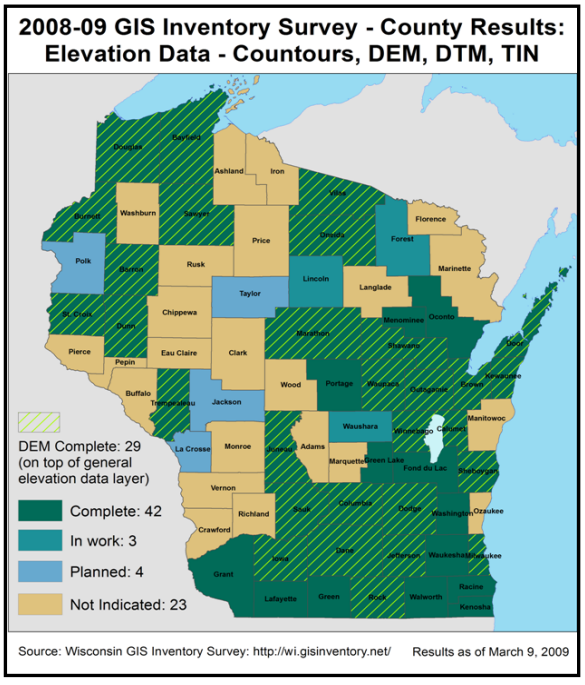

Figure 18 – Digital Elevation Model

Here, digital elevation models (DEM's) are reported on as a primary Framework Data category and LIDAR (light detection and ranging) data acquisition as a means of updated DEM production. Further investigation and stakeholder feedback is required to determine the most salient elevation data characteristics on which to focus and report on a regular basis. In addition to GIS inventory results, these statistics include supplemental information from the State Cartographer's Office.

Statistics

- 58% of counties inventoried DEM data with another 10% either in work or planned.
- Of these DEM data, 18 counties reported a supported contour interval of 4 feet or better.
- For LIDAR data, 18% of counties have it with another 7% in work or planned.
- LIDAR data acquisition appears primarily in counties with existing, more dated elevation data.
- In counties not reporting locally-produced DEM data, there are federal data products available through the National Elevation Dataset (NED) at either 30-meter or 10-meter resolution – but these products may be insufficient for many local modeling applications including updated floodplain mapping and stormwater modeling.

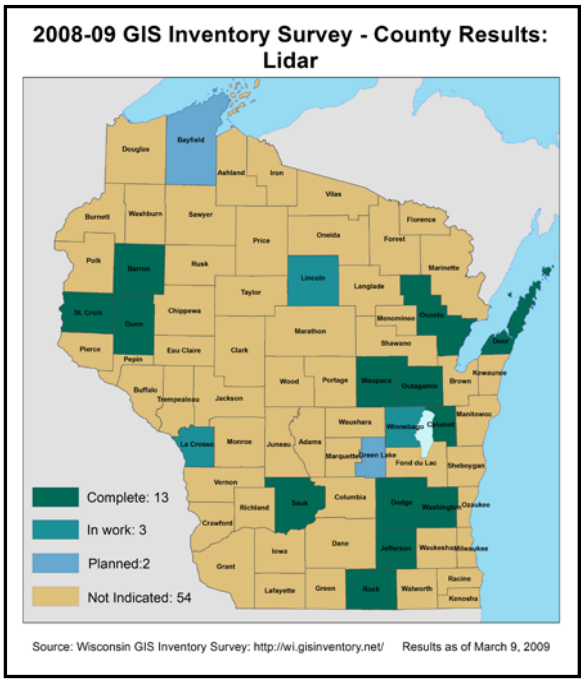

Figure 19 – LIDAR

Control Networks and Survey Control

Foundational Element: Geographic Reference Frameworks
Framework Data Category: Geodetic Control

Established survey control and newer high-precision survey networks form the foundation for well-positioned geographic (GIS) data of all kinds. The underlying quality of the location-based information is due in large part to the horizontal (geodetic control/PLSS) and vertical (Elevation data) frameworks to which this information is registered.

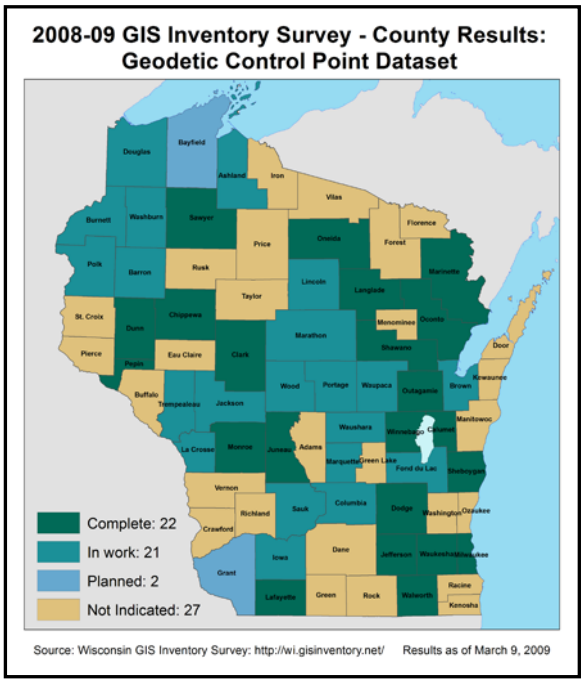

Figure 20 – Geodetic Control Point Dataset

Wisconsin has a long history and robust community of surveyors that have been pioneers in establishing high quality survey control across the state. Establishment of systematic high quality positions across counties started in the late 1980s and early 1990s with densified geodetic control networks (HARN – High Accuracy Reference Networks) being established across the state. These provided a *more dense mesh* of high quality monuments tied to the federal Continuing Operating Reference Stations (CORS) network at that time. In total, 46 counties inventoried a local HARN network.

In many cases, developing this network involved the establishment of local geodetic control monuments that were typically, but not always, registered in the national database of survey control with the National Geodetic Survey. Examples of this data can be seen in the State Cartographer's Office ControlFinder website application labeled as *county control*. Figure 21 shows the inventory results for HARN networks noting in particular the perceived value of updated control in the northern counties.

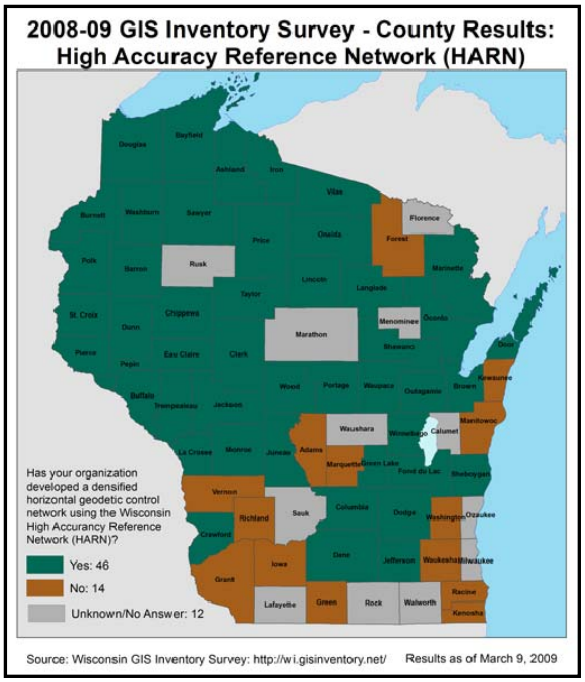

Figure 21 – HARN

In an effort to establish an updated network of elevation control monuments across the state, the Wisconsin Department of Transportation has been managing several multi-year grants from the National Geodetic Survey

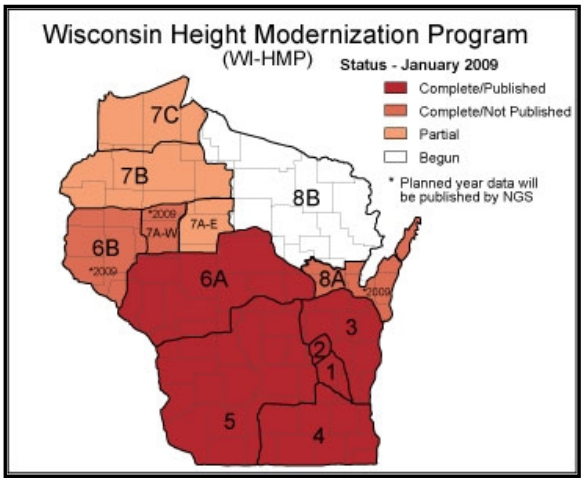

Figure 22 – Height Modernization Program

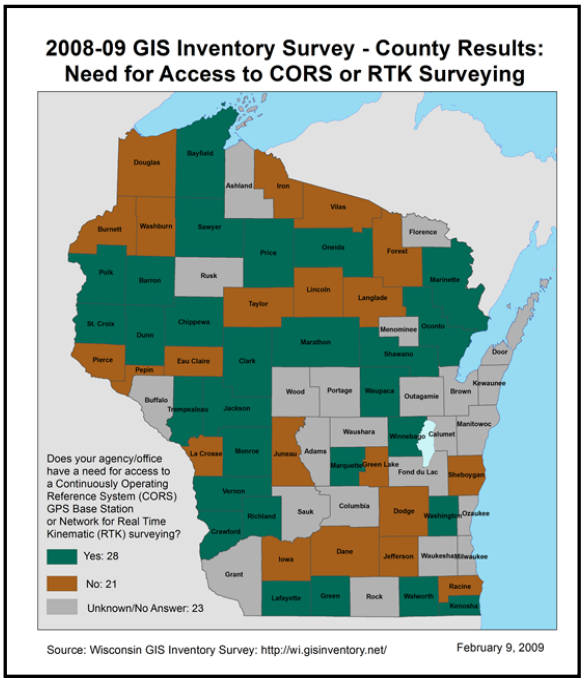

Figure 23 – Perceived need for access to WisCORS

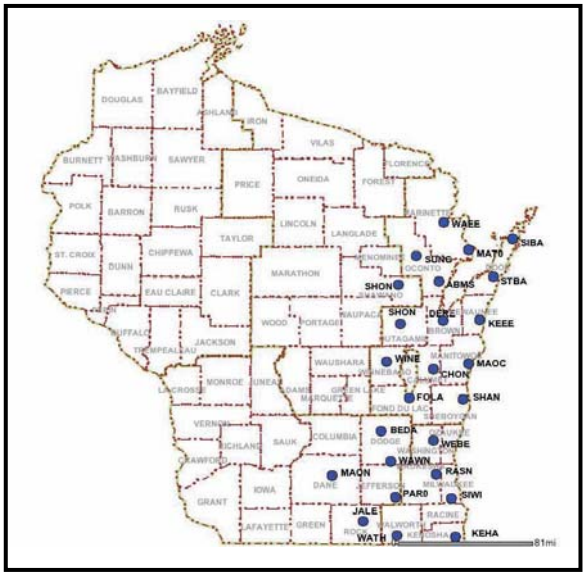

Figure 24 – WisDOT WisCORS Network
Source: http://wiscors.wi.gov/

(NOAA-NGS) to establish and maintain the Wisconsin Height Modernization Program (WHMP) as well as a recently-introduced Wisconsin Continuously Operating Reference Stations network, dubbed WisCORS. The survey asked counties about their perceived need for access to the new WisCORS system (which still only covers ~ ¼ of the state) and what example applications they had in mind. Figure 23 illustrates that many counties just outside of the current WisCORS

network are indeed aware of it and have a desire to tap into this broadcast technology for accurate positioning. Discussions with northern county representatives seem to indicate a perception of lower utility for WisCORS use when heavy forest cover and varying terrain are involved, prompting those stakeholders to continue to encourage the completion of the in-ground Height Modernization Program network as well. Nonetheless, western counties have attempted to tap into Minnesota's CORS Network indicating that access to realtime RTK surveying technology is in demand, particularly in more urbanized and changing areas.

Road Centerlines, Address Ranges, and Address Points Data

Foundational Element: Street Address & Street Network Systems
Framework Data Category: Transportation

While added later to the list of Foundational Elements, transportation data, specifically road centerlines and address locations, have always been considered a Framework Data theme and key to many geospatial siting and routing applications. The Wisconsin Department of Transportation maintains a database of interstate and state highways but much local roadway information is maintained at the local level. As county-based GIS operations have become more integrated with local emergency management, address integration has increased in priority as well.

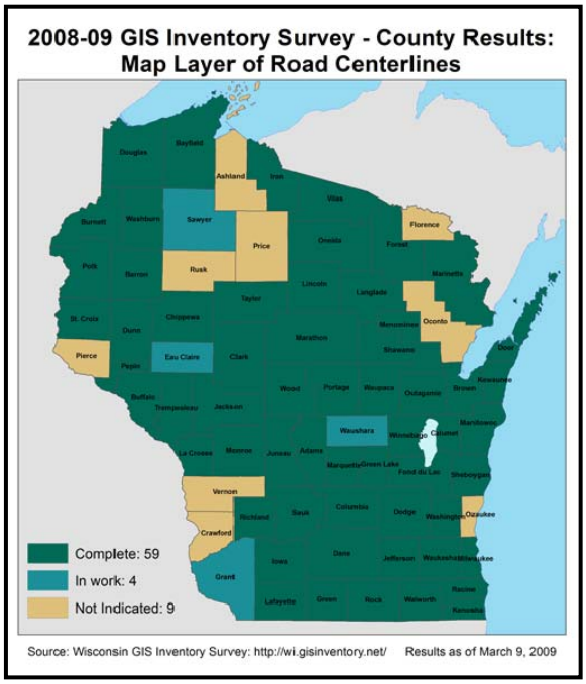

Figure 25 – Road Centerlines

Statistics:

- 59/63 counties reporting these data indicated "complete" for an average of 93.6% complete.
- 48/63, or 76.2%, reported the presence of address ranges as an attribute of road centerlines data.
- 44/62, or 71%, reported "complete" address point GIS data including most who do not maintain address ranges.
- 5 counties 50-75% & 5 counties < 50% complete

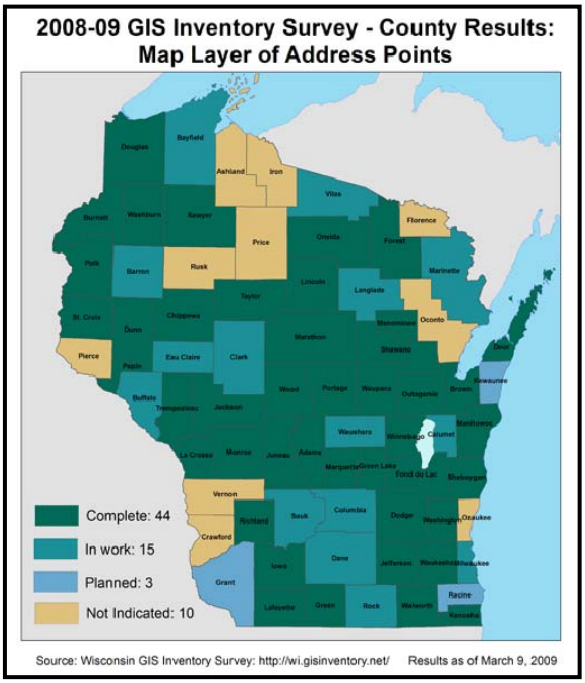

Figure 26 – Address Points

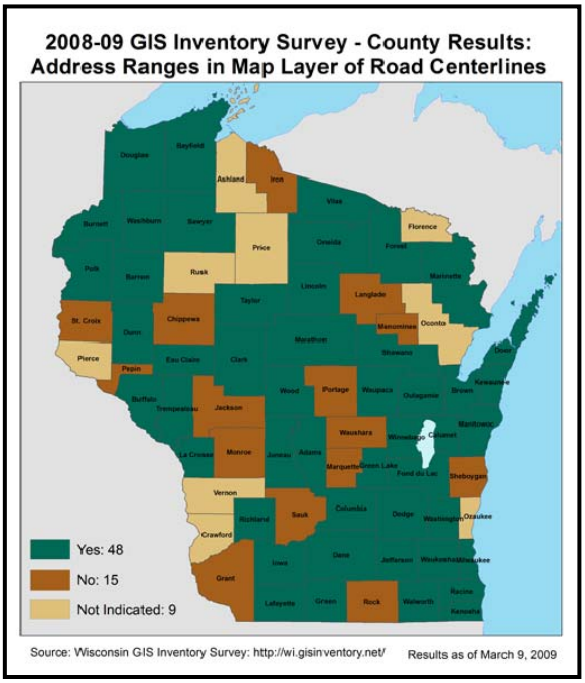

Figure 27 – Address Ranges

Related Information: The Wisconsin Department of Transportation (WisDOT) already exchanges local roads files with counties as part of its Wisconsin Local Roads database (WISLR.) WISLR is used to inventory local roads for proportionate allocation of maintenance funding. In the last five years, several other leading states have pursued production and maintenance of an integrated statewide road centerline file valued for many applications from regional planning to routing and emergency response applications.

Hydrography, Wetlands & Soils

Foundational Element: Natural Resources, Wetlands
Framework Data Category: Hydrography

While the Department of Natural Resources maintains a statewide hydrography database at a scale of 1:24,000, many counties have produced and maintain a local hydrography GIS data layer as well. In many cases, this local hydrography data is a derivative product from recent orthoimagery and is larger in scale and more detailed. While local hydrography data are not typically as robust in the attributes contained, there may soon be a need to address these two differing views of surface water in the hydrologic landscape.

Wetlands, identified as a Foundational Element, are maintained by the Department of Natural Resources and are currently undergoing

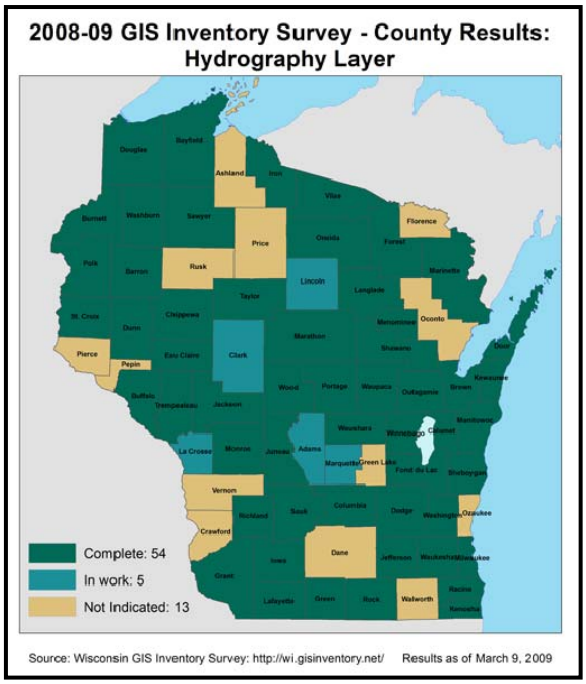

Figure 28 - Hydrography

modernization as part of the Digital Wisconsin Wetland Inventory.

Digital soils information, also a Foundational Element, were completed statewide at an accelerated rate through a cooperative agreement between the former WLIB and the USDA Natural Resources Conservation Service (NRCS) . Statewide digital soils data are available for all counties from the NRCS. These data are a specific example of how strategic investment can accelerate data production and accessibility for use.

Statistics:

- 75% of counties reported "complete" local hydrography data, with another 8% "in work."
- Of these, 6 counties reported a scale of 1:24K – indicating local use of DNR data.
- 36 counties reported a data scale of 1:4800 (1in.=400ft.) or better.
- DNR reports 26 counties with more recently compiled digital wetlands with "orthorectified data" while another 9 counties show "paper maps only."

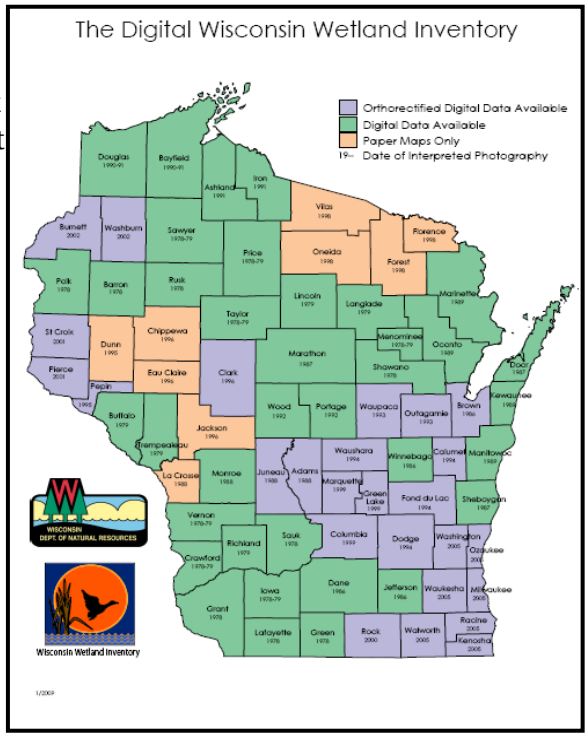

Figure 29 – Wetland Inventory (WI DNR)
http://dnr.wi.gov/wetlands/documents/DigitalWetlandStatusMap.pdf

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Governmental Boundaries

Foundational Element: Administrative and Election Boundaries
Framework Data Category: Governmental Units

Administrative and election boundaries were early identified as a Foundational Element and clear progress is evident in the digital creation and maintenance of these data by counties.

Statistics:

- 2/3 of counties inventoried digital county boundary data – with 33 indicating a compilation scale of 1:4800 or better (17 indicate 1:2400 or better).
- 71 counties (99%) inventoried municipal boundary data – 59 (82%) as complete.
- 53 counties (74%) reported municipal boundary data at a scale of 1:4800 or better (24%=1:4800; 50% <= 1:2400).

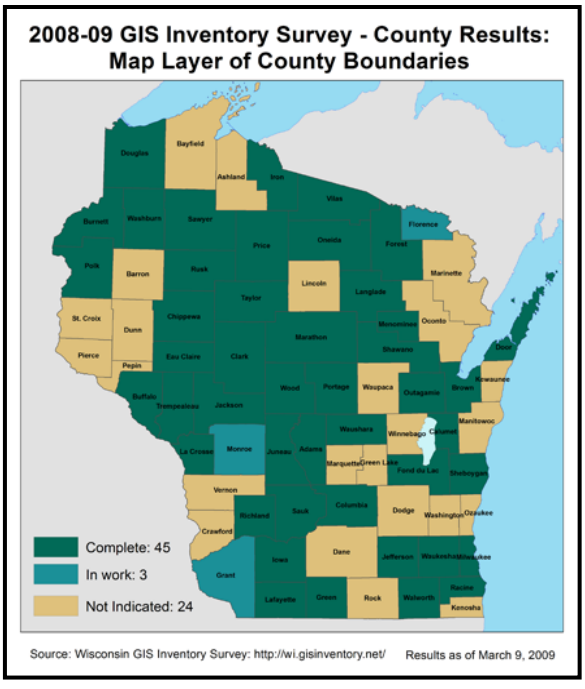

Figure 30 – County Boundaries

- 61 counties (85%) inventoried civil township boundary data – 53 (74%) as complete.

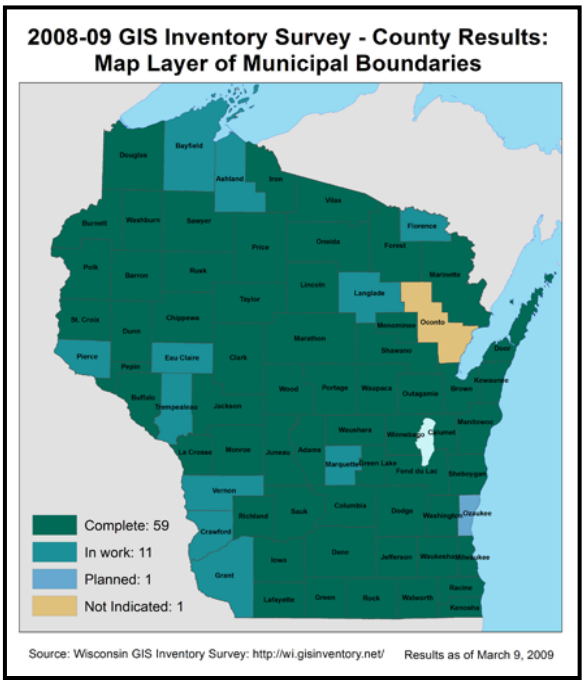

Figure 31 – Municipal Boundaries

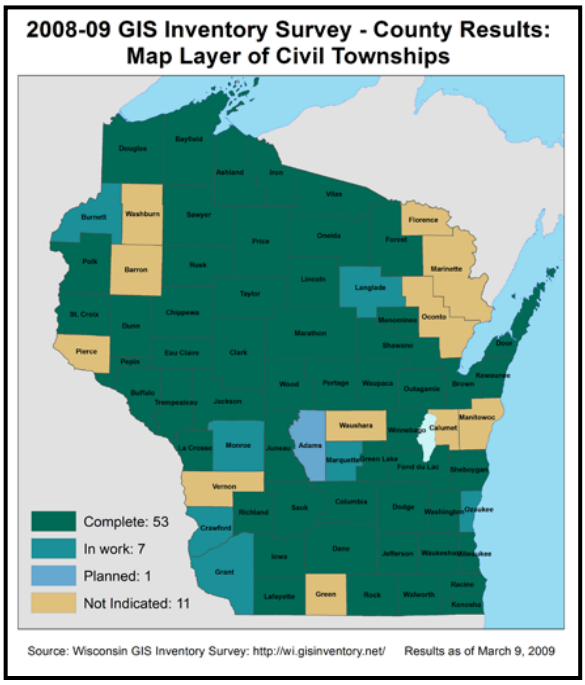

Figure 32 – Civil Townships

Public Access & Institutional Arrangements

Foundational Element: Public Access, Institutional Arrangements
Framework Data Category: None

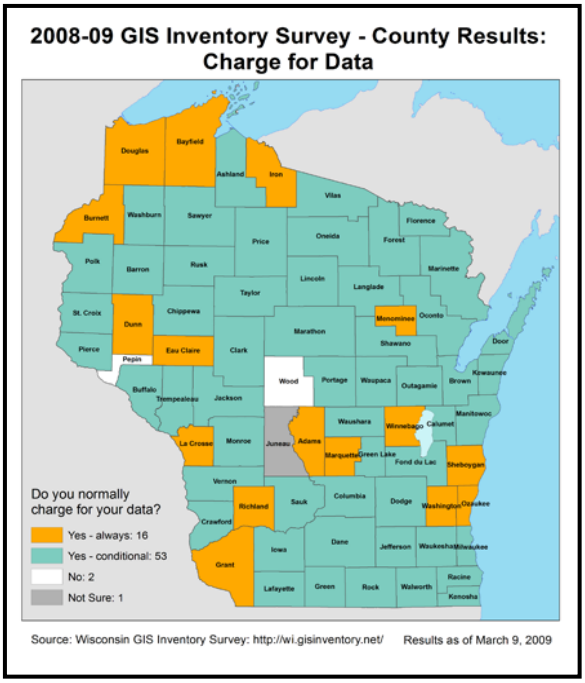

Figure 33 – Charge for Data

While not typically addressed as part of Framework Data discussions, public access and institutional arrangements have long been a part of the WLIP's Foundational Elements as an indication of maturity and outward-facing accessibility of land information. The Wisconsin Land Information Association has hosted a multi-year task force and multiple targeted sessions to assist counties and others in sorting out information policy issues. Looking beyond quantity and quality of data production, data accessibility continues to be identified as one of the most difficult factors preventing widest possible dissemination and use of high quality GIS data not only in Wisconsin but nationwide. While considerations for homeland security, personal privacy and institutional liability all play a role in this scenario, there appears to be a growing need for standardized approaches to these issues in order to ensure maximum return on GIS data investment.

Statistics:

- "Does your organization distribute its geospatial data?" 50 counties = yes; 22 counties= yes, but under limited circumstances.
- 53 counties answered "yes" to having a written distribution policy.
- 58 counties answered "yes" to having "an established policy for permanent off-site backup and archiving."
- 96% of counties reported charging a fee for GIS data – 74% conditionally, 22% always.
- 86% of counties reported waiving fees for governmental programs that benefit their organization.
- 38% (27) of counties license data – 14 always, 13 conditionally.
- 33% (24) of counties copyright GIS data – 13 always, 11 conditionally.
- 65% of counties restrict re-distribution of published GIS data – 21 always, 26 conditionally.
- 88% of counties expressed some level of willingness to contribute data to a statewide repository or clearinghouse – 39% = yes, 49%= maybe.
- 100% of counties indicated some level of willingness to contribute data when needed in case of an emergency – 82%=yes, 18%=maybe. In this case, 47% (34) indicated a signed usage/license agreement would still be necessary.

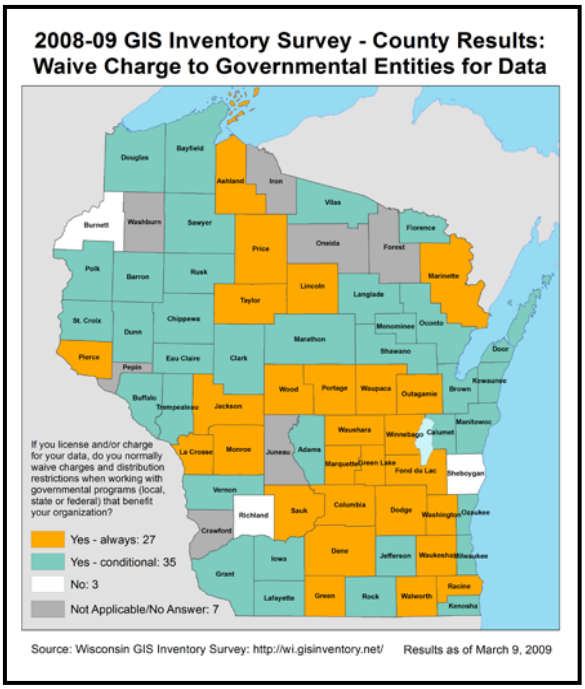

Figure 34 – Waive Charge to Governmental Entities for Data

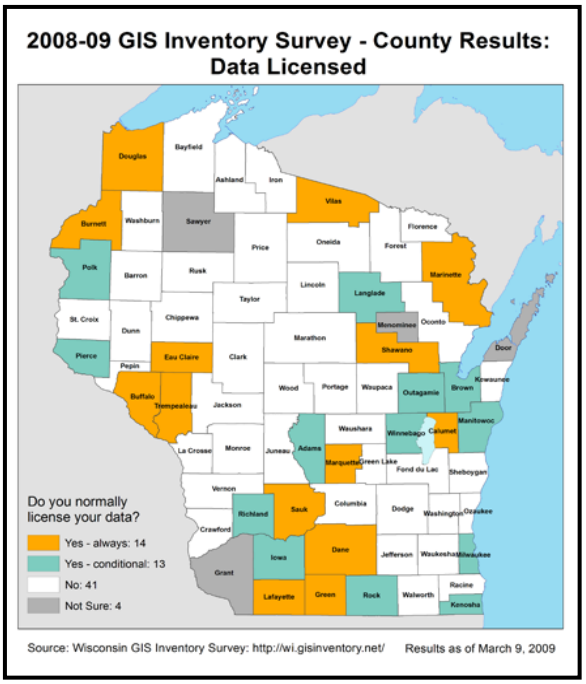

Figure 35 – Data Licensed

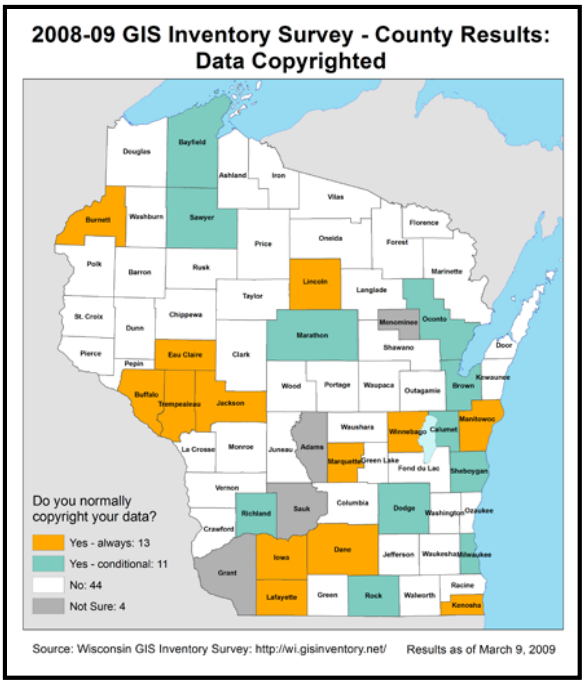

Figure 36 – Data Copyrighted

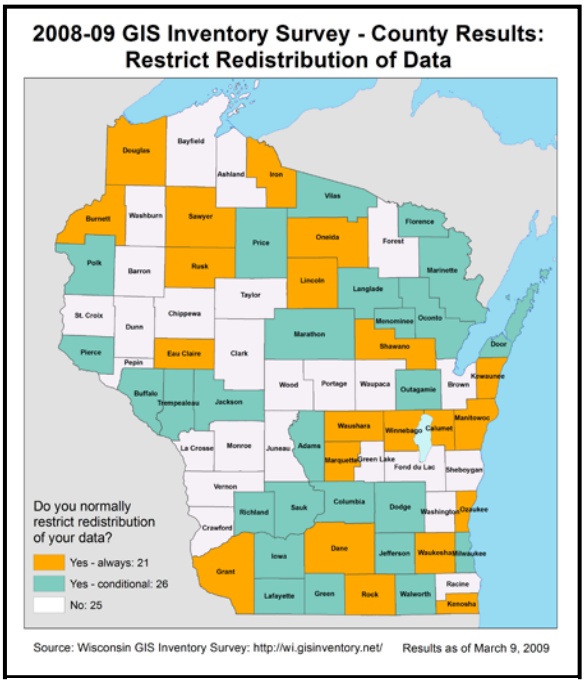

Figure 37 – Restrict Redistribution of Data

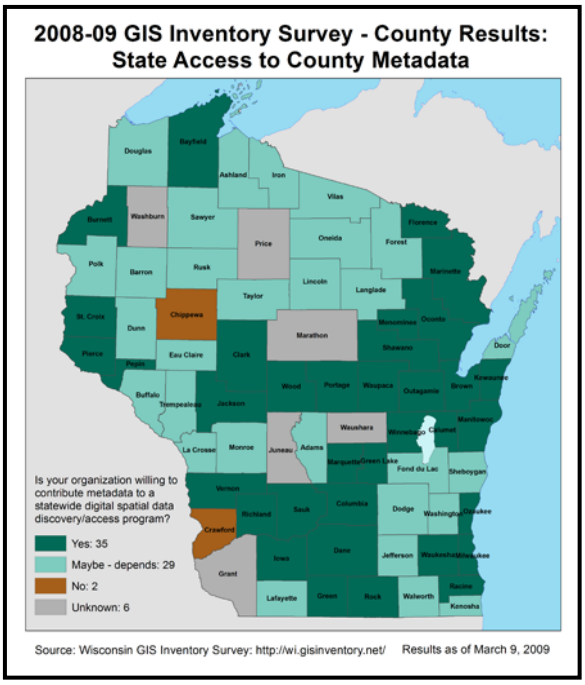

Figure 38 – State Access to County Metadata

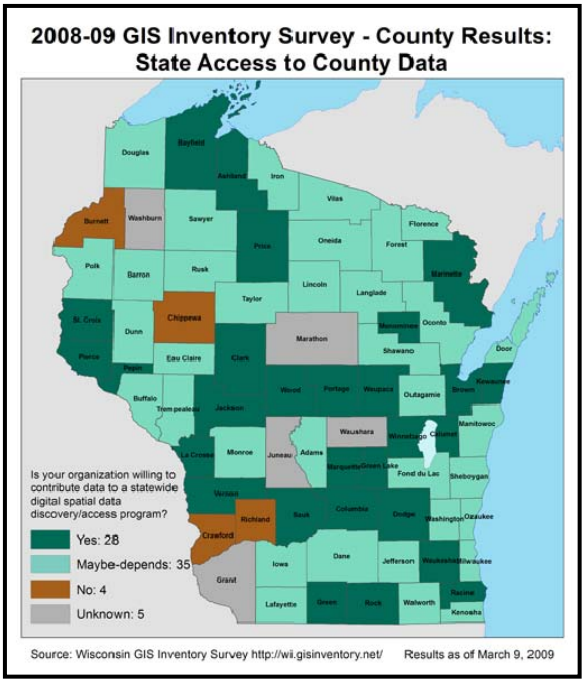

Figure 39 – State Access to County Data

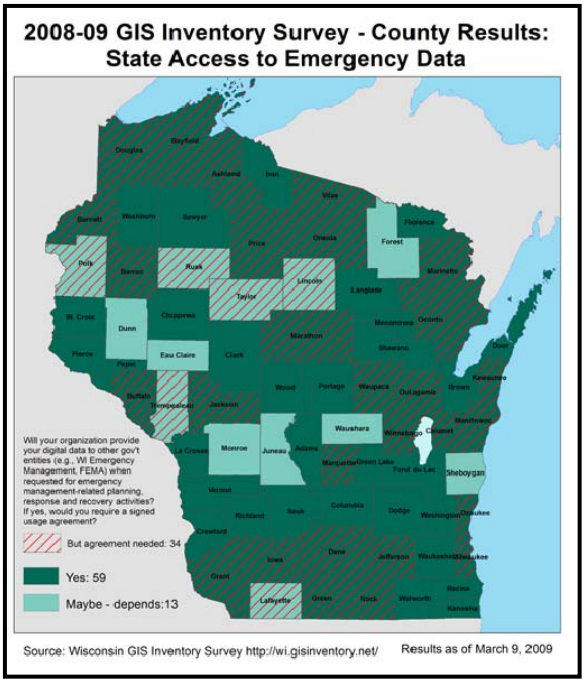

Figure 40 – State Access to Emergency Data

Related Information: In many counties, the advent of online internet mapping and GIS data viewing sites have begun to fill part of the need for wider access to timely local GIS information. Additionally, pursuit of internet mapping capabilities by counties have led to unique multi-county institutional agreements as well as supplementary cooperation with regional planning commissions, of which the Southeastern and Bay-Lake Regional Planning Commissions have been the most active.

Internet mapping sites provide a locally-published view of county GIS data to a wider audience than ever before providing online public access through a web browser. However, differing frequencies of data update, presence of data documentation, and ability to extract more robust formats for additional purposes limit these outlets (in their current form) to addressing

only part of the GIS data access/distribution spectrum. While direct data download might be seen as complementary to this activity, when asked in the survey, "Do you make your data available for download?" only 10 counties responded "yes." The means by which internet mapping sites are acquired and hosted continues to be a variable mix of in-house/private contract/cooperative development as well as in-house/contracted web server hosting.

Internet mapping statistics:

- 41 counties reported "in-house hosting" of their internet mapping site while 18 reported "remote hosting."
- 33 counties reported mapping website development "under contract;" 17 reported "in-house" development; and 14 reported a mix of "both."
- When asked, "What is your most frequently used or successful GIS/land records application?" 34 counties specifically referenced their online GIS mapping site and/or online parcel mapping.
- 0 counties expressed current plans to incorporate commercial mapping services such as Google Maps or Microsoft Virtual Earth into their local site.
- 9 counties expressed some level of familiarity with or intention to pursue Open Geospatial Consortium (OGC) web service publishing standards.

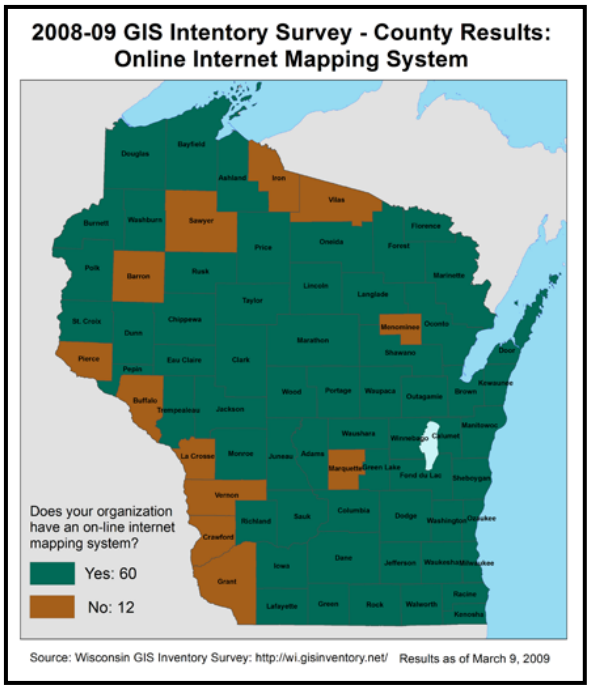

Figure 41 – Online Internet Mapping System

There is perceived growing interest in the use of geographic or *geospatial web services* to further augment online exchange of GIS data in a timely manner. These web services combine advantages of online data delivery with advantages of access to richer data formats. Furthermore, web service publishing supports innovative internal and external GIS data access in an interoperable way to mashups and other Web 2.0-style applications that are quickly taking hold in public and private decision making. In the recent past, full implementation of this type of data publishing has been limited to larger commercial (e.g. Google, Microsoft) and federal (e.g. NASA, USGS, National Weather Service) organizations. But current trends show increasing interest in and economic access to the technology necessary to support web service delivery by state, and in some cases, local agencies.

There is local evidence of these trends as well. The Geographic Information Office (GIO) within the Department of Administration is implementing web services for access to the 'Wisconsin Spatial Data Repository', a facility for integrating and distributing statewide geospatial data layers.

Appendix A: Wisconsin GIS Inventory Methodology

The report is based primarily on self-reported statistics using the *Wisconsin GIS Inventory* tool with answers provided by representatives of Land Information Offices (LIO) in each county. The *Wisconsin GIS Inventory* – an online survey system composed of the core national GIS inventory profile along with a Wisconsin-specific survey profile - was used to fulfill an annual survey requirement for the Wisconsin Land Information Program (WLIP) for both the 2008 and 2009 grant years, which is consistent with the WLIP's administrative rule, Adm. Rule 47.06(4). Only the following sections were actually required to be completed: "User," "Organization," "Systems," "Policies," "My Geography," and "State Questions." The Wisconsin Land Information Association (WLIA) and Land Information Officers Network (LION) both supported the WLIP survey requirement and completion of the survey in full.

The Wisconsin-specific survey profile was developed in the fall of 2006 at the State Cartographer's Office. The office recruited four review teams of community professionals to analyze and reconcile core GIS inventory questions with what had been included in a WLIP Annual Survey from 1998-2003. This analysis resulted in a list of 60 Wisconsin-specific questions that were added to the *Wisconsin GIS Inventory* through a state-specific customization module. Throughout 2007, outreach efforts yielded some early voluntary participation and helped clarify less-understood questions. In early 2008, the *Wisconsin GIS Inventory* tool was presented to the Department of Administration and proposed as the new annual requirement for the Wisconsin Land Information Program.

In October 2008, staff from the WLIP began to meet with AJ Wortley at the State Cartographer's Office (SCO) to create a report summarizing the survey results. Throughout the analysis, staff struggled to categorize the survey questions in terms of Foundational Elements as defined in the WLIP 2004 instructions for countywide plans for land records modernization. However, many of the survey questions do not directly assess the completion status of foundational element categories. Also, several Foundational Elements are institutional in nature and do not lend themselves to simple quantification. The national GIS inventory profile identifies key GIS datasets as "Framework Data." Therefore, staff analyzed the results both in terms of Framework Data and Foundational Elements.

In addition to GIS inventory survey results, a few sources of supplemental information were included where beneficial to more completely describe particular themes. These data were drawn from existing information in both the State Cartographer's Office and DOA-Division of Intergovernmental Relations and have been referenced where appropriate.

After an initial preliminary assessment of the survey results, it was obvious that the participation rate for many survey questions was not adequate to give a statewide assessment for many areas. Follow-up was needed in addition to some supplemental sources. Therefore, a memo was sent to LIO's on January 16, 2009 requesting them to update their survey profiles by January 23, 2009. It was explained that this would meet the survey requirement in the spring for 2009 WLIP grants. In order to clarify which survey responses were *most* important, a spreadsheet of draft summary results was attached to the memo with highlighted fields where information was missing.

AJ Wortley (SCO) and Peter Herreid (WLIP) both gave a presentation of preliminary results of the survey to LION on February 19, 2009. In light of the LION presentation, on February 23, 2009, another memo was sent to LIOs allowing for another opportunity to make any corrections or address any omissions by March 6, 2009. In order to finalize a report in a timely manner, survey results as of March 9, 2009 had to be final for purposes of this report, aside from some phone calls to LIO offices related to mapping layers for county zoning.

The online survey system will exist well beyond the next year such that LIOs and others can add or correct survey inventory information from previous years. It is intended that this report be updated with survey information in 2010.

Appendix B: Wisconsin GIS Inventory 2009 Map Illustrations

Due to file size limitations, Appendix B – page-size map illustrations from the report – can be accessed separately online at the following URL: www.doa.state.wi.us/WLIP