1997 Project Abstract
For the Period Ending June 30, 1999
This project was supported by MN Future Resources Fund [ML Ch. 216, Sec. 15, Subd 10(e)]

TITLE: LAND USE DEVELOPMENT AND NATURAL RESOURCE PROTECTION MODEL
PROJECT MANAGER: Eric Sorensen, City Manger
ORGANIZATION: City of Winona, MN
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LEGAL CITATION: ML 97, Ch. 216, Sec. 15, Subd. 10(e)
APPROPRIATION AMOUNT: $400,000

Statement of Objectives: Geographic Information Systems (GIS) are being increasingly used by cities to efficiently keep track of housing, businesses, utilities, zoning, land use, emergency routing, and others. One goal of this project was to develop such a system for the City of Winona, making all in-town, land use-related data quickly available for management purposes. This portion of the project also supports the primary objective - balancing development with natural resource protection - since a city needs to have a firm grasp of its current resources in order to adequately assess development needs.

The primary objective included development of a GIS-based computer model which would democratize decision-making by objectively subjecting any proposed development to the same evaluative criteria. Additionally, the models developed take into account the area residents' strong feelings about maintaining a quality environment while promoting development.

Overall Project Results: The GIS developed for Winona and the surrounding area (33,000 acres) consists of three primary models with user-friendly interfaces. The Land Use Development and Natural Resource Protection (LUDANPro) model is used to assess a proposed development. It looks at a variety of natural and infrastructure issues (land cover, slope, soil type, septic system suitability, erodability, rare biological features, distance to roads and utilities), and also impacts on high value issues (e.g. viewshed and appearance of the area's bluffs). The model connects the digital files of a proposed development site with a series of GIS databases and then tests the development using several suitability models, and flags any which might present problems. Site In (SiteIn) is a utility to LUDANPro which allows an effective means of importing a variety of geographic descriptions, and matching them to the map projection system used in Winona. Descriptions can come from CAD drawings, ArcView shapefiles, or they can be hand digitized on-screen, with a geographically-corrected photograph as a background.

Winona Property Inquiry (WinPropInq) provides a choice of methods for quick retrieval of property-related records including land records, owner records, short legal descriptions, address records, and even some photographic records. The operator can retrieve and view parcel records in a number of ways. Entering either the owner name, parcel identification number, or street address will display the appropriate section of town with the selected parcel highlighted. Conversely, if the location is known, the operator can simply click on that parcel to obtain all the associated information. This model can also be used to quickly identify adjacent property owners in a given distance that need notification of any proposed action.

Emergency Routing (EmeRt) is used for several purposes. When an address is entered, the display shows the most efficient route to that address from both of Winona's fire stations. It also displays the location of all the nearby fire hydrants and the water mains which feed them.

Project Results Use and Dissemination: The models have just been completed, and are only beginning to be used, but are viewed by City officials as having great potential to increase efficiency. For example, a real-life case of identifying adjacent owners for notification was reduced from three days to ten minutes. A pamphlet summarizing the capabilities of the models is being distributed to all Minnesota cities and counties.

Date of Report: July 1, 1999
LCMR Final Work Program Update Report

Date of Next Status Report: ~~June 30, 1999~~ None

Date of Workprogram Approval: June 23, 1997

Project Completion Date: June 30, 1999

LCMR Work Program 1997

I. PROJECT TITLE: LAND USE DEVELOPMENT AND NATURAL RESOURCE PROTECTION MODEL

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Total Biennial Project Budget:

$LCMR:	$400,000	**$Match:**	$88,000
-$LCMR Amount Spent	$400,000	**-$Match Amount Spent**	$88,000
=$LCMR Balance	$ 0	**=$Match Balance**	$ 0

A. Legal Citation: ML 97, Ch. 216, Sec. 15, Subd. 10(e).
Appropriation Language: This appropriation is from the trust fund to the commissioner of natural resources for an agreement with the city of Winona to develop a geographic information system implementation tool to assist in the evaluation of natural resource protection in land use decision making by local governments. This appropriation must be matched by at least $88,000 of nonstate money.

B. Status of Match Requirement: Winona City Council resolution of February 20, 1996 committed the city to proceeding toward full GIS development. Resolutions to provide the required match were passed by the City Council on October 21, 1996 as part of the normal budget process. Outside sources of additional funding are also being sought.

II. PROJECT SUMMARY AND RESULTS: Geographic Information Systems (GIS) are being increasingly used in a number of applications. One such emerging use is by cities to efficiently keep track of housing, businesses, utilities, zoning, etc. Such information, rapidly available, can serve as an aid to effective decision making. This project will not only provide these GIS capabilities to the City of Winona, but go considerably further. It ~~will~~ also includes the natural and semi-natural areas within and surrounding Winona. Those areas ~~will not~~ are not only ~~be~~ included, but also categorized according to a value system reflecting potential losses and effects should they be developed. This value system ~~will be~~ was derived from, and reflects, the recently (1995) adopted comprehensive plan for the city. This plan, which includes an environmental committee as a permanent city government fixture, reflects the area residents' strong feelings about maintaining a quality environment while promoting development .

~~Once completed, t~~This GIS will allow city decision makers and developers alike to do an environmental assessment of any proposed development, including a rapid estimation of such things as habitat loss, potential flooding problems, ground water contamination concerns, aesthetic impacts, etc. It will also be of value to potential developers in helping them find areas most suitable for development, anticipate problems, etc. In short, it will be a tool for balancing development and the natural environment in decision making. ~~Once developed, t~~The model ~~will be~~ is being publicized and promoted among other cities and other governmental units.

III. PROGRESS SUMMARY: ~~All aspects of the project are progressing well, but some are taking considerably more time than anticipated. Data that have been hard to obtain and/or that needed more processing than anticipated have slowed some work. Development of the parcel data layer has been especially time consuming due to difficulty locating some records, and due to problems with legal descriptions. Development of topographic data has been slowed by tardy delivery of aero-triangulation (AT) solutions from the aerial photography contractor. However, most tasks are close to schedule, and there is no concern about completing the project on time.~~ All aspects of the project have been successfully completed.

IV. OUTLINE OF PROJECT RESULTS:

Result 1. Planning and reconnaissance

LCMR Budget:	$5,000	Balance:	$0
Match:	$10,000	Balance:	$0
Completion Date: December 31, 1997			

For the early goal of developing the preliminary conceptual model, the top priority ~~is~~ was the determination of needs. All city offices which might use the model and/or have input ~~will be~~ were surveyed. Based on this input, a conceptual model ~~will be~~ was developed which~~, in turn, will~~ indicated which data ~~will be~~ were required. This is completed.

Result 2. Values assessment and analysis

LCMR Budget:	$10,000	Balance:	$0
Match:	$15,000	Balance:	$0
Completion Date: June 30, 1998			

The goal ~~is~~ was to accurately assess development vs natural resource values, both by the public and government. Priority consideration ~~will be~~ was given to the comprehensive plan recently developed by the city, with considerable public input. Polling of city, local township, Winona County and local DNR offices ~~will be~~ was done next. Public input ~~will be~~ was solicited via a self-mailing questionnaire in the local paper which provided a fair response. Additional input was to be obtained via a sponsored symposium, but few attended. ~~; and~~ Results were integrated with Winona's Comprehensive Plan to determine the value system on which to base development decisions. A report summarizing these findings, and how they ~~will be~~ were used, ~~will be~~ was prepared. This is completed.

Result 3. Locate, assess and acquire existing data layers

LCMR Budget:	$21,000	Balance:	~~$2,100~~ $ 0
Match:	$19,000	Balance:	~~$1,900~~ $ 0
Completion Date:	~~April 15, 1999~~ May 31, 1999		

The goal ~~is~~ was to acquire a complete set of databases necessary to the GIS. First priority ~~is~~ was to determine the existence and location of, and then obtain, databases including topography, soils, surficial geology, current and historical land cover/ use, County Biological Survey data, areas of archaeological and historical value, zoning, ownership, wetlands, hydrography, roads, major utilities, etc. The next priority ~~is~~ was to determine the accuracy, scale, resolution, and appropriateness of these databases. This ~~will~~ resulted in a determination of needs for additional and/or improved data sets. Considerably more time than anticipated was spent in acquiring parcel data, since some records are incomplete, and there are often problems with legal descriptions. This is ~~90%~~ completed.

Result 4: Equipment, software and supplies acquisition:

LCMR Budget:	$26,500	Balance:	~~$23,850~~ $ 0
Match:	$0	Balance:	$0
Completion Date:	~~May 31~~, June 30, 1999		

The goal ~~is~~ was to acquire all additional equipment and software necessary for City employees to fully implement the project. All equipment acquired by expenditures greater than $3,500 will be dedicated to. and available to, this project throughout the equipment's useful life, or, if the use changes, the City of Winona will pay back to the Fund an amount equal to either the cash value received or a residual value approved by the director of the LCMR if it is not sold. This is ~~10%~~ completed.

Result 5. Obtain topographic data for project area

LCMR Budget:	$33,000	Balance: ~~$6,600~~	$ 0
Match:	$44,000	Balance: ~~$8,800~~	$ 0
Completion Date:	~~April~~ June 30, 1999		

The goal ~~is~~ was to have digital, 2-ft topographic data necessary to adequately assess the study area. LMIC, USGS, and DOT data are at lower resolution. This ~~can be~~ was produced from new large scale photography with ground control, to establish 2ft. contours, more useful than purchasing data based on older, outdated photography. Final data ~~have only recently been~~ were received very late from the aerial photographic contractor, necessitating around the clock work to develop 2-ft data for all developable areas. This was the most frustrating portion of the project. This is ~~80%~~ completed.

Result 6. Acquire additional essential data

LCMR Budget:	$65,000	Balance: ~~$6,500~~	$0
Match:	$0	Balance:	$0
Completion Date:	~~April 15, 1999~~ June 30, 1999		

The goal ~~is~~ was to add missing data layers necessary to an effective GIS. Priority ~~will~~ was ~~be~~ put on interpretation of aerial photography for land cover/use, natural community types, existing development, etc. This ~~will next be~~ was supplemented by extensive ground-truthing, followed by rectification of the interpreted images. This is ~~90%~~ completed.

Result 7. Conversion of data to digital format

LCMR Budget:	$85,000	Balance: ~~$4,250~~	$0
Match:	$0	Balance:	$0
Completion Date:	~~April 30, 1999~~ May 31, 1999		

The goal ~~is~~ was to turn all non-digital database layers into digital format so they ~~can~~ could be used in the GIS. All geographic data (maps, photos, etc.) ~~will be~~ were digitized into ARC/INFO GIS computer files. This is ~~95%~~ completed.

Result 8. Refine the conceptual model and convert it to a working GIS tool

LCMR Budget:	$75,000	Balance: ~~$15,000~~	$0
Match:	$0	Match:	$0
Completion Date:	May 1, 1999		

The primary goal ~~is~~ was to develop a working GIS tool based on all work done earlier. The first priority ~~is~~ was to refine the original conceptual model in light of the nature of the data located and developed thus far. This ~~will~~ involved integration of developed databases and a quantified value system into a GIS model which ~~can be~~ was tested in "real-life" situations, including "user friendly" interfaces. This is ~~80%~~ completed.

Result 9. Test and refine the working model

LCMR Budget:	$70,000	Balance: ~~$63,000~~	$0
Match:	$0	Balance:	$0
Completion Date:	June 15,1999		

The goal ~~is~~ was to produce a user-friendly, efficient GIS allowing city offices to make development decisions balancing developmental needs with resource preservation. The first priority ~~is~~ was to use the developed model in real and simulated situations (both lab and field). Based on this experience, the model and its interfaces ~~will then be~~ were refined. ~~This is 10% completed.~~ This is completed.

Result 10. Develop data dictionary

LCMR Budget:	$2,500	Balance: ~~$ 625~~	$0
Match:	$0	Balance:	$0
Completion Date:	June 30, 1999		

The goal ~~is~~ was to produce an electronic and hardcopy description of the natural resource and economic development data, and the value system, used in the model. ~~This is 75% completed.~~ This is completed.

Result 11. Produce promotional material

LCMR Budget:	$7,000	Balance: ~~$5,600~~	$0
Match:	$0	Balance:	$0
Completion Date:	June 30,1999		

The goal ~~is~~ was to promote dissemination of the GIS model developed during this project. The first priority ~~will be~~ was to determine how best to publicize and promote the model. One approach will be through contacts between City of Winona officials and their couterparts in other cities. ~~This will be followed by implementation including, at a minimum, production and distribution of a~~ A descriptive brochure, informing local government officials throughout the state of the nature and utility of this project was also prepared for widespread distribution. ~~This is 20% completed.~~ This is completed.

V. DISSEMINATION. The project team and cooperators ~~will~~ are consulting closely with the League of Minnesota Cities and the Coalition of Greater Minnesota Cities to develop an effective dissemination plan for this model. While this portion was cut back from the original proposal at the request of LCMR staff, it is still considered a vital part of the effort.~~, so outside funding will be sought to host symposia, develop literature, and other efforts aimed at dissemination.~~ The results of the project will also be posted on the government page of the local network (LUMINET) and on Saint Mary's University's home page.

VI. CONTEXT

A. Significance: GIS development and use for cities is relatively new. This project ~~will~~ significantly expanded on this growing technology in two ways. It ~~will~~ extended the work area beyond the city, including adjacent watersheds where development could impact the city. Most significantly, it ~~will be~~ was developed as a values-based, decision-making tool, reflecting the strong desire of local residents to maintain a quality environment while still pursuing development needs. Diverse environmental factors ~~will~~ were ~~be~~ added to the database to supplement the usual catagories of zoning, utilities, etc. This ~~will~~ provides a GIS which ~~will~~ includes environmental impacts (ecological and aesthetic) of any proposed development to aid in deciding development issues.

B. Time: ~~It is~~ As anticipated, ~~that~~ development of the GIS model ~~will be~~ was completed within the two-year LCMR funding period. However, implementation of the project in the Winona area, and dissemination efforts beyond this area, will follow the project period. Efforts will be made to find additional, outside funding for these activities.

The City is currently under contract with Summit Engineering and NASA to build a water management system. This model will be integrated into the LCMR funded GIS. The approximate funding towards this project will be in excess of $300,000, including the City's, Summit's and NASA's commitments. Additionally, the City has received $50,000 from the McKnight Foundation to do a detailed environmental analysis and park plan of City owned property on the Mississippi River in Wisconsin.

C. Budget Context: The City of Winona has already committed $40,000 to early GIS development of portions of the city, involving ground control, registration, parcel mapping, etc,. as well as early determination of needs. It also purchased aerial photography and provided ground control of the entire project area in 1992, at a cost of $69,000, and has devoted significant paid staff time to this project. Winona County has committed an initial $5,000 to a detailed GIS assessment of a small portion of the project area outside the city as a trial effort. It is expected this committment will continue. Saint Mary's University's Resource Studies Center has also invested several thousand dollars of staff and student time working on early stages of this project. In total, significant money has been put forward to initiate this effort.

	July 1995-June 1997	July 1997-June 1999	July 1999-June 2001
	Prior expenditures on this project	Proposed expenditures on this project	Anticipated future expenditures on this project
1. LCMR	$ 0	$400,000.	$ 0
2. Other State	$ 0	$ 0	$ 0
3. Non State Cash	$114,000	$ 88,000	$ 140,000
Total	$114,000	$488,000	$140,000

Funding Allocated Within the Project:

BUDGET:	
Prof. Services	$ 384,500.
Equipment/Software	$21,400
Supplies	$5,100
Acquisition	$ 0
Development	$ 0
Other	$ 77,000
Total	$488,000

VII. COOPERATION: The City of Winona ~~will~~ directed this project. The team ~~will~~ consisted of the City Manager, City Engineer, City Planner, Director of Community Development, and Public Works Director, with other staff being used from time to time. No city staff ~~will~~ received LCMR funds. The city ~~will~~ subcontracted with the Resource Studies Center (RSC) of Saint Mary's University of Minnesota in Winona to do the actual development of the GIS model.

A number of people at the RSC ~~will be~~ were involved in this major effort, and for most the percentage of time ~~will vary~~ varied during the project, depending on which aspects ~~are~~ were being conducted. Senior staff with major participation ~~will~~ included Dr. Xiaoming Yang, and Rory Vose. Lesser involvement ~~will come~~ came from Dr. David McConville and Barry Drazkowski . Master's level staff with major involvement included Thomas Hoffmann and Chris Ensminger. An average of 5 graduate students ~~will be~~ working half to full-time were involved at any one time.

VIII. LOCATION Attached maps show the location of Winona and the study area.

IX. Reporting Requirements: Periodic workprogram progress reports ~~will be~~ were submitted April 24, 1998, October 31, 1998, and March 31, 1999. ~~A final workprogram report and associated products will be submitted by June 30, 1999, or by the completion date as set in the appropriation.~~

X. Research Projects: Not applicable.