1995 Project Abstract
For the Period Ending June 30, 1998
This project was supported by the Minnesota Future Resources Fund.

TITLE: Analysis of Lands Enrolled in Conservation Reserve Program (CRP)
PROJECT MANAGER: Mary Hanks
ORGANIZATION: Minnesota Department of Agriculture (MDA)
ADDRESS: 90 West Plato Boulevard, St. Paul, MN 55107-2904
WEB SITE ADDRESSES: www.mda.state.mn.us, www.extension.umn.edu/~agland
LEGAL CITATION: ML 95, Ch.220, Sec. 19, Subd. 7(k).
The availability of the appropriation for this project was extended to July 1, 1998 by ML 97, Ch.216, Sec.15, Subd. 26(a).
APPROPRIATION AMOUNT: $200,000

Statement of Objectives

The overall goals of this project were to facilitate state-level targeting of conservation program dollars toward the most environmentally critical areas, and to help maintain environmental benefits on land emerging from the CRP. The project had four objectives: **a)** completing the statewide GIS mapping of CRP lands begun in a previous project; **b)** analyzing the state's CRP lands and evaluating models for identifying other environmentally sensitive lands; **c)** publishing fact sheets on post-CRP land management alternatives for CRP contract-holders; and, **d)** developing a user-friendly, computer-based agricultural policy simulation exercise to increase understanding of the choices and consequences faced by farmers and policy-makers.

Overall Project Results

The ***Minnesota CRP GIS Database*** is a statewide and county GIS tool for analyzing the nearly 1.9 million acres of cropland enrolled in 27,000 contracts in the first 12 CRP sign-ups. It consists of a statewide GIS database and 84 county GIS databases, available in several formats, for use in ArcView, EPPL7, and other GIS software packages. The first 26 counties were digitized in a previous project, and the remaining 58 counties (containing 700,000 acres of CRP, or 38 percent of the state's peak acreage) were digitized in this project. (Three counties have no CRP lands.) More than 20 students and staff at eight different work sites around the state helped digitize CRP parcels for this project. The CRP GIS database is helping Minnesota agencies and organizations plan, manage, and target conservation programs (see "Use and Dissemination," below). MDA is seeking funds to update the database. The ***Minnesota CRP Information Series*** is a set of 13 fact sheets to help farmers and other CRP landowners evaluate post-CRP land management issues and options. The series highlights land use options that have the potential to maintain the CRP's environmental benefits while also providing an income. It is the single most comprehensive source of information for Minnesota farmers on post-CRP alternatives to row crops, which are especially important for highly erodible lands. ***Ag Land: The Game*** is a user-friendly, computer-assisted simulation game that helps improve players' understanding of agricultural policy choices and consequences. The game is an ideal learning tool for students, farmers, conservation professionals, legislators, and others involved in or affected by agricultural and land conservation policies in real life. Through the game, players experience the constraints of farming and government programs and cope with problems such as the time lag between policy implementation and results. ***Refining the Non-Point Source Surface Water Pollution Index for CRP*** is a report that suggests changing the Environmental Benefits Index (EBI) that USDA uses to rank CRP bids to account for the significant impact that flat, poorly drained lands with surface tile inlets may have on surface water quality. About 40 percent of the cropland in the Minnesota River Basin (among other croplands throughout the state) fits that description.

Project Results Use and Dissemination

Over 1,000 conservation professionals in every county were introduced to the ***Minnesota CRP GIS Database*** and offered free copies of the digital data at more than 20 conference exhibits and presentations and through direct mailings that included customized color maps of CRP in their counties. There are at least 70 known conservation program managers, local water planners, wildlife researchers, and others using the database at the statewide, watershed, and county levels to gain a better understanding of changing land use patterns and natural resource conditions. Many users have added the CRP GIS data to existing natural resource data sets or land use inventories. The database will continue to be available from MDA, BWSR, and other state agencies, and we hope to offer customized interactive demonstrations in the future. About 3,200 copies of the ***Minnesota CRP Information Series*** have reached farmers and information providers around the state, and the remaining 1,800 copies will be disseminated by MDA and the U of M Extension Service upon request and distributed at events typically attended by farmers such as county fairs. The series may also be found on the Internet at MDA's home page (see address above), and anyone may photocopy the fact sheets. ***Ag Land: The Game*** was tested by more than 200 students, farmers, and conservation professionals in classrooms and at lively workshops throughout the state. Their feedback was used to refine the final version of the game, which the University of Minnesota Extension Service is selling for $150 per set. The boxed set includes instructions, software, a game board, and game pieces. The game requires 5 to 25 players, a computer with Windows 3.1 or Windows 95, and a printer. About 3 hours are needed to play the game and discuss what was learned. More information about the game and how to purchase it may be found at the second web site address given above. The report ***Refining the Non-Point Source Surface Water Pollution Index for CRP*** has not been widely disseminated, but its availability was mentioned at a presentation to more than 100 conservation professionals, and copies are available from MDA.

Date of Report: July 1, 1998 **WORKPROGRAM AMENDMENT**
LCMR Final Work Program Update Report

I. Project Title and Number: Analysis of Lands Enrolled in Conservation Reserve Program, 7(k)

Program Manager: Mary J. Hanks
Minnesota Department of Agriculture
90 West Plato Blvd.
St. Paul, MN 55107
Phone: (612) 296-1277 Fax: (612) 297-7678
e-mail: mary.hanks@state.mn.us

A. Legal Citation: ML 95, Ch. 220, Sec. 19, Subd. 7(k)
Legal Citation for Extension ML 97, Ch. 216, Sec. 15, Subd. 26(a)
Total Biennial Appropriation: $200,000
Balance (6/30/98): $ 0

This appropriation is from the Minnesota Future Resources Fund to the commissioner of agriculture for continuing the analysis of lands enrolled in the conservation reserve program relative to nonpoint source pollution, developing land management options for lands emerging from the program and developing the capability to target future program funds for the greatest environmental benefit. The appropriation for this project was extended by Laws 1997, Ch. 216, Sec. 15, Subd. 26., "Carryforward," paragraph (a), which states that "The availability of the appropriations for the following projects is extended to July 1, 1998. . . .Laws 1995, chapter 220, section 19. . . . subdivision 7. . . .(k), analysis of lands enrolled in the conservation reserve program."

B. LMIC Data Compatibility Requirement, January 1, 1996: Data collection activities are coordinated with LMIC and are compatible with the GIS database systems of the state. Project staff's ongoing participation in the Data Access/Clearinghouse and Soils Data Committees of the LMIC-coordinated Governor's GIS Council will aid in meeting this requirement.

Timeline:	7/95	1/96	6/96	1/97	6/97	1/98	6/98
Digital data quality:	xxxx		xxxx				
Output format:	xxxx						
Documentation:		xxxxxxxxxxxxxxxxxxxxxxx					
LMIC delivery/acceptance testing:						xxxx	

Update, July 1, 1996: Existing and new metadata (detailed documentation) for the CRP GIS coverages is being organized and compiled with assistance from a private consultant using the metadata guidelines and template recently developed by the Governor's GIS Council. The process of compiling metadata entails checking certain aspects of data quality such as spatial and attribute accuracy and completeness so that these can be reported as part of the metadata. Well-organized and complete metadata will make the digital coverages easier to use.

Update, January 1, 1997: Metadata (detailed documentation) files are complete for 58 counties so far. We expect it be completed for remaining counties in early 1997.

Update, July 1, 1997: Metadata files are complete for all but the last four counties digitized. A final review of the completed metadata files is necessary to incorporate minor updates. The CRP metadata files for about 20 northern counties were used by the DNR/LMIC's Forest Resources Council Interagency Information Cooperative project; they sent the metadata files to county commissioners as examples, to encourage the counties to compile metadata for their forest resource databases.

Update, January 1, 1998: The data compatibility requirement has been satisfied. LMIC has tested digital data samples and found them to be exemplary. Metadata files are complete for all

counties. The metadata files provide users with important information about the contents, accuracy, completeness and history of the CRP GIS coverages. LMIC eventually will publish the metadata in an Internet data catalog. LMIC also will serve as a long-term repository for the CRP GIS data set.

Final Update, July 1, 1998: As described in the previous updates, the data compatibility requirement has been satisfied.

C. Status of Match Requirement: not applicable

II. Project Summary: The Conservation Reserve Program (CRP) is the most significant environmental initiative taken by federal farm programs to date. The program has markedly reduced the off-site effects of cropland erosion, improved water quality, enhanced fish and wildlife habitat, and supported farm income. ~~Of Minnesota's 1.9 million acres enrolled in the CRP, 1.1 million acres could be released in 1996 and many of the environmental benefits from ten years in the program may be lost if the CRP is not continued or if land returns to previous production practices.~~ This project arose from concerns about the potential loss of the CRP's environmental and economic benefits if the program were not continued or if land returned to previous production practices. The value of the original CRP's environmental and soil productivity benefits-over-costs was estimated at more than $10 billion annually nationwide, and CRP rental and cost-share payments to Minnesota landowners in the program's first ten years amounted to $1.14 billion. Although the CRP was, in fact, re-authorized in the 1996 federal farm bill, more than half a million former CRP acres did leave the program, and it appears that most were converted back to row crops (although there are no studies to confirm this). Minnesota's total CRP acreage dropped from its peak of 1.9 million acres in 1993 to a low of about 870,000 acres in late 1997, and will rise to at least 1.2 million acres by the end of calendar year 1998. (Contracts for about half of the original 1.9 million acres were originally scheduled to expire in late 1996, but many were extended one year and thus expired in late 1997.) This project ~~will facilitate~~ is facilitating effective state-level targeting of future ~~federal CRP and state~~ federal, state, and local land management funds to critical areas ~~by completing~~ through completion of the statewide GIS mapping of CRP land and ~~evaluating and utilizing~~ the evaluation and utilization of existing GIS models to identify priority lands based on nonpoint source pollution and other environmental factors. ~~For land that will emerge~~ Regarding land that has emerged or will emerge from the ~~program~~ CRP over the next decade, this project ~~will identify and communicate~~ has identified and communicated information in the form of a series of fact sheets about land ~~conservation practices and~~ management alternatives that ~~will~~ preserve the CRP's environmental benefits as the land returns to production~~, through the publication of fact sheets and the use of simulation tools~~. Finally, the project is increasing understanding of the choices and consequences of agricultural conservation policy, through a user-friendly, computer-assisted simulation game for students, farmers, conservation professionals, legislators, and others involved in, or affected by, agricultural conservation policies and programs such as CRP in real life.

III. Six Month Work Program Update Summary, January 1, 1996: Objective A is proceeding on course. Project staff will spend the majority of their time on Objective B and Objective C. Objective B is technically and conceptually the most difficult part of the project and requires more planning than the other objectives. The fact sheets in Objective C are proceeding on schedule; staff will concentrate in the next six months on editing, formatting and distribution. In Objective D, the U of M has hired a consultant to help develop the CRP policy simulation program beginning in Jan. 1996. The requested changes to this work program are minor ones that reflect the project's present status more accurately without affecting the objectives, products, overall deadlines or budget.

Update, July 1, 1996: Objective A continues on course and we expect digitizing to be completed this summer. (See enclosed copy of statewide map-in-progress.) In **Objective B**, the CRP Technical Advisory Team has met six times and developed a draft for a comprehensive planning framework for state and sub-state planning for CRP which can be applied to other conservation programs as well. Considerable preliminary analysis has been conducted to support the work of the technical team, using the CRP database and other statewide and county data. Examples include the enclosed color maps, which are further described in B.2.f., below. In **Objective C**, drafts for additional topics begun in the last six months (grazing and organic production) are now complete, and several authors are revising drafts based on reviewers' comments. A professional/technical contract is under way for editing of final drafts, and we are planning to distribute the fact sheets this August and September. The three "train-the-trainer" workshops on the CRP decision case were successful. Compilation of the resource directory will begin as soon as possible. In **Objective D**, a preliminary CRP policy simulator has been developed and will be tested with assistance from CRP contract-holders, county agricultural extension educators, soil and water conservation district staff, and others at a workshop in early August.

As with our previous update, the minor work program changes requested in this update are intended simply to reflect the project's present status more accurately, and have no impact on the project's objectives, products, overall deadlines or budget.

Several outside developments have created unique opportunities for this project's outcomes to be applied, but have also affected the project's progress: several requests per month for digital or hard-copy CRP data and/or presentations about the CRP project; several meetings with federal and state agencies and other stakeholders to discuss development of a CRP state plan prior to the next CRP sign-up; the Minnesota Legislature's establishment of a pilot CRP Land Transfer Program to be implemented by BWSR in consultation with the MDA using CRP project data and expertise; special requests from two soil and water conservation districts to have their RIM lands mapped at the same time we map their CRP lands (we made special arrangements to do so using methods that can be replicated in potential future mapping of RIM lands); and ongoing development of the 1995 federal farm bill. NRCS has asked us to use products developed by the CRP Technical Advisory Team to help identify 8-10 geographic "Conservation Priority Areas" throughout the state, by October 1, 1996, for a new federal Environmental Quality Incentives Program which is closely related to the CRP. We also anticipate a role in the CRP Subcommittee of a new NRCS State Technical Committee with broad stakeholder participation to be established by October 1996. The work completed by the CRP Technical Advisory Team, described in B.1.f and B.2.f, below, should provide an excellent starting point for the forthcoming CRP subcommittee.

Update, January 1, 1997: If approved, we plan to devote some of the resources originally allocated to Objective C to Objective A, and some from Objective A to Objective B. The requested budget changes are explained in the budget and the January 1, 1997 update sections for these objectives. We have also requested a one-year project extension (see enclosed copy of letter dated December 20, 1996). The timelines in this update do not yet reflect the requested extension. In **Objective A**, digitizing is complete for all but four counties (see enclosed map-in-progress). In **Objective B**, we have presented results of the CRP Technical Advisory Team's work at several meetings, conferences and conventions. In **Objective C**, final drafts for 11 fact sheets are being formatted and two more are being edited. Printing and distribution arrangements are under way. In **Objective D**, the CRP "Ag Lands" policy simulator was tested at a workshop in Fergus Falls. A refined version will be presented to future users at another workshop in early 1997.

Update, July 1, 1997: A one-year extension of the appropriation for this project was approved under ML 97, Ch. 216, Sec. 15, Subd. 26(a). The amendments to this work program consist of 1) revised timelines which reflect the project extension, and 2) a reallocation of $7,700 from Objective B to Objective A. In **Objective A**, digitizing of CRP lands is complete for all counties, thereby also completing the statewide digital CRP map. In **Objective B**, digital CRP map data was forwarded to the BWSR for distribution to county SWCDs. Also, we have contracted with the U of M to refine and test the nonpoint source surface water pollution index developed earlier. In **Objective** C, the *Minnesota CRP Information Series* was printed and widely distributed (see enclosed copy). In **Objective D**, development of the program underlying the "AgLand" policy simulation game is complete (see enclosed brochure).

Update, January 1, 1998: Objectives A and **D** have been met. We anticipate spending most, if not all, of the project's remaining funds ($6,642) to complete **Objectives B** and **C** (by April 1998) and to prepare and disseminate final project reports (by July 1, 1998). In **Objective B**, the remaining work consists primarily of printing and mailing CRP maps to selected recipients and making arrangements for long-term storage of the digital CRP data to ensure ongoing access by a wide range of users. In **Objective C**, we need to finish the 13th fact sheet in the *Minnesota CRP Information Series*, entitled "Converting to Native Vegetation," which is undergoing final edits based on reviewers' comments. We also intend to print additional folders for the series. When **Objectives B** and **C** are met, we will begin preparing final project reports. We will mail certain reports to project cooperators and participants.

From July through October—a time of immense change in Minnesota's CRP landscape—project staff participated in several state-level CRP policy efforts. Our involvement in these efforts is not part of this LCMR project per se but, rather, a positive outgrowth that benefits the project by keeping us abreast of changes in CRP policy and increasing our understanding of the choices landowners must make regarding CRP. Our involvement in these activities also has helped MDA secure a seat at the CRP policy table. Following is a summary of these activities: We wrote and designed a fact sheet called "Improving Your Bid" to help landowners increase the odds of getting land accepted in the 16th CRP sign-up, which was used extensively and praised by NRCS and FSA county offices and DNR field offices during the 16th sign-up; we presented information at public meetings sponsored by members of the Minnesota congressional delegation about the results of the 15th CRP sign-up; we began receiving and fielding phonecalls from landowners who want to understand how recent changes in CRP policy affect their situations; we participated in NRCS State Technical Committee meetings on CRP; and, finally, we initiated and wrote an inter-agency letter to the USDA Secretary urging changes in CRP policy.

Final Update, July 1, 1998:

In this project, we concentrated on putting decision-making tools into the hands of farmers and conservation professionals. The project consisted of three distinct, successful efforts:
1) complete a statewide digital database and map of CRP lands, disseminate the data, and explore ways to use the data to identify environmentally sensitive areas (Objectives A and B); 2) develop educational materials on environmentally sound and productive land management alternatives for land coming out of CRP (Objective C); and, 3) develop a user-friendly, computer-based exercise that simulates agricultural policy choices and consequences (Objective D).

The next several paragraphs summarize 1) overall project results and their significance; 2) how the budget was distributed and other funds that helped finance the results; 3) reflections on the process; and 4) plans for further work. Details on these topics are provided in the final updates for each project objective.

Overall Project Results and Significance:
This project resulted in the following major products:

- The ***Minnesota CRP GIS Database***—a statewide and county GIS tool for analyzing the nearly 1.9 million acres of cropland enrolled in the first 10 years of CRP. The database was offered free of charge to conservation professionals and planners in every county and is being used by several regional and statewide agencies and organizations. While statewide in scope, it can be used at many different scales, from large watersheds, to counties, to townships. Conservation program managers, local water planners, wildlife researchers, and others are using the database to gain a better understanding of changing land use patterns and natural resource conditions. Many agencies and organizations have added the database to existing natural resource data sets and land use inventories.
- ***CRP Maps***—publication-quality maps of the state and of each county, showing CRP lands in 1994. The county maps also include water features, roads, and township/city boundaries. These maps were sent to conservation professionals and planners in every county along with general information about the Minnesota CRP GIS Database, including how to access the digital data.
- ***Refining the Non-Point Source Surface Water Pollution Index for CRP***—a report which builds on the work of an interagency technical team that evaluated models for targeting environmentally sensitive lands (in Objective B of this project). The report provides evidence that flat, poorly drained lands with surface tile inlets in Minnesota are often a significant source of surface water pollution, which is overlooked in the Environmental Benefits Index (EBI) USDA uses to rank CRP bids. The report suggests revising the EBI. The report may be used in a proposed future project to develop user-friendly software that state and local agencies can use to identify lands critical to surface water quality.
- The ***Minnesota CRP Information Series***—a set of 13 fact sheets to help farmers and other CRP landowners evaluate post-CRP land management issues and options. The series focuses on land use options that have the potential to maintain the CRP's environmental benefits while also providing an income. About 3,200 copies have been disseminated to farmers and information providers around the state, and the remaining 1,800 will be disseminated by MDA and the U of M Extension Service. The series is the single most comprehensive source of information for Minnesota CRP contract-holders on post-CRP alternatives to row crops and issues related to leasing the land. Alternatives to row crops are especially important for highly erodible lands. (About half of Minnesota's original CRP lands were highly erodible.)
- ***Ag Land: The Game***—a user-friendly, computer-assisted agricultural policy simulation game designed to improve players' understanding of the complex choices faced by farmers and policy-makers. The game is packaged in a box containing software, instructions, a game board, and game pieces. It offers practice in making decisions that, in real life, can become monumental, involving a wide array of economic, social, and environmental factors. Based on test runs, the game appears to be especially helpful to at least two groups: 1) environmental specialists with little training in the agricultural sciences whose work increasingly involves programs affecting private farmlands; and, 2) high school and college students who may some day help set agricultural policy or be faced with real-life farming decisions.

Other products generated by this project include:

- *A set of handouts describing the Minnesota CRP GIS Database.* These handouts and the documentation mentioned below together serve as an ad hoc user's manual for the database.
- *Extensive documentation on the accuracy and completeness of the CRP GIS database, and a mapping procedures manual.* These will be used in a project to map RIM Reserve lands and in a proposed future project to update the CRP GIS database (see *Further Work*, below).

- *Digital demonstrations of the Minnesota CRP GIS Database (in EPPL7 and PowerPoint).* We used these in exhibits and presentations to describe the database and its capabilities to a wide range of conservation, agriculture, and GIS professionals.
- *Miscellaneous maps generated from the CRP GIS database and other GIS data.* One example is a map comparing the geographic distribution of sinkholes with CRP lands in Fillmore County. We hope to compile these maps into an ad hoc "atlas," or suite of maps, to showcase applications of the CRP GIS database at various geographic scales.
- *A set of three draft environmental benefits indexes focusing on surface water quality, ground water quality, and biodiversity.* These will be used to develop software to identify environmentally sensitive lands in a proposed future project (see *Further Work*, below).
- *Notes, tapes, and other materials from meetings of the technical team that developed the draft indexes mentioned above.* These meetings provided an opportunity for lively exchange among some of the state's leading soil, water, and wildlife experts, regarding the best way to identify environmentally sensitive lands.
- *Maps of RIM Reserve lands in Scott and Nicollet Counties.* The mapping of RIM lands was accomplished simultaneously with the mapping of CRP lands, at the request of the Scott and Nicollet SWCDs (and financed entirely by them). The resulting maps inspired BWSR to contract with MDA to help map other RIM Reserve lands statewide (see *Further Work*, below).
- *Improving your Bid for Enrollment in CRP*, a fact sheet that provided tips on improving the odds of acceptance in the 16th CRP sign-up (held in October/November 1997). This was an interagency project initiated by DNR and implemented by MDA's CRP project coordinator with assistance from other agencies and organizations. The fact sheet was disseminated to farmland owners throughout the state via USDA, DNR, SWCD, and Extension county offices. Minnesota's acceptance rate in the 16th CRP sign-up was 87 percent, compared to 37 percent in the 15th sign-up (held in March 1997).
- *A draft concept paper for a coordinated statewide effort to increase local-level flexibility in implementing federal and state conservation programs.* This generated considerable interest at interagency meetings in early 1996. It was not further developed because of changes in conservation provisions of the 1996 federal farm bill that complicated the issue. However, a revised version of the concept paper may prove useful in future discussions among federal and state agencies that want to better coordinate the way they interact with local government in implementing conservation policies and programs such as the federal EQIP program.
- *A collection of airphoto copies showing every Public Land Survey section in the state that contained CRP land in 1994*, when the photos were collected from USDA county offices.

Overall Project Budget Distribution and Financing:

The $200,000 budget for this project was distributed as follows:

Professional/technical services	$143,170
Part-time unclassified salary	$ 35,132
Printing	$ 9,220
Supplies (including software)	$ 6,726
Communications	$ 5,252
GIS training	$ 500

Other financing for the project was provided by MDA in the form of a) the project coordinator's salary (see staffing summary at end of report) and a portion of the salary for part-time staff working on the project; b) clerical support and miscellaneous overhead expenses, such as rent and telephone, for the project coordinator and part-time staff; and, c) GIS hardware and

peripherals. These expenses total approximately $105,000. Additional financing for Objective D included $40,000 provided by USDA, the U of M, and DNR.

Past financing of the project was provided by a general fund appropriation of $300,000 for fiscal years 1993-94 to the commissioner of agriculture to begin the statewide CRP mapping effort and issue grants for the development of CRP contract-holder education programs and materials.

Overall Project...In Hindsight:
This project has no unresolved problems, per se. However, it was an ambitious project—actually three separate projects—that pulled staff in several directions with little time or budget for overall project management and outreach activities. In the proposed continuation of this project (see *Further Work*, below), we are building in more time and requesting funds to enable us to prepare more reports, improve formal presentations, provide enhanced support to CRP GIS database users, visit digitizing sites and other project implementation locales, and attend more conferences and hold workshops to help disseminate major products. In this project, while we fell short in these activities, we did succeed in providing hands-on decision-making tools to farmers, educators, and conservation professionals throughout the state. Along the way, we also forged and broadened MDA's working relationships with several federal, state, and local conservation partners.

Further Work:
Plans to continue work on Objectives A and B include: 1) a pending LCMR proposal for $400,000 to update the Minnesota CRP GIS Database, disseminate the data, and maximize its utility; 2) a pilot project by MDA to update the CRP databases for two to four counties during fiscal year 1999; 3) ongoing maintenance and dissemination of the Minnesota CRP GIS Database by MDA during fiscal year 1999; and, 3) a fiscal year 1999 interagency agreement between BWSR and MDA to map RIM lands using GIS and lead a multi-agency task force to ensure compatible statewide GIS mapping procedures for RIM, CRP, and other conservation programs.

There are no formal plans for further work on Objectives C or D. MDA will update the Internet version of the *Minnesota CRP Information Series,* as time permits, and maintain the original, camera-ready materials. The U of M will make improvements to *AgLand: The Game,* based on feedback from players, as time permits.

Enclosures:
The following products (or copies) are delivered with this report:

- Laminated, wall-sized statewide map of CRP lands (in cardboard tube)
- *Minnesota CRP GIS Database* (a set of maps and handouts describing its contents and capabilities)
- *Minnesota CRP Information Series*
- *AgLand: The Game* flyer/order form.
- *Refining the Non-Point Source Surface Water Pollution Index for CRP*
- List of technical team members who met to evaluate models for identifying environmentally sensitive lands in Objective B of this project
- Newspaper articles on project activities and results

IV. Statement of Objectives:

A. Complete GIS mapping of CRP land in all remaining counties.

B. Assess the relative importance of CRP lands for soil conservation and water quality through environmental and geographic analysis.

C. Identify and communicate environmentally and economically sound land use alternatives for lands returning to production.

D. Develop and test a computer-based CRP policy simulation program that links GIS, contract holder survey and land use alternatives data gathered in first three objectives of this project and preceding FY94-95 general fund CRP project.

Timeline for Completion:	7/95	1/96	6/96	1/97	6/97	1/98	6/98
A. GIS mapping:					xxxx		
B. Environmental modeling:							xxxx
C. Land use alternatives:							xxxx
D. CRP policy simulation:					xxxx		

V. Objectives:

A. Title: Complete GIS mapping of CRP land in all remaining counties.

A.1. Activity: Complete GIS mapping of CRP land in all remaining counties.

A.1.a. Context: Minnesota has 1.9 million acres enrolled in the federal Conservation Reserve Program. Land was enrolled in the program because it was highly erodible or otherwise environmentally sensitive, or because it was eroding above the tolerable soil loss limits due to management practices. If targeting of much reduced CRP funds is to protect the most fragile acres, the location and other critical attributes must be known. To target most effectively and make use of existing GIS environmental databases, a CRP data layer must be developed. The CRP lands in 26 counties were mapped using GIS technology in the previous two-year project. Mapping of all remaining counties with CRP contracts will complete the statewide coverage. The geographical location of the contracted parcel, linked to an attribute database with information on land capability class, contract expiration date, vegetative cover type, etc., provides the foundation for future targeting.

A.1.b. Methods: Minnesota's CRP lands will be mapped at a scale of 1:8,000 using GIS technology to link locational and attribute data. Airphotos with CRP boundaries drawn in and a CRP attribute database were secured earlier from the USDA Farm Service Agency (FSA). SWCD and state university staff and students under professional technical contracts will digitize CRP parcels township by township using pc-ArcInfo software. Quality control and additional data processing necessary to build the statewide coverage and print maps will be contracted to the GIS consultant used for the previous project. The CRP GIS coverages will be usable in both ArcInfo and EPPL7 formats. Digital county, watershed and statewide coverages will be made available to county, state and local governmental agencies and others interested in the using the data.

A.1.c. Materials: 3.5 inch diskettes. Map plotting supplies. Contractors will provide the materials needed to produce the digital maps.

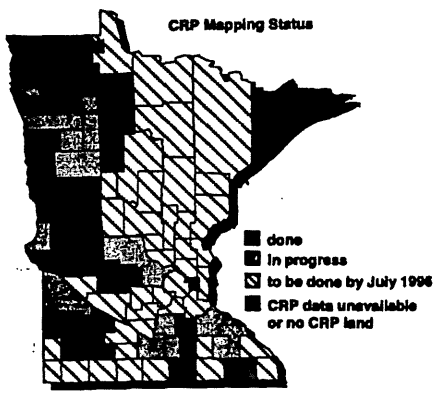
A.1.d. Budget:

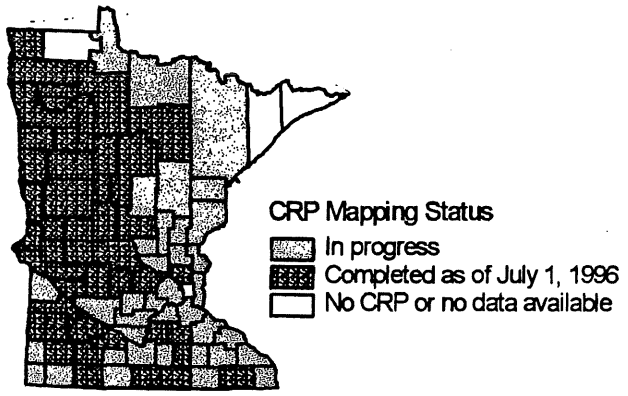
Amount Budgeted:	$106,340
Balance (6/30/98):	$ 0
Match:	no match required

A.1.e. Timeline:

	7/95	1/96	6/96	1/97	6/97	1/98	6/98
1. CRP parcels digitized:	xxxxxxxxxxxxxxxx						
2. County maps completed:		xxxxxxxxxxxxxxxxxxxxxxxx					
3. State maps produced:			xxxxxxxxxxxxxxxxxxxxx				

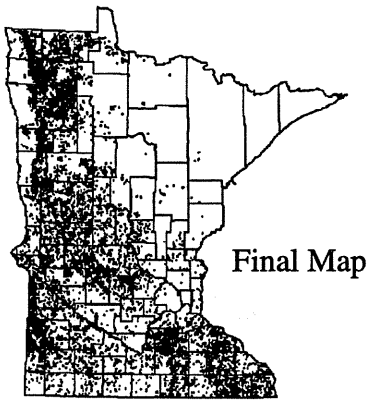
A.1.f. Workprogram Update, January 1, 1996: Digitizing of the CRP parcels in the remaining 57 counties (which contain 33 percent of the state's CRP acreage) is under way at six sites, including five SWCDs and St. Mary's Univ. of Minnesota. St. Cloud State Univ. will soon become the seventh and final digitizing site. GIS quality control and diskette preparation services are being provided by BRW, Inc. of Minneapolis. Interim maps of the existing (incomplete) statewide coverage will be produced as needed, culminating with a completed state map. Roseau County will not be included because it declined to provide the necessary CRP data.





Update, July 1, 1996: The 46 counties mapped to date contain 80% of the total CRP acreage and 72% of all CRP contracts in Minnesota. We anticipate completing the 37 remaining counties this summer. An interim map of the statewide coverage is shown below and a full-page copy is enclosed with this update. Conversion of the CRP GIS county coverages to EPPL7 format is under way, and the distribution to local governments will begin with the copies to be provided at a conference this July to interested local water planners from around the state. We anticipate a more systematic distribution by years' end of wall-sized paper plots and digital coverages to several local government offices in all counties except those with very little or no CRP land.

Update, January 1, 1997: All but four counties (Nicollet, Olmsted, Winona, and St. Louis) have been digitized. We anticipate completing these and the statewide coverage in early 1997. Conversion to EPPL7 is complete for all digitized counties. Preparation of plots and digital coverages is in progress and we plan to distribute these products in the next six months. However, distribution activities, including compilation of metadata (see section I.B.), will hereafter be discussed under Objective B, as the steps necessary to prepare the data for distribution relate more closely to GIS analysis than to digitizing. (Consequently, a $5,000 encumbrance that was accounted for in the previous update under the budget for Objective A is now accounted for under the budget for Objective B.) Additionally, a reallocation of $16,000 from Objective C to Objective A will enable funds no longer needed for Objective C to fund unanticipated expenses necessary to complete Objective A. These expenses include 1) the need to collect source data for three counties (for all other counties, we obtained source data in 1994 at no cost via special, one-time arrangements); 2) the opportunity to digitize Roseau County as source data unexpectedly became available; and, 3) complications in digitizing several counties with poor source data or highly irregular county boundaries (e.g., along rivers).



Final Map

Update, July 1, 1997: This objective has now been met. Nicollet, Olmsted, Winona, and St. Louis Counties have been digitized, thereby completing the statewide coverage (see left). Also digitized were 12 townships in the eastern third of Marshall County which we discovered had been omitted when we first digitized that county (in the project that preceded this one). We also encountered a problem in completing Olmsted County. We initially thought it would be more cost-effective to adapt to project needs an existing digital map of grassland created by Olmsted County's planning department, rather than digitizing the CRP land. We obtained the grassland coverage from Olmsted County in February and determined, after some assessment, that it would be more cost-effective to digitize. Funds from Objective B were moved to Objective A to cover the unanticipated expense of digitizing Olmsted and eastern Marshall Counties.

Update, January 1, 1998: With the statewide CRP map completed and Objective A met, our attention has turned to disseminating this information. Our contracts with BRW, Inc. and MASWCD for digitizing and GIS quality-control services ended June 30, 1997. At our request, BRW provided several versions of the final statewide coverage in different file formats and geographic projections to serve varied user needs. We have prepared a final, publication-quality map of the statewide coverage (see enclosed copy) and will mail copies to project participants and cooperators throughout the state. The task of disseminating the CRP maps and digital data falls more appropriately under Objective B and is discussed there in greater detail.

The original budget for Objective A was $90,000. We first increased the budget to $101,000 by reallocating funds from Objective C, and then increased it again to $108,700 by reallocating $7,700 from Objective B. In the end, the total cost to complete Objective A was $106,332. The reasons are described in previous updates for Objective A. With this update, we are reducing the budget for Objective A to $106,340 to reflect the amount actually spent. This allows us to restore $2,360 to Objective B where it is needed to help cover the costs of printing and mailing maps.

Final Update, July 1, 1998:

Objective A Results and Significance:
In Objective A, we mapped 700,000 acres of CRP land in 58 counties, resulting in 58 new county CRP GIS databases and a statewide ***Minnesota CRP GIS Database***, thereby completing the mapping of CRP lands begun in the previous project. (Of Minnesota's 87 counties, 58 were mapped in this project, 26 were mapped in the previous project, and 3 had no CRP lands. The 58 counties mapped in this project contained about 60 percent of the state's 27,000 CRP contracts and 38 percent of the state's peak CRP acreage.) We disseminated CRP maps and offered the digital data to nearly 1,000 conservation professionals throughout the state, as described in the final update for Objective B.

The completed Minnesota CRP GIS Database provides a snapshot in time, when CRP enrollment in Minnesota was at its peak of 1.9 million acres. It includes spatial and attribute data on lands accepted into CRP from 1986 to 1992. While statewide in scope, the database can also be employed at the watershed, county, or even the township level. At least 70 conservation program managers, local water planners, wildlife and biodiversity researchers, and others are currently using the digital CRP GIS data at a variety of scales to improve their understanding of land use patterns and natural resource conditions in their study areas. Many federal, state, and local agencies and non-profit organizations have added the CRP GIS data to their existing land use inventories or natural resource databases and are using it in combination with other GIS data to help develop, target, or evaluate conservation programs. The CRP GIS database may be used to

determine which CRP lands are the most environmentally sensitive, most productive, wettest, nearest to water or wildlife habitat, best suited for grazing or hybrid poplar, most likely to qualify for new conservation buffer programs (after CRP contracts expire), and much more.

Even before it is updated, the existing CRP GIS database has considerable historical value, making it possible to evaluate the environmental and economic impacts of the original CRP. The DNR, for example, is studying the effect of CRP on wildlife based on historical roadside wildlife population surveys and CRP data. The historical CRP data also makes it possible to analyze the environmental and economic fate of lands coming out of CRP—to determine, for example, which lands were re-enrolled and which were converted to pasture or hybrid poplar or back to row crops. This information may help farmers and rural communities plan for changes in land use as more CRP contracts expire over the next decade. The CRP GIS database also provides a baseline for making ongoing updates.

When USDA succeeds in implementing GIS in its county offices (as it plans to do over the next several years), the updated CRP GIS database will aid the CRP enrollment process, and may also be used to help promote the program. At least one USDA county office has already used the existing CRP GIS database to promote enrollment in the new "Continuous CRP," by identifying which soon-to-expire CRP lands qualify, and contacting those landowners directly to inform them of their eligibility.

Other beneficial outcomes of Objective A include: 1) hands-on GIS experience for the students and staff who digitized CRP parcels at SWCD offices and universities; 2) experimentation with a different mapping method (for Winona and Houston counties only) that we will consider using in future mapping efforts (see below, *Objective A...In Hindsight*); and, 3) the mapping of RIM lands in Nicollet and Scott counties simultaneously with the mapping of CRP lands. We arranged this at the request of the Nicollet and Scott SWCDs, using entirely their funds. The resulting maps inspired a fiscal year 1999 MDA-BWSR agreement in which MDA will arrange for the GIS mapping of RIM lands statewide and lead a task force on compatible GIS mapping procedures for RIM, CRP, and other conservation programs (see below, *Further Work on Objective A*).

Objective A Budget Distribution and Financing:
The $106,340 budgeted for Objective A was spent as follows:

- $86,547 - digitizing contracts
- $19,785 - contract for GIS quality control and preparation of final statewide database
- $8 - communications

In the previous project, MDA spent $119,240 in general fund dollars to map more than one million acres of CRP land in 26 counties. Thus, the total, direct cost to build the Minnesota CRP GIS Database was $225,580. That figure does not include the project manager's salary (provided in-kind by MDA), or data documentation and dissemination expenses, which are included in the budget for Objective B.

Objective A...In Hindsight:
If the continuation of this project is funded (see *Further Work on Objective A*, below), there are several mapping procedures we may change. None of these changes could have been made during this project, however, as the circumstances were different or the technology did not exist. For example, on-screen digitizing using digital ortho-photo quadrangles (DOQs) is a mapping method that produces superior results, leaving few or no spatial errors and allowing the digitized CRP parcels to be displayed against an airphoto backdrop. However, throughout this project, not only was the DOQ method prohibitively expensive but, also, DOQs were unavailable for much of the state. Today they are available for all but a few counties, in a more user-friendly format that renders them less time-consuming and, therefore, less costly to use than in the past. Another example is that recent software extensions and upgrades make it possible to accomplish certain

essential GIS tasks in-house rather than contracting with consultants. This will lead to greater project control, flexibility, and efficiency.

Further Work on Objective A:
Plans to continue this work include 1) a pending LCMR proposal to update the Minnesota CRP GIS Database, disseminate the data, and maximize its utility; 2) a pilot project by MDA to update the CRP databases for two to four counties during fiscal year 1999; 3) ongoing database maintenance and dissemination by MDA during fiscal year 1999; and, 4) a fiscal year 1999 BWSR-MDA agreement to map RIM lands statewide using GIS and to lead a multi-agency task force to ensure compatible statewide GIS mapping procedures for RIM, CRP, and other conservation programs.

B. **Title:** Assess the relative importance of CRP lands for soil conservation and water quality through environmental and geographic analysis.

B.1. **Activity:** Characterize CRP lands on a statewide basis and assess their importance to nonpoint source pollution prevention.

B.1.a. Context: Numerous existing digital GIS environmental and natural resources databases (e.g., the National Wetlands Inventory, county soil surveys) are available for statewide analysis. These databases will be combined with the digital CRP database completed by this project to describe CRP lands and analyze the potential impact of releasing CRP lands on nonpoint source pollution. GIS technology is uniquely appropriate for geographic analysis of CRP lands in the context of natural resource protection. This analysis will enable Minnesota to determine priority uses for future CRP funds, should the 1995 federal farm bill allow states more input on targeting decisions.

B.1.b. Methods: Using the statewide digital CRP database produced in Objective A, the geographic and environmental characteristics (e.g., land capability class, vegetative cover) of CRP lands will be documented. A technical team of soil scientists and natural resource experts will determine critical factors for protection of soil and water resources. Based on the team's recommendations, an analytical framework for identifying the most environmentally significant CRP lands will be developed for sub-state regions. Digital data for the environmental analysis will be obtained from various sources, including LMIC and the U of M. Using the framework, the CRP data, and the digital environmental and natural resource data, geographic analyses will be completed for the state. The digital data will be distributed along with the analytical framework to SWCDs (through the BWSR) and other agencies for local use and modeling.

B.1.c. Materials: Digital natural resource data. ArcView 2 software. Computing and map plotting supplies. Contractors and partners will be expected to provide all other materials and hardware needed.

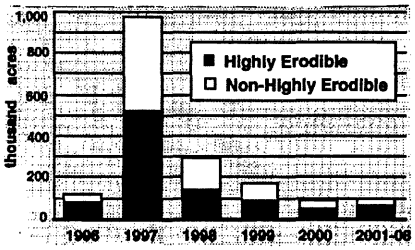
B.1.d. Budget (for B.1 and B.2 combined):

Amount Budgeted:	$55,980
Balance (6/30/98):	$ 0
Match:	no match required

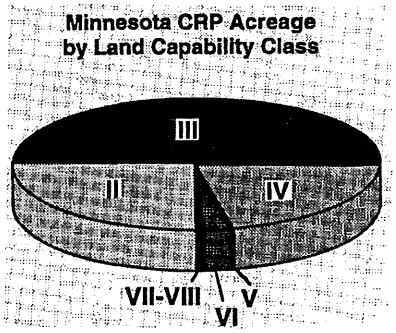
B.1.e. Timeline (for B.1 and B.2 combined):7/95 1/96 6/96 1/97 6/97 1/98 6/98

1. CRP lands characterized: xxxxxxxxxxx
2. Technical team convened: xxxxxx
3. Framework developed: xxxxx
4. Models selected, tested, demonstrated; xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
5. Digital data acquired: xxxxxxxxxxxxxxx
6. Analyses produced: xxxxxxxxxxxxxxxxxxxxxxxxxx
7. Data disseminated: xxxxxxxxxxxxxxxxxxxxxxxx

B.1.f. Workprogram Update, January 1, 1996: Project staff, including a new 50%-time, temporary MDA Research Analyst are developing a preliminary framework to serve as a starting point for the technical team. Tables, graphs and maps of the state's CRP land are under way based on the data currently in the CRP database: location, acreage, vegetative cover, erodibility (highly or non-highly erodible), land capability class and subclass, contract expiration date, and CRP rental rate. One of the maps, for example, will show which CRP parcels fall into each of four different categories: high erodibility/low productivity, high erodibility/high productivity, low erodibility/low productivity, and low erodibility/high productivity (where land capability



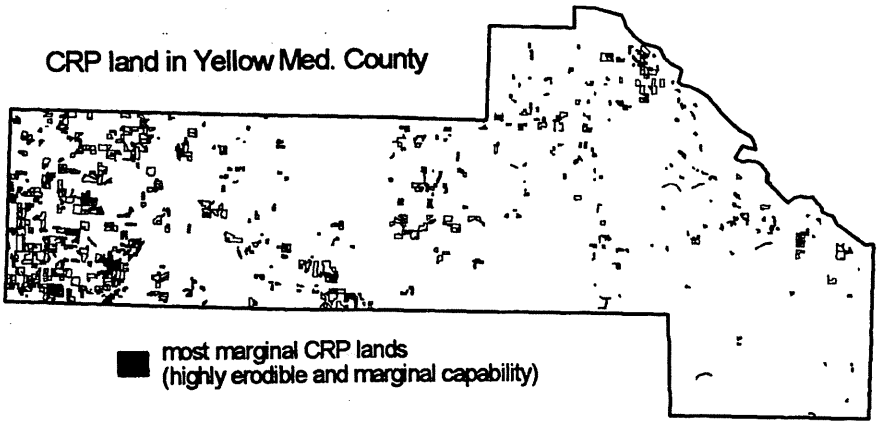
Class	Total CRP Acres
I	1,911
II	494,412
III	974,146
IV	396,577
V	4,276
VI	46,273
VII	4,866
VIII	20
unreported	6,472
Total	1,922,481



classes I through III are treated as "high productivity"). Maps and corresponding tabular data will be available at the state level for the counties mapped so far and at larger scales for at least one major watershed and one or all ten of the agro-ecoregions recently delineated for the Minnesota River Basin (as part of a set of MDA-funded agricultural nonpoint source pollution base studies conducted by U of M soil scientists). An interagency agreement is under way with BWSR to facilitate incorporating the CRP data into BWSR's existing GIS county databases in EPPL7 format and in exchange gain access to BWSR's integrated data layers. Arrangements are also under way to gain access to the STREAMS database at LMIC via the Internet.

Update, July 1, 1996: The CRP Technical Advisory team has met six times (on 3/19, 3/29, 4/18, 5/10, 5/28, and 6/25) for three hours each meeting. The team has identified critical factors for protection of soil and water resources as well as wildlife benefits and biological diversity and incorporated these factors into a set of three indexes for identifying the most environmentally significant lands for CRP and other conservation programs. The three indexes respectively address nonpoint source surface water pollution potential, wildlife habitat benefits/biological diversity, and ground water contamination susceptibility. They can be applied to statewide as well as sub-state analysis. We envision the following near-term applications of the indexes: statewide analysis of all agricultural lands to identify those that rank highly on one or more of the indexes (high rank means most suitable for CRP); a starting point for development of a CRP state plan by the USDA-NRCS CRP Subcommittee; and preparation of worksheets to help NRCS field office staff rank individual CRP bids. NRCS has indicated their interest in working closely with us in these efforts. Yet another near-term potential application of the indexes is the designation of state "Conservation Priority Areas" for a new federal conservation program to be administered

by NRCS. Numerous county and statewide maps and a computer demonstration have been compiled to help the technical team and to illustrate the capabilities of the CRP GIS database alone and integrated with other natural resource data. Examples include CRP and buffer zones around streams, CRP relative to publicly owned lands, and the four-category statewide map



described in the previous update, a version of which is illustrated above for a single county. A statewide digital natural resource database in EPPL7 format has been obtained gratis from DNR-Forestry, and acquisition of a pc ARC/INFO statewide reference database from LMIC is under way. These will be used to conduct statewide analysis based on the indexes developed by the technical team and to prepare large-format county plots of CRP land to send to county offices.

Update, January 1, 1997: Beginning with this update, we are combining Activities B.1. and B.2. into a single activity (B.1.) These activities have become so intertwined that it is difficult and pointless to distinguish progress and dollars spent in one from progress and dollars spent in the other. Consequently, we have integrated the budget and timeline for Activity B.2. into Activity B.1. (The resulting combined budget would be $55,000. However, as explained in the update for Objective A, $5,000 is being moved from Objective A to Objective B, which changes the total budget for Objective B to $60,000.) The context, methods, and materials described under the former Activity B.2. remain the same and may simply be considered part of the "new," combined Activity B.1. The rest of this section reports on progress in the "new" Activity B.1. The framework for CRP analysis developed by the CRP Technical Advisory Team was presented in demonstrations and displays at several 1996 conferences and conventions (Local Water Planners, New Ulm, July; Nonpoint Source Pollution, La Crosse, WI, September; Minnesota GIS/LIS, St. Louis Park, September; Minnesota Assoc. of Soil & Water Conservation Districts, Bloomington, December) and at the first meeting of the CRP Subcommittee of the State Technical Committee of the USDA Natural Resources Conservation Service in October. That month we also conducted an extensive analysis of current CRP land and total cropland likely to be eligible for CRP under the proposed new CRP rules as background for multi-agency comments on the proposed rules. We utilized the indexes developed by the technical team for much of this analysis. For example, in applying the wildlife/biodiversity index to existing CRP acres in Kittson County, we found that at least 20% are highly suitable for permanent wildlife habitat. On a scale of 0 to 20, these acres scored 18 or higher, based on a combination of parcel size and vegetative cover. Additional "bonus point" factors can increase a parcel's score by anywhere from 1 to 8 points—enough to put some into the "highly suitable" category of 18 or higher. These factors include but are not limited to: adjacency to an existing wildlife conservation area, potential to connect an existing wildlife habitat corridor, diversity of cover types and diversity of species within a cover type. A CRP bid ranking process based on these indexes could be made more competitive by accepting only scores of 20, less competitive by

accepting scores ≥ 15, or whatever is judged appropriate by those approving the process. We plan to prepare similar examples for the surface water and groundwater quality indexes and to prepare a report summarizing the indexes.

Update, July 1, 1997: Conversion to EPPL7 is complete for all digitized counties, and files for all but the last four counties digitized have been forwarded electronically (via FTP) to the BWSR for incorporation into its EPIC water planning database and eventual distribution to county SWCD offices. Preparation of digital coverages and hard copy maps for distribution to other county-level agricultural agencies continues; we plan to distribute these materials by the end of the year. Conversion of the statewide coverage to EPPL7 is also complete, but additional processing (either in-house or by LMIC) is necessary to prepare the EPPL7 version for incorporation into a statewide natural resource database called MGC100. This will allow greater access to the statewide coverage and facilitate its analysis. We started a $4,000 contract with the U of M (through Dr. David Mulla of the Soil, Water, and Climate Department) to refine and test the nonpoint source surface water pollution index developed by the CRP technical advisory team (as described in the July 1, 1996 update for this objective). We have been called upon to help analyze issues related to the 15th general CRP signup—particularly Minnesota's low acceptance rate—and the Minnesota Conservation Reserve Enhancement Program. Congressman David Minge has scheduled public meetings in July to address these issues. The CRP GIS database has been employed by several other projects in recent months including the DNR's GAP analysis project, studies of the Lake Agassiz Beach Ridge area by The Nature Conservancy, and the BWSR's CRP land transfer pilot program.

Update, January 1, 1998: The most important remaining task is to disseminate the CRP data compiled under Objective A. Since the beginning of this project, we have disseminated the county-level digital (GIS) data upon request as it became available. Now that all county coverages and the statewide coverage are complete, we will disseminate a hard-copy, publication-quality version of this data to an even wider audience of conservation professionals, many of whom do not yet use GIS technology. So far, we have finished printing state maps showing lands enrolled in CRP in 1994, and we have begun plotting larger-scale county maps. The state map will be mailed to agencies and organizations throughout the state with an interest in CRP. The county maps will be mailed to selected recipients in each county, including SWCD managers, NRCS conservationists, FSA directors, Extension educators, local water planners, board of commissioners chairpersons, and planning and zoning coordinators. Many have already requested and are using the digital CRP data for their counties. For those who have not already requested the digital data, however, the mailing will include a form for ordering it free of charge from MDA. Also accompanying the state and county map mailings will be several enclosures to help provide context. These include a graphic illustration of the attribute data in the CRP database (erodibility, land capability, expiration date, rental rate, etc.) and an example of how the data may be used to assist with conservation planning.

The project's part-time, temporary, unclassified research analyst position, which had been extended beyond its initial March 1997 end date, came to an end on October 14, 1997. The graduate student who had filled this position since December 1995 was unavailable for another extension. To fill a need for assistance in printing the CRP maps for the mailings described above, we hired a part-time, temporary undergraduate student worker. (Details are provided in the project staffing chart at the end of this update.)

In addition to planning the mailings described above, we also are making arrangements for ongoing access to the digital CRP database and for its long-term archival. These needs will be met in several ways. First, as described above, MDA will send upon request a free digital version of each county's CRP GIS database to selected recipients in that county. Second, after this LCMR project ends, MDA may forward such requests to LMIC. We are working with LMIC to develop a policy to address long-term data dissemination issues, such as the circumstances under

which future users may have to pay for the CRP data. Final ordering information will be added to the metadata file that accompanies each coverage. In addition to its role as a long-term repository of the CRP GIS database, LMIC will also incorporate the EPPL7 version of the statewide coverage into the existing "MGC100" statewide natural resource database, which will provide another way for users to include the CRP data in state-level environmental analysis. Third, BWSR will distribute nine data layers from the CRP GIS database for each county to SWCDs and local water planners as part of its EPIC water planning database. EPPL7 versions of the final four county coverages were forwarded to BWSR for that purpose in August. Finally, we are working with DNR to provide its staff access to the CRP GIS data through its core GIS database. Several DNR researchers are already using the recently completed statewide CRP coverage. DNR's GIS system will allow users to organize the CRP data by watershed, eco-region, legislative district, and other types of regions.

Our contract with the U of M to refine and test a nonpoint source surface water pollution index ended December 31, 1997. Deliverables include revisions to an existing nonpoint source surface water pollution index developed by the CRP technical team that met earlier in this project (see the July 1, 1996 update for Objective B.1) and examples from one or more test sites where the revised index was applied. The general conclusion is that the existing index adequately emphasizes the importance of steep, highly erodible lands that lie next to water, but does not adequately identify another important factor—steep lands that are connected to poorly drained lands. Poorly drained lands situated at the toe of a steep slope can contribute significantly to nonpoint source surface water pollution, especially if there are surface tile inlets.

The original budget for Objective B was $55,000. In January 1997 we increased it to $60,000 (see the January 1, 1997 update for Objective B). In July 1997 we reduced it to $52,300 to move $7,700 to Objective A for unanticipated mapping expenses (see the July 1, 1997 update for Objective A). With this update, we are increasing the budget for Objective B to 55,980 to reflect the amount needed for estimated remaining expenses. This will be accomplished by moving $2,360 from Objective A and $1,320 from Objective C.

Final Update, July 1, 1998:

Objective B Results and Significance:
In Objective B, we successfully analyzed CRP lands and evaluated models for identifying environmentally sensitive lands. We spent more time than anticipated on maintaining, documenting, and disseminating the statewide and county digital data created in Objective A—in short, the essential "housekeeping" activities that are part and parcel of creating a large database.

Specific results for Objective B include:

- ***Analysis of CRP Lands***. Throughout the project, we used the CRP GIS database to create numerous maps, tables, and graphs on an ad hoc basis to inform CRP policy discussions, to help implement BWSR's pilot CRP land transfer project, to identify lands that were eligible for the new CRP, to provide background for letters to USDA requesting changes in the rules for the new CRP, and more. As described in the final update for the overall project, we aspire to compile these materials into a suite of maps that not only describe the state's CRP lands but also showcase applications of the Minnesota CRP GIS Database. Several of these maps were enclosed with previous work program update reports. Many need updating to include the complete statewide CRP database or to reflect the current status of CRP lands.
- ***Evaluation of existing models for identifying environmentally sensitive lands, leading to development of environmental benefits indexes***. While the Minnesota CRP GIS Database enables us to identify which CRP lands are the most environmentally sensitive, other tools and data are needed to identify other (non-CRP) sensitive lands. We convened a technical team of soil, water, and wildlife experts that met six times, for a total of 18 hours, to evaluate existing models for identifying environmentally sensitive lands. The purpose of that effort was to help target future CRP and other conservation program enrollments to critical areas.

The team considered existing models such as LMIC's nonpoint source pollution potential study, the groundwater contamination susceptibility study completed by MPCA in the late 1980s, and DNR's County Biological Survey database. The team concluded that none of the existing models alone were adequate and instead devised a set of three environmental indexes focusing on surface water quality, ground water quality, and wildlife habitat and biodiversity. The indexes incorporate elements of existing models but also include additional factors critical to environmental quality. The indexes have considerable potential to aid federal, state, and local conservation program planning and implementation. However, they are simply drafts that require further review and development.

- ***Further work on the nonpoint source surface water pollution index.*** We commissioned a study by Dr. David J. Mulla (University of Minnesota, Department of Soil, Water, & Climate) to refine the draft surface water quality index—one of the three environmental benefits indexes developed by the technical team described above. The resulting report, *Refining the Nonpoint Source Surface Water Pollution Index for CRP*, provides evidence that flat, poorly drained lands with surface tile inlets in Minnesota are often a significant but overlooked source of surface water pollution. Despite the water quality benefits that would accrue from enrolling this type of land in CRP, most of these lands (including about 40 percent of the cropland in the Minnesota River Basin) are ineligible for CRP (or, if eligible, compete poorly relative to other lands) due to low erodibility index scores, which are based predominantly on slope. Further work is needed to translate the revised index into a tool that agencies and organizations can use to identify lands most critical to surface water quality. These lands may then be targeted for other conservation programs.
- ***Conversion of the Minnesota CRP GIS Database*** (one statewide database and 84 county databases) to more than six different formats and projections to accommodate a wide range of user needs, and arrangements with 3 other state agencies to assist with long-term archival and dissemination. The various formats make it possible to open or import the statewide or county databases using any standard GIS software. Two of the formats greatly facilitate using the data with EPPL7 and ArcView, which are favored by many local governments throughout Minnesota. Nine layers of CRP data were incorporated into the EPPL7/EPIC natural resource data sets maintained and disseminated by BWSR (county data) and LMIC (statewide data). These data sets allow EPPL7/EPIC users to analyze and combine the CRP data with a vast array of other natural resource GIS data easily and inexpensively—without having to obtain, re-project, or convert specific data layers. For users of ArcView, the state and county databases are available as "shapefiles." For users of Arc/Info and other GIS software packages, the digital database files are available in their native format (Arc/Info coverages) and a universal export format which is easier to distribute.
- ***Dissemination of the Minnesota CRP GIS Database*** in several formats to over 70 conservation professionals. About 1,000 conservation professionals in 84 counties received our April/May 1998 mailing in which we introduced the Minnesota CRP GIS Database, enclosed several color maps, and offered to provide digital data free of charge. The mailing included a statewide CRP map, a county CRP map, an illustration of the attribute data in the CRP GIS database (erodibility, land capability, expiration date, rental rate, etc.), and a map identifying potential buffer strips in the Cottonwood Watershed, which serves as an example of how the database can be applied to conservation planning and analysis using GIS. Different versions of the mailing contained different types of county CRP maps. Of the approximately 700 county-level recipients, 250 received laminated wall-sized maps of their own counties, while another 420 received page-sized maps of their own counties. About 300 state and regional agencies and organizations received a sample county map. County-level recipients also received an order form for requesting digital CRP data. Even though many of the recipients do not yet have access to GIS technology, the mailing has so far generated almost 50 requests for the digital GIS data. These are in addition to the 20 or so requests for digital data we have received and filled over the course of the project. The statewide and county digital data is posted on MDA's electronic data transfer (FTP) site on the Internet at

ftp.mda.state.mn.us (user=anonymous, no password). Users may also elect to receive the data on a diskette by mail.

- ***Approximately 1,250 county and state CRP maps in color***, printed in-house at MDA. These were mailed to conservation professionals around the state, as described above. MDA has on file a set of large and small county maps, and will maintain the computer files needed to revise and re-print these maps in the future. Many recipients of the maps have told us that they have posted them on the walls of their county offices and refer to them frequently.
- ***Detailed data documentation***. As described in the data compatibility section of this report, we prepared a "metadata" file containing detailed documentation for each county CRP GIS database, using a template provided by the Governor's Council on Geographic Information. Every copy of the state or county CRP GIS databases we distribute is accompanied by the appropriate metadata file. The metadata files contain essential information on attribute data codes, who digitized each county and when, what data sources were used, missing data, and spatial accuracy. All too often, digital databases are created with little or no metadata, which can lead to under-use or misuse of the data. We sought to avoid those problems by compiling detailed documentation, in a format recommended by state-level GIS experts.
- ***Outreach***. We conducted at least 20 formal presentations or demonstrations of the Minnesota CRP GIS Database for a wide range of audiences, from farmers to conservation and GIS professionals. This was a highly effective means of sharing project results.

Objective B Budget Distribution and Financing:
The $55,980 budgeted for Objective B was distributed as follows:

- $35,032 - part-time, unclassified staff (see staffing summary at end of report)
- $9,663 - professional/technical services (geographic analysis, data documentation)
- $4,706 - software and training (pc Arc/Info, ArcView)
- $2,198 - supplies other than software
- $1,554 - travel expenses for outreach activities (exhibits, dissemination)
- $1,053 - postage
- $954 - digital base map data
- $820 - copies and laminating

Financing provided in-kind by MDA included an additional $2,270 in salary for the two part-time, unclassified staff employed in this project, and approximately $11,000 worth of GIS hardware and peripherals.

Objective B...In Hindsight:
In hindsight, we realize that we underestimated the need for database documentation, maintenance, outreach, and user support. As the project evolved, these essential activities consumed a great deal of time and became a higher priority than using the database to conduct in-house analyses of CRP lands. The result is that we spent more time supporting others' use of the database than on using the database ourselves. In the proposed continuation of this project, we are requesting the funds necessary to pursue both user support and in-house analysis. The two activities go hand in hand: as we ourselves, at MDA, become more experienced users of the CRP GIS database, our ability to assist others in applying the data will improve.

Further Work on Objective B:
As described in the final update for Objective A, further work on both Objectives A and B is planned on several fronts. Work on Objective B will continue in the form of ongoing maintenance and dissemination of the Minnesota CRP GIS Database in fiscal year 1999 and, if funded, Results #2 and #3 of our LCMR proposal to update the Minnesota CRP GIS Database and maximize its utility. Result #2 includes translating the environmental benefits indexes developed in this project into user-friendly software that agencies and organizations can use to identify environmentally sensitive lands, and developing demonstrations that can be tailored interactively to specific counties, watersheds, and environmental quality issues. Result #3 of the

proposed LCMR project entails using the CRP GIS data to study the environmental and economic fate of former CRP lands, in cooperation with rural community-based planning groups. This information will help these and other groups anticipate future shifts in land use as CRP contracts continue to expire over the next decade. The findings may also suggest ways to leverage the CRP to help meet local environmental and economic goals.

B.2. Activity: (Combined with Activity B.1. as of January 1997 update.) Identify existing environmental models, assess their appropriateness for addressing nonpoint pollution concerns related to CRP, and demonstrate efficacy of selected model(s) on a local or regional basis.

B.2.a. Context: Numerous models have been developed to estimate and anticipate the environmental impacts of agricultural practices and climatic events. Existing models, using digitized database layers, vary in their ability to predict real impacts over a variety of landscapes. Building on the preceding geographic analysis, the CRP data would be further analyzed using existing, technically sound, environmental models to examine the impact of changes in the geographical distribution of CRP parcels on nonpoint source pollution. Data from these models will assist local and state level decision-making as targeting priorities are considered. Demonstrating the efficacy of several of these models at the local planning level will help the state consider the benefits and consequences of different local and statewide scenarios when targeting decisions are made for future long-term set-aside funds from federal or state initiatives.

B.2.b. Methods: The technical team convened in the preceding activity will review and evaluate existing environmental models. Preliminary analyses will be done at MDA, with more complex modeling done through interagency and cooperative agreements with other state, federal and county agencies. Selected models will be demonstrated through small group forums with CRP contract holders, local water planners, and SWCD, county, state, and federal agency staff.

B.2.c. Materials: pc ARC/INFO software. Computing and map plotting supplies. Contractors and partners will provide other materials and hardware necessary to develop and test models.

B.2.d. Budget: (now combined with B.1.d.)

B.2.e. Timeline (now combined with B.1.e):

B.2.f. Workprogram Update, January 1, 1996: Technical team candidates have been identified and will be contacted in January 1996 to request their participation in four-five meetings whose agenda are in preparation. The team will begin by examining the preliminary descriptive analysis of CRP lands prepared in B.1. and a recent U of M report (part of the MDA-funded agricultural nonpoint source pollution base studies) that describes and compares several computer models of agricultural nonpoint source pollution in terms of appropriate uses, limitations, assumptions, necessary inputs, and type and reliability of output. The team will provide input into the development of a user-friendly digital "script" for demonstrating selected model(s) to local conservationists.

Update, July 1, 1996: In the course of developing the indexes described in B.1.f. above, the technical team has identified and evaluated the existing models. The team determined that the relevant existing models are only partially adequate for application to statewide CRP planning. Certain models are inappropriate for local-level planning and others are appropriate where the necessary data exists. For example, limited data on pesticide use makes it virtually impossible to analyze this particular factor in ground water contamination statewide, but it may be possible to do so for a minor watershed. The team's nonpoint source and ground water pollution indexes incorporate and expand upon certain elements of existing statewide models developed by MPCA in the late 1980's. The enclosed color maps are based on the MPCA models. We will create

similar new maps based on the technical team's indexes, which take additional critical factors into account. Remaining funds will be spent on additional in-house analysis and small professional/technical contracts with experts at the U of M, Mankato State and elsewhere to conduct specific analyses which help illustrate and test the indexes.

Update, January 1, 1997: (see B.1.f., January 1, 1997 update)

Update, July 1, 1997: (now combined with B.1.f.)

Update, January 1, 1998: (now combined with B.1.f.)

Final Update, July 1, 1998: (now combined with B.1.f.)

C. Title: Identify and communicate environmentally and economically sound land management alternatives for CRP lands returning to production.

C.1. Activity: Provide information on environmentally sound, soil conserving, and economically viable land management practices through a series of fact sheets and related educational activities.

C.1.a. Context: About 52% of CRP land in Minnesota is classified as highly erodible. Most of the remaining 48%, classified as not highly erodible, was enrolled in the program because it was eroding excessively due to management practices. CRP contract holder surveys conducted in the previous project suggest that a large proportion of enrolled land could return to pre-CRP management practices if the CRP is not renewed. Even if the program is continued, it is anticipated that its total nationwide acreage will be substantially reduced. In either scenario, contract holder education could contribute to better informed land management decisions and help protect the ten-year CRP investment in soil and water conservation, on both fragile, highly erodible land and productive land that was badly eroded upon enrollment. Contract holders surveyed in the previous project identified post-CRP land management needs and interests that included land transfer alternatives, livestock grazing, conservation tillage, conversion of CRP to crops, wind and biomass energy production, and organic crops. Disseminating information on these topics along with information on soil conservation practices will provide CRP contract holders and other farmers with management alternatives for returning land to production with minimal loss of environmental benefits. Information dissemination will be coordinated with the complementary activities of a CRP Leadership Team initiated in March 1995 by the Minnesota Extension Service in partnership with MDA and the University of Minnesota.

C.1.b. Methods: A CRP Fact Sheet Team met in May 1995 to coordinate the production and distribution of a Minnesota fact sheet series. The team will agree upon a format, review process and other issues to produce a cohesive information series. Analysis of contract holder focus groups and surveys conducted in the previous project will be used to identify fact sheet topics. Ten to twelve fact sheets will be developed through grants awarded in the previous project. Existing soil conservation information compiled by NRCS and other organizations will be included with or incorporated into fact sheet sets. The CRP fact sheet team will review, edit and evaluate fact sheets and will develop and implement a distribution strategy and network. Fact sheet packets and complementary educational products and events will be tailored to the needs of sub-state regions. Workshops and train-the-trainer sessions for a CRP decision case study will be conducted under grants awarded in the previous project, and a Minnesota CRP resource directory will be compiled with help from the Minnesota CRP leadership team. All written materials will be available electronically on the Internet as well as on paper.

C.1.c. Materials: No materials other than paper will be purchased, rented or leased as part of this objective.

C.1.d. Budget:

Amount Budgeted:	$17,680
Balance (6/30/98):	$ 0
Match:	no match required

C.1.e. Timeline:

	7/95	1/96	6/96	1/97	6/97	1/98	6/98
1. Fact sheet outlines completed:	xxx						
2. Format and design developed:	xxxx						
3: Distribution planned:	xxxxxxxx						
4. Fact sheets written, reviewed:	xxxxxxxxxxxxxxxxx						
5. Fact sheets edited, formatted:		xxxxxxxxxxx			xxx		
6. Fact sheets printed, distributed:			xxxxxxxxxxxxxxxxxxxxxxx				

C.1.f. Workprogram Update, January 1, 1996:

Drafts of the 10 titles at right are currently being reviewed. Drafts for three additional post-CRP land management options/issues are under way: intensive rotational grazing, organic production and market opportunities for alternative production. The series will be distributed free of charge to information providers throughout the State including SWCD managers, Minnesota Extension educators, Sustainable Farming Association Chapter Coordinators, county offices of the federal agencies that administer the CRP, and others, all of whom will be encouraged to photocopy individual fact sheets freely. The series will also be available on the Internet and in print individually or as a set from the MDA and other agencies. The future availability of the fact sheets has been announced on the Internet to readers of a Minnesota Extension Gopher CRP information site, and will also be announced at decision case "train-the-trainer" workshops in January and February 1996 in Marshall, Rochester and Thief River Falls. Workshops based on the fact sheets--an extension of the CRP Education and Demonstration grant activities in the previous CRP project--are being planned to target distribution to CRP contract-holders and others who will be managing land about to exit the program.

Minnesota CRP Information Series

Series Overview & Order Form
Options for Leasing Land After CRP
Energy from Biomass After CRP
Harvesting the Wind After CRP
Native Vegetation After CRP
Persistence of Planted Forages After CRP
Weeds and Rodents After CRP
Renovation for Forage Production After CRP
Harvesting Hay and Silage After CRP
The CRP in Minnesota: Facts and Figures

Update, July 1, 1996: Drafts for two of the three additional topics mentioned in the previous update are completed and being reviewed, along with a set of four titles on land leasing options which replace the previous "Options for Leasing" title. A draft for the "market opportunities" topic is still under way. A professional/technical contract is under way to edit the entire series. The editor will also format each completed draft to fit the template which has already been designed. We anticipate an initial print run in August, with distribution to follow, according to the plans described in the previous update.

New Titles, July 1, 1996

Conversion from CRP to Grazing
Conversion from CRP to Organic Production
Leasing Land after CRP: Issues and Options
Lease Provisions for Conservation on Farmland
A Glossary of Agricultural Lease Terms
Non-Agricultural Leases for Land After CRP: Wind and Recreation Uses

Update, January 1, 1997: A reallocation of $16,000 from this objective to Objective A is made possible by our decision not to undertake the CRP resource directory and also by the lower than anticipated costs of editing, formatting and providing illustrations for the Minnesota CRP Information Series. The resource directory would now be redundant because 1) the Minnesota Institute for Sustainable Agriculture has developed a web page on the Internet that serves the same purpose and to which we can contribute as needed, and 2) at the end of each of the fact sheets in the CRP Information Series is an extensive list of related resources. Editing of the fact sheets took longer than expected and has just been completed for all but two of the above titles. Formatting of final drafts and arrangements for printing and distribution are under way. Final versions also will be put on the Internet. We purchased 100 copies of a CRP Land Use Guide from the University of Nebraska Extension Service and have provided these to farmers at CRP-related field days around the state. In March, we co-sponsored a workshop on converting from CRP to organic production with the Coteau chapter of the Minnesota Sustainable Farming Association (SFA). In July we co-sponsored a CRP field day with the Cannon Falls SFA chapter. Remaining funds will be spent on printing and distribution of the Minnesota CRP Information Series.

Update, July 1, 1997: Five thousand copies of the *Minnesota CRP Information Series* have been printed. (See enclosed copy.) Of these, 2,500 are collated sets of the complete series in folders, and the rest are loose copies of each of the 12 individual fact sheets in the series. About 1,500 complete sets have been mailed so far to agricultural conservation professionals and landowners around the state. Specifically, the complete *Minnesota CRP Information Series* and flyers that briefly describe each fact sheet and provide ordering information were mailed in June to all county Extension, NRCS, FSA, and SWCD offices and many other agricultural and environmental organizations throughout the state. In addition, a news release was issued to MDA's standard media list. The response has been so overwhelming that our complete sets are nearly gone and we are considering printing more. The information is very timely, as almost 60% of the land bid for enrollment in the 15th CRP signup held in March 1997 was rejected, and landowners are wondering what to do. The fact sheets are available not only from MDA but also from the University of Minnesota Extension Service, which has a toll-free number for callers outside the Twin Cities metro area. The fact sheets—complete sets as well as individual titles of interest to specific groups—are also being advertised and distributed at various agricultural meetings around the state. The series is complete except for one fact sheet entitled "Converting to Native Vegetation;" the author's draft requires major revisions. We intend to complete this in the next several months and mail a copy to all known recipients of the otherwise complete series.

Update, January 1, 1998: Almost all of the fact sheets in the *Minnesota CRP Information Series* are now on the Internet, at www.mda.state.mn.us. We continue to receive requests for hard copies of the series. To fill the demand, we compiled additional sets using extra folders from the first printing, but we have now run out of folders. Upon completion of the final fact sheet entitled "Converting to Native Vegetation," we plan to print additional folders and use them to collate and stuff additional complete sets of the series. We still have 600 to 800 individual copies of each fact sheet reserved for groups interested in specific topics rather than the whole series. The Native Vegetation fact sheet is undergoing final revisions based on comments provided by two outside experts. When finished, it will be included in 1,500 new complete sets, placed on the Internet, and mailed to people who received incomplete sets earlier this year.

The original budget for Objective C was $35,000. In January 1997 we reduced it to $19,000 in order to move $16,000 to Objective A for unanticipated mapping expenses. With this update, we are further reducing the budget for Objective C to $17,680. This allows us to move $1,320 to Objective B for map mailing expenses, while leaving enough to cover the estimated remaining expenses in Objective C.

Final Update, July 1, 1998:

Objective C Results and Significance:
In Objective C, we produced the ***Minnesota CRP Information Series***, a set of 13 fact sheets in a folder designed to help farmers and conservation professionals evaluate post-CRP land management options. The *Minnesota CRP Information Series* comprises 46 pages of highly readable information with 37 tables, maps, graphs, diagrams and illustrations, and a concise summary on the front of each fact sheet. It contains at least 80 carefully researched resources (organizations, publications, and websites) that readers may turn to for further information, most of which are Minnesota-based. Fact sheet titles include *Energy from Biomass, Harvesting the Wind, Converting to Organic Production, Weeds and Pocket Gophers, Converting to Native Vegetation, Persistence of Planted Forages, Controlled Grazing, Renovating for Forage Production, Harvesting Hay and Silage, Basic Considerations for Leasing Post-CRP Land, Selecting a Lease Type, Maintaining Conservation Benefits on Leased Land,* and *Recreation Leases.*

Other projects have provided Minnesota farmers with plenty of information on how to return CRP lands to row crop production (such as Extension's "Life After CRP" demonstration project in Lincoln County). In contrast, the *Minnesota CRP Information Series* is the single most comprehensive source of information for Minnesota farmers on post-CRP alternatives to row crops. Alternatives to row crops may be especially beneficial for water quality and erosion reduction on highly erodible post-CRP lands that are subject to USDA's conservation compliance rules. The *Minnesota CRP Information Series* highlights often-overlooked alternatives, such as grazing and organic production, which have the potential to maintain the CRP's conservation benefits while producing an income. The series also emphasizes connections between CRP and other issues important to rural Minnesota, such as wind and biomass energy development. While the fact sheets were written specifically for those who own, rent, or manage CRP lands, anyone interested in the production alternatives and land leasing concepts addressed by the fact sheets should find the series useful. The fact sheets may serve in the future as the basis for educational workshops on post-CRP alternatives.

We printed 5,000 copies of the fact sheets and 4,000 folders. To date, we have disseminated about 2,700 complete sets in folders, and about 500 to 1,000 loose copies of each fact sheet, to individual landowners and county and state-level agricultural and conservation agencies and organizations that work with farmers—all at no charge. We mailed the series to information providers such as county Extension educators, SWCDs, and USDA offices in every county. Many of these offices in turn requested additional copies of the series or the promotional flyer/order form, which they then set out on their counters or distributed at meetings and county fairs. We also encouraged photocopying of the fact sheets and promoted the series via a press release that reached all of the state's agricultural and environmental press. For months following these dissemination efforts, we received daily requests for the fact sheets from landowners.

We wanted to reach all of Minnesota's approximately 20,000 CRP contract-holders directly, by including the promotional flyer/order form in one of USDA's routine contract-holder mailings (such as rental payment checks). However, USDA was unable to include the flyer in their mailings or to provide us with contract-holder names and addresses. We did encourage USDA county officials to include the flyer in their newsletters for all farm program participants.

We anticipate an ongoing demand for copies of the *Minnesota CRP Information Series* over the next several years as CRP contracts continue to expire. MDA and the U of M Extension Service will continue disseminating copies while they last. The fact sheets are also accessible at MDA's homepage on the Internet at **www.mda.state.mn.us**.

Objective C Budget Distribution and Financing:
The $17,680 budget for Objective C was distributed as follows:

- $10,220 - printing and collating
- $5,221 - professional/technical services (editing, formatting, illustrations)
- $1,227 - postage
- $912 - copies and supplies
- $100 - portion of salary for Mary Ann Cunningham

The cost of developing the *Minnesota CRP Information Series* was financed in part by the $300,000 general fund appropriation for the previous project. About $30,000 of that appropriation went toward grants to The Minnesota Project, the Minnesota Institute for Sustainable Agriculture, and the University of Minnesota (Dr. Craig Sheaffer, Department of Agronomy and Plant Genetics) to write fact sheet drafts.

Objective C...In Hindsight:
If we had the project to do over again, we might have allocated additional time and resources to hold workshops for CRP contract-holders on the post-CRP land management options and issues covered in the fact sheets.

Further Work on Objective C:
There are no formal plans to continue work on this project objective. MDA will continue to disseminate copies of the *Minnesota CRP Information Series* while they last. As time allows, MDA also hopes to revise the Internet version of each fact sheet, adding newly available resources, updating telephone numbers and addresses, and incorporating links to other websites. MDA will also maintain the camera-ready materials to allow for hard-copy revisions and re-printing in the future. Finally, as CRP contracts continue to expire over the next decade, MDA may use the fact sheets as a foundation for workshops on post-CRP land use alternatives.

D. Title: Develop and test a computer-based CRP policy simulation program that links GIS, contract holder survey and land use alternatives data gathered in the first three objectives and in the FY94-95 project.

D.1. Activity: Link diverse interrelated data and socioeconomic and environmental issues in a user-friendly computer simulation program to foster broader understanding of CRP policy choices and consequences.

D.1.a. Context: Choices regarding the future of the CRP at both a policy and farm level are complex and involve economic, social and environmental issues. A computer simulation program integrates the information and data gathered, the conclusions drawn and the questions raised by this and the previous project (environmental modeling, surveys of contract holder intentions and needs, market studies of alternative land uses, etc.). The simulation links these diverse databases and issues to bring farmers and technical staff together to discuss the issues and to help participants in workshops make more informed decisions. This analysis tool will allow the project to test and improve targeting scenarios developed in the environmental modeling objective and to provide contract holders with information on the impact of alternative land uses on the environment, the economy and the community. The simulation will also be used to inform state and federal decision makers.

D.1.b. Methods: The simulation program will be developed collaboratively with the DNR, the U of M, Minnesota. Extension cluster groups and CRP contract holders. Additional funding for the program will also be provided through a USDA sustainable agriculture grant, the DNR and the U of M Dept. of Agricultural and Applied Economics. A working group made up of MDA, U of M,

DNR and others will work closely with a consultant to develop the model and incorporate CRP data. Workshops will draw together contract holders and county/state/federal officials and technical staff to explore the impacts of choices and future initiatives on environmental, economic, and social issues.

D.1.c. Materials: Simulator software. Contractor will provide the necessary materials to develop the simulation program.

D.1.d. Budget:

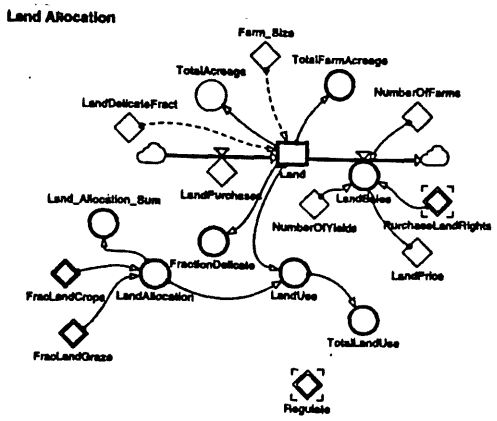
Amount Budgeted:	$20,000
Balance (6/30/98):	$ 0
Match:	no match required

D.l.e. Timeline:

	7/95	1/96	6/96	1/97	6/97	1/98	6/98
1. Develop simulation program:		xxxxxxxxxxx					
2. Program tested and modified:			xxxxxxxxxxxxxx				
3. Workshops held using program:				xxxxxxxxxxx			

D.1.f. Workprogram Update, January 1, 1996: A $15,000 contract with the U of M is being written toward development and testing of the policy simulator. The revised timeline will make it possible to incorporate CRP maps and data, from Objectives A and B, as well as farm and lender assessments that explore community-wide economic management decisions. (The farm and lender assessments will be conducted as part of an LCMR project entitled "Sustainable Grassland Conservation and Utilization.")

Update, July 1, 1996: Work group meetings to develop the policy simulator were held in April, May, and June, and another is scheduled for July. The model will simulate the CRP-related land use dynamics for a county for 10 years, with two sets of decision-makers--policy-makers and individual landowners. Both farm profits and environmental impacts associated with various land use changes will be explored. Elements of the CRP technical team indexes (see B.1.f., above) are being incorporated into the environmental impact module. CRP contract-holders, county extension educators, soil and water conservation district staff, and others with an interest in CRP will be invited to help test the policy simulator at a workshop on August 7 in Fergus Falls. The work group will meet the next day to discuss revisions and will hold additional meetings as needed to further refine the policy simulator.



Update, January 1, 1997: The contract with the U of M was amended to add $5,000 for workshops to further test the "Ag Land" policy simulation game and at least one train-the-trainer session to promote its use throughout the state. The simulator was tested at an August 8 workshop in Fergus Falls. About 30 people from around the state attended and offered feedback. The project's core working group met twice to refine the game based on that feedback. Plans are under way to package and distribute a revised version to potential users at a train-the-trainer workshop in February or March 1997.

Update, July 1, 1997: Development of the program underlying the "AgLand" computer-assisted simulation exercise is complete. (See enclosed brochure.) "AgLand" has been tested at several workshops and refined based on feedback. An initial "train-the-trainer" workshop was held March 3 in Fergus Falls and several attendees have since run the game on their own with various

audiences, including the DNR's Management Improvement Committee, Faribault and Blue Earth County Extension staff, other Blue Earth County officials, Mankato State University students, and U of M faculty, as well as students and local officials in Wisconsin and North Dakota. Boxed sets of *AgLand: The Game* will be available this fall.

Update, January 1, 1998: Objective D has now been met. Our contract with the U of M to develop a user-friendly agricultural policy simulation tool ended December 31, 1997. The final product is a boxed set of *AgLand: The Game*, described in previous updates for Objective D. Payment of $20,000 will be made to the U of M shortly. Since the previous update, the game has been played by about 200 professionals and students in at least ten trials. Problems, issues and ideas that arose in these "test runs" helped the game's developers put the finishing touches on the accompanying software and manual. Upon its official release in January or February 1998, the game will be widely marketed to diverse audiences by the U of M Extension Service (using funds from other sources, not from this project). A web site about the game is under development at www.extension.umn.edu/~agland. Based on the high level of interest displayed by participants at almost 20 test runs and the lively discussion that followed most of those sessions, we believe *AgLand: The Game* will be played often in the next several years at conferences, annual meetings, and in the classroom, and that it will help players appreciate the complexity of agricultural policy choices and consequences.

Final Update, July 1, 1998:

Objective D Results and Significance:
In Objective D, we helped fund and develop a user-friendly, computer-assisted exercise that simulates real-life agricultural and land conservation policy decisions and consequences. The final product is ***AgLand: The Game***, a boxed set containing software, instructions, a game board, and game pieces. At least 10 workshops, test runs, and demonstrations were held to test and refine the game, involving more than 200 conservation professionals and students in various parts of the state. The game requires a facilitator, 5 to 25 players, a computer with Windows 3.1 or Windows 95, and a printer. It takes 2.5 to 3 hours to play the game. An *AgLand* web site can be found on the Internet at **www.extension.umn.edu/~agland**.

In the game, "AgLand" is a region with farms, rivers, wetlands, wildlife, and a town. Players acting as farmers make decisions about crops, livestock, conservation practices, and participation in government programs such as CRP. Players acting as policy-makers decide whether to offer incentives, levy taxes, or impose regulations to achieve economic, environmental, and social goals (such as improving water quality or wildlife habitat). Although the farmers and policy-makers can influence each other's results, their success also depends on two exogenous factors—crop prices and weather. Players do not need much prior background on agriculture, economics, or environmental issues. The materials that come with the game provide the necessary information, including a sophisticated, computerized database and simulation model that can be modified by the game facilitator to include additional factors or options (such as an additional type of crop, or crop rotation).

The game offers practice in making decisions that, in real life, can become monumental, involving a wide array of economic, social, and environmental concerns and relationships. Players are encouraged to develop strategies for dealing with these complexities, examine the consequences of their decisions, and reconsider assumptions about the driving forces behind an agriculture-based economy.

The game so far appears especially helpful to at least two groups: 1) natural resource and pollution control specialists with little training in the agricultural sciences, whose work increasingly involves programs affecting private farmlands; and, 2) high school and college students who may some day help set agricultural policy or be faced with real-life farming decisions. We anticipate that the game will be used frequently at conferences and annual

meetings of conservation professionals, as well as in high school classrooms, vocational and technical colleges, and universities.

Objective D Budget Distribution and Financing:
The $20,000 budgeted for this project objective was spent entirely on a contract with the University of Minnesota (Dr. Steven J. Taff, Department of Applied Economics) to develop and test the policy simulation exercise.

The total direct cost to produce *AgLand: The Game* was $60,000 ($20,000 from this project, $30,000 from USDA, $5,000 from DNR, and $5,000 from the U of M), plus an estimated $35,000 in U of M and DNR staff time and production and marketing funds from the U of M Extension Service. Extension is charging $150 per boxed game set to offset production and marketing costs and fund game improvements.

Objective D...In Hindsight:
In hindsight, we wish we had had additional staff time and travel funds to facilitate greater participation by MDA in the development and testing of *AgLand: The Game.*

Further Work on Objective D:
While there are no formal plans to continue work on Objective D, the U of M will continue to refine *AgLand: The Game* based on feedback from players, as time and funds permit. Revisions to the game will be posted on the *AgLand* web site on the Internet. Also of interest: the experience gained in this project has inspired the U of M to start developing a simulation exercise on urban sprawl.

VI. Evaluation: The project ~~will be~~ is considered a success with the completion of digitizing of remaining priority counties, production of county coverages, development and use of environmental models that identify environmentally critical lands and assist targeting of future funds, production, wide distribution and use of CRP fact sheets, and increased understanding of choices and consequences related to CRP among contract holders and others. The CRP's estimated total environmental and soil productivity benefits over costs exceeds $10 billion annually nationwide. In Minnesota, the information from this project ~~would~~ will facilitate targeting of current state expenditures for conservation programs as well as future federal CRP payments to the most critical land parcels should the federal government allow states more input in targeting. This project will also perpetuate the soil and water resources benefits accrued during the ~~ten years of the~~ CRP, and thereby decrease off-site damages from soil erosion and improve the effectiveness of future expenditures to mitigate nonpoint-source damage to lakes and streams.

VII. Context Within the Field: This project continue~~s~~d a two-year project which 1) mapped the CRP land in 26 counties; 2) used associated attribute data to begin evaluating CRP lands on the basis of criteria such as land capability classification, erodibility, and location; 3) Conducted focus groups and a survey to identify CRP contract holder intentions, policy concerns and information needs regarding the return of CRP lands to production if contracts are not renewed; and, 4) identified, demonstrated, and disseminated information on some of the alternative land management practices that would protect the environmental benefits of CRP. This project is unique in the United States. Minnesota is the only state to create a statewide CRP GIS coverage. This gives the state the unique ability to proceed with statewide geographic analysis and modeling of CRP and thereby to participate with the federal government in targeting of scarce federal funds to protect state-identified priority agricultural lands in the next CRP. While many states have conducted contract holder surveys and education programs to communicate and demonstrate alternative land management practices, Minnesota is the only state to integrate

geographic analysis of CRP with contract-holder needs assessment and educational activities. ~~The previous and current projects have~~ Like the previous project, this project had broad, diverse participation from local, state and federal agencies, the U of M and other state universities, the Minnesota Extension Service, and several private non-profit organizations. The previous project was designed to build GIS capacity and expertise at the local level, and ~~the current project will continue~~ this project continued to do so while producing this important digital database for statewide use.

VIII. Budget context: This project ~~is~~ was a continuation of a project funded during the 1993-94 biennium from the general fund ($300,000). Additional general fund monies ~~will be~~ were spent on this project: MDA ($84,000 - 1 FTE); DNR ($5000); U of M ($5000); and USDA ($30,000).

VIII. Dissemination: ~~A copy of the digital database will reside at LMIC for distribution and use through their standard procedures. In addition, digital data, in EPPL7 or ArcInfo format, will be disseminated through the Board of Soil and Water Conservation Districts to district staff, shared with project cooperators in other agencies and organizations, and distributed upon request to others. Protocols for use of the digital CRP data will be developed prior to distribution. Availability of the data, geographic analyses and models will be announced through natural resource, agricultural, and GIS avenues. Demonstrations and presentations of the results and products are planned for CRP contract holders, local, state and federal natural resource and planning staff and policy makers. Fact sheets will be distributed through numerous organizations including the MDA, U of M Extension Service, BWSR, Mn. Association of Soil and Water Conservation Districts, USDA Natural Resources Conservation Service, several private non-profit organizations, agricultural commodity groups, and others. The advisory team convened throughout the previous project and the technical team established in this project will assist with several project activities.~~

The *Minnesota CRP GIS Database* is available in many formats, not only from MDA, but also from LMIC, BWSR and, eventually, DNR. We mailed county and state CRP maps, database order forms, and accompanying materials describing the database to almost 1,000 conservation professionals, planners, and county commissioners in 84 counties. (Further details on dissemination of the CRP GIS database are provided in the final update for Objective B and in the section on data compatibility requirements.)

The *Minnesota CRP Information Series* was mailed to conservation educators in every county (such as Extension and SWCDs). It was promoted in agriculture and conservation organization newsletters, *Agri-News*, and many other avenues including a general press release. Numerous copies have been handed out at meetings, workshops, conferences and county fairs attended by farmers and agriculture professionals. (Further details are provided in the Objective C updates.)

On at least 20 separate occasions throughout this 3-year project, we presented, demonstrated, and exhibited project results to a wide range of audiences, including farmers, GIS professionals, and conservation professionals.

X. Time: This project ~~will be completed in a one biennium~~ was completed in a 3-year time frame.

XI. Cooperation:

A. **Mr. Peter Buesseler**, State Prairie Biologist, Dept. of Natural Resources, will help produce and disseminate and analyze CRP maps and data, and will direct the development of the policy simulation tool.

B. **Mr. D'Wayne D. De Ziel,** Executive Director, Mn. Association of Soil and Water Conservation Districts, will help produce and disseminate county CRP maps.

C. **Ms. Debra Elias**, Program Associate, Mn. Institute for Sustainable Agriculture, U of M, will participate in contract holder education and in fact sheet production and dissemination.

D. **Dr. Mary J. Hanks**, Supervisor, Energy and Sustainable Agriculture Program, Minnesota Department of Agriculture, will have overall project management responsibility.

E. **Land Management Information Center (Mr. John Hoshal, and Mr. Chris Cialek)** will provide technical advice and coordination between the project and LMIC to ensure compatibility of GIS data collection with state systems.

F. **Mr. Dennis W. Neffendorf,** State Resource Conservationist, USDA-NRCS, will participate as a member of the overall advisory team and as a member of the geographic analysis technical team.

G. ~~**Mr. Don Olson,**~~ **Mr. Bill Wilcke,** Extension Program Leader, Minnesota Extension Service, will participate in fact sheet production and distribution and in planning other contract holder educational activities.

H. **Dr. Steven J. Taff,** Associate Professor and Extension Economist, Department of Applied Economics, will participate as a member of the overall advisory team and in geographic analysis and modeling using the CRP digital data.

I. **Ms. Barbara Weisman,** CRP Project Coordinator, Energy and Sustainable Agriculture Program, Minnesota Department of Agriculture, will supervise data collection, analysis and quality control, staff technical team and fact sheet team work, and will have primary responsibility for program reports and information dissemination.

XI. Reporting Requirements: Semiannual six-month work program update reports will be submitted not later than January 1, 1996; July 1, 1996; January 1, 1997; July 1, 1997; January 1, 1998, and a final status report by ~~June 30, 1997~~ July 1, 1998.

APPENDIX 1: Qualifications

PETER BUESSELER

Department: Minnesota Department of Natural Resources
Rank: State Prairie Biologist
State Prairie Biologist for the past five years. Two years experience in organizational development and strategic planning for the DNR. Project leader for the Agriculture Environment Forum, one of the DNR's Integrated Resource Management Initiatives.

D'WAYNE D. DE ZIEL

Department: Minnesota Association of Soil and Water Conservation Districts
Rank: Executive Director
Chief administrator officer of the Association for six years. Extensive experience working with private and government organizations on natural resource and agricultural issues.

DEBRA ELIAS

Department: University of Minnesota, Minnesota Institute for Sustainable Agriculture (MISA)
Rank: Program Associate
Responsible for communications of MISA, including establishing and coordinating the MISA resource center. Master's Degree in Agricultural Economics, University of Minnesota.

MARY HANKS

Department: Minnesota Dept. of Agriculture, Agricultural Marketing & Development Division
Rank: Supervisor, Energy and Sustainable Agriculture Program
Four years experience in program development, planning and management as supervisor of the Sustainable Agriculture Program at MDA. Ten years experience in industrial research. Ph.D. in Plant Pathology, Iowa State University.

LAND MANAGEMENT INFORMATION CENTER

Department: Minnesota Planning
LMIC was created in 1977 to continue the development of environmental databases and GIS modeling technology to serve Minnesota through the effective use of geographic information that supports public policy and government operations. Widely recognized as a pioneering organization in the GIS field, LMIC's staff of geographers, environmental analysts, planners, cartographers, and computer specialists has extensive experience designing, developing, and implementing large GIS databases and managing the resources necessary to complete large projects on time and within budget. Past projects involving large-scale database development include: Minnesota Groundwater Clearinghouse Information System, Minnesota Stream Information System, Phase II Forest Inventory, and Sewer Interceptor Database Development. LMIC staff has designed and implemented procedures to develop digital map data for a wide range of small to medium sized projects and maintains rigorous standards for quality assurance that ensure the long-term usefulness of geographic information. LMIC has played a major role in leveraging geographic data investments within the state, through compatibility guidelines for LCMR funded projects, the LMIC Spatial Data Clearinghouse, its support of the Governor's Council on Geographic Information, and through ongoing relationships with state agencies such as the Department of Natural Resources, Pollution Control Agency, and the Department of Transportation. Through its participation on the previous project, LMIC has a well-developed understanding of MDA's geographic information needs. The principal LMIC staff available to interact on this project include:

David Arbeit, Director of LMIC. He has worked with spatial information technologies and other modeling technologies since 1966, as an educator, researcher, and practitioner. He has served on the board of directors for the Urban and Regional Information Systems Association and is well known in the GIS field through his presentations, writings, and research.

John Hoshal, Supervisor of LMIC's Project Services bureau. He joined LMIC in 1979 and has directed or participated in a broad range of projects where GIS has been used to form important environmental decisions in Minnesota. John is currently a member of MDA's CRP Advisory Committee and has extensive experience with both ARC/INFO and EPPL7.

Chris Cialek, GIS Supervisor, Data Management & Operations and ~~Mike Baker~~ Nancy Rader, Data Management.

DENNIS W. NEFFENDORF

Department: USDA Natural Resources Conservation Service
Rank: State Resource Conservationist
Team leader for Ecological Sciences/Conservation Planning. 23 years with NRCS.

UNIVERSITY OF MINNESOTA EXTENSION SERVICE

Department: University of Minnesota Extension Service
Contact: ~~Donald P. Olson~~ Bill Wilcke
As Extension Program Leader for Sustainable Agriculture for the last two years, provides leadership for statewide ~~agricultural programs~~ Extension programs related to sustainable agriculture. M.S. in Agricultural Engineering. ~~for the last five years. Previous experience as county extension educator in Ramsey County, Minnesota for three years and in Scott County, Iowa for 30 years. Master's Degree in Horticulture.~~

STEVEN J. TAFF

Department: University of Minnesota, Department of Applied Economics
Rank: Associate Professor and Extension Economist
Also an Adjunct Professor with the Department of Forest Resources. Former county extension agent and regional planner. Advanced degrees in urban and regional planning (M.S.) and in agricultural economics (Ph.D.). Specializes in the economics of agricultural and natural resource policies with research programs centering around policies that influence private land management decisions.

BARBARA WEISMAN

Department: Minnesota Dept. of Agriculture, Agricultural Marketing & Development Division
Rank: CRP Project Coordinator
Coordinated previous CRP Project at MDA. M.A. in Geography, University of Minnesota. Extensive GIS experience through work as a cartographic consultant with University of Wisconsin-LaCrosse and a graduate research fellow at the Center for Urban and Regional Affairs (U or M).

APPENDIX 2 Project Staffing Summary

Project Manager: Mary J. Hanks **Telephone**: (612) 296-1277

Project Title: Analysis of Lands Enrolled in Conservation Reserve Program

Project #: 7k

Position Title, Employer	Employee	%Time Working Per Year	Classified/ Unclassified
Planner Intermediate, MDA	Barbara Weisman	(**NOT WITH LCMR FUNDS**) 100% 1st year 100% 2nd year 50%-73% 3rd year	Initially unclassified. Became classified on May 28, 1997.
Research Analyst, MDA	Mary Ann Cunningham	50% 1st year 50% 1st three quarters of 2nd year. Position extended into final quarter of 2nd year and first 2 quarters of 3rd year. Ended Oct. 14, 1997.	Unclassified
Student Worker, MDA	Mandla Mehlomakulu	50% beginning 2nd quarter and lasting through final quarter of 3rd year. (Position began Dec. 15, 1997 and will end no later than May 31, 1998.)	Unclassified