CENTRAL REGION INTEGRATED SCIENCE PARTNERSHIP FUNDS

Project Title: The role of wetlands in greenhouse gas storage: an inventory of existing stocks in the prairie pothole region and their potential to sequester carbon dioxide emissions

Principal Investigator: Ned H. Euliss, Jr., (BRD)

Partners/Collaborators and Affiliations: Richard M. Forester (GD), Robert Gleason (BRD), Glenn Kelly (NMD), Gregg J. Wiche (WRD), Alan Olness (USDA-ARS), and Emi Ito (University of Minnesota—St. Paul)

Total Funding Requested: $75K

Proposal Submission Date: February 7, 2003

Problem: There is growing public concern over the management of global greenhouse carbon because of its relation to global change. The USGS's Northern Prairie Wildlife Research Center (NPWRC) and USDA's Agricultural Research Service (ARS) collaborated to study the potential of prairie pothole region (PPR) wetlands to sequester atmospheric carbon. Results suggest that prior to European settlement, wetlands functioned as sinks for atmospheric carbon, but present-day cultivation, the current principal land use, has changed wetlands from sinks to sources of atmospheric carbon. Our data suggest that equal or greater amounts of atmospheric carbon can be stored in wetlands through restoration programs than on cropland even though the acreage of wetlands is much smaller.

The finding that prairie wetlands are important for carbon storage presents a new opportunity for various entities to partner with landowners to store atmospheric carbon. A recent Joyce Foundation grant was used to create a market for trading greenhouse gas emissions (see www.chicagoclimatex.com) that initially targeted a 7-state area in the Midwest but will expand to international markets by 2004. Carbon trading also is being implemented directly between industry and private landowners. Entergy, a leading utility company, has committed to purchasing 30,000 tons of carbon stored by zero-tillage farmers over the next 10 years (see attached news release). Further, storage of carbon in agricultural soil and marketing of carbon credits has been the subject of much debate in various state legislatures and during drafting of the federal farm bill. Wetlands provide additional opportunities for carbon trading and storage.

Objective: This project will develop a state-by-state inventory of existing and potential wetland carbon stocks in the PPR of the United States, evaluate differences in carbon storage among various wetland types, and based on paleorecord evidence, examine how carbon production may vary with climate change.

Scope: This project will be conducted in the PPR of the United States (includes portions of IA, MN, SD, ND, and MT) and we will provide an inventory of existing and potential carbon stocks associated with wetlands for each state. Carbon data from a previous study (see Study Plan 168.01 at http://www.npwrc.usgs.gov/wetland/) conducted by NPWRC and the USDA-ARS (Morris, MN) will be used to project current carbon stores from spatial wetland data provided by the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI). We also will estimate buffer strip area (and their associated carbon stocks) needed to reduce erosion of topsoil into wetlands from adjacent cropland. Topsoil sedimentation makes wetlands less effective in sequestering atmospheric carbon.

Approach: The project will be accomplished through the coordinated efforts of each of the 4 USGS Divisions, USDA-ARS, and the University of Minnesota—St. Paul. USDA-ARS and NPWRC carbon data will be summarized by wetland type for each state in the PPR. Wetland area (from NWI) and carbon storage will then be summarized for each state. BRD, NMD, and WRD will estimate the potential of wetland restoration to store additional carbon through published estimates of wetland loss and USDA Natural Resources Inventory data.

Another component of the work will involve examining the relationships between hydroperiod (i.e., the duration of standing water in wetlands) and carbon sequestration. This will be examined by comparing the water volume data from 204 wetlands studied by NPWRC in the restoration study (Study Plan 168.01) to carbon data obtained by USDA-ARS for the same set of wetlands. An additional analysis will be performed to evaluate the observed relationship from the various vegetative zones for which we have carbon data because they also reflect variations in hydroperiod. This part of the work will be conducted by BRD.

A final component of the work will be to examine the relation between modern-day carbon activity and the paleorecord of that activity at wetland P1 of the Cottonwood Lake Study Area (CLSA). The CLSA (see http://www.npwrc.usgs.gov/clsa/), is a long-term research site of BRD and others, and is an ideal site for this component of the study. To address this component, GD and the University of Minnesota will use data from an ongoing study, and data derived from a 2 m sediment core collected from wetland P1 in the late 1980s. Since August 2000, the GD and University of Minnesota have been collecting on a monthly basis, water samples from wetland P1. Data from those collections include nutrient concentration, δ^{13} C values of dissolved inorganic carbon (DIC), and other parameters. This data will be used to develop the relation between δ^{13} C values of DIC and carbon production. The δ^{13} C value of DIC is expected to provide a good proxy of carbon production because it generally corresponds with nutrient concentration and fluctuates with seasonal changes in primary production (e.g., algal photosynthesis). This relation between δ^{13} C and carbon activity will then be used to interpret the 2 m core. Information available from this core includes radiocarbon dates (e.g., 3738 @ 190 cm) and δ^{13} C values determined from ostracode shells. This analysis will provide a picture into the past of how carbon activity has varied since the Late Holocene to present times. Moreover, we will determine if modern productivity dynamics differ from past conditions.

Benefits: The finding that prairie wetlands are important for carbon storage provides a unique opportunity to manage wetland resources from diverse perspectives. Aside from the obvious economic incentive to land owners, this project should provide valuable information for policy makers considering future farm legislation and create opportunities for additional partnerships with entities interested in other wetland functions (e.g., wildlife habitat, flood water storage, nutrient assimilation).

Outcome/Products: This project will yield a scientific publication that will be submitted in 2004.

Budget:

	Salary Permanent/Seasonal	Travel	Supplies	Contract Services	Publication Costs	Salary for Writing	Project Total
GD	3.8K			6.0K		3.8K	
WRD	12.0K						
NMD	3.0K						
BRD	17.0K	2.7K	1.5K	4.0K	5.5K	15.7K	
Subtotal	35.8K	2.7K	1.5K	10.0K	5.5K	19.5K	75.0K

Timeline: Fieldwork will be completed in 2003; a manuscript will be prepared and submitted in 2004.

PRESS RELEASE

entergy to pay farmers to direct seed land

Luncheon Press Conference
11:15 am, Tuesday, January 16, Spokane Doubletree

Pasco, WA, January 15. The Pacific Northwest Direct Seed Association (PNDSA) has joined with Entergy, one of the nation's leading utility companies, to reduce greenhouse gases. A historic letter of intent was signed today that will protect the environment while keeping agricultural lands in production. Carbon dioxide is one of the major greenhouse gases associated with global warming, and direct seed cropping systems reduce carbon dioxide emissions and store organic carbon in the soil. Entergy will pay direct seed farmers for offsetting the $C0_2$ emissions from the company's power plants in the United States. With Entergy's support, the direct seed project would reduce over 30,000 tons of $C0_2$ emission over a 10-year period. Environmental Defense (ED), a national environmental organization, brought the two entities together early this summer.

"This is the first lease agreement for offsetting carbon dioxide emissions anywhere in the world," announced Karl Kupers, vice president of the PNDSA and lead for negotiations on behalf of the PNDSA. "This project opens the door to tremendous potential for the future. We are interested in leasing carbon dioxide offsets, sequestered in the soil, rather than selling them and permanently transferring risk to the landowner. We are excited about the positive implications this arrangement has for farmers, forward-looking industries and the environment." Kupers started the transition to direct seeding six years ago and now farms 100% of his acreage near Harrington, Washington with this system.

"The potential to store carbon in the land is a bonus, but not the primary reason for adoption of the direct-seed method of farming," said Russ Zenner, president of the PNDSA and farmer near Genesee, Idaho. Zenner, who has been direct seeding for more than 10 years, further explains. "Direct seeding minimizes the disturbance of

soil before planting, essentially stops soil erosion from wind and water and saves fuel and time. The residue left on the soil surface provides greater habitat for birds and other wildlife and facilitates the buildup of organic matter, which improves soil quality and potentially, yields. It is a win-win scenario, but potential benefits come with real financial and economic risks. The lease agreement between the PNDSA and Entergy is one way to offset the financial risk and to encourage growers to adopt direct seeding," he concluded.

The PNDSA, a relatively new grower organization with over 300 members that collectively represent about 500,000 acres of farmland, has the goal of increasing the direct-seeded farmland in the Pacific Northwest to 2 million acres by 2005. Improvements in land management through practices such as direct seeding and reforestation are now being considered internationally as a means to stabilize or reduce the amount of greenhouse gases in the atmosphere, according to R. James Cook, a faculty member at Washington State University and a member of the PNDSA committee chaired by Kupers that led to the lease agreement. "Models are being developed by soil scientists to both predict and estimate the amount of carbon stored in soil as organic matter, so we do not need to sample field by field to verify the amount of carbon stored," Cook said. "The agreement between PNDSA and Entergy will expedite research and verification methods that will encourage future alliances."

Karl Kupers summarizes the event. "We are proud to be involved in this unprecedented partnership between farmers, major industry and an environmental group. Such cooperation is critical to *retooling agriculture*, which must happen to ensure survival of the family farm business, the fabric of rural America and ultimately a higher quality of life for everyone."