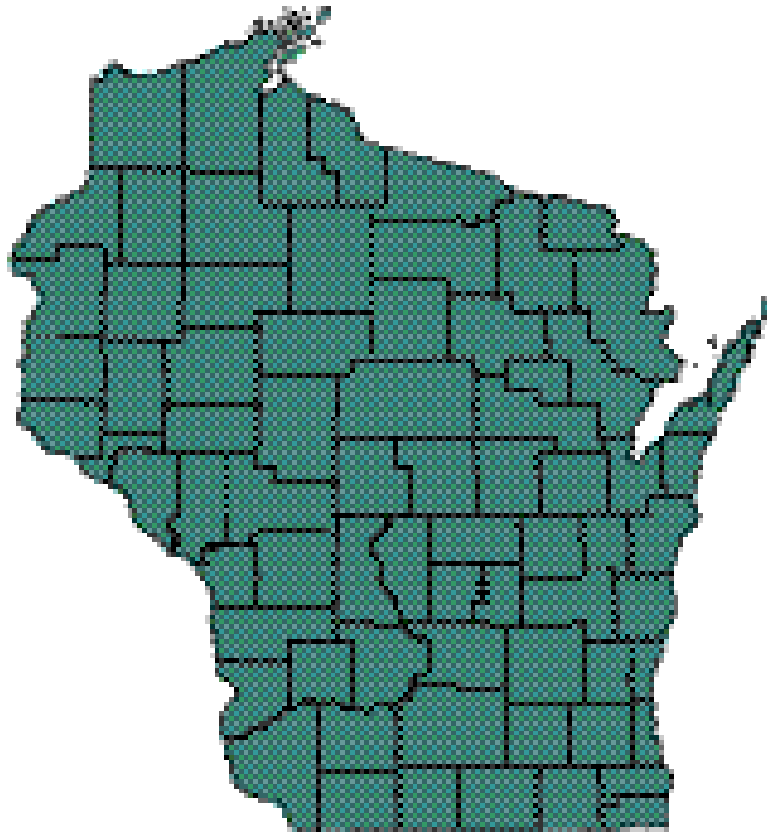


Land Information Modernization Activity in Wisconsin: Impacts, Status and Future Tasks 1990-2000



 Wisconsin Counties Participating in the WLIP

**A Report for the Wisconsin Land Information Board
and the Strategic Assessment Task Force**

January 2001

Cover: All 72 counties actively participate in the Wisconsin Land Information Program (WLIP).

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Preface

This report has been prepared for the Wisconsin Land Information Board and the WLIB's Strategic Assessment Task Force, a temporary task force of the Wisconsin Land Information Board.

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Executive Summary

Modernization of Wisconsin's 150-year-old land records system is progressing in a timely and thoughtful process due to the establishment of the Wisconsin Land Information Program (WLIP) in 1989:

- The State of Wisconsin as a whole is viewed as the most progressive state in the Union for the implementation of modern land information systems (LIS).
- All 72 counties are actively pursuing land records modernization (see cover figure).
- By 2003, about 60% of the originally designated foundational records will have been modernized, and 80% of all property records will be modernized.
- The WLIP has accomplished and will continue to carry out its legislative charges.

Modernization investments have resulted in numerous types of economic benefits:

- The six-dollar increase in the Register of Deeds' recording fee has resulted in a \$71-million information investment over the past decade. Equal matching funds by Wisconsin local governments have been generated both in new dollars and in-kind contributions.
- New companies have been formed and older companies have expanded their expertise and skills. Now, Wisconsin companies are moving new outlets into other states. These efforts have resulted in new jobs, higher-paying jobs, and jobs with a future.
- Because of modernization of land records, citizens and companies who purchase real estate in Dane County are saving an estimated \$6 million annually from reduced title insurance costs. Also, because of more accurate land records, citizens in Winnebago County are paying an estimated \$14 million less in flood insurance costs over the life of their mortgages.
- New applications and uses of modernized record systems are now emerging, such as comprehensive land use planning and public-safety and emergency government applications. Access to digital data generated by the WLIP from these systems is reducing the cost of these applications.
- A variety of local units of government are availing themselves of new information management and analysis technologies resulting in more efficient and effective products and procedures.

Modernization investments have created new working partnerships among various units of government and its citizens:

- Over 650 people and 40 businesses from throughout Wisconsin and nearby states have come together as part of the Wisconsin Land Information Association (WLIA). This group has embraced the basic idea of the WLIP, and the development of a federated land information network to provide the needs of all land information users in the state. Additionally, these individuals and companies have volunteered thousands of hours of their time to help define the WLIP and have worked tirelessly in its support.
- More county departments have developed arrangements supporting a variety of applications through shared databases (see Table 4).
- A new cooperative working-partnership memorandum of understanding (MOU) has been created between the Wisconsin Land Council (WLC) and the WLIP.
- With the pending implementation of the Wisconsin Land Information System (WLIS), the modernization of local governmental records offers private and public users on-line access to up-to-date detailed information statewide.
- A new funding partnership (one-third state and two-thirds federal) has been established between the Natural Resource Conservation Service (NRCS), the WLIP, and state agencies that will result in statewide digital orthoimagery by 2001 and complete digital soils mapping by 2005.

This progressive flurry of activities and programs is not without new challenges and tasks:

- More effective standards need to be developed and adopted by the land information community to assure reliable and informed decision-making and to ensure that records can be integrated across all jurisdictional and administrative boundaries.
- Ensuring public and private access to this modernized information while protecting privacy rights is an area that needs attention and solutions from the information community and legislators.
- More active participation by state and federal agencies is needed to ensure that duplication between data development and system operation is minimized, and the public and private sector modernization investments are maximized.
- The land information community needs to pursue assertively the implementation of the Wisconsin Land Information System (WLIS). The implementation of WLIS is crucial for achieving long-term benefits and effective use of WLIP's past and ongoing investments. Implementation of WLIS is fundamental to many of the land use and information issues the state faces now and in the future.
- The WLIP and its Board must continue to provide overall program management to sustain its original vision and to monitor progress, ensuring that this public investment is prudent, useful, equitable and sustainable.
- Investment in local government and application development must continue in order to provide for a successful WLIS.

A Decade of Progress Through Modernization

The Wisconsin Land Information Program (WLIP) is approaching its tenth anniversary as the premier local land records and information modernization program in the country. It is therefore an appropriate time to take stock of how the program is doing: what it has accomplished, the multiple benefits it has generated, and the tasks that still need to be addressed to fully implement Land Information Systems (LIS) across the entire state.

The accomplishments that the WLIP has made through the WLIP need to be measured in terms of the systems of land records that the WLIP program was designed to address. As noted in Table 1, the annual costs to collect, maintain and share records for all levels of government and private utilities are substantial. Although these costs are based on extrapolation of 1976 expenditures using the consumer price index, they are useful to show the relatively modest investment in modernization compared to the overall costs of land records systems.

Table 1
Estimate of Annual Costs of Maintaining Land Records in Wisconsin: 1990-1999
 (1) (Larsen et al., 1978)

Year	Local Government Cost (Millions of dollars)	Total Cost (2) (Millions of dollars)
1990	94	180
1991	98	187
1992	101	193
1993	104	199
1994	107	203
1995	110	210
1996	113	216
1997	116	221
1998	117	224
1999	120	229
TOTAL	1,080	2,062

(1) Based on 1976 Wisconsin Dept. of Administration study costs, inflated by Consumer Price Index.

(2) Local, State, and Federal Government, plus private utilities.

Over the ten years of the WLIP, the costs to maintain the existing land records system have totaled \$2.06 billion. During this same period, the ongoing cost to counties alone has totaled over \$1.0 billion. It should be noted that the cost estimates in Table 1 are conservative, especially in light of the rapidly expanding use of land records and land information in recent years. New and more comprehensive uses of land information during this period include floodplain and wetlands mapping, public safety and emergency government, and recently emerging use of this information for comprehensive land use planning.

The funds generated by the WLIP for this same ten-year period total \$71 million. These WLIP funds amount to only about 3.5% of the ongoing land records costs for governments and utilities in Wisconsin.

Therefore, this report documents that the WLIP was designed to improve, not replace, the existing land records system; and it has produced major accomplishments with a modest investment, compared to ongoing land records system costs.

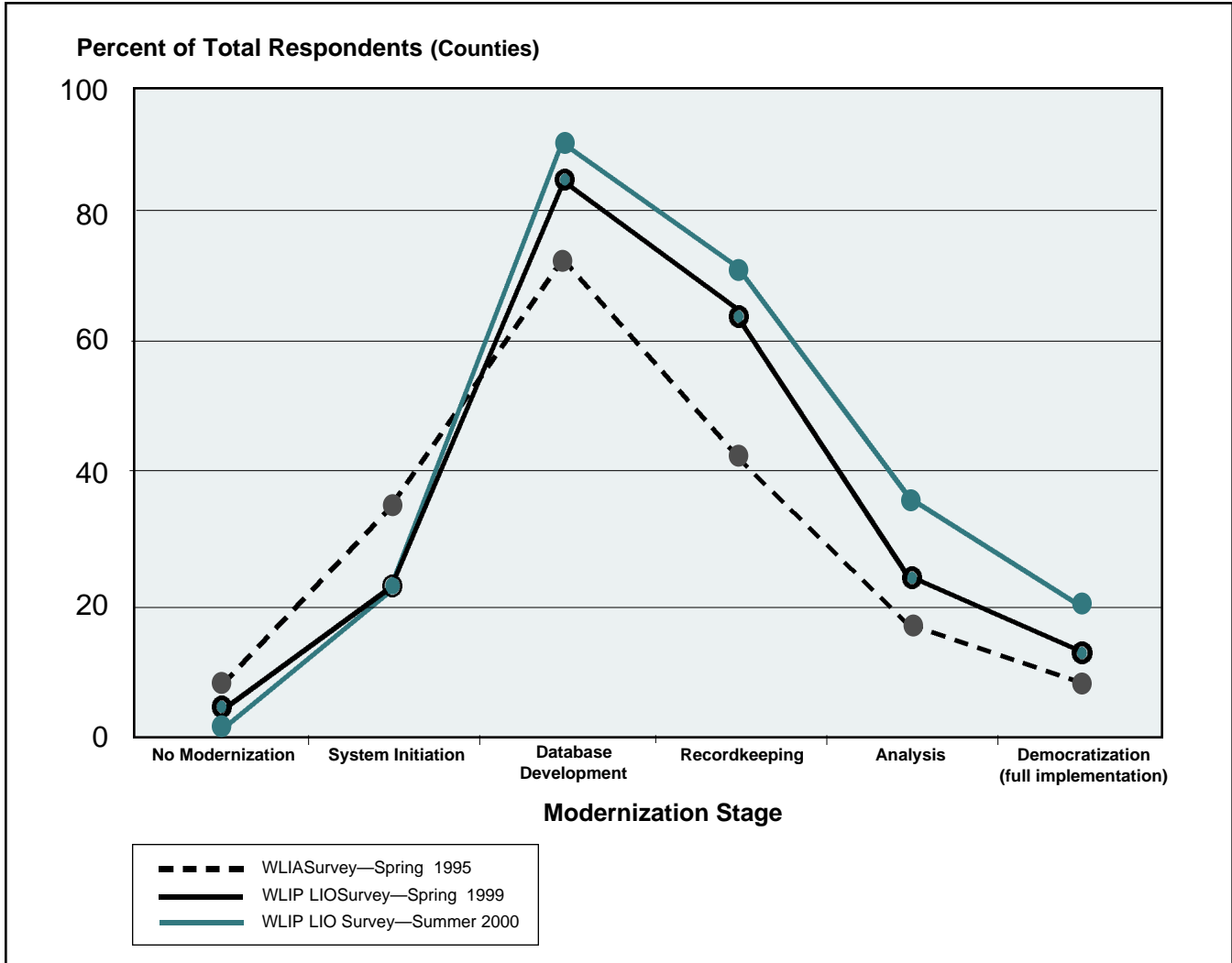
We note here five impacts: *functional, economic, technical, institutional and applications*. We document these impacts and outline a number of applications that have either been made possible by, or greatly benefited from, the availability of modernized land information systems and the accurate, up-to-date data that reside therein.

We also note that the progress of land information system modernization has been continuing and increasing over the life of the WLIP program. This progress is illustrated in Figure 1 showing the status of six stages of Land Information System development: no modernization, system initiation, database development, record keeping, analysis, and democratization (full implementation) (Tulloch, 1997). These data, from surveys of the WLIP and the land information community (i.e., Wisconsin Land Information Association), illustrate the steady increase toward the more advanced stages of modernization, i.e., the five stages to the right of “no modernization” in land record systems.

Summary: A Decade of Progress through Modernization

Ten years after the establishment of the Wisconsin Land Information Program (WLIP) by the Wisconsin Legislature in 1989, \$71 million in WLIP funds have been invested across Wisconsin’s local governments to modernize the state’s 150-year-old paper-based land records management system. All 72 counties and many other agencies participate in the WLIP. Benefits have been sustained and widespread in many applications. Local initiatives continue to build on a decade of progress.

Figure 1
Stages of LIS modernization: 1995-2000



Sources: Tulloch, David L. 1997. "A Theoretical Model of the Life Cycle of Community Land Information System Development," PhD dissertation, University of Wisconsin-Madison.

Wisconsin Land Information Program Surveys, conducted in Spring 1999, Summer 2000

Hart, David A. 2000. "Building a Horizontally and Vertically Integrated Coastal GIS Using Local Government Spatial Data: The Case of Coastal Erosion Hazards on the Lake Michigan Coast of Wisconsin," PhD dissertation, University of Wisconsin-Madison.

Legislative Charges and Their Accomplishments

Over the past ten years, the WLIB has met its responsibilities as defined in state statutes within the limits of funding and staff availability.

Serve as the State Clearinghouse for Land Information and Land Information Systems

A clearinghouse service has been created on the Internet (WISCLINC) to serve WLIP data and associated metadata. WISCLINC is also a registered node on the National Spatial Data Clearinghouse Network. The WLIB has recently completed a \$72,000 contract with the State Cartographer's Office to enhance and expand WISCLINC. WISCLINC also will be a structural foundation for the proposed Internet-based Wisconsin Land Information System (WLIS).

Provide a Program of Technical Assistance and Advice to State and Local Governments

A technical assistance service in the form of a list-serve (LIO-Tech) has been operating for approximately four years. LIO-Tech is an extremely valuable resource for sharing technical and policy-related information.

Administer a Program of Grants-In-Aid to Local Units of Government and Review for Approval Applications for Grants-in-Aid from Local Governmental Units

- For ten years, all grant funds available to the Board have been successfully awarded.
- A revised administrative rule governing the award of local grants became effective June 1, 2000. The rule, which was created from widespread public input, identifies four grant categories: base budget, training and education, contribution-based, and strategic initiative.
- Base-budget grants guarantee certain counties minimum funding levels.
- Training and education grants guarantee funding to all counties to acquire the skills necessary to participate in the program.
- Strategic initiative grants allow the Board to provide funding to critical needs within the program.
- The grant program has successfully passed an internal audit.

Develop Appropriate Policies, Standards and Guidelines to Coordinate the Modernization of Land Records and Information Systems

In addition to standards adopted in earlier years, within the past year, the Board has adopted a parcel-mapping content standard, and a metadata content standard that is consistent with the federal metadata standard.

Review for Approval County-Wide Plans for Land Records Modernization, and Review for Approval Agency Plans for Land Records Modernization

Over the past two years the WLIB has approved second-generation plans for all 72 counties. These plans guide the county's modernization activities, and all WLIP county project grant applications must conform to the approved plan. Eleven state agencies must submit plans to the Board every two years. The next round of plans is due from the agencies in 2002.

Direct and Supervise the Land Information Program

- Supported the WLC's Tech Working Group and the Joint WLC/WLIB Project Team's recommendations for the design and development of the WLIS.
- For three consecutive years, the Board has conducted an annual survey, completed by the County Land Information Offices, with the purpose of assessing the program's expenditures and completion progress at the local level. This survey is now Web-based, can be filled-out on-line, and as a result is much easier to complete than the earlier paper-based survey.
- A new Administrative Rule, effective June 2000, was instituted to govern the administration of the local grants-in-aid program.
- The grants-in-aid application process has been highly simplified and the application time period has been placed on a standardized annual schedule.
- Allocated \$415,000 in Program funds annually for six years to complete digital soils mapping statewide.
- Allocated \$72,000 over the past 1-1/2 years to expand and enhance the Program's land information clearinghouse.
- In 2000, approved second-generation modernization plans for all 72 counties.
- Currently is in the process of conducting a strategic assessment of all 15 of the Program's foundational elements.
- In 2000, adopted a Strategic Initiative Grants policy that encourages and accepts public input. For the 2000 grant period, the Board allocated \$100,000 toward a statewide strategic initiative.
- In 2000, adopted standards on parcel mapping and metadata.
- Successfully passed a sunset review conducted by Lieutenant Governor Scott McCallum for the 1997-99 biennial budget.

Functional Impacts

There have been a number of functional impacts of the WLIP that have made improvements in how government is organized and how it functions. These organizational and functional improvements have an impact on public decision-making, particularly as to the extent and means by which citizens can participate in decision-making. This broader-based citizen participation is termed democratization. Several of the most significant impacts are:

Empowerment

- Over 30 years ago, Philip Lewis (Lewis, 1996) and Ian McHarg (McHarg, 1992), pioneers in comprehensive planning research, called for statewide inventories using mapped data representing both natural and cultural factors. They suggested that, if merged using an overlay process, these would be extremely useful for comprehensive land planning and management purposes. This land information system (LIS) can now be created in every Wisconsin county using modern computerized systems.
- LIS systems now provide ready access to comprehensive land data for public and private sectors that can be used for a variety of land information planning and decision-making activities.
- Citizens are now able to retrieve information about their property from the Web, empowering them to look at comparable home values and related land use activities around them.

Innovation

- The Wisconsin Land Information Board (WLIB), established by the Governor and Wisconsin Legislature, has forged and leads the development of the most innovative local land records modernization program in the country.
- All 72 Wisconsin counties developed and follow land record modernization plans, and participate fully in the WLIP.
- Hundreds of local and state agency personnel have benefited from training and education opportunities that the WLIA and the WLIB have provided over the past 10 years.
- The training and education provided by the WLIP and WLIA have led to increased opportunities for the trainees, including expanded opportunities for career growth.
- County and state agency staff working on WLIP-supported activities have become empowered within their agency, enabling them to have greater influence on decisions related to many land-management and land-development programs and projects.

Partnerships

- A variety of new, working modernization partnerships between local governments has emerged, resulting in joint data-development projects, development of new applications, joint sharing of data, and access to additional funding.
- A new cooperative working partnership has been initiated and codified in a memorandum of understanding (MOU) between the recently established Wisconsin Land Council (WLC) and the WLIB. The MOU has resulted in joint endorsement of the Wisconsin Land Information System (WLIS) and the recommendation that the Governor fund and implement it as part of E-government.
- In January 1999, the WLIB committed program funds to a partnership with the Natural Resources Conservation Service (NRCS) for the completion of digital soils mapping (a WLIP foundational element) statewide by 2005. This was a new funding relationship for the Board, which was aided with state funding provided by three agencies. When completed, Wisconsin will be one of only three states to have border-to-border digital soils mapping coverage.

This NRCS partnership specifies the digital conversion of existing surveys for 29 counties, and fieldwork and digital soils mapping for nine additional northwestern counties. Overall, the NRCS will be contributing nearly \$8.0 million (2/3 of the total cost) to this \$12 million project. An added benefit realized from this partnership is the completion of digital orthophotos statewide. As an accurate base image for soils mapping, the NRCS requires digital orthophotos. For this project, they ordered and paid for digital orthophotos for 45 counties that had not yet completed their orthophoto program.

Leadership

- As a result of the WLIP, Wisconsin government, both at the state and local level, is recognized as being a leader in information technology generally, and in adopting electronic methods for serving citizens of the state more efficiently and more effectively.
- State universities, in the spirit of the “Wisconsin Idea,” especially UW-Madison and UW-Milwaukee, have provided leadership in both training and education, and in research and development on building, maintaining and implementing cutting-edge land information systems.
- Nationally, the Wisconsin program is heralded as a model that other states emulate. At least three other states have recently adopted program or legislative provisions based on the WLIP to fund their land records modernization efforts: Illinois, Michigan and Oregon. Other states such as Arkansas are contemplating similar programs.
- Wisconsin leadership in land information system improvement is also evidenced by the steady stream of requests from other states and countries for presentations and speeches on the Wisconsin Land Information Program. Recent requests have come from the states of Minnesota, Nebraska, New York, Illinois and Texas, and the countries of Jamaica and Albania.

- The leadership of Wisconsin in developing an innovative program for land records modernization has been recognized through the award of a number of federal grants to support WLIP related activities. These grants include:
 - 1) a Community Demonstration Project in Dane County;
 - 2) an FGDC grant to develop a user-friendly, Web-based system for accessing geodetic data (from local, state and federal data files);
 - 3) an FGDC grant to build on the WLIP survey of benefits and progress of the WLIP;
 - 4) an FGDC grant to the State Cartographer's Office and WLIP (DOA) to develop and operate one of the first land information clearinghouses in the country; and
 - 5) a recent FGDC grant to the State Cartographer's Office to develop Web-based methods of accessing digital orthophotos.

- Many Wisconsin counties have made major strides in documenting their data files by adopting and using the Digital Geospatial Metadata Content Standard developed by the Federal Geographic Data Committee (FGDC). Use of this standard is the direct result of WLIP-led training of over 100 individuals who work on local and state government land information systems.

- Dane County and the UW-Madison were awarded Vice President Al Gore's National Partnership for Reinventing Government "Hammer Award" for their roles in the National Spatial Data Infrastructure (NSDI) Community Demonstration Project sponsored by the FGDC.

- The recent National Framework Survey conducted by the FGDC and the National States Geographic Information Council found that Wisconsin is far in the lead in the development of locally produced digital data for many important land record "layers" (NSGIC/FGDC, 1999).

Summary: Functional Impacts

The WLIP is recognized by many as the most innovative and successful land records modernization program in the United States.

Economic Impacts

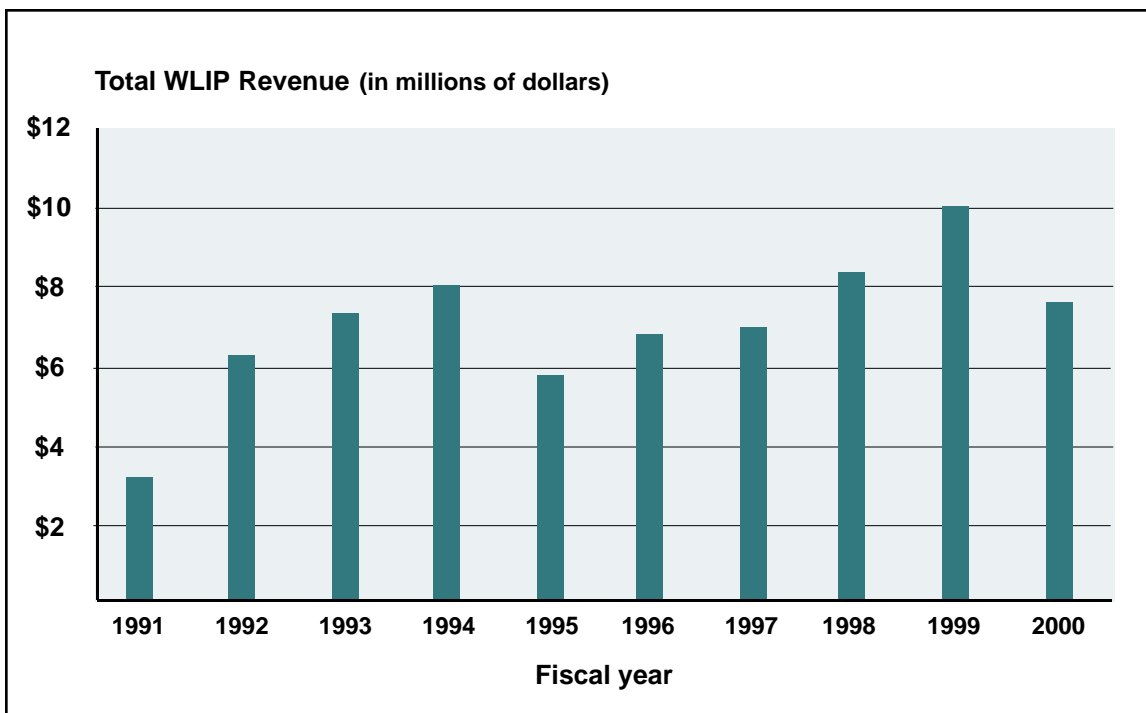
It is nice to be recognized as a leader, especially in an innovative program such as the WLIP. However, the actual economic benefits of the WLIP are even more important to the citizens of Wisconsin. These include both direct and secondary economic benefits.

Direct Investments in Land Records Modernization

- The land records system modernization investments noted earlier (i.e., the average of \$7 million annually since 1991) are not insignificant (see Figure 2). However, these WLIP investments are small, relative to the \$229 million expended in Wisconsin by 1999 for the collection, maintenance and dissemination of land information by local, state, and federal agencies, and private utilities (see Table 1).

Figure 2

WLIP revenues: 1990-2000 [data provided by Office of Land Information Services (OLIS)]



- Also, the investments of WLIP program funds have been matched with funds from a number of other sources. The annual survey in 1994 indicated that these additional funds have effectively nearly doubled the total investments made in land records modernization in the state (Tulloch and Niemann, 1996).

Other Direct Benefits

- Increased federal financial support from the NRCS to modernize the soils statewide amounting to \$8 million in additional new federal contributions to the state.
- Decreased cost for title insurance for buyers of property in Dane County (annual savings estimated at \$6 million per year by the Dane County Register of Deeds) (Licht, 1998). Additional savings result from reduced office and storage space, and fewer staff to manage records.
- Decreased cost for floodplain mapping and flood insurance in Winnebago County (savings estimated at over \$14 million for 1100 buildings over the life of a 30-year mortgage, plus the affected properties have increased in real estate values by more than \$10 million) (Schmidt and Lulloff, 1998).
- The federal information technology grants, as noted under Functional Impacts, linked to the WLIP.
- Increased financial support for the National Consortium for Rural Geospatial Innovations (RGIS), with administrative headquarters at the University of Wisconsin-Madison.
- Eliminated Special Assessment District taxes in Waukesha County for parcel owners outside the district. As an example, tax refunds were recently provided to 75 owners living outside the Phantom Lake District. This is one of 75 lake districts in Waukesha County.

Secondary Benefits

Secondary benefits, while sometimes more difficult to quantify and monitor, often are the most significant in terms of the total economic return from a program. Benefits that have been identified as flowing from the WLIP for land record modernization in Wisconsin include:

- Several new Wisconsin technology-based companies have been started and a number of companies have expanded and adapted their business practices to provide consulting, software, and related services in support of the WLIP. Also, 24 Wisconsin companies are members and business partners of the WLIA. Several notable examples of recent start-up and expanding companies are:

GeoAnalytics, Inc.: This firm did not exist five years ago, but now is a thriving company, headquartered in Madison, Wisconsin, employing over 30 professionals with an annual payroll well in excess of \$1 million. GeoAnalytics is a geographic information technology company offering consulting and software development services. The company has expanded outside the state as well, and now has offices in Chicago, Illinois and West Palm Beach, Florida. The principal owners of this company trace their professional roots directly to the WLIP, one as a former executive director of the WLIP, and the other a project leader and applications developer with the UW-Madison Land Information and Computer Graphics Facility.

UCLID Software, Inc. : This 27-employee firm located in Madison started in March, 1998. UCLID produces a highly rated software product (IcoMap) for converting parcel maps and related documents into digital maps and associated electronic documents. Earlier this year, IcoMap received the Governor's "Best of the State" new product award from the Wisconsin Society of Professional Engineers, an award recognizing engineering and scientific contributions to economic growth in Wisconsin. Curt Szymanski, UCLID CEO, says that many people involved in the WLIP played significant roles in getting this software developed and tested. The product is now being marketed nationally, and Szymanski says his experience has clearly shown that Wisconsin is the most progressive state in the nation in regards to land records modernization.

Ayres Associates: Ayres is a long-established engineering/scientific/photogrammetric mapping/surveying firm headquartered in Eau Claire. Its photogrammetric mapping operations and some of its consulting-services staff are located in Madison. Fred Halfen, VP of Operations for the Madison office, estimates that over the past 3 to 4 years Ayres has added 20 positions as a result of WLIP-related projects. These are professional positions requiring university-level education. Of the 20 new positions, 90% have been filled with UW System graduates.

- In addition to new companies and the expansion of established firms, numerous support-related positions within these firms have become higher paying and more satisfying to the employees, who have increased opportunities to become more skilled and more employable.
- Wisconsin's leadership due to the WLIP has resulted in out-of-state firms coming to Wisconsin to learn about the program and gain experience which they have taken back to their home state. Minnesota and Illinois are notable examples. Of the 40 corporate members of the WLIA, 16 are firms located outside of Wisconsin.
- Conversely, Wisconsin's leadership has provided expanded opportunities for Wisconsin companies to provide services in adjoining states, based on experience gained with the WLIP. Florida, Illinois, Iowa and Michigan are notable examples.
- Increased competition among software companies has produced lower software costs for Wisconsin counties and state agencies (e.g., ESRI, Intergraph and AutoCad products). The costs of company-sponsored training and support have also been lowered.
- One indicator of the national impact of Wisconsin companies providing services to improve land record systems can be seen in a recent issue of the *URISA News* (newsletter of the Urban & Regional Information Systems Association—a nationwide professional organization.) In the *News'* Consultant Directory, four of the nine consultants who chose to list their business have Wisconsin addresses (*URISA News*, May/June 2000).
- Because the WLIP is a statewide program, base budget provisions of the WLIP local grants program provide counties base-level funding for land records modernization. This redistribution of funds is designed to help assure completion of foundational data layers statewide. Additional benefits will accrue with the availability of these data on a statewide basis, compared to having data only available for counties in the state with the most active real estate markets.

Summary: Economic Impacts

Direct economic benefits from the WLIP include \$8 million in federal funds as a part of a statewide soils modernization program, partnering with the Natural Resource Conservation Service (NRCS). Other direct benefits include reduced annual title insurance costs of an estimated \$6 million to Dane County land owners and reduced floodplain insurance costs of an estimated \$14 million over the life of 30-year mortgages in Winnebago County.

Secondary economic benefits include the creation of consulting and software development companies resulting in many new well-paid jobs. Existing companies have also expanded. One such professional engineering firm has created 20 new positions. One of these new software development companies was recently awarded the Governor's "Best of the State" new product award from the Wisconsin Society of Professional Engineers.

Technical Impacts

Ten years ago, the Wisconsin Legislature and the Governor, with assistance from the land information community, began a collective journey to transform information about the land from a 150-year old paper-based institution into a digital world reflective of, and in step with, the information age. As a result, many technical accomplishments are now in place.

Status of Modernization

- Modernization of land records and the resultant implementation of the LIS is an evolutionary process known as diffusion. A new technology, as it matures and is adopted, goes through various stages—from initial adoption to full deployment. Such is the case with information technology (see Figure 1).
- As one would expect, investment in modernization is, over time, helping to diffuse technology from the development stages—“no modernization,” “system initiation” and “database development”—to the application stages—“record keeping” and “analysis”—to the fully operational stages. And, as described earlier, implementation is occurring at a level where a variety of constructive benefits and users have begun to emerge.
- Of the original five technical foundational elements established in 1989, 39% had been modernized statewide by the end of 1999. In 2001, digital orthoimagery and a digital elevation model (DEM) will be completed. By 2003, modernization will increase to about 61%, and in 2006 to about 65% when the soils and proposed wetland initiatives are scheduled for completion. The 2006 estimate is a conservative estimate because it does not include any WLIP dollars or investment for the period 2003 to 2006.
- Of the expanded foundational element list established by the WLIP in 1996 totaling 18 items, 28% had been modernized by the end of 1999. In 2001, digital orthoimagery and a digital elevation model (DEM) will be completed. By 2003, modernization will increase to about 51%, and to about 61% by 2006 when the soils and proposed wetlands initiative are scheduled for completion. The 2006 estimate is a conservative estimate because, again, it does not include any investment of retained or grant WLIP dollars for the period 2003 to 2006.
- Parcel mapping modernization has been one primary focus of the program. Through 1999, 16 counties have completed the mapping of parcels (see Figure 3); by 2003, 82% of all of Wisconsin’s parcels are expected to be completed (see Figure 4). And by 2003, 44 counties will have completed parcel mapping (see Figure 5). This accomplishment is seen as the crucial backbone for a variety of local, regional, and statewide multipurpose applications including Wisconsin’s recently required “Smart Growth” comprehensive land use planning programs (66.0295, Wis. Statutes).
- Adoption of CAD and GIS software to support the modernization by local Wisconsin governments has grown dramatically. In 1994, when the first annual WLIP Survey was conducted,

Figure 3

Percent of parcel mapping complete in digital format in Wisconsin counties: 1999-2003

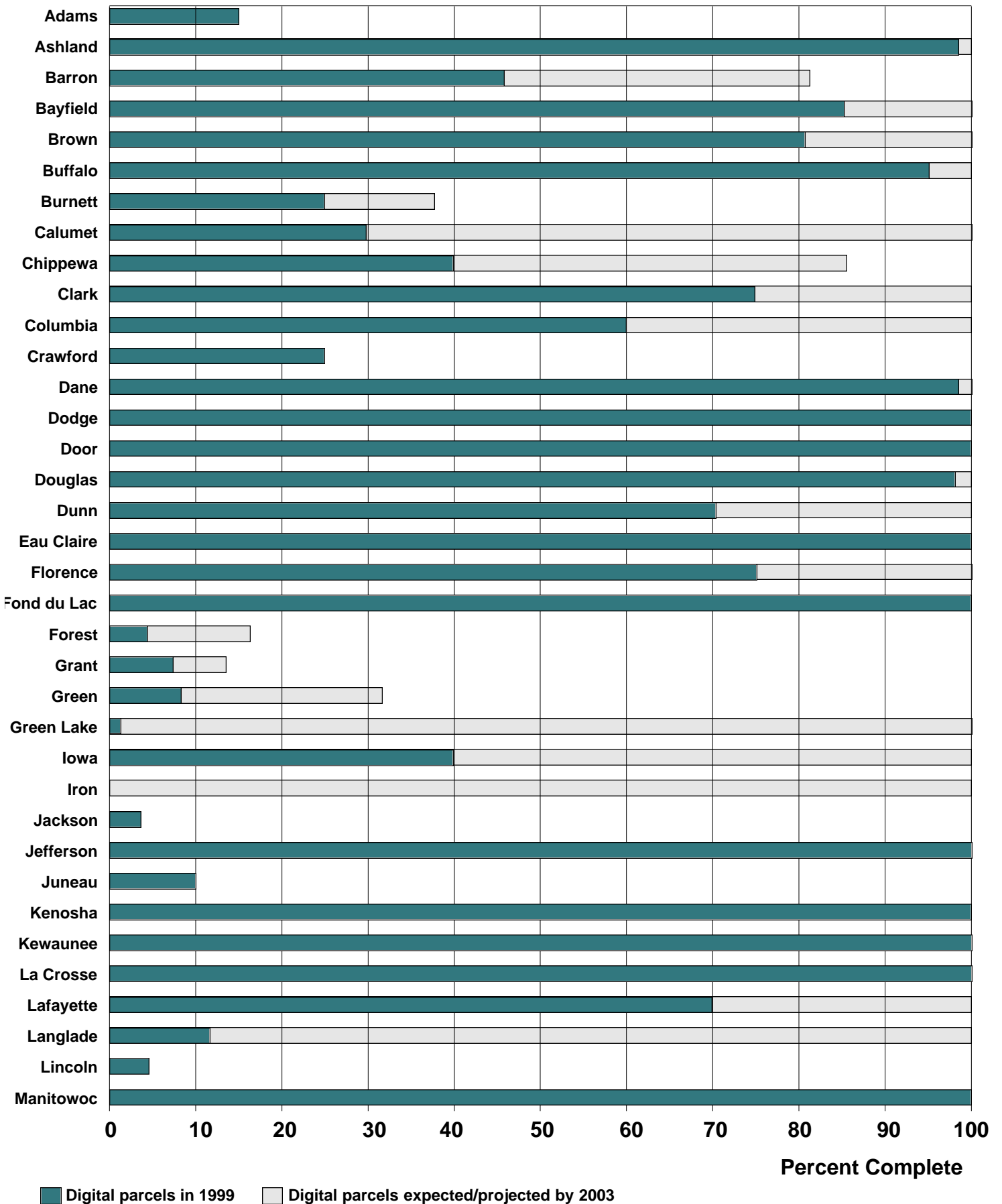
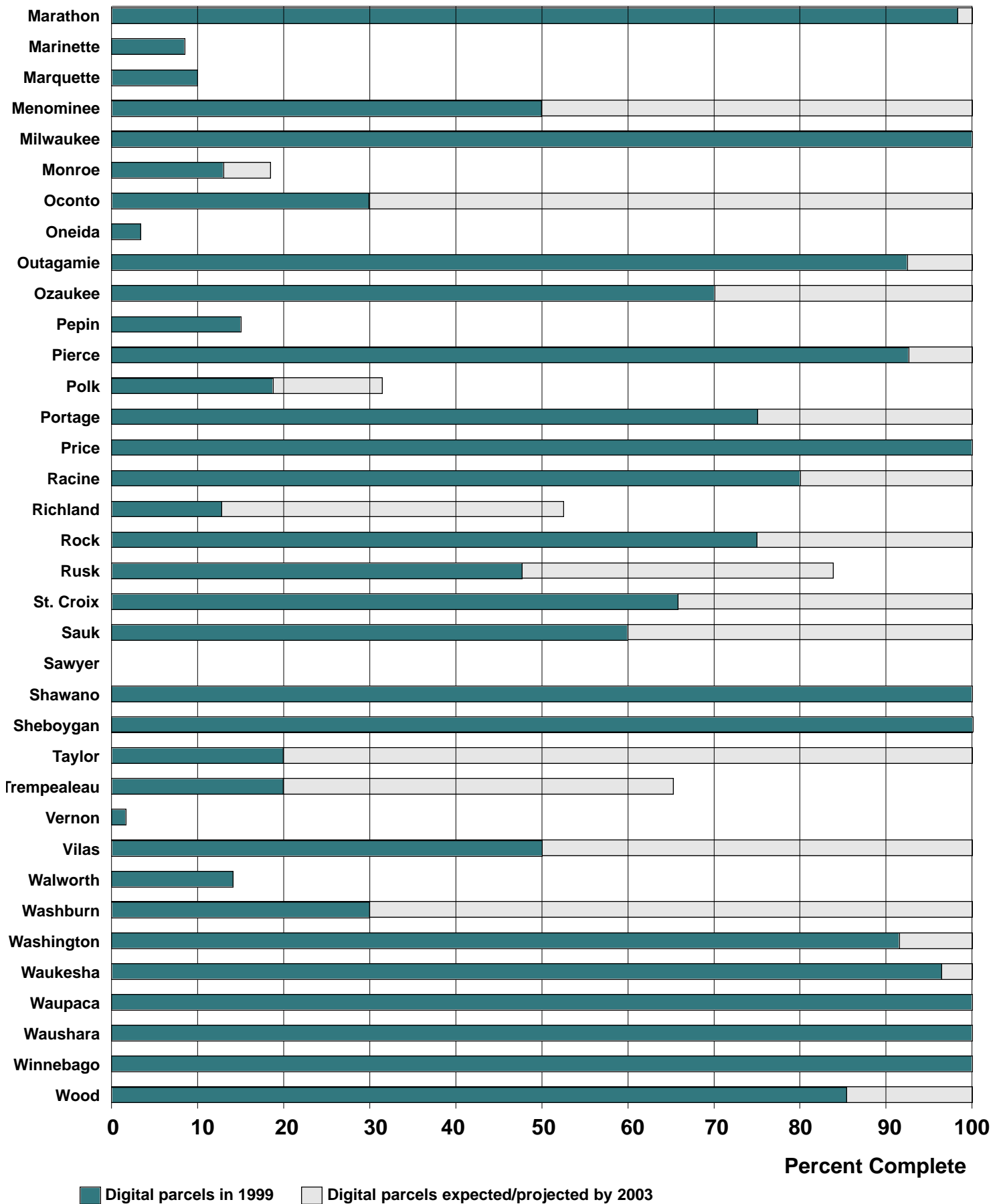
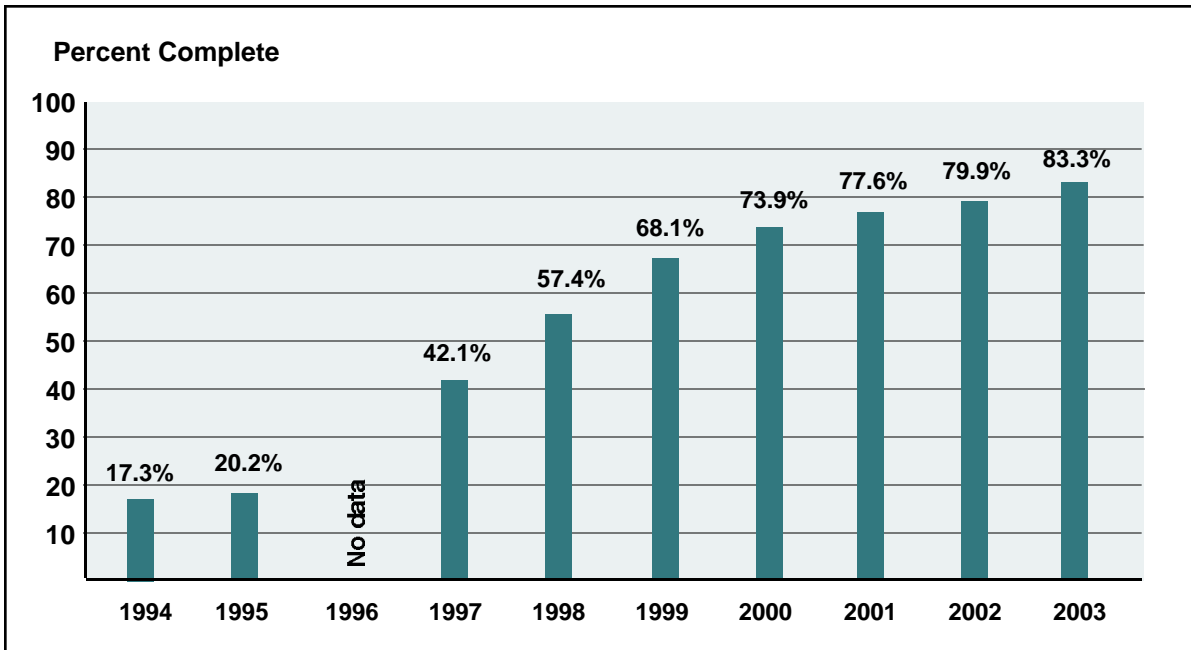


Figure 3 (continued)



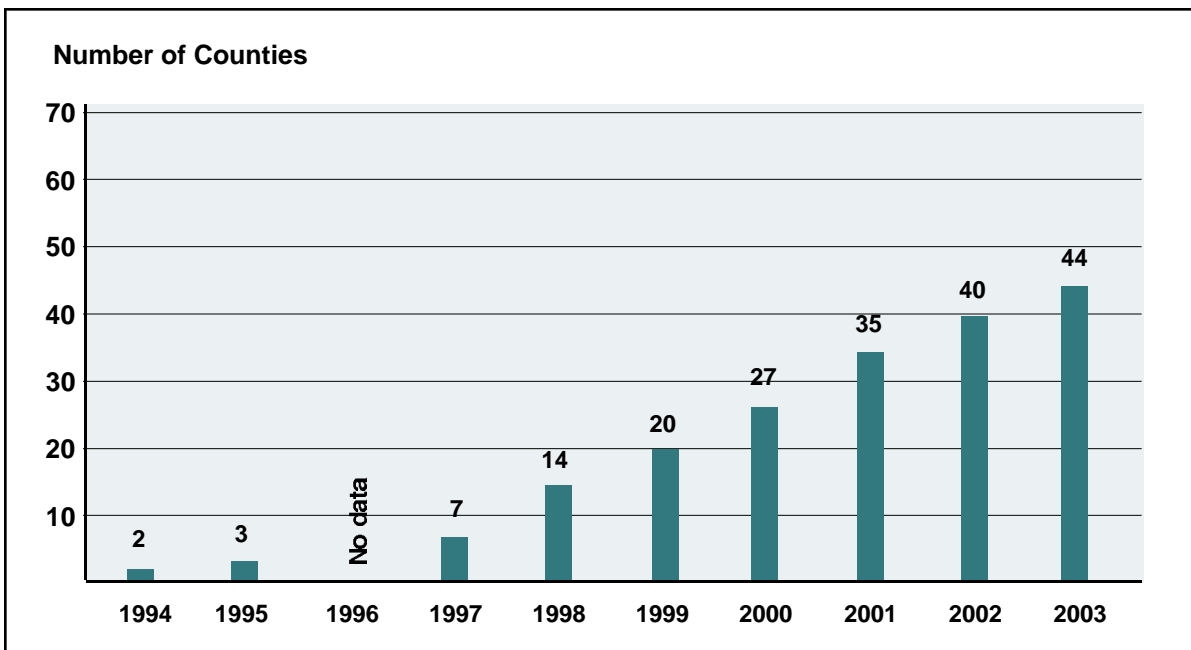
Digital parcels in 1999
 Digital parcels expected/projected by 2003

Figure 4
Percent of Total Parcels Complete Statewide in a Digital Format: 1994-2003



Estimates for percent completion of digital parcel mapping from 2000 to 2003 were determined by first noting the projected completion data provided in Section 18 of the 1999 WLIP survey, and then projecting the 1998-1999 completion rate into the future on an annual basis.

Figure 5
Counties with Complete Digital Parcel Mapping



33 counties reported no access to CAD or GIS software. The remaining counties acknowledged use of about 109 software programs across their various departments. By 1999, counties reported access to 219 programs or a 50% increase in use across their various departments. During this same period, CAD software programs have remained constant, whereas GIS-based programs have doubled in use (see Figure 6a). Also note that in 1999, all counties reported having access to CAD or GIS software (see Figure 6b). This reinforces the finding that data use is moving from paper records toward digital record-keeping and analysis stages of full implementation of the modernization diffusion curve (see Figure 1).

Summary: Technical Impacts

By 2003, 61% of the original foundational elements will have been modernized across the state. This includes statewide orthoimagery and digital elevations by 2001 and soils by 2005. Sixteen counties now have completed parcel records modernization. By 2003, 82% of all the state's parcels will be modernized and 44 counties will have been completed. To expand their use of new digital data and to implement new applications, local governments have doubled their investment in geographic information systems.

Figure 6a
Software used by Wisconsin counties: 1992-1999

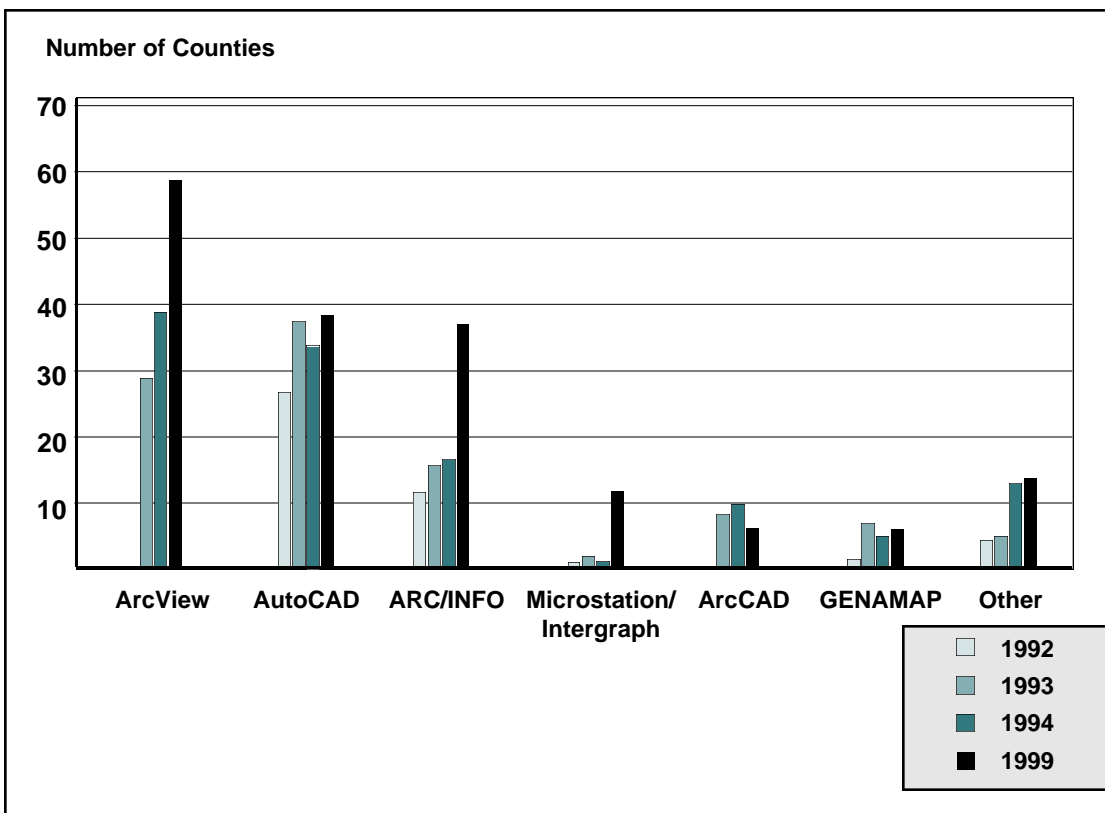
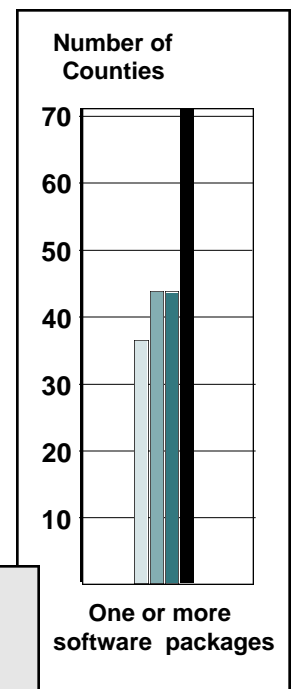


Figure 6b
Number of counties using at least one CAD or GIS software package: 1992-1999



Institutional Impacts

A variety of new institutional arrangements and modernization partnerships have emerged due to the implementation of the WLIP.

- As part of the overall modernization process, most counties have active communication and training programs for their departments and staff. According to the 1999 WLIP survey, on a scale of 1 to 5 (1 = least active and 5 = most active), the amount of formal training is about 3.5 and the average amount of communication programming is 3.2 (see Table 2). This suggests that most of the counties are encouraging their employees to use these new information technologies and methods in their daily work.

Table 2
Status of County Activity in Communication, Education and Training programs

Level of Activity	Communication (Number of Counties)	Education and Training (Number of Counties)
1 - Very little	7 (9.7%)	9 (12.5%)
2 - Little	10 (13.9%)	15 (20.8%)
3 - Moderate	30 (40.3%)	2 (2.8%)
4 - High	14 (19.4%)	12 (16.6%)
5 - Very high	11 (15.3%)	7 (9.7%)

- In respect to developing partnerships and working relationships across county departments, 610 such relationships were reported in 1998 or about 9.7 per county. In respect to local units of government in their counties, this overall working relationship number drops to 88 such relationships or 1.4 per county. In respect to state agencies, this drops to about 74 such relationships or 1.2 per county. And, in respect to federal agencies, this drops to about seven such relationships (see Table 3). Within the county, the program seems quite well connected, but across other local units, and state and federal agencies, the results indicate the need for more analysis to determine whether additional relationships would be productive.

Table 3
Partnerships with other units of government

Type of Government Unit	Total Number of Formal Arrangements	Total Number of Informal Arrangements	Total Number of Arrangements in Negotiation
Local (city, village, town, other)	119	127	16
Other Counties	48	59	0
Private Sector	42	45	5
State Agency	43	38	1
Federal Agency	30	25	1

- In respect to sharing or integrating data across administrative boundaries within the county and across the county boundary, 48 counties (76%) said it was ongoing or technically feasible to share and merge data across municipal boundaries and about 59 (82%) said the same thing across adjacent county boundaries. In respect to implementation of WLIS, this is a critical variable. More analysis is needed to determine the full impact of these findings on WLIS.
- In respect to providing public access to the various data sets being modernized as part of the WLIP, this program requirement is being addressed in a variety of technical methods. These include 37 counties by terminal or kiosk, 47 by compact disc, 19 by Internet or dial-up access and nine by other means. In respect to sharing data using the Wisconsin Land Information Clearinghouse (WISLINC), about 51 counties (71%) so plan, and about 58 (81%) plan on providing metadata to WISLINC. This appears to indicate that most counties are quite willing to participate in the spirit of sharing, an important component for the Wisconsin Land Information System (WLIS).
- About 28 counties (36%) have some form of data-distribution management policy in place. Twelve use copyright, eight a license agreement, and 37 have some form of re-use restrictions. Policies placing restrictions on the use and dissemination of data do raise questions regarding the ease and/or complexity of sharing data in the future—for example, in the proposed Wisconsin Land Information System (WLIS). Additionally, data-use restriction has been identified as an issue needing further investigation in the WLIP’s Strategic Assessment report of the Public Access Foundational Element, and in the Hart (2000) report. An example of a data-sharing partnership that is working well between a county and the local business community is in Dane County. Twenty-seven firms (80 customers) have signed agreements to pay \$.20 per minute to gain internal access to the Register of Deeds’ on-line land records system. This cost-recovery mechanism results in a more reliable Internet system, saves public access spots in the office, and defrays the cost of more hardware purchases. Most importantly, it also maintains the data as a publicly accessible asset.

- Finally, active state agency participation as custodians to help set standards and expedite modernization of various foundational elements has been varied and problematic. Positive involvement from DOT in the proposed densification of the High Accuracy Reference Network and the vertical framework, and DATCP's and DNR's leadership role in the soils modernization initiative are noteworthy. Also, DNR's proposed new wetland initiative and DOR's interest in beginning to address how to monitor land use changes transactionally are welcome. However, there is yet much to be done. Foundational issues in need of attention are zoning, street address and centerlines, administrative boundaries, other natural resources, etc. It is expected that an ongoing (to be completed by Winter 2001) WLIP strategic assessment exercise of each foundational element will clarify interests and develop responsibility for these various modernization tasks.

Summary: Institutional Impacts

New working data-gathering and application-development partnerships among local governments and other units of government have been created due to the WLIP. The ease of data distribution and use is an important issue. While 48 Wisconsin counties report that they believe it is technically feasible to share data across their boundaries, 28 counties report having some form of data policy that restricts use and dissemination by others.

As part of the WLIP Strategic Assessment process, various state agencies are assuming an increased leadership role to further the development of various foundational elements: DATCP's focus on soils mapping; DNR's recent initiative to modernize the wetlands mapping process; DOR's recent agreement to facilitate and coordinate land use mapping issues; DOT's expressed intent to build a widely useable vertical-control network as part of its Height Modernization Program; and DOA's agreement to lead a study group to identify key legal questions and policies concerning public access and data sharing.

Application Impacts

As digital data become more available and as local governments become more familiar with GIS software, new applications are being implemented.

- Land Records Administration** A variety of land information applications are under development ranging from modernization of public property records (e.g., Licht, 1998) to the modernization of flood plain delineations (e.g., Schmidt and Lulloff, 1998). There is considerable activity in a variety of county departments; and across the WLIP counties, there are 296 departmental cooperative agreements (see Table 4).

Table 4
Number of county land information applications by type

Department	Total Number of Formal Arrangements	Total Number of Informal Arrangements
Cartographer	11	19
Conservationist	23	36
Data Processing Department	19	34
Emergency Government	12	43
Forest and Park Administration	7	40
Land Information Office	27	32
Planning and Zoning	22	36
Real Property Lister	22	43
Register of Deeds	25	40
Sheriff	12	40
Solid Waste Department	4	25
Surveyor	25	38
Transportation	13	39
Treasurer	19	38
Zoning	22	39
Other	1	4

- **Emergency Management** Another major set of applications is being developed to support emergency management and police and fire responsibilities. There is also considerable activity in public-safety and emergency county-related departments; among these departments, 96 cooperative agreements are functioning.
- **Land Conservation Planning and Management** The Dane County Land Conservation Department is a specific example of how land conservation and planning can become more efficient and effective through the use and application of modern LIS. Such examples include watershed management, farmland preservation, the development of a farm/fields database, infiltration management planning, and farm drainage management (Moyer, 2000).
- **Planning** Using a broad definition of planning—planning and zoning, solid waste management and transportation planning—these departments have created 218 cooperative agreements.
- **Comprehensive Land Use Planning** In response to the recent comprehensive planning and transportation grant initiatives administered by the WLC, there is evidence that access to WLIP data is helping to reduce the cost of planning by 50%, or about \$42,000 in one instance. Because Winnebago County has a well-established modern land information system in place, it was not necessary to request funds to develop the requisite database for a proposed transportation planning grant. If these data did not exist, it would have, at a minimum, doubled the requested amount of \$42,000 (personal conversation with David Schmidt, Land Information Officer and Director, Planning & Zoning, Winnebago County).

Summary: Application Impacts

Many new applications are being developed and implemented across Wisconsin. A prominent example is the modernization of the records collected and managed by the Register of Deeds. Emergency management is another active application area. Wisconsin's new "Smart Growth" programs are gaining attention and, where LIS are in place, access to existing digital data is reducing the cost of planning.

Tasks before WLIB: The Land Information Community, OLIS and DOA

Standards and Integratability

The WLIP, from its inception, has incorporated an appropriate standard for each of its foundational elements. With the advent of GPS, the Internet, cheaper, more powerful software and hardware, an expanding user base, the pending advent and implementation of WLIS, and the expectation of integratability across software applications and jurisdictional units, the role and need for new, more-relevant standards needs attention and re-examination. This is an important task.

Task: Using the strategic assessment process now under way, assess the relevance of existing standards for each foundation element and recommend that the WLIP adopt or adapt new mapping, data content and data policy standards as needed. Complete this review by the winter of 2001.

To assure compliance, plan and implement a process to conduct audits.

Information Access

Another important task is how to respect personal privacy rights, maintain expensive data and information systems, and yet maintain the right of public access to the viewing and use of the information. This has always been an important issue, but today's information technology furthers the need to deal with privacy as an issue. Thoughtful discussion among the interested and affected parties is in order to help clarify the status, existing authority, and the desired social outcome.

Task: Using the WLIP's strategic assessment document, Public Access Foundational Element, as a guide, assess the status of public access, distribution and use. Seek clarification of WLIP authority. Based upon the findings, develop relevant WLIP public policy.

Agency Inactivity

One decade has now gone by since the establishment of the WLIP. All 72 Wisconsin counties have prepared modernization plans. A variety of inter-county departmental partnerships have been established. Partnerships with other inter-county governmental units are much more limited. Partnerships with state and federal agencies are also quite limited. On the other hand, the various state agencies on the Land Information Board have just begun to reach out to develop partnership and custodian roles. Also, the program has been very cautious in respect to building data-gathering partnerships with requisite federal agencies. Possibly, the WLIP needs to return to an intergovernmental cooperation grant-funding policy (i.e., a requirement of the now-abandoned competitive grants program). Also, it may be a prudent step to more formally encourage or require various state agencies to foster the modernization of various WLIP foundational elements (i.e., DNR: hydrography, environmental corridors, storm water/floodplain mapping; DOT: street addresses and centerlines; DOR: parcel

IDs, land use, zoning, integrated tax assessment procedures, etc.; DATCP: agricultural use, prime farmland; and DOA: administrative boundaries and census information.

Task: Lack of active and formal cooperative agreements and programs between county land information activities and other local units of government needs attention and incorporation of incentives. This task needs Board attention.

Using the strategic-assessment process, identify which state agencies could become responsible and assume custodial activities for some of the various WLIP foundational elements. Complete assessment and negotiations by winter of 2001.

Actively seek the involvement of federal data modernization partners. Suggestions include:

- *Wetlands:* US Fish & Wildlife Service; Natural Resource Conservation Service (NRCS)
- *Environmental Regulations:* Environmental Protection Agency (EPA)
- *Floodplains:* Federal Emergency Management Agency (FEMA)
- *Horizontal & Vertical Control:* National Geodetic Survey (NGS)
- *Smart Growth:* Housing & Urban Development (HUD)
- *Shoreland Management:* U.S. Army Corps
- *PLSS & Cadastral Records:* Bureau of Land Management (BLM)

Wisconsin Land Information System (WLIS)

Eighteen years after the Barton-Ashman report (1973), the state of Wisconsin is again on the brink of discussing the implementation of a statewide land information system. Much has transpired over this time. Technology has matured, local governments are becoming information-age literate, and the WLIP has accelerated the modernization of the 150-year-old paper-based paradigm. As a result of the joint WLC/WLIS task force, a plan to implement the Wisconsin Land Information System (WLIS) has been transmitted to the Governor for his review (Wisconsin Land Information System Project Team, 2000). The state as a whole is about to propel itself into the geospatial information stage.

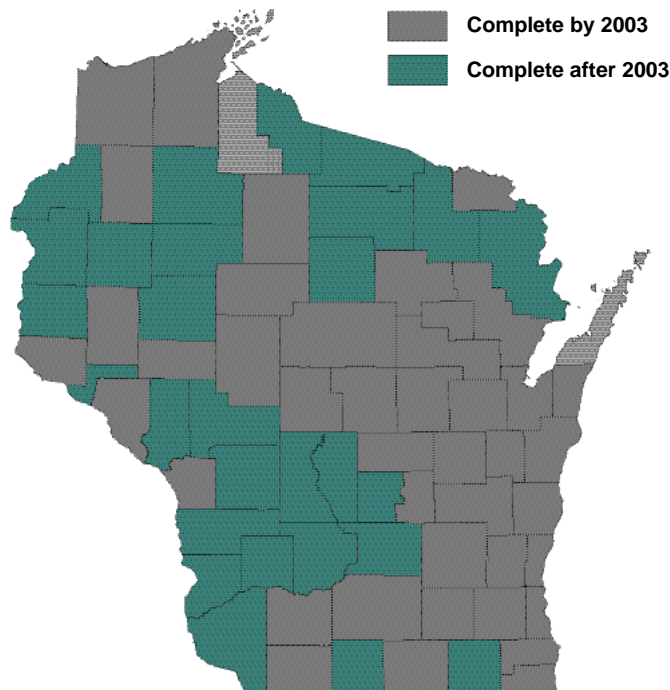
Task: Conduct a discussion and establish a strategy with those 28 counties that may need special attention if they are to become full-functioning WLIS partners by 2003 (see Figure 7).

Task: Absent from the WLIS report are any recommendations or strategic plans to augment WLIS with a set of functioning applications. In concert with the WLC and other groups, the WLIP should assist in the development of a set of initial applications such as a “Planning Tool Kit” for use by citizens and local government officials that will foster immediate and broad use of WLIS.

Emerging Federal Opportunities

Within the past year, several federal agencies, which in the past have not been overly involved with state/local GIS/LIS activities, have been expressing interest in such programs. In particular, the Federal Office of Management and Budget (OMB) has begun an information initiative to explore how to improve the quality of the spatial data the government collects. As part of this initiative, OMB is requesting that states form Implementation Teams (I-Teams) to prepare a comprehensive plan for compiling, maintaining, and financing the spatial infrastructure in the state. The Team is to align the needs and resources of state, local, tribal, federal

Figure 7
Wisconsin Counties with Digital Parcels Not Fully Automated by 2003



and private sectors. Also, the National Aeronautics and Space Administration (NASA) has plans to begin this year a state/local/tribal grants initiative that will make several million dollars available annually for projects using remote sensing technology and data. Finally, the Bureau of Land Management (BLM) is facilitating an initiative to improve and standardize cadastral mapping nationally.

Task: Investigate the potential and benefits of creating an I-Team, and participate in the OMB spatial data initiative. Track the progress of the NASA state/local/tribal initiative.

Funding

As noted in this report, the WLIP has had a significant impact on the modernization of the state's local land records, although the funds generated by the WLIP form a relatively small percentage of the total costs expended to modernize these records. With the anticipated creation of the WLIS, the potential of having sufficient funding resources to build and operate WLIS poses a big question. Also, more than 20 counties project that they will not have digital parcel mapping completed by 2003. It is difficult to envision how, at the current modernization rate, these counties will effectively be part of the WLIS initiative without this data theme completed.

Task: Conduct discussions and establish a strategy to identify potential funding sources to support the creation and operation of WLIS, and to provide sufficient funding to those counties that may not be able to become full-functioning WLIS partners by 2003.

Wisconsin Land Information Program: Future Long-Term Management

When the WLIP was first discussed with Governor Thompson's administration, the community held steadfast that whatever effort should emerge, modernizing our 150-year-old land records institution would take at least a couple of decades. So one of the major legislative ingredients (or musts) was some way to assure institutional memory and continuity that extends beyond administrations, administrators, executive directors, board members, etc. The governor-appointed WLIB (originally 13, now a 15-member board) was seen as that mechanism.

Task: Beyond the 2003 sunset, the WLIB should continue to provide leadership, guidance and vision for the WLIP and its programs including:

- the annual assessment of progress;
- monitoring the grants program;
- reviewing and adopting standards;
- retaining the active involvement and assistance of the land information community;
- seeking new federal and private modernization partners; and
- fostering and implementing strategic initiatives such as the soils modernization program, the base budget program, and the recently approved metadata strategic initiative.

Task: Develop a clear completion and timeline strategy for each WLIP sponsored foundation element. Use the ongoing strategic assessment process to conduct this task.

WLIP Evaluation

Over the past ten years, the Board has, at times, been distracted from its primary land records modernization mission. There have been changes in executive directors (three), changes in Board representation from DOA (four), and changes in the Secretary of the DOA (three). There was also the required review of the WLIP status as part of the McCallum Review, and two years ago, a major reorganization to become jointly administered by OLIS and to share staff and an executive director with the WLIS. Most recently there was a re-assignment of OLIS and the WLIP to the DOA's Division of Housing and Intergovernmental Affairs. In 1998, with the culmination of these and other events, the overall effectiveness rating of the WLIP was judged by the county LIOs to be 2.77 (on a scale of 1 to 5), or slightly below the "Good" category (3.0). In 1999, in response to the following question: "In the last year how would you rate the performance of the Wisconsin Land Information Board?", the overall effectiveness rating was up about 8.9% to 3.12, moving the Board's rating into the "Good" category (see Table 5). Some selected quotes from the 1999 annual survey suggest a variety of reasons for the improvements:

"The WLIP gets consumed in politics, lack of communication, and struggling for survival. . . taking the aforementioned problems into consideration, the WLIP has done remarkably well and HUGE strides have been made."

"They [WLIP] have done an excellent job considering the number of vacancies on the Board."

"Most significant - Benefits resulting from the near completion of the parcel mapping foundational element."

"[WLIP] Grants, we are able to do things that we would not be able to do otherwise."

"Today that vision [Land Records Modernization] is starting to become clear and actually embraced [by the county]."

Table 5
Change in performance of the WLIB: 1999-2000

Performance	Spring 1999 (No. of respondents)	Spring 1999 (percent)	Summer 2000 (No. of respondents)	Summer 2000 (percent)
Excellent	1	1.5%	5	7.0%
Very Good	10	14.9%	17	23.9%
Good	26	38.8%	36	50.7%
Fair	28	41.8%	13	18.3%
Poor	2	3.0%	0	0.0%
Total Respondents	67	100.0%	71	100.0%
Mean	2.70		3.20	

Source: Wisconsin Land Information Program Surveys conducted in Spring and Summer 2000

Question: In the last year, how would you rate the performance of the Wisconsin Land Information Board?

“Better, more accurate, and quicker response to public questions regarding property boundary requests in areas where parcel mapping has been completed. In addition, there has been a lot of use of maps for zoning redistrict hearings.”

“The ability to get more work done in a shorter period of time.”

“Development and integration of multiple data sets to support the preparation and adoption of the county’s first County Development Plan”

Task: Continue to use the WLIP Annual Survey to continue to monitor the performance of WLIB.

Summary: Tasks before the Land Information Community

New data standards in concert with new applications and new technology need attention by the WLIB. Public access to data while recognizing the needs for privacy is becoming a very important issue. Sorting out this issue is an urgent task in need of immediate attention by the WLIB and the land information community.

More active database development partnerships for such elements as zoning, street centerlines, address, administrative boundaries, other natural resources with relevant state and federal agencies need attention. Additional funding partnerships with other relevant federal agencies need to be pushed to help Wisconsin gain more access to such funds.

The implementation of WLIS statewide deserves the immediate and sustained attention of the WLIB and the land information community. Also, the WLIB needs to help promote the design and implementation of planning applications for use by citizens and local government officials to ensure that WLIS has an immediate and positive impact. Through the annual WLIP survey, the WLIB needs to monitor its performance, adjusting its programs as needed to remain both efficient and effective.

The WLIB has successfully carried out the legislative charges that define the WLIP. However, much remains to be done. Not all foundational elements will be modernized by 2003. Emerging technologies allow for new ways to collect data and share information. As an experienced leader, the WLIB needs to continue to lead the Program and be responsive to changes and new challenges.

References

- Barton-Ashman Associates, Inc. 1973. "A Statewide Geographic-Based Land Use Information System for the State of Wisconsin: Phase 2 Report Feasibility and Pre-Design Study. (Prepared for the Wisconsin Department of Administration, Bureau of Planning and Budget), Evanston: Barton-Ashman and Associates, Inc., 84 pp.
- Comprehensive Planning Legislation, Wisconsin Act 9, 1999. Technical amendments to the comprehensive planning statutes were passed with the adoption of AB 872 in March 2000. The legislation changed Wisc. Stat in several places, including 66.0295, 16.965, 66.034, 1.13, 227.113, 236.13, 15.01, 60.62, 62.23, 59.69, and 66.945.
- Hart, D., 2000. *Acquisition and Implementation of Digital Parcel Mapping to Support Coastal Management Along the Lake Michigan Coast of Wisconsin*. A report from Land Information & Computer Graphics Facility.
- Holland, W., 1991. *WLIP: Modernizing Wisconsin's Land Records Through Decentralized and Integrated Land Information Systems*, Wisconsin Land Information Board, Madison, WI.
- Larsen, Barbara J., James P. Clapp, Allen H. Miller, Bernard J. Niemann Jr, and Arthur L. Ziegler. 1978. *Land Records: The Cost to the Citizen to Maintain the Present Land Information Base: A Case Study of Wisconsin*. Madison, Wisconsin: Wisconsin Department of Administration.
- Lewis, P., 1996. *Tomorrow by Design*, New York: John Wiley & Sons, Inc.
- McHarg, I., 1992. *Design with Nature*, New York: John Wiley & Sons, Inc.
- Moyer, D. and B. Niemann Jr., 2000. "On Solid Ground: Multipurpose Land Information System Ushers in New Era of Land Conservation," *Land Information Bulletin*, National Consortium for Rural Geospatial Innovations (RGIS), University of Wisconsin-Madison, June 2000.
- NSGIC/FGDC Framework Survey, 1999. <http://www.fgdc.gov/framework/survey-results/readme.html>
- Schmidt, D., and A. Lulloff. 1998. "Making Waves in Floodplain Mapping," *Land Information Bulletin*, LICGF, University of Wisconsin-Madison, No. 2, Summer 1998.
- Tulloch, D., D. Moyer and B. Niemann Jr., 1998. "Modernizing Dane County's Register of Deeds: Saving Property Owners \$6 Million Annually," *Land Information Bulletin*, LICGF, University of Wisconsin-Madison, No. 1, Spring 1998.
- Tulloch, D. 1997. *A Theoretical Model of the Life Cycle of Community Multipurpose Land Information System Development*, Unpublished PhD dissertation, University of Wisconsin-Madison.
- Tulloch, D. and B. Niemann Jr., 1996. "Evaluating Innovation: The Wisconsin Land Information Program," reprinted from *GeoInfo Systems*, October 1996.
- URISA News*. May/June 2000. Urban and Regional Information Systems Association, Park Ridge, IL.
- Wisconsin Land Information System Project Team. 2000. *Final Report of the Wisconsin Land Information System Project Team*. Madison, WI.

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