Management of Agricultural Landscapes with Wetlands and Riparian Zones: Economic and Greenhouse Gas Implications

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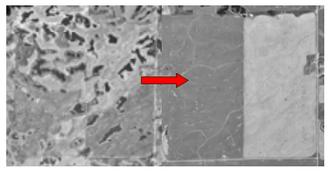
Background

Prairie wetlands and associated riparian zones are inseparable elements of the agricultural landscape, but are not currently included in greenhouse gas (GHG) balance estimations for agricultural land because their carbon sequestration potential is poorly quantified. No research has previously been done on the GHG flux and carbon sequestration potential of prairie wetlands. An estimated 71% of wetlands have been lost in the Prairie Pothole Region (PPR) of Canada, and drainage and cultivation of wetlands continues.

1950 - Wetland Drainage - 1995



Management Practices Detrimental to Wetlands in the PPR

Riparian Zone Tillage | Sedimentation | Infilling | Drainage | Over-Grazing

Our Initiative

Ducks Unlimited Canada's Institute for Wetland and Waterfowl Research is leading a collaborative multi-agency research initiative into the potential for wetlands, riparian areas, and grasslands to function as carbon sinks and reduce greenhouse gas emissions within the agricultural landscapes of Canada. There is some evidence that wetland soils in the PPR can store up to twice as much carbon as adjacent agricultural land but the net sink potential of these wetlands and riparian areas is unknown, due to the absence of data on carbon storage and GHG emissions from these systems. This lack of credible data is the greatest impediment to the development of sound, sustainable policies to offset GHG emissions.

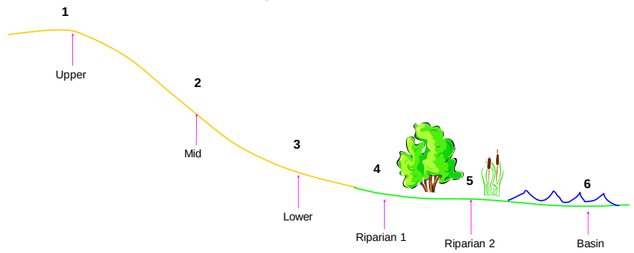
Time Line

2005 - 2008 Duration of Ag. Canada funding with 10 cooperator sites across 5 provinces, extension and training of Ag. Industry professionals, and economic analyses of farm practices.

Alberta | **Saskatchewan** | **Manitoba** | **Ontario*** | **Nova Scotia ***

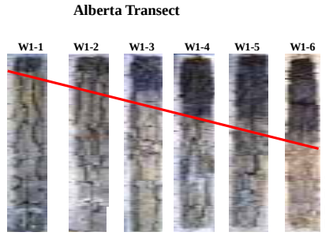
* Eastern pilot sites investigate lotic water bodies

This study encompasses the entire landscape from upland to wetland.



Objectives

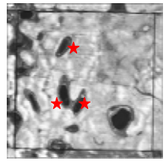
- Quantify soil organic carbon along wetland-riparian-upland transects across the PPR
- Quantify GHG flux (CO2, CH4, N2O) along same transects
- Measure key ecological drivers that control changes in C and GHG in wetland- riparian ecosystems
- Identify impacts of agricultural upland management (conventional tillage, conservation tillage, grass cover) on changes in C storage and GHG flux along transects
- Economic evaluation of selected farm management practices in relation to ecological goods and services benefits such as carbon sequestration
- Develop a carbon model specific to wetlands and riparian areas with links to economic and policy issues



Soil cores 1 meter in depth were collected using a coring truck.

Soil cores (left) show a consistent increase in soil organic carbon from position 1 in the upland (W1-1) to position 6 in the wetland (W1-6).

Cooperating Landowners:
There are two co-operating landowners in each of the five provinces: Grassy Lake, AB; Coronation, AB; Shaunavon, SK; Chaplin, SK; Minto, MB; Rivers, MB; Arthur, ON; Freelton, ON; Thomas Brook, NS; Truro, NS



This example shows a single site consisting of 3 transects in Shaunavon, Saskatchewan

Parameters Measured

GHG Sampling Equipment

Greenhouse Gas Emissions

Greenhouse gas emissions of CO_2, N_2O and CH_4 from the surface of soil and water are sampled four times per year with static vented chambers and floating chambers respectively.

Floating GHG Chambers

Coring Truck

Soil Organic Carbon

Soil organic carbon and nitrogen content to one metre depth will be sampled once at the outset of the project with a coring truck.

An Oakfield corer is used to obtain soil fertility samples (0-15 cm depth) twice per year (spring and fall). Additional samples are collected in the fall from a greater depth (15-30 cm).

Soil Fertility sampling with Oakfield Corer

Riparian vegetation biomass, crop yield and residue sampling is completed once annually.

Basic weather stations provide a continuous record of air temperature, soil temperature, soil moisture and precipitation at all sites.

Water chemistry sampling is conducted three times annually.

Research Team

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Eastern Node Leaders:
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Cooperators
Soil Conservation Council of Canada, Alberta Reduced Tillage Linkages, Saskatchewan Soil Conservation Association, Manitoba Zero Tillage Research Association, Ontario Soil and Crop Improvement Association, Soil and Crop Improvement Association of Nova Scotia

Project Participants

- Ducks Unlimited Canada's Institute for Wetland and Waterfowl Research
- Agriculture and Agri-Food Canada
- Natural Resources Canada
- Alberta Agriculture, Food and Rural Development
- Universities: Saskatchewan, Manitoba, McMaster, Western Ontario, Guelph, Nova Scotia Agricultural College

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada
Ducks Unlimited Canada — Canada's Conservation Company
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