NDSU NORTH DAKOTA STATE UNIVERSITY

GRANT APPLICATION TRANSMITTAL

This page indicates university endorsement of the referenced proposal and is intended to be submitted to the sponsor organization.

Sponsor Organization:	Environmental Protection Agency/North Dakota Department of Health
Project Title:	*North Dakota Discovery Farms Phase II*
Project Director:	Paulo Flores
Department:	Carrington Research Extension Center

Project Budget:

Total Direct Costs		$ 126,000
F&A/In-direct Costs		$ 14,000
F&A/IDC Rate	10 %	
Total Requested		$ 140,000

Authorized University Representative:	Jill Mackenzie
Title:	Award & Program Officer, Sponsored Programs Administration
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Signature:	Jill Mackenzie
Date:	2/4/15

Any future notifications regarding this proposal, including award notices, should be directed to the authorized university representative at the address listed above.
Thank you.

1.0 **PROJECT SUMMARY SHEET**

PROJECT TITLE: North Dakota Discovery Farms - Phase II

LEAD PROJECT SPONSOR: NDSU Extension Service
Carrington Research Extension Center
P.O Box 219
Carrington, ND 58421
701-652-2951
paulo.flores@ndsu.edu

CONTACT PERSON: Paulo Flores

STATE: North Dakota

WATERSHED: Statewide

HYDROLOGIC UNIT CODE: N/A

HIGH PRIORITY WATERSHED: NA PROJECT TYPE: I&E

WATERBODY TYPES: Lakes/Reservoirs, Rivers, Streams NPS CATEGORY: Agricultural

SUMMARIZATION OF MAJOR GOALS:
Determine environmental impacts of tile drainage, common farming practices, nutrient management and effectiveness of best management practices (BMPs) through on-farm water quality monitoring. Produce a final report that will include all the data collected from the three ND Discovery Farms since the inception of the program, as well as interpretation of that data, looking for relationships between the data collected and the management practices adopted in each specific site.

PROJECT DESCRIPTION:
A Discovery Farm is a working farm or ranch voluntarily cooperating with the project to demonstrate and evaluate the effectiveness of BMPs at reducing environmental impacts of common agricultural practices used in North Dakota. Currently we have North Dakota Discovery Farms at Underwood, McLean Co.; Dazey, Barnes Co.; and Embden, Cass Co. Edge of the field water quality monitoring has been ongoing on those sites since 2008. Discovery Farms are located across North Dakota to account for the diversity of agriculture, topography, weather and other factors. Each Discovery Farm addresses specific grass-roots issues that are of greatest importance to the cooperating producer and that region of the state. With this grass-roots focus, the results from each Discovery Farm will have local application, as well as relevance to a broader range of the producers around the state.

FY2015 319 Funds Requested: $140,000 Match: $93,333

Other Federal Funds: $59,894

Total Project Cost: $293,227

319 Funded Full Time Personnel: None

2.0 **STATEMENT OF NEED**

Water nutrient enrichment is one of the nation's main causes of water impairment, especially surface water bodies like streams, rivers, lakes, and reservoirs. Most of the nutrient applied to crop fields serve their intended purpose of increasing or sustaining crop yields. Depending on the soil management and weather conditions, substantial amounts of nutrients can be washed off into waterways. According with the North Dakota Department of Health, more than 24% of the state's lakes, reservoirs and ponds are listed as impaired due to water nutrient enrichment, and 41% and 11% of the perennial streams in the state are impaired due excessive amounts of phosphorus (P) and nitrogen (N), respectively. Some of those nutrients eventually will find their way into the Missouri River, and then to the Gulf of Mexico, where they contribute to further depletion of the levels of oxygen in the nation's largest hypoxic zone.

Like many states, North Dakota has focused much of its ecosystem improvement efforts on decreasing the negative risks associated with livestock manure runoff. Regulations have been imposed and significant cost share dollars have been made available for producers to better manage livestock facility runoff. North Dakota producers, regulators, academics and conservation managers all agree that most of the regulatory policies were developed using broad assumptions from a limited amount of environmental data. By building a grass-roots team of affected individuals, the ND Discovery Farms project is a statewide intensive on-farm runoff water monitoring project that will test those assumptions.

In North Dakota several farmers have both livestock and crops as part of their operation. Crop fields are seen by many as the main source of nutrients responsible for impairing water quality, since farmers sometimes apply large amounts of fertilizers to ensure high crop yields. Another practice that has been used by North Dakota farmers to increase yields is the use of tile drainage. The increase in adoption of tile drainage has raised concerns about the impact of that practice on water quality, with special attention to N-nitrate, which is very soluble and can leach to deep layers in the soil, reaching the tile lines.

BMPs can help to decrease the amount of nutrients lost in the runoff from both livestock and crop operations. The Discovery Farm model provides the opportunity to test the impacts of BMPs on water quality in a field scale working farm/ranch. This gives the collected data more credibility since it is collected in real farm/ranch conditions. Another aspect that makes the ND Discovery Farms project unique is the fact that the cooperator is the person that decides the best management approach to solve any eventual water quality issues identified during the monitoring process. So, on this project we will be monitoring water quality in real farm/ranch conditions and testing the BMPs proposed by a real farmer/rancher cooperating with the project.

This type of project comes with its own challenges, especially during early spring, due to the high volume of runoff caused by snow melting. The challenges are different in each site and some of them are easier to overcome than others. The most challenging site so far has been the Dazey site. There, the landscape, the presence of natural springs on the hill sides and outside farm runoff contribution have made it very difficult to keep the gaging stations operational and collect reliable data to reach the project's goal. A great amount of time and funds were expended at the site to overcome some of those challenges, but so far those efforts have not paid off. Because of that, the Dazey site will be discontinued after September 2015. The sites at

Both Embden and Underwood have a good baseline of data collected in the previous 5 to 6 years. BMPs were put in place on both sites, and additional monitoring is necessary to measure their effectiveness to protect water quality.

The current Discovery Farm in Underwood is an example where the cooperator has both livestock and crops. The water quality on that site has been monitored since 2008. Some issues related runoff from the feedlot were identified through monitoring and visual observation. In 2012 the cooperator decided to implement a clean water diversion system, to prevent the water resulting from snow melting from running through his feedlot. Some of the data collected so far shows a possible positive effect of that BMP on water quality, but further monitoring is necessary to provide more conclusive data. Unfortunately, due to budget limitations, the Underwood site will be terminated after September 2015.

The Discovery Farms Project has been monitoring water quality on tile drainage and surface drainage at the Embden site since 2009. The data so far has shown indications that the use of cover crops and alfalfa, BMPs put in place by the cooperators, have positively affected the water quality coming off the tiles, but additional monitoring is necessary to provide more conclusive data. Furthermore, the data indicates that there is possibly a contribution of subsurface water on the runoff measured on the tiles, which can have an impact on the data being collected. Further monitoring will add great value to the Discovery Farms project, because it will help us to better understand the impacts of the cover crops, and the impact of removing alfalfa from the field on water quality coming out of the tile drainage system.

The idea for Discovery Farms was first formulated and implemented in Wisconsin to address the issue that environmental concerns and water quality regulations were inconsistent with profitable agricultural. Similar concerns also exist in North Dakota. Farmers, ranchers, researchers, policymakers and governmental agencies in the state recognize that a balance must be reached between the maintenance of agricultural profitability and the implementation of regulations and policies that protect our natural resources. With the final report to be generated at the end of this project, we hope that the Discovery Farms program will provide important water quality field data to help these decision makers strike that balance. The ND Discovery Farms program will supply a reliable source of information to evaluate the water quality benefits or impacts of established agricultural land-use practices. The project is a combined effort of the producers, NDSU, USGS, ND Department of Health, and ND Water Commission.

3.0 **PROJECT DESCRIPTION**

3.1 **Goal**

The goal of the Discovery Farms project is to:

3.1.1 Goal 1: By working directly with farmers and ranchers, identify and promote feasible management techniques that support responsible development of a diverse agriculture industry that will benefit crop and livestock

production while protecting the beneficial uses and quality of the state's water resources.

3.2 **Objectives:**

3.2.1 Objective 1: Determine water quality and soil impacts of runoff from cropland cultivated with annual and perennial crops and drained by a tile drainage system.

Task 1: In cooperation with ND USGS and local watershed coordinators, collect runoff data from the Discovery Farm in Embden to determine the impact of agricultural practices on water quality coming out of a tile drainage system.

Product: Water quality data collected from crop fields cultivated with annual and perennial crops and drained by a tile drainage system. Water quality parameters monitored will include total suspended solids, nitrate plus nitrite, total nitrogen, ammonium, total phosphorous, chloride and suspended sediment.

Estimated cost $146,615 $70,000 319 grant, $46,667 – Match

$29,948– other Federal funds

Task 2: Terminate water quality monitoring operations, and recover/reclaim the sites at Dazey and Underwood to their original condition and/or to owner's satisfaction.

Product: Reclaim the sites to their original condition and/or to cooperators' satisfaction.

Estimated cost $43,984 $21,000 – 319 grant, $14,000 – Match

$8,984– other Federal funds

Task 3: Collect soil samples around and inside the waterway channel to verify possible soil nutrient enrichment at the Embden site.

Product: Provide information about soil nutrient content around and on increasing distances from the point of discharge of the tile drainage. Routine soil analysis will be used to determine soil nutrient content.

Estimated cost $1,667 $1,000 – 319 grant, $667 – Match

$0 – other Federal funds

3.2.2 Objective 2: Determine effectiveness of BMPs to improve water quality on crop fields with surface and tile drainage at the Embden site.

Task 4 Continue to collect water quality data at the Embden site to evaluate the success of applied BMP in reducing the NPS pollutants impairing water quality.

Product: BMPs developed from the farmer perspective that are effective at enhancing water quality.

Estimated cost $29,323 $14,000 – 319 grant, $9,333 – Match

$5,990 – other Federal funds

3.2.3 Objective 3: Share the outcomes of the project to a broad base of individuals such as agricultural producers, researchers, educators, the general public and regulatory agencies.

Task 5 Meet individually with the cooperators to share the latest findings of the water quality monitoring, and to gather the historic, current and future land management at the Embden site.

Product: Share the findings during the monitoring process with the program cooperators, to keep them informed about how their management practices are affecting water quality on their operations.

Estimated cost $14,662 $7,000 – 319 grant, $4,667 – Match

$2,995– other Federal funds

Task 6 Host a Field Day at the Embden site.

Product: A Field Day will be held at the Embden site to provide an opportunity for the constituents to learn more about the ND Discovery Farms program and to visit the site.

Estimated cost $1,667 $1,000 – 319 grant, $667 – Match

$0 – other Federal funds

Task 7 Develop a final report that will include all the data collected from the Dazey, Embden, and Underwood sites since the inception of ND Discovery Farms program.

Product: A final report that will present and interpret the water quality data collected on all ND Discovery Farms since the beginning of the program, linking that data to the management practices adopted for the cooperators in each specific site.

Estimated cost $55,311 $26,000 – 319 grant, $17,333 – Match

$11,979 – other Federal funds

3.3 **Milestone Table**

See appendix A (Milestone Table North Dakota Discovery Farms – Phase II).

3.4 **Lead Project Sponsor**

The lead project sponsor is NDSU, which will be represented by a collaboration between the NDSU Extension Service and NDSU Agricultural Experiment Station. The Carrington Research Extension Center (CREC) is responsible for coordinating and managing the project. With offices in every county in the state, the NDSU Extension Service provides a statewide educational system. The Agricultural Experiment Station provides statewide support via the seven out-state research extension centers. The NDSU Agricultural Experiment Station and Extension Service draw upon the knowledge base of other agencies and organizations including the Natural Resource Conservation Service, the North Dakota Department of Health and the North Dakota Department of Agriculture. NDSU has a long history of working with partners in the development and delivery of educational programming and has the ability to focus research and extension specialist knowledge from the departments of Soil Science, Animal and Range Science, Plant Sciences, and Agricultural and BioSystems Engineering.

4.0 **COORDINATION PLAN**

4.1 **Cooperating Organizations**

This program will be coordinated with other state agencies and organizations involved in water quality, livestock manure management and agriculture. NDSU, represented by the Carrington Research Extension Center, is the lead organization. The Natural Resource Conservation Service will cooperate with technical resources and guidelines. The ND Department of Health will provide analytical support for water quality samples. Livestock producer organizations and crop commodity organizations are part of the project's steering committee and provide another conduit to the producers and represent the producers' viewpoint. County Extension Agents and SCD personnel will provide contact with producers in counties not represented by a 319 watershed project. The ND USGS will coordinate water quality sampling and equipment operation at the Discovery Farms. NDSU will work in conjunction with USGS to both summarize and interpret the data collected, looking to establish relationships between the data collected and the management practices in each specific Discovery Farm. USGS will publish a technical report by the end of this project summarizing all the findings since the inception of ND Discovery Farms program. That report will be made available for all interested parties.

A Discovery Farms steering committee has been developed to provide guidance for the project. Entities invited to be part of the ND Discovery Farms steering committee include: NDSU Extension Service Ag Program Leader; representatives of the ND Stockmen's Association, ND Dairy Coalition, ND Pork Council, ND Grain Growers Association, ND Soil Water Conservation, ND Corn Growers, ND Soybean Council, ND Barley Council, ND Wheat Commission, ND Department of Agriculture, Northern Pulse Growers Association, National Sunflower Association, Northarvest Bean Growers Association, Northern Canola Growers Association, Farm Bureau, Farmer's Union, USDA-ARS, NRCS, ND USGS, and North Dakota Department of Health. The NDSU Nutrient Management Specialist will provide on-going supervision of the project and insure coordination with different groups and entities to keep the project on track to reach the proposed objectives and products.

4.2 **Local Support**

Producers, NRCS, ND Department of Health, and Soil Conservation District personnel have all

indicated a need for this type of informational and educational program. Individuals working with local 319 funded water quality projects have also indicated a need. The ND Stockmen's Association, the ND Water Commission and the ND Soybean Council have also voiced their support to the project.

4.3 Letters of Support

Letters of support are kept on file for future reference.

4.4 Coordination

This project will be coordinated with ongoing funded 319 projects and support them with technical information and educational assistance related to the results/findings on the ND Discovery Farms program.

4.5 Duplication of Efforts

This program is not duplicated by other organizations or agencies. There is no other organization conducting a project such as this in North Dakota.

5.0 EVALUATION PLAN

5.1 The project goal and tasks will be evaluated at the end of the period covered by this proposal. At that time, a comprehensive final report including a the data collected since the inception of the ND Discovery Farms (water quality data, weather data and farm management practices) will be generated and made available for all interested parties.

5.2 QAPPs, covering the SAPs and SOPs, where developed by the USGS in conjunction with ND Department of Health. Due to the large the number of pages (63 pages total) it is not attached to this proposal, but it is available upon request.

5.3 The monitoring and sampling analysis strategy has been developed in cooperation with ND USGS and the ND Department of Health Water Laboratory. The monitoring will be conducted at the edge of crop fields and in tile drain lines. There are three gaging stations at the Embden site with ISCO auto samplers and flumes to measure flow rate. Constituents that will be analyzed include suspended solids, chloride, ammonia, nitrate + nitrite, and total phosphorus. Runoff water samples will be analyzed by the ND Department of Health Water Laboratory. Soil samples will be submitted to a complete routine soil analysis at Agvise Laboratories (Northwood, ND). Suspended sediment concentrations will be analyzed by the USGS Iowa Sediment Lab (Iowa City, IA)

5.4 Data will be stored on the EPA STORET database and then transferred and managed on the USGS National Water Information System-Web Interface. Due to the statewide educational system provided by the NDSU Extension Service, the NDSU Extension Service will be the primary channel for reporting and dissemination of findings after data analysis and interpretation.

5.6 The monies requested in this proposal will fund the operation and maintenance of the project. The NDSU-CREC is responsible for the overall management of the project.

6.0 **BUDGET**

The budget is detailed in the three budget tables. Part 1 details funding sources by year. Part 2 is a detailed budget of the section 319/non-federal budget. Part 3 details specific match dollars. The following narrative will explain Part 2. The salary/fringe line includes 319 and non-federal NDSU cash match monies. The 319 funds will be utilized for operation and maintenance of the Discovery Farm sites needed to address objectives 1 and 2. The salary funds requested will be used to cover part of the PI to implement project objectives including working with cooperators, soil sampling and data analysis and interpretation and CREC technicians that will assist with dismantling of the sites. The NDSU non-federal match in the salary and fringe lines are calculated based on the time devoted to the project by other NDSU faculty and staff who will be supporting the project. The rent/utility line reflects the utilities for each of the three current sites. The fees include costs associated with field day, soil analyses and possible costs associated with dismantling the sites (remove electrical service, reclaiming of the sites, etc). The remainder of the budget would be supported from 319 funds. This includes operation and maintenance of gaging stations at the Embden site (sub-contract with ND USGS) as well as travel support for the project supervisor. Educational material cost includes the development of Extension publications and printed material for field days. Equipment/supply costs include supplies needed for monitoring not included in USGS sub-contract.

Appendix D of the budget outlines cash match from the following sources:
1) NDSU Extension Service Specialists who provide program development and delivery in animal science and soil science and fertility.

2) County Extension Agents who will organize local educational efforts and help provide educational program delivery that is focused on the specific needs of producers in their region. Specific contributions to the project will include organizing and facilitating field days at the Discovery Farm sites. The primary County Extension agents providing match for the project will be from the counties where the Discovery Farms are located.

7.0 **PUBLIC INVOLVEMENT**

The steering committee provides a major conduit for public involvement. The project supervisor is also invited to speak on Discovery Farms findings at producer meetings, state agencies meetings, among others. Throughout the project the general public will be informed of progress through the media (as requested by them), articles on the CREC Center Points blog, and through a final report.

Appendixes

Appendix A: Milestone Table North Dakota Discovery Farms – Phase II
Appendix B: Part 1. Budget Table for the North Dakota Discovery Farms – Phase II.
Appendix C: Part 2. Section 319/Non-Federal Budget for the North Dakota Discovery Farms – Phase II.
Appendix D: Part 3. Value of Time and Services Provided by Extension Personnel as non-Federal match for the North Dakota Discovery Farms – Phase II.

APPENDIX A

Milestone Table - North Dakota Discovery Farms – Phase II.

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	OUTPUT QUANTITY	YEAR 1 10/15-09/16 2015	YEAR 2 10/16-6/17 2016
OBJECTIVE 1				
TASK 1: Collect runoff samples from the Embden site. TASK 2: Terminate and reclaim the sites at Dazey and Underwood. TASK 3: Collect soil samples in and around the water channel where the tiles discharge at the Embden site. Groups: 1,2,3,4	-Baseline water quality data from tile drainage -Dazey and Underwood sites will be reclaimed to their original condition. - Measure possible nutrient build up due to water discharge from a tile drainage system	2	Apr. 1- Sept. 30 Oct. 1- Apr. 30 May 1- Jun. 30	
OBJECTIVE 2				
TASK 4: Collect water quality samples to determine effectiveness of BMPs implemented Groups: 1,2,3,4	-Field data that will describe the performance of BMP implemented by the cooperators.		Apr. 1- Sept. 30	
OBJECTIVE 3				
TASK 5: Meet with cooperators and share the data collected with them. TASK 6: Host a Field Day at the Embden site. TASK 7: Develop a ND Discovery Farms program final report. Groups: 1,2,3,4	-Give the cooperators feedback about the water quality data on their operation - Share the findings with farmers in the region and with the general public. -The final report will provide an interpretation of the data, trying to link the data collected with management practices	3 1 1	Feb. 1 – Apr. 30 May 1 - Aug. 31	 Jan 1 – Jun 30

Group 1- NDSU
Group 2- USGS
Group 3 – 319 Funded Projects
Group 4 – ND Department of Health

Appendix B

Part 1. Budget Table for the North Dakota Discovery Farms – Phase II

Funding Sources	Oct1-Sept30 **2015-2016**	Oct1-Jun30 **2016-2017**	**TOTAL**
FY2015 319 Funding	87,236	52,764	140,000
Other Federal Funds USGS In-kind	36,818	23,077	59,895
NDSU Non-federal Match**	58,157	35,176	93,333
Total	182,211	111,017	293,228

**The sources and value of cash match provided by NDSU staff is provided in more detail in Appendix D.

Appendix C

Part 2. Section 319/Non-Federal Budget for the North Dakota Discovery Farms – Phase II.

Fiscal Year	Oct1-Sept30 2015-2016	Oct1-Jun30 2016-2017	Total 319 Funds	NDSU Non-federal Match FY2016-2017	Total
Personnel/Support					
1) Salary	10,105	7,806	17,911	62,222	80,133
2) Fringe	4,087	3,079	7,166	21,778	28,944
3) Travel	10,000	6,000	16,000		16,000
4) Printing	1,000	1,000	2,000		2,000
5) Rent/Utility	3,600	1,800	5,400		5,400
6) Equipment/Supplies	2,500	1,243	3,743		3,743
8) Telephone	720	360	1,080		1,080
9) Fees	1,500	1,200	2,700		2,700
10) Contract with USGS	45,000	25,000	70,000		70,000
Subtotals	78,512	47,488	126,000	84,000	210,000
Administrative	8,724	5,276	14,000	9,333	23,333
Total 319/Non-Federal Budget	87,236	52,764	140,000	93,333	233,333

Appendix D

Part 3. Value of Time and Services Provided by Extension Personnel as non-Federal match for the North Dakota Discovery Farms – Phase II.

Fiscal Year	FTE	Oct1-Sept30 **2015-2016**	Oct1-Sept30 **2016-2017**	Total
Personnel/Support				
State and Regional Specialists (3 staff)	0.30	20,581	10,561	31,141
Extension Agents (6 staff)	0.30	18,191	12,890	31,081
Fringe Benefits		13,570	8,208	21,778
Administrative		**5,816**	**3,518**	9,333
Total Non-Federal Match Budget* **		58,157	35,176	93,333

*** Matching funds in the form of salaries and fringe benefits are tracked through NDSU's effort reporting system.

*** Matching funds are estimated at the beginning of the project period. Amounts are subject to change with changing staff and changing salaries. Total match will always meet agency requirements.