1995 Project Abstract
For the Period Ending June 30, 1998
This project was supported by MN Future Resources Fund (Subd. 5r)

TITLE: Developing, Evaluating, and Promoting Sustainable Farming Systems.
PROJECT MANAGER: Linda Dahl
ORGANIZATION: Whitewater Watershed Project
ADDRESS: PO Box 39, Lewiston, MN 55952
Note: Monitoring Project portions of this grant were completed by Land Stewardship Project, 2200 4th St., White Bear Lake, MN 55110.
LEGAL CITATION: ML95, Ch.220, Sec.19, Subd.5(r)
APPROPRIATION AMOUNT: $225,000

The Monitoring Team completed three years of research and education designed to test a process of on-farm observation and interaction that brings together farmers and other professionals. The project has focused on farms in transition to Management Intensive Grazing (MIG).

The Team: collected analytical data on six team farms and paired farms (nearby farms with similar soils or stream reaches); documented farmer observations; and tested selected on-farm indicators. For example, the Team collected soils data from 54 permanent plots. In addition, in-field comparisons led to identification of five soil monitoring tools to be included in a Monitoring Tool Box. Volunteers and farm families conducted breeding bird and breeding frog and toad counts. Information was collected from streams on four team farms and three paired sites on the same or adjacent streams.

Several findings suggest that MIG has broad ecosystem and socio-economic benefits. Rested paddocks show promise as nesting sites and cover for endangered grassland bird species. MIG stations on two streams improved chemical, physical and biological parameters when compared to continuously grazed stations. A set of four economic indicators of sustainability shows that the advantages of grazing go beyond profitability.

In winter 1998 we will publish *a Monitoring Tool Box* of indicators that can be used by farmers to see if they are making progress toward their goals. The Tool Box will contain narrative and visual aids from the research areas and will encourage farmers to use a whole farm planning and monitoring approach.

The Monitoring Project has been very active in dissemination activities. We gave more than 60 presentations reaching in-state and national audiences. In addition we held 10 field days reaching local, state, regional and national audiences totaling more than 450 people. Dick Levin's publication *Monitoring Sustainable Agriculture with Conventional Financial Data* has been distributed to over 700 people. Alison Meares' article on quality of life was published in the Winter 1997 issue of *Rural Sociology.* The Rupprecht farm and the Monitoring Project were covered in the October 1996 issue of *Successful Farming.* The project was also covered in January-February 1996 issue of *The Minnesota Volunteer*, in a story called "The Diversity of Life on the Farm". Additionally, the Project was featured in other news stories.

Two Whitewater Demonstration Farms

Two demonstration farms are completed in the Whitewater Watershed, which demonstrate a variety of sustainable farming practices. The demonstration farms provide an arena for farmer-to-farmer information sharing and education on the land and through written materials and presentations.

Farm plans were developed for both farms. Some of the activities completed within the plans include: fencing to exclude cattle from streambank; bioengineering and native grass planting to stabilize an eroding bank; burning a former CRP field and planting it to native grasses for rotational grazing; realigning contour strips; planting shelterbelts for building protection; tree planting and warm season native grass planting to increase habitat corridors; and planting Switchgrass to widen a waterway. Land surveying for animal waste storage, and waste system designs were completed. Construction has begun on one system, while the other is still in the permitting stage.

A self-guided tour is completed and marked by a roadside pullover, signs, and brochures. It is located near Whitewater State Park and is open to the public. The park is including it in their Whitewater Valley Points of Interest map, which is handed out to park visitors. In addition, Public education via presentations on the Whitewater Watershed, including the LCMR-funded Demonstration Farms, is a continuing process that has reached over 10,000 people.

Date of Report: **July 1, 1998**

LCMR Final Work Program Update Report

I. **Project Title and Project Number:** Developing, Evaluating, and Promoting Sustainable Farming Systems/ H4

Program Manager: Linda Dahl
Agency Affiliation: Whitewater Joint Powers Board
Mail Address: PO Box 39, Lewiston, MN 55952
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A. **Legal Citation:** **ML95, Ch.220, Sec.19, Subd. 5(r)**
Total biennial LCMR appropriation: **$225,000**
Balance: **$6,749.45** (73,628.31 –66,878.86) as of 6/30/98

Appropriation Language: This appropriation is from the future resources fund to the commissioner of agriculture for an agreement with the Whitewater joint powers board to develop and evaluate farming systems for impacts on ecosystems, profitability, and quality of life through on-farm research, experiment station research, watershed demonstration farms, and education. This appropriation must be matched by at least $50,000 of non-state money.

The availability of the appropriations for the following projects is extended to June 30, 1998: Laws 1996, chapter 407, section 8, subdivision 3, paragraph ® developing, evaluating, and promoting sustainable farming systems.

B. **Status of Match Requirement:** Secured
Match Required: $50,000
Amount Committed to Date: $50,000
Match Spent to Date: $50,000 as of 12/31/97
Match Balance: $0

II. **Project Summary:** The proposed project is an integrated program of research on sustainable farming systems. Demonstration farms provide farmer-to-farmer information sharing and education on the land and through materials. Information will reach 1,500 people and can also be disseminated throughout the state. To speed the adoption of sustainable farming practices, the project will generate data and indicators through on-farm and experiment station research. This research will help farmers, researchers, and agency officials evaluate the impacts of sustainable farming systems on a farm's terrestrial and stream environments, riparian corridors, and also on profitability and family quality of life. By developing and implementing demonstration farms and corresponding educational programs in the Whitewater watershed, the project will improve water quality in the Whitewater River. The partnerships among researchers, agencies, non-profits, farm organizations, and farmers that will be formed through this project will help create an improved climate for cross-fertilization of ideas and creative problem-solving among farmers, researchers, and regulators. It may help reverse the increasing emphasis on regulation as a way to solve agriculture's environmental problems. This project will expand the partnership involved in the Whitewater Joint Powers Board--MN DNR, SCS, MDA, USFWS, MPCA-- to include the University of MN Lamberton and Land Stewardship Project. Once the monitoring approaches have been tested in the Whitewater and at Lamberton, they will be generalized to other farming systems.

III. Six Month Work Program Update Summary:

1/1/96

The Monitoring Team has completed a second year of research and education designed to: develop on-farm indicators to assess ecological, financial and family quality- of-life changes on farms adopting sustainable farming systems; create a whole farm research process; and disseminate information to farmers, policy makers and scientists. The Team of 24 people combines agricultural disciplines, ecology, rural sociology, hydrogeology and the perspectives of farmers, agency officials, researchers, consultants and non-profit staff. The project has focused on farms in transition to Management Intensive Grazing (MIG).

In 1995, the Team: collected analytical data on the six team farms and paired farms (nearby farms with similar soils or stream reaches); documented farmer observations; and identified and initiated testing of selected on-farm indicators. For example, the Team collected soils data from 60 permanent plots sighted on the six team farms and five paired farms. Preliminary results show MIG improves soil quality compared to row crops and suggest that deep soil nitrate levels are at or below those for conventional management. Breeding bird and breeding frog and toad counts were conducted by volunteers and farm families. Increased bird numbers and some breeding success were documented on rested pads compared to nearby grazed pads. Information was collected from streams on four team farms and three paired sites on the same or adjacent streams. Stream bank erosion rates were lower under MIG management than stream reaches in permanent pastures. Several water quality measures indicated improved stream conditions along MIG fields compared to stream reaches along conventionally grazed fields.

A set of four economic indicators of sustainability was developed and is being tested by team members. Quality of life measures highlighted the importance of emotional support for farm men and women, although their sources of support were different.

The Team held two field days in August, involving a total of 130 people. Two articles were written in reference to the project in major popular publications. Two articles were accepted for scientific publications and at least six presentations were given by Team members since July 1995. Additionally, a legislative tour was held at the Dan French farm in September that featured this project.

Plans were drafted for implementation of sustainable agricultural practices on the two demonstration farms in the Whitewater Watershed. Work teams made up of different specialties were formed. Two farms were selected after advertising and accepting applications. Team members met with the landowners, discussed farm goals, and worked together to develop farm plans. Plans include: rotational grazing, low cost manure storage, warm season grass plantings, tree plantings, widened waterways with unmowed grasses, a shelterbelt, streambank tree revetment, prescribed burning, and other options are being considered. Implementation will begin Spring 1996. There have been 29 watershed public presentations with the LCMR project highlighted. One of the slide presentations was taped and shown on the City of Winona's Cable TV network. To date approximately 750 to 1,000 people have heard the presentations. **Special note**: Because work can not begin on the farms until Spring of 1996, the project may need a 6 month extension to finish work Fall and Spring 1997. Some of these land practices take time to become established.

7/1/96
The Monitoring Team began a third year of research and education designed to: develop on-farm indicators to assess ecological, financial and family quality- of-life changes on farms adopting sustainable farming systems; create a whole farm research process; and disseminate information to farmers, policy makers and scientists. The Team of 24 people combines agricultural disciplines, ecology, rural sociology, hydrogeology and the perspectives of farmers, agency officials, researchers, consultants and non-profit staff. The project has focused on farms in transition to Management Intensive Grazing (MIG).

In 1996, the Team: collected analytical data on the six team farms and paired farms (nearby farms with similar soils or stream reaches); documented farmer observations; and identified and initiated testing of selected on-farm indicators. For example, the Team collected soils data from 54 permanent plots sited on the six team farms and five paired farms. We analyzed data from fall sampling, analyzed economic data and are releasing a report about new indicators for data analysis. We also conducted assessments of quality of life with several team members.

Analysis of soil samples at Lamberton Experiment Station is underway. Some interpretation has begun. Farmer researcher cooperators are currently being identified. Summer soil observations and fall sampling of farmer/cooperator field sites are planned.

Two Whitewater Demonstration Farms
Farm plans were developed for each farm. The activities are being completed and are detailed in B.5. Briefly, the work being done consists of: tree planting and warm season native grass planting to increase habitat corridors, shelterbelts for building protection, an alternative manure storage facility, rotationally grazing youngstock, fiberglass fencing to exclude cattle from streambank, bioengineering "tree revetment" technique and native grass planting to stabilize an eroding bank, realigning contour strips, burning a former CRP field and planting native grasses for rotational grazing, and planting a reed canary grass filter strip for milkhouse waste. Time taken for the projects is being tracked; most of this time is in-kind. Public presentations are being made about the watershed project and specifically the LCMR project. This list is being recorded. Also, a slide program and video are being compiled for the LCMR project. A road sign highlighting streambank conservation practices is being placed at the Brosig Farm. Co-hosted tours (Whitewater Watershed Project and Land Stewardship Project) are planned for June 29th and August 24th.

January 1, 1997
The Monitoring Team completed a third year of research and education designed to: develop a process of on-farm observation and interaction that brings together farmers and other professionals to monitor ecological, financial and family quality- of-life changes on farms adopting sustainable farming systems; create a whole farm research process; and disseminate information to farmers, policy makers, private business, agency officials and scientists. The Team of 24 people combines agricultural disciplines, ecology, rural sociology, hydrogeology and the perspectives of farmers, agency officials, researchers, consultants and non-profit staff. The project has focused on farms in transition to Management Intensive Grazing (MIG).
In 1996, the Team: collected analytical data on the six team farms and paired farms (nearby farms with similar soils or stream reaches); documented farmer observations; and tested of selected on-farm indicators. For example, the Team collected soils data from 60 permanent plots sighted on the six team farms and five paired farms. Preliminary results show that coffee-can infiltrometers consistently measured a higher intake rate than that determined by the sprinkler method. Breeding bird and breeding frog and toad counts were conducted by

volunteers and farm families. Increased bird numbers and some breeding success were documented on rested pads compared to nearby grazed pads. Information was collected from streams on four team farms and three paired sites on the same or adjacent streams. MIG stations showed reduced levels of particulates in streams when compared to continuously grazed stations.
A set of four economic indicators of sustainability show that the advantages of grazing go beyond profitability. Several farmers on the team have low veterinary bills without sacrificing yield or herd health. Qualitative information collected in association with survey assessments suggest that traditional survey techniques are inadequate for addressing respondents beliefs about spirituality.
The Team held five field days in June, July, August September and October, involving a total of 270 people. Two articles were written in reference to the project in major popular publications. Two articles were accepted for scientific publications and at least 20 presentations were given by Team members since January 1996.
Analysis of soil samples at Lamberton Experiment Station is underway. Some interpretation has begun. Farmer researcher cooperators are currently being identified. Summer soil observations and fall sampling of farmer/cooperator field sites are planned.

Two Whitewater Demonstration Farms
Work continues on the two demonstration farms, as detailed in section B.5. In summary, work during this quarter consisted of maintaining previous work, rotationally grazing youngstock, land surveying and soil sampling for animal waste storage, planting switchgrass to widen a waterway, and cutting a native grass planting. A portion of the streambank grass plug planting washed away during a heavy period of rain. This will be replanted next spring. A tree revetment will also be installed to stabilize the bank. Monitoring in the form of bird counts, frog/toad surveys, and fish and invertebrate samples have begun. Time taken for the projects is being tracked; most of this time is in-kind. Since the LCMR project began, there have been 72 watershed and LCMR presentations to approximately 4,400 people. A self-guided tour at Mark Brosig's is now ready and marked by a roadside pull-over, signs, and brochures. The Whitewater Watershed Project and Land Stewardship Project successfully co-hosted 2 field days.

June 30, 1997
The Monitoring Team has worked during the last two years to develop a process of on-farm observation and interaction that brings together farmers and other professionals to monitor ecological, financial and family quality- of-life changes on farms adopting sustainable farming systems; create a whole farm research process; and disseminate information to farmers, policy makers, private business, agency officials and scientists. The Team of 24 people combines agricultural disciplines, ecology, rural sociology, hydrogeology and the perspectives of farmers, agency officials, researchers, consultants and non-profit staff. The project has focused on farms in transition to Management Intensive Grazing (MIG).
In 1997, the Team has been analyzing data on the six team farms and paired farms (nearby farms with similar soils or stream reaches); analyzing farmer observations; developing the first "test" edition of the Monitoring Tool Box; and drafting case studies, and other reports. 100 copies of the test edition have been printed and are being used with 18 farmers and four resource management groups who are testing the prototype Tool Box. Comments and suggestions on the Tool Box will be reviewed and a final version of the Tool Box will be released in winter 1998.
The Team will be participating in a field day in June for people from around the country and the Kellogg Foundation in southeastern Minnesota.

Analysis of soil samples from the Southwest Experiment Station (Lamberton) and six area farmers in complete. The soil tests will be used to develop indicators of farm sustainability.

Two Whitewater Demonstration Farms

Work continues on the two demonstration farms, as detailed in section B.5. In summary, work during this quarter consisted of maintaining previous work and determining which options would be used for manure storage. Both farms would like to have this and would benefit from it. Because of the large costs associated with manure storage, we wanted to piggy-back with the USDA EQIP program and its cost-share program. This program just began during the final quarter so an LCMR year extension was made. Monitoring in the form of bird counts, frog/toad surveys, and fish/invertebrate samples continue. Time taken for the projects is being tracked; most of this time is in-kind. The self-guided tour at Mark Brosig's is being used.

Final Status -- December 31, 1997

A full accounting of the positive benefits from the Monitoring Project will be included in an upcoming publication to be released in March 1998. Positive impacts to-date fall into three broad categories: 1) documentation and observation of Management Intensive Grazing (MIG) benefits to the environment; 2) documentation and observation of MIG benefits to farm family quality-of-life; and 3) documentation and implementation of the project team process. More specifically, benefits identified for MIG, based on three seasons of data collection, are:

Environmental Benefits

* Increased soil biological activity, as measured by earthworm populations and soil microbial biomass C, under MIG compared to row crop production
* Increased soil structural integrity (as measured by soil aggregate stability), improved infiltration, and greatly increased surface cover for MIG when compared to row crop production suggesting greatly reduced soil erosion under MIG
* Improved stream physical, biological, and water quality characteristics in stream reaches adjacent to MIG pastures when compared to stream reaches along conventionally-grazed pastures
* Improved grassland bird species habitat under MIG compared to conventional management
* Improved grassland bird habitat within grazing systems by using extended rest periods
* Development of simple, inexpensive monitoring methods that improve awareness and understanding of ecosystem function
* Decreased veterinary costs without negative impacts to production or herd health

Quality of Life Benefits

* Lower-stress lifestyle and personal empowerment for farmers
* Construction of an accepting and supportive network of sustainable agriculture/MIG practitioners that shares ideas and experiences
* Development of techniques that surface underlying feelings or attitudes about farm goals and quality of life
* Identification that some quality of life factors, such as spirituality, cannot be adequately described or measured through survey instruments

Team Process Benefits

* Bridging the gap between farmers, university researchers, and agency staff
* Empowerment of farmers by giving equal weight to their knowledge and observations
* Development of a powerful model for future dialogue about our land, water and human resources
* Demonstration of a practical, multidirectional, hands-on educational process that is highlighting the true potential of holistic, adaptive management
* Clarification of the terms profit and profitability which should benefit the discussion of farm economics at large

The work of the Monitoring Project has already had national impact with the publication *Monitoring Sustainable Agriculture with Conventional Financial Data* disseminated to more than 700 people throughout the nation. Our research shows that cattle can be managed in a way that improves streambanks. On heavy soils, we have not found deep soil nitrate leaching from pasture-based over wintering areas. This suggests that policies that completely exclude cattle from streambanks or that would prohibit over wintering in a pasture situation are misguided.

We will work hard to encourage more farmers to monitor their land as a way of helping them understand the impacts of their management, clarify their goals, and adapt their farming systems to improve the environment, farm profitability and the family quality of life.

Future plans include dissemination of the first edition of the "Monitoring Tool Box", after editing of comments received during the prototype testing that took place this past summer with 18 farmers and four teams in Minnesota and northern Iowa. A publication discussing the results, conclusions and recommendations from the project will be completed in winter 1998. A subsidiary publication including case studies of farms and detailed research papers will also be made available. Dissemination plans are ongoing and include outreach in Minnesota and the nation as a whole.

Monitoring Project research has corroborated basic research on soil quality and MIG impacts on soils, streams, wildlife and people. A new project has begun through Minnesota Institute for Sustainable Agriculture to test the hypothesis that improved soil quality will improve water quality.

Two Whitewater Demonstration Farms

Both of the farms are interested in alternative Ag waste storage systems. One has been designed and a permit has been applied for. The second is still in the design phase, surveys and soil borings have been completed, and the drawings will be finished this winter. The self-guided tour is now open to the public. Public education via presentations on the Whitewater Project, including the LCMR Demonstration Farms is a continuing process.

Final Status – June 30, 1998

Two Whitewater Demonstration Farms

Farm plans were developed for each farm. The activities completed are detailed in B.5. Briefly, the work done consists of: tree planting and warm season native grass planting to increase habitat corridors, shelterbelts for building protection, land surveying and soil sampling for animal waste storage, planting switchgrass to widen a waterway, rotationally grazing youngstock, fiberglass fencing to exclude cattle from streambank, bioengineering "tree revetment" technique and native grass planting to stabilize an eroding bank, realigning contour strips, and burning a former CRP field and planting it to native grasses for rotational grazing. Time taken for the projects has been tracked; most of this time has been in-kind.

Both demonstration farms have Ag waste system designs and have been accepted for EQIP funding to provide cost-share for the waste storage systems. EQIP funds are additional funds to piggy-back with LCMR funds. The year extension was made with LCMR to facilitate this partnership. The Brosig system has been permitted and construction has begun this summer. The Sloans are still in the permiting stage.

A self-guided tour at Mark Brosig's is ready and marked by a roadside pull-over, signs, and brochures. It is located near Whitewater State Park and is open to the public. The park is including it in their Whitewater Valley Points of Interest map, which is handed out to park visitors.

The Whitewater Watershed Project and Land Stewardship Project successfully co-hosted 2 field days. Public education via presentations on the Whitewater Project, including the LCMR Demonstration Farms is a continuing process.

Monitoring in the form of bird counts, frog/toad surveys, and fish and invertebrate samples continue. It is too early to draw conclusions from the monitoring results, but we will continue to track changes into the future.

IV. Statement of Objectives:

A. Develop and Test the Indicators

Develop and test the indicators that can be used by farmers for monitoring impacts on their ecosystem, economics, and social well-being.

Outcomes:

1. Identify additional test farms
2. conduct monitoring
3. analyze and interpret information

B. Develop and Implement

Develop and implement farm management systems that meet farm operators' goals and the Whitewater Watershed goals for reducing run-off; soil and nutrient movement; and improving soil structure, wildlife habitat, and water quality.

Outcomes:

4. convene team, select farms, and develop plans
5. implement farm plans
6. evaluate

C. Education

Engage farmers, researchers, and policy makers and promote sustainable ag. systems through educational programs and materials.

Outcomes:

7. reach 500 people at 4 public events per year
8. develop case studies, papers, & kits on indicators
9. develop fact sheets and self-guided tours in watershed

Timeline for Completion of Objectives:

	7/95	1/96	6/96	1/97	6/97
Objective A. Research:	_____	_____	_____	_____	_____
Objective B Develop and Implement:		_____	_____	_____	_____
Objective C Education:		_____	_____	_____	_____

V. Objectives/Outcomes

A. Title of Objective/Outcome: Develop and test indicators

A.1. Activity:
Collect data on farms and experiment station

A.1.a. Context within the project:
The data we collect will provide the basis for evaluating and developing farmer-friendly indicators. It also will provide the basic information for interpretation and analysis.

A.1.b. Methods:
We will monitor ecological, economic and family quality-of-life parameters over time on six farms that are undergoing a transition from conventional farming to MIG. In this system vigorous plots of grass are harvested by livestock rotated among numerous small paddocks. These farmers are part of the research team (team farm). Each team farm will be paired with an adjacent or nearby conventionally managed farm (paired farm) to monitor for ecological impacts.

Ecological monitoring will be divided into two main categories, terrestrial and stream, each with multiple parameters (see Table 1). We will determine which farmer-friendly indicators are best correlated with lab measures and are most robust across a range of soil and weather conditions. Details about monitoring each of the ecological indicators can be found in Table 1.

Economic monitoring will include calculation of financial performance, energy use and certain production-related statistics. Financial monitoring will focus on identifying indicators appropriate to the farmers' goals. Data from our indicators will be compared with selected farm business management association records. Animal health productivity will be monitored through statistics kept by farmers such as cost of vet services, death losses, culling rate, number of emergency procedures and somatic cell counts. A solar energy coefficient will be calculated by converting all input energy used to British Thermal Unit (BTU) equivalents (farmer records, Doug Gunnink and LSP staff). This total will be divided by the energy harvested per acre (in BTUs) to calculate the solar energy coefficient and will be done annually. *Farmers will provide the data and be involved at each step.*

Social Monitoring Quality-of-life concerns will be assessed through a combination of participatory approaches and interviews with the farm families involved on the team. *Farm team members will draw the farming operation on a map and the inputs and outputs will be mapped for each enterprise, revealing not only the materials moving through the farm but informal relationships operating in the household. The map is then controlled by the farm household.*

The families and team members also will be interviewed or questioned by the family systems team member (Flora) annually to evaluate characteristics of family adaptability and cohesion (Olson et al, 1980), family business and household decision involvement (Danes and Retig, 1983), and critical aspects of the family business such as succession and strategic planning (Handler, 1989). *Issues such as job satisfaction, more free time or family time, implementing goals, working together effectively in the business or other items that relate specifically to a farm family's goals will be monitored.* Selected parameters also may be applied to non-farm team members to evaluate changes due to participation.

A.1.c. Materials:
Materials to be used include chemicals for analysis, collection devices, and materials to record data.

A.1.d. Budget: $114,000
Total Biennial LCMR Budget: $74,000
LCMR balance: $0 (33,100-33,100) as of 6/30/97
MATCH: $40,000
MATCH BALANCE: $0 (4,000 - 4,000) as of 6/30/97

A.1.e. Timeline:	7/95	9/95	12/95	3/96	6/96	9/96	12/96	3/97	6/97
Product # 1 Soil quality sampling	.....	.....		.....	.....	.....		.....	
Product # 2 Vegetation sampling	.....	.....		.....	.....	.....		.....	
Product # 3 Sampling fauna	.....	.....		.....	.....			.....	
Product # 4 Stream sampling	.....	....		.....	.....			.....	
Product # 5 Hydrology information	.....			.....					
Product # 6 Economic information			.....			.....			
Product # 7 Assessments of quality of life			.....			.....			

A.1.f. Workprogram Update
1/1/96
Soils
*Ways in which farmers assess soil health (soil color, amount of runoff after rain, earthworms or their castings on the soil surface, health of vegetation, decomposition of cow pies, etc.) were documented. A second year of in-depth physical, chemical, and biological measures of soil quality were conducted at 60 permanent sites established on the six project farms and their pairs. Standard and modified ("farmer friendly") methods for evaluation of earthworm activity were compared. Quick, simple, and inexpensive tests of infiltration and soil compaction were tested.

A.1.f. Workprogram Update

Vegetation

*The Monitoring Team was awarded a grant by MDA-ESAP for ancillary monitoring of pasture vegetation. Thirty permanent monitoring sites (most contiguous to soil quality plots) were identified. Seasonal (late spring, mid-summer, early fall) assessment of species composition and percent cover was conducted. Samples were collected before grazing (all plots) and after grazing (half of plots) for biomass and moisture content determination, and forage quality analysis. Team members experimented with alternative sampling techniques to better capture the variability inherent in management intensive grazing of pastures.

Frogs and Toads

*Evening survey routes at six locations were again run three times in 1995, with modifications made from 1994 based on comments by the observers. Data are in the process of being analyzed.

Birds

*Farmers experimented with the use of staggered-in- time "rest areas" (unclipped paddocks with extended periods between grazing events) to provide season-long areas of improved cover and habitat for grassland species. Supplemental point counts were conducted on these areas.

Streams

*A second year of in-depth physical habitat, water chemistry, benthic macroinvertebrate and fish measures of stream quality were conducted at four of six project farms. An additional site where MIG had been implemented in the last two years was added to increase the number of sampling locations. The data derived from analytical measures were compared to farmer monitoring of stream characteristics to elucidate common observations/findings. Team farms were instrumental in identifying and arranging for additional paired farms for stream analysis in 1995.

Hydrology

*Well sampling was conducted in September. Farmers and other Team members discussed and recorded observations about changes in water cycle processes (infiltration, runoff, erosion, spring flow, pond volume, etc.) in response to implementation of MIG.

Economics

*Dick Levins was invited to join the Monitoring Team. A set of alternative indicators of farm economic health was developed after on- farm interviews and was based on Team farmer values. These indicators were discussed with project farmers and others, and a background paper on financial analysis in farming will soon be published. Southern Experiment Station faculty member David Ziegler conducted cattle body condition scoring in the summer and fall on most Team farms.

Quality of Life

*Quantitative and qualitative indicators of quality of life were developed and tested during 1995. Data from a questionnaire taken by most Team members was summarized. This summary of the initial questionnaire led to a more concise quality of life survey that was distributed to Team members this fall.

A.1.f. Workprogram Update

7/1/96

Soils
Analyses of soil samples for the Monitoring Project were completed for soil chemical parameters, particulate organic matter (114 samples).

Vegetation
Vegetation samples were collected at two paddocks per farm using the grab sampling method. Samples were sent to Dairyland Labs in Wisconsin. Additional observations were made at the farms.

Economics
A set of alternative indicators of farm economic health was published. Southern Experiment Station faculty member David Ziegler conducted cattle body condition scoring in the summer and fall on most Team farms.

Quality of Life
Interviews were conducted with six Team members and their families.

Soils - Lamberton
Laboratory analysis of Biomass Carbon is complete Samples are currently being processed for aggregate stability, particulate organic matter, total carbon and nitrogen, cation exchange capacity and percent base saturation. Further data interpretation will be conducted upon completion of sample analysis.

January 1, 1997

Soils
From an initial list of 11 soil physical and biological traits, we decided to make "side-by-side" comparisons between standard methodology and more user-friendly techniques for the following five properties: penetration resistance ("compaction"), infiltration, aggregate stability, earthworms, and decomposition rate (biological activity).

Vegetation
In addition to the comparison of clipped and grab samples, we also are now sampling entire paddocks instead of the 5 m x 5 m plot areas. We have changed the sampling grid to a 18" x 18" sampling quadrate and are comparing biomass estimates to a plexiglass/yardstick pasture plate. When possible, we are including farmers' estimates of forage biomass and other observations. The field technician is taking notes on pre-grazing and post-grazing forage height (by species) and animal consumption patterns. To accomplish a more detailed study of grazing sites, we have reduced the number of sites tracked to a total of nine on five farms.

Frogs and Toads
As part of larger frog and toad surveys of southeastern Minnesota watersheds, evening surveys were conducted in spring, early summer, and late summer 1996 on the survey routes established on the six team farms.

A.1.f. Workprogram Update
1/1/97

Economics
Economic activities fell into four general categories: 1) clarification within the team of the terms profit and profitability; 2) development of a economic analysis approach that more accurately capture the broad concerns of sustainable agriculture; 3) exploration of relationship between management, production, and herd health; and 4) development of a strategy to document energy flows on and off team farms.

Quality of Life
Due to a desire that all team members reflect on how they are changing in response to the sustainable agriculture movement and, in particular, participation in the Monitoring Team, selected non-farmer team members participated in "facilitated social monitoring" exercises to elicit their own perceptions of their quality of life.
Information gathered as part of the quantitative assessment of quality of life of Monitoring Team members has been incorporated into a more comprehensive survey of farm couples involved in sustainable agriculture organizations in the North Central Region.

Soils - Lamberton
168 samples were analyzed for Biomass Carbon aggregate stability and particulate organic matter. Data interpretation is still being conducted.

June 30, 1997

Soils
Analyses of soil samples for the Monitoring Project were completed for soil chemical parameters, particulate organic matterand deep soil nitrates.

Frogs and Toads
Surveys were run on four team farms this spring.

Economics
Southern Experiment Station faculty member David Ziegler conducted cattle body condition scoring in the spring on four Team farms.

Streams
Stream samples were processed for benthic macroinverttebrates. Data previously generated from chemical, biological and physical parameters was analyzed.

Soils - Lamberton
Soil samples from six cooperating farms coupled with experiments from the Southwest Experiment Station were analyzed to develop soil indices of sustainable farming practices. Soil A horizon depth, depth to carbonates, depth to mottling, soil surface color, organic matter, soil structural properties, soil consistence, bulk density, water-stable macro-aggregation, pH, nutrient status, and microbial activity were analyzed and found useful for the development of indices of sustainable farming practices.

TABLE 1 PARAMETERS TO BE MONITORED	By Expert	By Farmer	Methodological	Reference
TERRESTRIAL				
SOIL QUALITY AND VEGETATION				
Soil biological characteristics				
Microbial biomass, respiration, active N	X			Jenkinson and Powlson (1976)
Decomposition rates (litter bags $ popsicle stick)	X	X		Robertson (KBFS)
Invertebrates (nematodes)	X			Campbell et al. (1993)
Soil physical characteristics				
Bulk density	X			Doran (1993)
Penetration Resistance			X	Doran (1993)
Infiltration	X	X		Doran (1993)
Aggregate stability	X			Karlen and Colvin (1992)
Soil chemical characteristics				
(C/N ratio, OM, N, P, K, Ca, Mg)	X			U of M Laboratory
Vegetation				
Species composition, % cover, density	X	X		Campbell (1993)
HYDROLOGY				
Precipitation		X		
Well sampling	X	X		County Health Depts
FAUNA				
Invertebrates (pit and emergence traps)	X	X		Campbell (1993)
Birds (selected breeding species using BBS)	X	X		BBS, (1990)
Amphibians (DNR)	X	X		MHS (1993)
LAND USE				
Landscape evaluation (using aerial photos and transects)	X	X		Campbell (1993)
Habitat suitability (WHAG model adapted locally)	X	X		Ulrich, et al. (1984)

TABLE 1 PARAMETERS TO BE MONITORED	By Expert	By Farmer	Methodological Reference
AQUATIC			
STREAM			
Biological characteristics			
Benthic macroinvertebrates (Biotic Index)	X	X	Hilsenhoff (1982)
Fish (Multi-phase depletion electrofishing)	X		MDNR (1989)
Physical characteristics (using 20-30 transects/stream reach)			Olson-Rutz & Marlow, 1992
Depth, bank shape, cover and stability	X	X	
Recession rates	X		
Velocity	X		
Structural diversity	X		
Sediment (observe)	X	X	

A. Title of Objective/Outcome: Develop and Test Indicators

A.2. Activity: Analyze data collected

A.2.a. Context within the project:
Analyzing the data generated as a result of data collection in A.1 will allow the project to prepare reports and generate a set of indicators that can be promoted through education and on-farm experiments in other components of the project.

A.2.b. Methods:

Data integration -- In the analysis of the monitoring data, we will attempt to:
_ document the range and variability of the environmental parameters within each farm (among fields and years), between the MIG and paired farms, and among the team MIG farms.
_ document which strategies promote avian, terrestrial and aquatic species abundance and diversity.
_ determine which parameters consistently distinguish MIG and conventional farms and the degree of site specificity in establishing "healthy" ranges of values for these parameters; and
_ determine the rate of change and length of time to stabilization for environmental parameters as farmers make a transition from a conventional to a MIG system.
_ cross-reference with data collected on a regional and national scale through the EMAP, KBFS and NWAFSQ studies.

A.2.c. Materials:
Materials will include computer time, paper, etc.

A.2.d. Budget: $38,000
Total Biennial LCMR Budget: $38,000
LCMR balance: $0 (3,000 - 3,000) as of 12/31/97
MATCH:
MATCH BALANCE:

A.2.e. Timeline: 7/95 9/95 12/95 3/96 6/96 9/96 12/96 3/97 6/97

Product # 1 ....
Data analysis and interpretation

Product # 2 ....
Preliminary or final reports

Product # 3 .....
Kit of indicators

A.2.f Workprogram Update:

1/1/96

a. Selected findings:

*Deep **soil nitrate** concentrations (>60 cm) in MIG plots sampled in Fall, 1994 were substantially lower (1 ppm) than those for corn (5 ppm) and continuously grazed (5 ppm) plots. One concern about MIG management has been the potential for high nitrates in groundwater due to loading from urine and manure.

***Water stable soil aggregates greater than 1 millimeter** averaged 52% on MIG plots compared to 39% on corn plots (n=6). More stable aggregates lead to reduced erosion, better infiltration and aeration, and maintenance of organic matter content.

***Soil microbial biomass carbon** averaged 746 ppm C on MIG plots compared to 396 ppm C on corn plots, suggesting higher biological activity for MIG (n=6). This should result in greater decomposition and nutrient cycling rates and the buildup of soil humus.

*Standard protocols and "on-farm" (spade full of soil) measures of **earthworm counts** showed a strong correlation ($r^2 = 0.81$), indicating that the much easier on-farm measure provides reliable estimates. Earthworm counts for Fall, 1995 averaged 23 worms per shovelful on MIG sites, 15 for continuously grazed sites and 9 for corn. Earthworms are a good indicator of soil quality since they require good soil structure, plenty of fresh organic materials, adequate moisture and aeration, and the absence of certain pesticides.

*Presence of **grassland bird species** including grasshopper, vesper, savanna and field sparrows, eastern and western meadowlarks, dickcissels and bobolinks were confirmed on MIG sites but not adjacent cropped fields in both 1994 and 1995.

*Supplemental point counts by farmers on unclipped, ungrazed rest paddocks on three of the farms showed that **savanna sparrows and bobolinks** gravitated to the denser cover of the rest pads as surrounding pads were grazed.

*Measures of **stream width, bank slope, erosion and percentage of fine substrate material** all indicate that MIG management may improve bank stability and reduce sediment movement into streams compared to continuous grazing.

***Stream fecal coliform bacteria and turbidity levels** (indicating amounts of organics and suspended solids in the water column) were consistently lower for MIG sites than conventional sites.

A.2.f. Workprogram Update

1/1/96

*Measures of **stream invertebrates** indicated lower levels of organic pollution and a more balanced invertebrate community in the stream along the MIG farm. **Fish density** was higher when compared to the conventionally managed farm. However fish species diversity, size distribution and proportion of species in different trophic or feeding guilds did not differ.

*Physical and biological **measures confirm farmer observations** of differences in MIG and conventional grazing effects on streams. Farmers had observed that stream banks along MIG sites were more moderately sloped with grassy cover, while banks along continuous grazing sites were more barren and graded down. Farmers also observed that fish tended to concentrate in pool areas along the stream reaches, which was confirmed during sampling.

*Farmer observations of reduced runoff, cleaner runoff, year round support of springs, and pond water levels indicate improvements in **water cycle effectiveness** under MIG compared to previous management.

*In 1994, of the 11 possible species of **frogs and toads** found in southeastern Minnesota, 10 were recorded on Team farms. Overall, frogs and toads were heard in the seasons and temperature ranges expected. To compare management changes with frog and toad population trends will require several years of consistently collected data.

*A set of alternative **indicators of farm economic health** based on project farmer values was developed. These include: dependence on farm programs, value of labor, use of machinery and non-renewable resources, and balance between feed production and use. Preliminary assessments indicate that the MIG dairy farms may have less reliance on government payment and inputs, more money paid to labor, and a better balance of feed produced and used on the farm.

*Characteristics/indicators that were found to most influence **farm quality-of-life** include: family time, spirituality, community acceptance, appreciation by neighbors and relatives, empowerment, flexibility and support groups.

*The single most frequently mentioned distinction in men's quality-of-life since they became involved in MIG/sustainable agriculture has been the construction of a trusting network and support group of other male farmers. In contrast, the farm women have tended to emphasize community activities outside of the sustainable agriculture movement. The **solidarity, sharing and trust-building** in these community activities and in pursuing HRM is perceived by both men and women as important. While women were more accustomed to this support, it is new for some of the men.

A.2.f. Workprogram Update
1/1/96
b. Selected farmer observations

"The interdisciplinary team approach used in this monitoring project is an exemplary model for resource conservation efforts." (Jennifer and Mike Rupprecht- Team farmers).

The following are examples of observations and observation tools which the farmers have indicated they use on their farms, in various ways and by individual preference:

Mike uses a refractometer, which he purchased for $125, to get an idea of how healthy the plants are on his farm. Mike says the refractometer measures the sugar level in the plant. A higher sugar level means the plant is healthier, more resistant to insects and more palatable to animals (people, too!). However, there are many variables, such as time of day, cloud cover and differences between plant species, to consider when using this tool. Also, certain questions arise with the use of the refractometer. Could it be used to monitor pastures? To what does one compare it? Does one compare measurements from year to year?

Mike uses soil tests as one aspect of monitoring on his crop and hay fields. Mike believes that biological responses are directly linked to soil fertility. Since making adjustments to his fertility balance on his crop fields, by using less caustic forms of fertilizer, applying to high Ca - low Mg lime instead of dolomitic lime, and paying attention to trace minerals, Mike has noticed better test weights on corn. Also his soils work up better (looser), and he has been able to cut back on nitrogen.

Mike has tested soils in his pastures before initiating grazing, and after grazing. He is seeing higher potassium levels in his MIG soils.

Dan feels the fertility level of his pastures is becoming more balanced now, based on what he's observed in the pastures after grazing such as the number and rate of distribution of cow pies and cow stocking rate. He wonders if he may have a problem with overfertility in the future.

Ralph feels some indicators of soil health are: 1) how well plants recover after stress (animal impact, weather, etc.); 2) clovers present in the pastures (clovers establish in bare areas and precede grasses, then feed grasses); and 3) soil smell (from lying down in the grass - soil with fungi and good bacteria will have a certain smell, relative to moisture, time of year, etc.)

Ralph says animals will tell you what they need. "They will absolutely balance their nutritional needs, and tell you". They also have a memory.

When it comes to the cow's health, Art can tell more by the cow's ears than anything else. Cold ears mean that there is a problem. Art noted that almost all of his heifers were successfully bred to freshen within 30 days. He says this is a sign that the heifers were growing properly.

A.2.f. Workprogram Update

1/1/96

When Joe tried strip-grazing this fall, he could tell by the cows' behavior when they wanted to be moved. Joe says the cows adjust to the system.

Joe feels some farmers may use the water infiltration ring to measure infiltration, but a farmer could also be out in the pasture observing water running off or soaking in while out in the rain. Joe says a farmer could also observe any erosion control structures to tell how hard it's raining or how much is soaking in.

Some of the farmers feel the shovel method will help to observe the health of the soil (earthworm activity, soil structure, biodiversity, etc.) Joe saw a documentary on PBS illustrating an orchard farmer using the shovel method to observe soils.

All of the farmers in the group use visual cues of earthworm castings in the lanes and earthworms under cow pies to observe worm activity. Most feel earthworm observation depends on the time of year, time of day (Mike says in the morning during the full moon is best), moisture in the soil, and availability of food on the surface. Ralph observed lots of earthworms in each shovelful while sampling one day in early November. He found about half the number of earthworms in the hay ground compared to his grazed pads.

Art notices that everyone likes the bird part of the project "because it's observing!"

c. Data integration

As findings emerge from the data analysis and documentation of farmer observations, the interaction of various ecosystem components becomes more apparent. For example, farmer observations of enhanced manure decomposition with MIG management may be related to soil biological activity and reduced streambank erosion and may result in lower fecal coliform bacterial counts in streams. More stable aggregates lead to reduced erosion and better infiltration (also improved by high earthworm activity) resulting in more moisture retention in the soil profile, fewer flooding events of ponds and streams, and more stable water supply from springs. These conditions improve stream and wetland habitats for fish, frogs and toads. Integration of the collected data and recorded observations is a challenge for the Team. As one strategy to address it, a "commonalties" subcommittee was formed this summer and has met several times to suggest ways to link our activities and reporting of results in an integrated framework.

7/1/96

a) Selected findings:

*Analysis of **spring runoff** from winter feeding areas suggest that it is very difficult to draw many conclusions. However, wintering areas at two farms were similar to feedlots in that the number of animals, time spent in the wintering area and size of the area govern manure accumulation. Key runoff indicators were in the range of what would be expected for conventional feedlots. Location of the wintering area plays an important role in determint amount and quality of runoff. The potential benefits of the round bale feeding system were not evaluted.

A.2.f. Workprogram Update
7/1/96
b) Documentation of farmer observations

*Ralph commented that this year's runoff was the worst in years, in terms of volume.

*Art observed cow hoofprints acting as many small reservoirs holding melt water. He commented that his pastures felt soft in comparison to cropped fields he visited at anpit the same time (early March).

*Further observations can be found in the April and June editions of the Monitoring Hotwire (attached).

C) Data integration

*No new updates for this report.

D) Results - Lamberton
Microbial Biomass Carbon reflects the activity of microbes in the soil. Analysis show that Microbial Biomass Carbon is greater under a four-year rotation (corn, soybeans, oats, alfalfa) as compared to a two-year rotation (corn/soybeans). Soil samples taken from Native Prairie sites show an even greater microbial Biomass Carbon than the two- or four-year rotation sites. Microbial Biomass Carbon also is greater on footslope soils (Webster series) as compared to upland soils (Clarion Series).

January 1, 1997
A. From a Kit of Indicators to a Tool Box
One of our original project objectives was to develop a kit of indicators that farmers could use to monitor biological and other parameters on their farms. The concept of a "kit" of indicators connoted for many a static set of universal indicators available as a nifty product for interested individual farmers. Several Team members expressed strong concerns that without people-to-people interaction or relevance to personal goals even the best designed materials would attract more dust than human users. A special meeting was held with Team farmers and other concerned Team members in early January to review a proposal for Phase II of the Monitoring Project, which focused on disseminating the process and products of the Team, including the tool kit. One Team farmer said: "I'm trying to get an easier life, I don't need to adopt a new tool kit. I wouldn't use this." Another suggested that we shouldn't sell a kit "unless a person comes with it." An agency staff person echoed those sentiments when he said "The power in what we are doing is through face-to-face meetings."
The idea of a tool box was suggested instead. "When you have a particular task you need to do, you go to a tool box and get the tool that will help you. You only need to pick the one you need when you need it." (See attached draft Tool Box Intro.) Embedded within the tool box, and prefacing the material on monitoring approaches, is the context for on-farm monitoring. Farmers will be encouraged to use a holistic-management-style process to identify comprehensive farm goals. The monitoring tools will then be used to see if they are making progress toward *their* goals (not those of the tool box designers). Through a series of narratives and examples from our project, the tool box users will be encouraged to solicit information and wisdom from those with different perspectives or specialized knowledge, in essence, to develop their own support *team*. As these concepts were developed at the annual Team meeting, the idea of a Tool Box came to be a more meaningful expression for the Team as a whole than the "kit of indicators."

A.2.f. Workprogram Update
1/1/97

At this writing, we have draft tool box materials from all of the research areas. For each area, we have a one-page "teaser" (what, why, who, when, how much, etc.) and a more in-depth monitoring guide (how to). Where appropriate, a field aid (such as a laminated card) has been, or is being, developed to outline key points of the monitoring process. All of the materials have been developed through our team process. By February 1997, we will create a prototype tool box that will be distributed to team farmers and new farmer cooperators in Phase II of the monitoring project for a test run. Throughout 1997 we will be engaged in a process of testing the prototype tool box with farmers using a variety of farming systems. Their feeedback will help the Team improving the tool box by early 1998.

B. Selected findings:

Birds Paddocks that are rested for an extended period during the nesting season appear to be desirable habitat for grassland bird species. As surrounded areas were grazed or mowed, birds moved to the "rest paddocks."

Streams Stream data collected from all sites reflect the extremely low water levels present during this sampling season. Due to similarity in data across years, it appears that Sugarloaf Creek, which is a spring fed stream, was not as impacted by drought as the other streams.

As in 1995, % fines and % embeddedness were highest at continuously grazed stations on Milliken Creek and decreased downstream along rotationally grazed stations.

For the second year in a row on Sugarloaf Creek, density and absolute numbers of fish are higher in the stream stretch with a grassed buffer than in the wooded and non-buffered stretches.

Fecal coliforms follow 1995 trends at Milliken Creek and Sugarloaf Creek. Fecal coliform levels were consistently higher at continuously grazed stations than at rotationally grazed stations.

Soils Coffee-can (ponded, single ring) infiltrometers consistently measured a higher intake rate than that determined by the sprinkler method.

Vegetation Grab samples collected based on observation of livestock grazing behavior had higher feed quality as measured by relative feed value (RFV) than clipped samples.

Quality of Life Quantitative analysis of farm families involved in sustainable agriculture revealed that the most important quality of life factors for these individuals focused on: the use of alternative resources and learning techniques; and respect and understanding from family, resource professionals, and contemporaries. Surprisingly, money and health issues were not part of either quality of life dimension.

Qualitative information collected in association with our quantitative quality of life assessment suggests that traditional survey techniques are inadequate for addressing respondents beliefs about spirituality.

Some common threads from quality of life monitoring of non-farmer team members include: non-farmer participants in the Monitoring Team perceive their land stewardship role as supportive and indirect; the people-centered inquiry of the Monitoring Project is more meaningful, and the importance of community.

Economics Team farmers legitimately concerned about "the bottom line", but not in the traditional maximization context developed by most economists, strove to have "enough" money to support other goals, but were unwilling to compromise non-monetary goals in search of higher profits.

Using new indicators of economic health, it was shown that the advantages of grazing go beyond profitability. Grazing is shown to have low reliance on government programs, relatively low use of equipment and chemicals, relatively high job creation, and a near perfect feed balance when compared to conventional farming techniques. These important dimensions of grazing would all be missed if only conventional economic analysis was pursued.

A.2.f. Workprogram Update
1/1/97

Preliminary results indicate that the Monitoring Team farmers are doing a remarkable job of controlling veterinary and herd health expenses without sacrificing yield or herd health. Measured as a percent of gross income, veterinary and herd health expenses are two to three times higher for conventional farms than for these farms.

C. Selected Farmer Observations

Art and Jean saw their first bluebirds on March 31.

Dave noted three to four times more growth on the previous year's rest paddocks in early spring than on adjacent pads.

Art reported that quack and white clover fared well during the dry spring.

Last fall, Mike had the cows graze hard on the paddocks where he intended to frost seed. Opening up the vegetation appears to give the seed a better chance to establish in the spring. The clover and birdsfoot trefoil were coming on strong in these areas.

The paddock which was used for last winter's feeding had the best growth through the dry summer and into fall at Art's.

Joe noted how the standing grass and residue on the surface acted as little "check dams" during spring runoff.

Mike noticed lots of field sparrows in the spring. He says they can be identified because "they sound like a ping pong ball dropping."

Dan turned his cows out on April 8th to get them off of muddy lots and noted that they were eating orchardgrass and other dried grasses.

Art noticed earthworms under cowpies on April 11.

Several project farmers noted that cows will eat almost all "weeds" (ragweed, buttonweed, burdock, foxtail, lambsquarters, etc.) as long as they are young and tender. The palatability appears to be very seasonal. Dairy cows will eat young burdock leaves and dandelions before anything else in the spring (one farmer speculated that these plants are selected for their "cleansing effect"). Later in the season, burdock and other weeds go untouched.

Art noted how sparse the ground cover (mostly brome) was in his neighbors CRP ground that he grazed this year. He also noted that the bird life seemed to be limited to blackbirds. Art feels that "nine years is too long to rest land" which needs to have some kind of animal impact.

Animals select white clover and grasses over red clover and alfalfa, especially later in the season. Alfalfa and red clover tend to become stemmy as the season progresses while white clover remains leafy and lush.

Joe reported that yields for 2nd crop hay were about half of normal due to the drought.

Art observed that the only forages growing during the extended dry conditions were alfalfa with its deep taproot and reed canarygrass.

Dan had a difficult time in August and September finding cement for his new parlor because of all of the construction (including a 1200 cow dairy) in his neighborhood.

In September, Mike reported that alfalfa, red clover, and orchardgrass were fairing best under the dry condtions. Bluegrass never came back.

Contrary to other folks, Dave (who received 5.7" of rain in August) says his pastures look better, and production has been more consistent, than last year.

On October 13, Mike and Jo observed two groups of bluebirds and a group of yellow-rumped warblers passing through their farm.

Ralph says that during the winter his cows often prefer mature grassy hay to good cut alfalfa hay. He speculates that they may be seeking minerals accumulated in the mature grass.

June 30, 1997

a) Selected findings:

Soils:

Management System Comparisons:

- Juvenile worms (L. Terrestris), nightcrawler middens and total worms all were found in higher numbers on Management Intensive Grazing sites than continuous grazing or corn field sites.
- Water-stable aggregates were higher under Management Intensive Grazing than corn fields on paired soil sites.

Tool Box Comparisons:

- The shovel method for sampling total worms was statistically correlated to the core method of counting worms. The shovel method is easy and quick to use.
- The coffee can approach to measuring infiltration over estimated infiltration by 20 -400% in relation to a calibrated sprinkler system.
- The single sieve method of measuring water stable aggregates has a good correlation to nested-sieves, a more complicated analytical method.
- Decomposition strips show promise but need further research as a measureable indicator of soil microbial activity.

Quality of Life:

Team farmers showed higher satisfaction on qualty of life indicators compared to non-farmer team members. The questionnaire developed by the Monitoring Project is being used in a study with 640 farmers through Iowa Farm Survey, one in Virginia and another through a graduate thesis project in Iowa and Minnesota.

Streams:

- On one longititudinal stream study, continuous grazing had a higher level of turbity and fecal coliform readings than Management Intensive Grazing.
- The percentage of fine material in the stream was higher in a continuous grazing system than in Management Intensive Grazing. Moreover, the readings improved as the water flowed through the reach treated by Management Intensive Grazing.

Frogs and Toads

The approach taken during the three years of breeding routes done on Team farms is unique. We have chosen areas with some changes happening and will be following this over time. It provides different data than choosing randomly sampled routes. It also is unprecendented becuase landowners are not usually solicited to participate.

b) Documentation of farmer observations

Farmer observations have been documented in issues of the Monitoring Hotwire.

C) Data integration

Final reports from each of the data collection sub-teams have been prepared and are being compiled into a final report for this aspect of the project. That report will be included during the next period.

D) Results -

On-farm research and research from the Southwest Experiment Station were used to develop soil indices and threshold values for evaluating sustainable farming practices. Useful soil indicators and threshold values of long-term soil sustainability were identified as topsoil depth, depth to carbonates, depth to mottling, and organic matter. Soil indicators and threshold values useful as an early warning signal of non-sustainable farming practices were also developed and include soil structural characteristics, water-stable macro-aggregation, bulk density, soil consistence, nutrient status, pH, and microbial activity. These results are in the attached report entitled "Development of soil indices of sustainability". These results have been presented to farmers at the Southwest Experiment Station field days and will be published in a Master of Science thesis at the University of Minnesota and in a technical journal.

V. Objectives / Outcome:

B. Title of Objective / Outcome: Research and Implement
B.1. Activity: Convene a team for the purpose of developing farm selection criteria.

B.1.a Context within the project: This activity sets criteria for farms.

B.1.b. Methods: The team will meet 3 times over the next 3 months.

B.1.c. Materials: The team will have reference material and technical expertise. Other materials to use are the Whitewater's Comprehensive plan and the MISA plan of work.

B.1.d. Budget: $0
Total Biennial LCMR Budget: $0
LCMR Balance: $0 as of 6/30/98
MATCH:
MATCH BALANCE:

B.1.e. Timeline:

	12/94	1/95	2/95
Product #1 Meet and develop criteria	_____	____	_____

B.1.f. Workprogram Update:
1/1/96
Project is complete. A team of watershed workers-Soil and Water Conservationists, Foresters, and Wildlife specialists were convened. Criteria and a questionnaire were developed for selecting the farms.

V. Objectives / Outcome:

B. Title of Objective / Outcome: Research and Implement
B.2. Activity: Advertise for farms.

B.2.a. Context within the project: It will be necessary to attempt to select at least one farm by March 1995 so that implementation can begin July 1995. Two farms will be selected by July 1995.

B.2.b. Methods: The team will advertise widely via Extension, Newsletters, and Agri-News. The project manager understands that any expenses before July 1, 1995, will not be reimbursable by LCMR.

B.2.c. Materials Extension, Newsletters, and Agri-News.

B.2.d. Budget: $382.50
Total Biennial LCMR Budget: $382.50
LCMR Balance: $0 as of 6/30/98
MATCH:
MATCH BALANCE:

B.2.e. Timeline:

	2/95	3/95	7/95
Product #1 Advertise for Farms	____	____	
Product #2 Program Manager's Time/Salary	____	____	
Product #3 Selection of 2 Farms	____	____	____

B.2.f. Workprogram Update:
1/1/96
Project is complete. Advertisement was sent to all landowners in watershed through the 3 county newsletters. Six people replied. Candidates were sent a questionnaire. Two farms were selected from the completed questionnaires, previously developed criteria, and knowledge of the farming operations.

3/23/98
We propose to reduce this budget by $117.50 because the cost of advertising was kept down by utilizing existing county newsletters which are sent to all the landowners in the watershed.

V. **Objectives / Outcome:**

B. **Title of Objective / Outcome:** Research and Implement
B.3. Activity: Develop farm management systems

B.3.a. Context within the project: The team will develop farm management systems with the farmers' assistance.

B.3.b. Methods: The team will use Land Stewardship Project's Holistic Resource Management class and other resources to develop goals and objectives. The project manager understands that any expenses before July 1, 1995, will not be reimbursable by LCMR.

B.3.c. Materials HRM classes and other resources.

B.3.d. Budget $437.00
Total Biennial LCMR Budget: $437.00
LCMR Balance: $0 as of 6/30/98
MATCH:
MATCH BALANCE:

B.3.e. Timeline:

	3/95		9/95
Product #1 Implementation criteria developed for 2 farms	_____	_____	_____
Product #2 Time spent by program manager	_____	_____	_____

B.3.f. Workprogram Update:

1/1/96

Project is not complete. A first draft plan for each farm has been developed. (These plans are attached to work program.) Plans will be finalized by Spring of 1996 and then work will begin.

John Sloan Farm summary-wildlife habitat, buffer strips along waterways, shrub/forb/grass plantings, shelter belts, rotationally grazing dairy youngstock, low cost alternative ag. waste management system.

Mark Brosing Farm summary-additions/improvements to rotational grazing; low cost streambank work including tree revetment, cattle watering facilities, native grass buffering, and cord grass plugs; warm season grass buffer 30-50 feet behind barnyard, realign contour strips, improve tree species, burn goat prairies for natural regrowth, and establish grassed headlands.

Special note-Most of the time spent developing farm plans is in-kind by farm team members or specialists. To date: 127 in-kind hours. 900 in-kind miles.

7/1/96

John Sloan Farm-The team is still looking at options for a low-cost alternative manure storage system. The team has consulted with MDA and MPCA plus other experts in the field; and there have not been too many options offered.

Mark Brosig Farm-Work plans are developed and are being completed. Work is outlined in B.5.

Special Note-Most of the time spent working on the farms and developing farm plans is in-kind. Total to date(this includes 1/1/96 update): 347 in-kind hours. 1,687 in-kind miles.

1/1/97

John Sloan Farm-The team is still reviewing options for a low-cost alternative manure storage system. The survey and soil borings have been done at the site. In January there will be a meeting with ag. waste experts and the Sloans to review all possibilities that people have suggested. One workable option will be selected and work could begin in the spring.

Mark Brosig Farm-Work plans are developed and are being completed as outlined in B.5. Mark Brosig is also interested in ag. waste storage. He will also be involved in the January meeting.

Special Note-Most of the time spent is in-kind. As of 1/1/97 there have been a total of 474 in-kind hours and 2,423 in-kind miles contributed.

6/30/97

John Sloan Farm-The team met with other experts and Sloan on January 14th. They reviewed all possibilities of manure storage. There is a page summary of this dated January 14, 1997. The survey and soil borings have been done at the site. A design is being prepared. Sloan is signed up for USDA EQIP cost-share. Cost of project and how it will be funding is yet to be determined. One reason that the project has been delayed is that EQIP sign-up just began for 1998.

Mark Brosig Farm-Work plans are developed and are being completed as outlined in B.5. Mark Brosig is also interested in ag. waste storage. His plans were also reviewed at the January 14th meeting. There is a page summary of this dated January 14, 1997.

State Revolving Fund engineers are designing a possible system. Costs still have not been determined.

Special Note-Most of the time spent is in-kind. The summary of 1/1/97-6/30/97 in-kind will be given at the next six month update.

12/31/97

John Sloan Farm-The alternative ag. waste storage system is still in the design phase. The survey and soil borings have been done at the site. Design drawings will be completed this winter. Sloan is signed up for USDA EQIP cost-share. Cost of project and how it will be funded is yet to be determined.

Mark Brosig Farm- Mark Brosig is also interested in alternative ag. waste storage. State Revolving Fund engineers have designing a system, and a permit has been applied for. Costs still have not been determined. Additional streambank tree revetment is planned for the Brosig farm this spring.

Special Note-Most of the time spent is in-kind. The summary of in-kind is included.

3/23/98

We propose to reduce this budget by $563.00 because most of the time spent developing farm plans is in-kind by farm team members or specialists. To date there have been over 930 in-kind hours and 3,011 in-kind miles contributed.

6/30/98

Project is complete. The farmer and farm team members developed farm management systems for each farm, as outlined in B.5.

V. **Objectives / Outcome:**

B. **Title of Objective / Outcome:** Research and Implement
B.4. Activity: Develop a monitoring/evaluation plan for the farms.

B.4.a. Context within the project: The monitoring/evaluation plan will determine if the goals/objectives are being met.

B.4.b. Methods: The team will devise the monitoring/evaluation plan using the first farm to develop the plan. The project manager understands that any expenses before July 1, 1995, will not be reimbursable by LCMR.

B.4.c. Materials Mapping data, analysis, digitizing, soil surveys

B.4.d. Budget: $300.00
Total Biennial LCMR Budget: $300.00
LCMR Balance: $108.87 (108.87 - 0) as of 6/30/98
MATCH:
MATCH BALANCE:

B.4.e. Timeline:

	3/95		9/95
Product #1 Monitoring/Evaluation Plan	_____	_____	_____
Product #2 Time spent by program manager	_____	_____	_____

B.4.f. Workprogram Update:

1/1/96

The project is not complete. The farm team members have met to discuss what elements should be monitored. Possibilities include: bird counts, frog/toad counts, water monitoring, and evaluating the original farm goals established by the farmers.

7/1/96

The project is not complete. Farm team members have set up the following monitoring:
John Sloan Farm-map landuse differences, monitor filter strip, bird counts done by Ecoservices division of DNR, and a frog/toad survey.
Mark Brosig Farm-map landuse differences, stream monitoring (fish shocking, macroinvertebrate) done by UofM students, frog/toad count, and bird counts done by Ecoservices of DNR.

B.4.f. Workprogram Update:

1/1/97

The project is not complete. Farm team members have organized monitoring for each farm.

John Sloan Farm

Not Completed Yet-There will be landuse mapping that illustrates differences before and after the project. Spring 1997 Jon Cole will do a frog/toad survey. There may also be a bird count June 1997.

Mark Brosig Farm

Not Completed Yet-There will be landuse mapping that illustrates differences before and after the project. A bird count will be done June 1997. There will be a frog/toad survey done spring 1997. There will be stream monitoring summer 1997.

Completed-June 13, 1996 there was a bird count. Spring 1996 a frog/toad survey was taken. Summer 1996 sream monitoring was done for invertebrates, fish, and generalized fish habitat.

6/30/97

The project is not complete. Farm team members have organized monitoring for each farm.

John Sloan Farm

Not Completed Yet-There will be landuse mapping that illustrates differences before and after the project. Spring 1997 Jon Cole will do a frog/toad survey. There is not enough cover for a bird count.

Mark Brosig Farm

Not Completed Yet-There will be landuse mapping that illustrates differences before and after the project. A bird count will be done summer 1997. There will be a frog/toad survey done spring 1997. There will be stream monitoring summer 1997.

Completed-There was a meeting to review protocol for stream work at Brosig's. The University of MN is doing the stream work.

12/31/97

The project is not complete. Farm team members have organized monitoring for each farm. The project manager assisted with electroshocking at the Brosig's farm this quarter. A bird survey was completed this summer.

3/23/98

We propose to reduce this budget by $700 because much of the monitoring and evaluation work is being provided in-kind by project cooperators.

6/30/98

Project is complete. Farm team members developed monitoring and evaluation plans for both farms. Monitoring parameters include spring bird counts, frog and toad surveys, water quality, land-use mapping, and stream monitoring of invertebrates, fish and general fish habitat.

V. Objectives / Outcome:

B. Title of Objective / Outcome: Research and Implement

B.5. Activity: Implement farm management plan.

Brosig Farm

1. Fence cattle off stream & rotational grazing in lower pasture
2. Streambank stabilization using tree revetment & native grass plugs
3. Establish cool season grass buffer area (Reed Canary) for milkhouse waste water
4. Establish warm season grasses (switchgrass & big bluestem) in a CRP field that will be taken out of CRP and eventually used for rotationally grazing
5. Realign contour strips
6. Burn small goat prairies for natural regrowth of native grasses
7. Manure storage system to reduce workload and use nutrients effectively and not spread in the winter. The LCMR funds will be targeted for only a portion of the system.
8. Establish a new lane for rotational grazing

Sloan Farm

1. Tree cover planting along west fence, farmstead, and feedlot
2. Burr oak planting in pasture- to enhance the burr oak stand
3. Native grass planting in between tree plantings and widening waterway
4. Rotational grazing the youngstock to reduce manure generation in the lot
5. Manure storage system to reduce workload and use nutrients effectively and not spread in the winter. The LCMR funds will be targeted for only a portion of the system.

B.5.a. Context within the project: Recruit others as needed to help with plan implementation (e.g. Whitewater WMA has a Buffalo Seeder for sowing warm season grasses which has been offered.

B.5.b. Methods: The project manager understands that any expenses before July 1, 1995, will not be reimbursable by LCMR.

B.5.c. Materials

B.5.d. Budget $77,799.50
Total Biennial LCMR Budget: $77,799.50
LCMR Balance: $0 (66,060.76 – 66,060.76) as of 6/30/98
MATCH:
MATCH BALANCE:

B.5.e. Timeline:

	7/95-12/95	1/96-6/96	7/96-12/96	1/97-6/97
Brosig Farm				
1. Fencing		1.----------		
2. Tree revetment & plugs		2.----------		2.----------
3. Grass buffer planting				
4. Native grasses in CRP		3.----------		
5. Realign contour strips		4.----------	4.----------	4.----------
6. Burn goat prairies				
7. Manure Storage System	5.----------			
8. New Rotation. graz. lane				
				6.----------
				7.----------
			8.----------	
Sloan Farm				
1. Tree planting		1.----------		1.----------
2. Burr oak planting		2.----------		
3. Native grass planting				3.----------
4. Rotationally grazing			4.----------	
5. Manure Storage System				5.----------

B.5.f. Workprogram Update:

1/1/96

Project is not complete. Work will begin on the farms in the spring of 1996.

7/1/96

Sloan Farm-1,600 trees were planted, adding to a shelter belt and fence rows to provide building protection and connect more habitat corridors. Trees included: red cedar, chokecherry, cranberry bush, crabapple, red osier dogwood, bur oak, plum, and service berry. We will also be widening a grass waterway with some native warm season grasses. We are still investigating a possible low-cost alternative manure storage.

Brosig Farm-A former CRP field was burned, and warm native grasses were planted. In the future, the field will be used in a rotational grazing system. 186 rods of fiberglass fencing was installed to keep cattle off the streambank. Two tree revetments were installed. This is a low cost bioengineering method to stabilize eroding banks. 6,000 native grass plugs were planted along the bank as an experiment to stabilize the eroding bank. These plugs were 2 year grass seedlings with a good root system, designed to establish faster than grass seed. However several days of rain saturated the ground followed by a heavy downpour, and the water rose higher on the bank than it has for two years. Approximately 1/3 of the plugs were washed away. A filter strip of reed canary grass was planted for milkhouse waste. Also, contour strips were realigned.

B.5.f. Workprogram Update:

1/1/97

John Sloan Farm-Youngstock are being rotationally grazed during the permissable grass growing season. Before this the youngstock were kept in a feedlot, and manure was concentrated in that area. The manure had to be scraped and hauled; now when the cattle are out in the rotational pasture that does not have to be done. Also, land surveying and soil probing have been done as preparation work for the ag. waste storage facility. The native grasses will be planted spring 1997.
Mark Brosig Farm-The former CRP field that is now planted to warm native season grass was mowed for competitive weeds. This will be mowed periodically over the next two years and burned in 1998. There was a heavy rain in late June that washed portions of the streambanks that were planted to native grasses. These grass plugs will be replaced spring 1997 and a tree revetment will be put in also. A waterway was widened using switchgrass. A steep cattle access is being looked at to see if there is a safer way for cattle to move to a lower pasture. Also, Mark is interested in a form of ag. waste storage.

6/30/97

John Sloan Farm-Youngstock continue to be rotationally grazed during the permissable grass growing season. Native grasses will be planted this early fall when the sweet corn is harvested. The sweet corn is on hilly ground and will be retired to native grasses. Further soil probes and land surveying have been done as preparation work for the ag. waste storage facility.
Mark Brosig Farm-The former CRP field that is now planted to warm native grasses will be mowed periodically over the next two years and burned in 1998. An additional tree revetment will be installed in an eroding streambank. Work has begun on survey and soil probes for a waste storage facility.

12/31/97

John Sloan Farm-Youngstock are once again being rotationally grazed during the permissable grass growing season. Native grasses were not planted this fall when the sweet corn is harvested, but will be planted next spring. The sweet corn is on hilly ground and will be retired to native grasses. Further soil probes and land surveying have been done as preparation work for the ag. waste storage facility.
Mark Brosig Farm-The former CRP field that is now planted to warm native grasses will be mowed periodically over the next two years and burned in 1998. An additional tree revetment will be installed in an eroding streambank this spring. An waste storage facility has been designed and a permit has been applied for.

3/23/98

We propose increasing this budget by $17,799.50 because the alternative Ag waste systems these farmers will install will cost more than what was expected when the budget was set. Both farms are eligible for EQIP cost share on their Ag waste systems, up to $50,000 each. The proposed increase in LCMR funding to this item, along with the maximum EQIP cost-share, will not exceed 75% cost share to the farmer.

6/30/98

Brosig Farm- Tree revetments and planting of native forb plugs along the streambank have been moderately successful to date. The plugs along the top of the bank took hold well, while the bottom did not hold as well due to heavy spring rains. Rotational grazing

continues and the streambank is healing since it has been fenced off. Monitoring has showed water quality improvements from where the stream enters Mark's pasture to where it exits. The CRP field planted to warm season native grasses will continue to be mowed and burned as needed. Construction has begun on Mark's Ag waste system, which will incorporate recapturing sand bedding.

Sloan Farm- Youngstock continue to be rotationally grazed during the summer. Native grasses were not planted this spring as planned. John agreed to plant the grass this fall after his sweet corn is harvested. John applied for a permit this winter for his Ag waste system. The tree and shrub planting was moderately successful, but the burr oak planting did not survive as they were not fenced as planned and were grazed off by his cattle.

V. **Objectives / Outcome:**

B. **Title of Objective / Outcome:** Research and Implement
B.6. Activity: Develop a time tracking device.

B.6.a. Context within the project: Time tracking will provide a history of this project that includes team participation, time, expenses, methods, procedures, protocols.

B.6.b. Methods: All of the above will be recorded. The project manager understands that any expenses before July 1, 1995, will not be reimbursable by LCMR.

B.6.c. Materials

B.6.d. Budget $3,650
Total Biennial LCMR Budget: $3,650
LCMR Balance: $187.90 (1006.36- 818.10) as of 6/30/98
MATCH:
MATCH BALANCE:

B.6.e. Timeline:

	7/95		7/97
Product #1 Time Tracking	_____	_____	_____
Product #2 Time spent by program manager	_____	_____	_____

B.6.f. Workprogram Update:

1/1/96
Project is not complete. A time tracking device was developed so that all farm team members could record their in-kind time & mileage. Every month these time reports are sent to the program manager for compiling. To date: 127 in-kind hours. 900 in-kind miles.

7/1/96
Project is not complete. The second quarter work is now recorded. Every month in-kind reports are submitted to the program manager. To date (including 1/1/96 work) 347 in-kind hours. 1,687 in-kind miles.

1/1/97
Project is not complete. The third quarter work is now recorded. Every three months donated work or in-kind work reports are submitted to the program manager. To date there are 474 in-kind hours and 2,423 in-kind miles put in by farm team members.

6/30/97
Project is not complete. The fourth quarter is now recorded. There has been a year extension so there will be two more six-month updates. Every three months donated work or in-kind work reports are submitted to the program manager.

12/31/97
Project is not complete. This past quarter is now recorded. There has been a year extension so there will be one more six-month update. Every three months donated work or in-kind work reports are submitted to the program manager.

3/23/98
We propose to reduce this budget by $1,350 because less time was needed to develop a time tracking device than was expected.

6/30/98
The project is complete, and the final quarter is now recorded. The final in-kind work report has been submitted to the program manager. There have been 969 in-kind hours and 3182 in-kind miles put in by farm team members.

V. **Objectives / Outcome:**

C. **Title of Objective / Outcome:** Education

C.1. Activity: Ongoing Public Presentations

C.1.a. Context within the project: Currently, the project has 1,000 personal contacts at 40 public events per year. The LCMR project will be highlighted at these ongoing events.

C.1.b. Methods: These are slide presentations and booth displays.

C.1.c. Materials The materials have already been supplied.

C.1.d. Budget $0

Total Biennial LCMR Budget: $0

LCMR Balance: $0 as of 6/30/98

MATCH:

MATCH BALANCE:

C.1.e. Timeline:

	7/95		7/97
Product #1			
60 Slide Presentations	_____	_____	_____
Product #2			
20 Booth Displays	_____	_____	_____

C.1.f. Workprogram Update:

1/1/96

Project is not complete. There have been 29 watershed public presentations with the LCMR project highlighted. One of the slide presentations was taped and shown on the City of Winona's Cable TV network. To date approximately 750 to 1,000 people have heard the presentations.

Project is not complete. An update of total presentations will be given after the 3rd quarter, which is the end of our fiscal year.

1/1/97

The project is not complete. As of 1/1/97there have been 72 presentations given for C.1. and C.2. The LCMR and watershed messages have reached an estimated 4,400 people. There is a list specifiying the date, group, and number of people at each presentation.

6/30/97

Project is not complete. An update of total presentations will be given at the end of the calendar year.

12/31/97

A list of slide presentations and booth displays is compiled and continuously updated. An update of total presentations is attached to this report.

6/30/98

This portion of the project is ongoing. A list of slide presentations and booth displays is compiled and continuously updated. An update of total presentations is attached to this report.

V. **Objectives / Outcome:**

C. **Title of Objective / Outcome:** Education

C.2. Activity: LCMR Public Presentations

C.2.a. Context within the project: Have 20 presentations per year that specifically address the LCMR project.

C.2.b. Methods: Develop a presentation that can be given at a variety of meetings.

C.2.c. Materials Chronicle the project on videotape to be shown at meetings.

C.2.d. Budget $0

Total Biennial LCMR Budget: $0

LCMR Balance: $0 as of 6/30/98

MATCH:

MATCH BALANCE:

C.2.e. Timeline:

	7/95		7/97
Product #1 40 LCMR Public Presentations to 1,000 people	_____	_____	_____

C.2.f. Workprogram Update:

1/1/96

Project is not complete.

7/1/96

Project is not complete. Two LCMR presentations have been made: 5/31/96 and 6/29/96. The project manager is compiling a list.

1/1/97

The project is not complete. Slides of the LCMR demonstration farms have been given to all Whitewater Watershed presenters. They have incorporated these slides into their talks. These are listed as one master list of all presentations. As stated in C.1., there have been 72 total presentations for C.1. and C.2.. These presentations have been for a total of approximatedly 4,400 people.

6/30/97

The LCMR slides are still incorporated into the slide programs. The total number of presentations will be tallied and given as an update at the end of the calendar year.

12/31/97

The LCMR slides are still incorporated into the slide programs. The total number of presentations is compiled and continuously updated.

3/23/98

We propose to reduce this budget by $1,000, because we realized we could reach more people by incorporating the LCMR public presentations into our Whitewater Watershed slide show. These presenations have been given by watershed presenters on a continuing basis and provided in-kind.

6/30/98

The LCMR slides are incorporated into the Whitewater Watershed slide programs. These presentations have been given by watershed presenters on a continuing basis and provided in-kind. The total number of presentations is compiled and continuously updated.

V. **Objectives / Outcome:**

C. **Title of Objective / Outcome:** Education
C.3. Activity: Fact Sheets, Videotape, Records, and team farm case-studies.

C.3.a. Context within the project: The two Whitewater demonstration farms and Land Stewardship Project farms will all be treated as case studies. The process for farm selection, team participation, implementation, and evaluation will be recorded and summarized for case study. Records of management practices, costs, pros and cons, and profitability will be recorded. This information will also be used to evaluate the goals/objectives of the LCMR project.

C.3.b. Methods: The case studies will be recorded as fact sheets and videotapes. Also records will be maintained.

C.3.c. Materials Fact sheets, videotapes, bookkeeping

C.3.d. Budget $12,500
Total Biennial LCMR Budget: $12,500
LCMR Balance: $6,265.05 ($6,265.05 - $0) as of 6/30/98
MATCH:
MATCH BALANCE:

C.3.e. Timeline:

	7/95		7/97
Product #1 Fact Sheets and Videotapes	_____	_____	_____
Product #2 2,000 people will be reached by fact sheet and/or videotape	_____	_____	_____
Product #3 Bookkeeping/Recording time spent by program manager	_____	_____	_____

C.3.f. Workprogram Update:
1/1/96
Project is not complete. The farm teams will be taking slides during implementation. These slides will be assembled into the slide program and possibly put on video.

C.3.f. Workprogram Update:

7/1/96

Team farm case studies have not yet been drafted. A case study based on data from several Monitoring Project Team farms on the issue of veterinary bills under Management Intensive Grazing is under development.

The two demonstration farms have on-going videos being made of all the work on the farms. Also, slides are being taken by the two farmers and eventually a slide program will be developed. The current slides are distributed and being used in talks about the LCMR project.

1/1/97

Team farm case studies are under development. A case study based on data from several Monitoring Project Team farms on the issue of veterinary bills under Management Intensive Grazing is almost completed.

Two Whitewater Demonstration Farms

Farm team members are incorporating the LCMR slides into their watershed talks. The number of presentations given were listed in C.1. and C.2. The videos of the two farms continue to be updated as work progresses.

6/30/97

Drafts of three team farm case studies are available. Additional case studies will be completed later this summer.

Two Whitewater Demonstration Farms

Farm team members are incorporating the LCMR slides into their watershed talks. The videos of the two farms continue to be updated as work progresses.

12/31/97

Drafts of three team farm case studies are available.

Two Whitewater Demonstration Farms

Farm team members are incorporating the LCMR slides into their watershed talks. The videos of the two farms continue to be updated as work progresses. Cameras and slide film were purchased for each farm and the landowners and team leaders have been taking slides throughout the project. These can be used in a slide program or converted to video.

3/23/98

Two Whitewater Demonstration Farms

We propose to reduce this budget by $11,000 because much of the monitoring records were maintained by farm team members, who provide in-kind services. An amateur video has been taken throughout the project, but we feel that the best way to disseminate the information is through the current Whitewater slide show.

6/30/98

Drafts of three team farm case studies are available.

Two Whitewater Demonstration Farms

Farm team members are incorporating the LCMR slides into their watershed talks. The videos of the two farms continue to be updated as work progresses. Cameras and slide film were purchased for each farm and the landowners and team leaders have been taking slides throughout the project. These can be used in a slide program or converted to video.

V. Objectives / Outcome:

C. Title of Objective / Outcome: Education
C.4. Activity: Self-guided tours

C.4.a. Context within the project: Two mailboxes with brochures at the two Whitewater Demonstration Farms will be easily accessible to the public. Interested individuals will be able to give themselves self-guided tours of the demonstration farms at their convenience.

C.4.b. Methods:
C.4.c. Materials 2 Mailboxes and brochures

C.4.d. Budget $500
Total Biennial LCMR Budget: $500
LCMR Balance: $187.13 (187.13 - 0) as of 6/30/98
MATCH:
MATCH BALANCE:

C.4.e. Timeline:

	7/96		7/97
Product #1 Self-guided Tours at the 2 Whitewater Farms using mailboxes and brochures/fact sheets	_____	_____	_____

C.4.f. Workprogram Update:
1/1/96 Project is not complete.
7/1/96

A road sign has been made by the US Fish and Wildlife Service. This will be placed overlooking the Brosig Farm's stream work. The next step is to place a brochure holder next to the big road sign. The brochure will detail LCMR work that has been done.

1/1/97

The self-guided tour is now open to the public. County newsletters have had an article advertising the site and the day of the field day there was a lot of advertisement. Also the State Park is going to include this site on their "Sites to See" pamphlet that they hand out to visitors.

The self-guided tour site has a gravel pull-over alongside the road. Winona County Highway Department hauled the gravel in for the pull-over. Next to the pull-over is a sign highlighting what work has been done and by who. There is a ladder and bridge to use to cross over a fence. A pamphlet is available on-site, housed in a clear box. All of this work was done in cooperation with US Fish and Wildlife Service, Winona Soil and Water Conservation District, MN Dept. of Natural Resources, and MN Conservation Corps.

6/30/97 and 12/31/97

The project is complete and is being used.

3/23/98

We propose to reduce this budget by $1,500 because we were able to complete the objective under budget through the cooperation of the US Fish and Wildlife Service, Winona Soil and Water Conservation District, MN Dept. of Natural Resources, and MN Conservation Corps.

6/30/98

The project is complete and is being used.

V. Objectives / Outcome:

C. Title of Objective / Outcome: Education
C.5. Activity: WJPB/LSP Tours

C.5.a. Context within the project: There will be two coordinated public tours per year. There will be a total of 200 people to attend over the two year span.

C.5.b. Methods: Advertise in the watershed and through LSP and WJPB sources.

C.5.c. Materials

C.5.d. Budget $7,431
Total Biennial LCMR Budget: $7,431
LCMR Balance: $0.14 ($0.14 - 0) as of 6/30/98
MATCH:
MATCH BALANCE:

C.5.e. Timeline:

	7/96	7/97
Product #1 2 Tours per Year reaching 200 people total	_____	_____

C.5.f. Workprogram Update:

1/1/96

Summer field days organized by the Team:

* August 9: Jointly sponsored with South Central SFA chapter and other co-sponsors. The field day featured presentations and a field tour about Monitoring and Holistic Resource Management at Brian and Carol Schultz farm. Several Team members spoke at the field (day 45 attended).
* August 23: Jointly sponsored with the National Extension Conference (Minnesota Extension Service), Cannon River SFA chapter, Cannon River Watershed Partnership and others. The field day examined the soils, vegetation, water quality and socio-economics on the Minar farm. Several Team members spoke. (85 people attended)
* September 14: MISA sponsored farm tour for the Legislative Commission on Minnesota Resources. The field day, held at the French farm, highlighted the work of both the MISA Monitoring and Dairy Teams.

7/1/96

Field days will be reported during the next update. June 29, 1996 there will be a tour at the Rupprecht farm and the Whitewater Watershed Project will also talk about their LCMR work. Then August 24, 1996 the Whitewater Watershed Project will have a tour at the Mark Brosig Farm and LSP will also speak about their LCMR work. For both of these tours mailing lists will be shared.

1/1/97

June 29: "Sustainable Livestock Farming in S.E. Minnesota" on the Mike and Jennifer Rupprecht watershed goals. Co-sponsored with the MDAESAP, MISA, SE SFA and the Whitewater Watershed Project, the tour illustrated holistic goal setting and mangement, monitoring on the farm and connection to watershed goalsTex and Art described grazing management impacts on grassland bird habitat as part of field day at Rupprecht's in Lewiston. Jay and Mike discussed soil quality. About 30 people attended
July 1: "Teamwork Tour" a three state tour by 62 participants from across the country focusing on cutting-edge technologies in farming systems that sustain the environment while supporting the family farm and rural communities. The tour was sponsored by agricultural universities and farm groups in Iowa, Minnesota, and Wisconsin, and the USDA Sustainable Agriculture Research and Education program. One stop on this three-state Chapter three tour was at the Thicke Farm. The Monitoring Team included presentations by Jay on soils, Tex and Art on birds, Bruce Vondracheck on stream monitoring, Dick Levins and Ralph on economics and the Team as a whole on its process.
August 17th: "Share the Wealth: Center for Holistic Management . Co -sponsored by LSP. The Monitoring Team conducted the field tours at the Rupprecht and French farm on Saturday. Stops included holistic goals (both farms) soil quality (Jay and Mike), birds (Tex and Art), animal health (Doug), economics (Dick), streams (Larry G, Laurie, Bruce), quality of life (Alison and Dan) and general discussion of Team About 100 attended.
September 18: Part of the Non-Point Conference program, post confernce tour. Stops included farm system (Art), soil (Jay), grazing management impacts on grassland bird habitat (Tex and Art). About 20 attended

Two Whitewater Demonstration Farms
June 29, 1996, there was a tour on the Jennifer and Mark Rupprecht farm (LSP). John Sloan, Mark Brosig, and Shelly Eckblad spoke at this tour about the work being done on the two Whitewater Demo. Farms. Shelly supplies LSP with Whitewater mailing labels to help with the advertisement, and the Whitewater Watershed Project was listed as a co-sponsor. There were 40 people in attendance.

August 24, 1996, there was a tour on the Mark Brosig Farm. There were 12 people in attendance. This was a tour which was coordinated between the Watershed Project and Whitewater State Park. This worked well. Dave Palmquist, park program coordinator, publicized the date in all the local newspapers and community ed. programs. Shelly Struss did a bulk mailing to over 400 farmers in the watershed. LSP provided mailing labels and were co-sponsors. Senator Steve Morse attended. We do not know why more people did not come. The tour ran very smoothly and people there asked many questions and were interested.

6/30/97 and 12/31/97
Project is complete.

3/23/98

We propose to reduce this budget by $1,569 because we were able to complete the farm tours under budget by co-sponsoring the tours with the Land Stewardship Project.

6/30/98
Project is complete.

V. **Objectives/Outcome**

C. **Title of Objective/Outcome:** Education

C.6. **Activity:** Develop Brochure and educational packet for kit of indicators

C.6.a. **Context within the project:** The information generated by the project will be made available to farmers to help them better observe the impacts of their management on the farm's ecology, profitability and family quality of life.

C.6.b. **Methods**: A farmer-friendly kit of ecological, economic, and social indicators to monitor farm health will be developed in 1996. We anticipate that dissemination of this kit to farmers practicing sustainable and conventional agriculture will be part of efforts to foster increased adoption of highly sustainable farming systems.

A brochure on the use of biological indicators to observe on-farm ecological health will be prepared and distributed through Sustainable Farming Association chapters, other farm organizations, state agencies, non-profits, the University of Minnesota and the Minnesota Extension Service, other state organizations and nationally in 1996.

C.6.c. **Materials:** Materials will include printed and some audio-visual materials.

C.6.d. **Budget:** $20,000
Total Biennial LCMR Budget: $10,000
LCMR balance: $0 (10,000 - 10,000) as of 6/30/97
MATCH: $10.000
MATCH BALANCE: $0 (10,000 - 10,000) as of 1/1/97

C.6.e. Timeline: 7/95 9/95 12/95 3/96 6/96 9/96 12/96 3/97 6/97

Product # 1 .....
Package kit of indicators for use by farmers and other agricultural professionals

Product # 2 .....
Develop brochure for dissemination

Product # 3 .....
Disseminate kit through existing organizations

C.6.f. Workprogram Update:

1/1/96
Project is not complete.

7/1/96
No new information here

C.6.f. Workprogram Update

1/1/97

These items are under active development (see Section V.A.2.f workprogram update 1/1/97). At this writing, we have draft tool box materials from all of the research areas. For each area, we have a one-page "teaser" (what, why, who, when, how much, etc.) and a more in-depth monitoring guide (how to). Where appropriate, a field aid (such as a laminated card) has been, or is being, developed to outline key points of the monitoring process. All of the materials have been developed through our team process. By February 1997, we will create a prototype tool box that will be distributed to team farmers and new farmer cooperators in Phase II of the monitoring project for a test run. Throughout 1997 we will be engaged in a process of testing the prototype tool box with farmers using a variety of farming systems. Their feeedback will help the Team improving the tool box by early 1998.

6/30/97

The "Test" edition of the Tool Box is complete and 100 copies have been made for initial testing (see *The Monitoring Tool Box,* Land Stewardship Project, White Bear Lake, MN 1997). The dissemination plan includes distribution to 18 farmers and four Resource Management Groups, totaling about 40 people, for testing. The Tool Box also will be made available to three national groups and selected other individuals from the state and nation for review and comment. Portions of the tool box also are being reviewed by more than 60 professionals in their fields. Re-drafting will take place in the fall with a publicly available edition being produced during the winter of 1998. At that time, the tool box will be available nationwide. In addition, presentations to farmers and scientists have and will be taking place during 1997, e.g. Sustainable Agriculture Research and Education Program Administrative Council, Kellogg Integrated Farming Systems Initiative Project Directors, etc. The fact sheet is available and articles in publications discuss the Tool Box.

12/31/97 and 6/30/98

Reports we are publishing on the project:

Levins, Richard. June 1996.*Monitoring Sustainable Agriculture With Conventional Financial Data*. Land Stewardship Project. White Bear Lake. 30 pages.

Monitoring Tool Box, 1998. Published by Land Stewardship Project and Minnesota Institute for Sustainable Agriculture describing monitoring Tools.

C*lose to the Ground. 1998.* A video about the project. Although the video production was not funded by Legislative Commission on Minnesota Resources recommended funds, LCMR is credited for helping fund the Monitoring Project activities. A copy will be sent to the office when it becomes available.

A final report on the project describing our findings, conclusions and recommendations about the team process will be published in 1998.

In addition others have published articles in the popular press.

VI. Evaluation:

10.Feedback will be provided through workshops and tour participants on the usability of the methods.
11.LSP course alumni will be surveyed at the end of the project to determine if they have adopted or adapted any of the monitoring practices that they were exposed to during the course.
12.Number quality of materials along with demand for materials will be a form of measurement.
13.Attendance at field days and events will be another measurement.
14.Time spent on the objectives will also be tracked.
15.Over the long term, it will be necessary to follow-up with farmers to see what impact these materials have had in seeking information or adopting new practices.

VII. Context within field:

The project being proposed is an integrated program of research on sustainable farming systems that can protect water quality. The demonstration farms provide farmer-to-farmer information sharing and education on the land and through materials that can be disseminated throughout the state. To speed the adoption of sustainable farming practices, it is important that farmers, researchers, and policy makers be able to identify the broader impacts of adopting such systems on farm ecology, finances, family quality of life, and broader landscape goals for the area. These indicators are specific examples of the information to be collected by the Minnesota Environmental Indicators Initiative. The cooperation necessary to develop farmer-friendly monitoring tools and demonstration farms will help create an improved climate for cross-fertilization of ideas and creative problem-solving among farmers, researchers, and regulators and may help reverse the increasing emphasis on regulation as a way to solve agriculture's environmental problems. Once the monitoring approaches have been tested in the Whitewater and at Lamberton, they will be generalized to other farming systems. This project will expand the partnership involved in the Whitewater Joint Powers Board--MN DNR, SCS, MDA, USFWS, MPCA--to include University of MN Lamberton and the Land Stewardship Project.

VIII. Budget context:

a. Ending June 30, 1995

MN Institute for Sustainable Ag.	$60,000 + pending
Sustainable Ag. Research and Ed. program	$15,000
Ag. in Concert with the Environment	$15,000
Kellogg Foundation	$15,000
C.S. Mott Foundation	$15,000
Wallace Genetic Foundation	$15,000

b. Beginning July 1, 1995

MN Institute for Sustainable Agriculture	$54,160 (calendar year of 1996)
Sustainable Ag. Research and Ed. program	$35,000
Ag. in Concert with the Environment	$35,000
Kellogg Foundation	$8,000 (beginning July 1996)

IX. Dissemination

Dissemination will occur through Objective C-Education. In brief summary, dissemination will include the following: public presentations; videotapes; fact sheets; public tours; and distribution to SFA chapters, farm organizations, state agencies, non-profits, U of MN, and Extension.

X. Time:

Monitoring for impacts resulting from changes in management, education, and evaluation are long-term commitments. The Develop and Test the Indicators Objective is being initiated in 1994. LCMR funding would allow the monitoring to continue for two additional years. The Whitewater Watershed objective is a long-term, comprehensive planning process for watershed management. Longer term support for all objectives of this project may be required.

XI. Cooperation:

Primary collaborators include the Land Stewardship Project and the University of MN Lamberton Experiment Station. Collaborative arrangements also exist between the Whitewater Joint Powers Board and Olmsted, Winona, and Wabasha Soil and Water Conservation Districts; USFWS; MN DNR; University of MN. LSP's monitoring team includes seven farmers, two researchers at the University of MN, the Sustainable Farming Association, MDA, MPCA, MN DNR, USFWS, and three consultants. In addition the Blue Earth River Basin Initiative will cooperate with the monitoring component of this project.

Objective A.

PROJECT COOPERATOR	TIME (%)	ROLE
Dr. Deborah Allan	5	Soil quality and supervise post doc
Audrey Arner	15	Organizer
George Boody	25	Monitoring Project Coordinator
Dr. Jay Dorsey	100	Post doctoral scientist: soil data collection and analysis; assembling all project data; preparing reports
Joe Finley	10	Farmer team member
Dr. Cornelia Flora	5	Quality of life work and supervisor of graduate student working on quality of life
Dan French	10	Farmer team member
Larry Gates	5	Stream data analysis and supervise frog and toad collection
Doug Gunnink	5	Economics data analysis and interpretation
Mary Hanks	5	Outreach, on-farm research
Tex Hawkins	5	Supervise bird counts
Larry Johnson	5	Supervise hydrogeology data collection
Dr. Linda Kinkel	2	Supervise statistical analysis
Ralph Lentz	10	Farmer team member
Dave Minar	10	Farmer team member
Helene Murray	5	Quality of life data collection and project administration
Mike/Jennifer Rupprecht	10	Farmer team member
Art Thicke	10	Farmer team member

Objective A

PROJECT COOPERATOR	TIME (%)	ROLE
To be hired	45	Data collection organizing field days
Ed Weir	5	Stream quality analysis and modeling
Dr.Bruce Vondracek	5	Stream analysis and supervise graduate students working on stream analysis
Karen Mumford	50	Stream data collection and analysis
Laurie Solvell	25	Stream data collection and analysis
Alison Meares	50	Quality of life data collection and analysis
Dr. Craig Schaeffer	2	Supervise plant ecology data collection
Graduate Student	25	Plant ecology data collection and analysis
Lee Klossner	10	Asst. scientist, sample collection and analysis
Dave Huggins	5	U of M Lamberton Manager

Objective B

PROJECT COOPERATOR	TIME (%)	ROLE
~~Shelly Eckblad~~ Linda Dahl	16	Program Manager
Whitewater Project Staff	10	Implement Obj. B

Objective C

PROJECT COOPERATOR	TIME (%)	ROLE
~~Shelly Eckblad~~ Linda Dahl	17	Program Manager
George Boody	15	LSP Coordinator

XII. Reporting Requirements:

Semiannual six-month workprogram update reports will be submitted not later than January 1, 1996, July1, 1996, January 1, 1997, June 30, 1997, January 1, 1998 and a final six-month workprogram update and final report by June 30, 1998.