Benefit/cost implications of wetland drainage on most productive sections of agricultural lands, Vermilion River Sub-basin 17, Alberta, Canada.

Eric Asare[1] and Kenneth Belcher[1], Dept. of Ag. & Resource Econs., University of Saskatchewan

1.0. Introduction

Wetlands structures and functions produce ecological services that have direct and indirect benefits to society. Some of the ecological services are flood control, carbon sequestration, tourism, human and livestock foods, and habitat to support diverse biotic communities (De Groot et al. 2012). Approximately 984 acres (5%) of wetlands have been lost in western Canada from 1985 to 2001 (Watmough and Schmoll 2007). Forty percent (40%) of the wetland area lost was cultivated (Watmough and Schmoll, 2007). The main contributing factors of wetland acreage conversion to cultivated acreage are the fertile lands of the Prairie Pothole region of North America, and technological progress, which has made it easier and cheaper to convert wetlands (De Laporte, 2014). Loss of wetlands is a considerable loss to society. Unfortunately, the loss of wetlands in agricultural landscapes is expected to continue into the future (Lawley, 2014). This study investigates the benefit/cost implications of wetland drainage on most productive sections of agricultural lands in the Vermilion Watershed, Alberta, Canada.

1.1. Research Question

- What is the cost/benefit implications of wetland drainage on cultivated lands at Sub-basin 17, Vermilion River Basin, Alberta, Canada?

1.1. Research Objective

- To estimate the cost/benefit of different wetland management scenarios (that is, drainage of wetlands in the top 10%, 25% and 50% of farmland values in sub-basin 17), and compare it with no drainage scenario.
- To compare social cost of drainage to net-private benefit of drainage.

2.0. Study Area

- Study area is Vermilion River Sub-basin 17, which is a hydrologic response unit in the Vermilion Watershed, Alberta, Canada.
- It covers an area of 316.1 sqkm.
- From its center it is about 100.48km from Edmonton, and 296.6km from Calgary.
- Major agricultural productions are calf/cow and grain (City of Minburn, 2019).

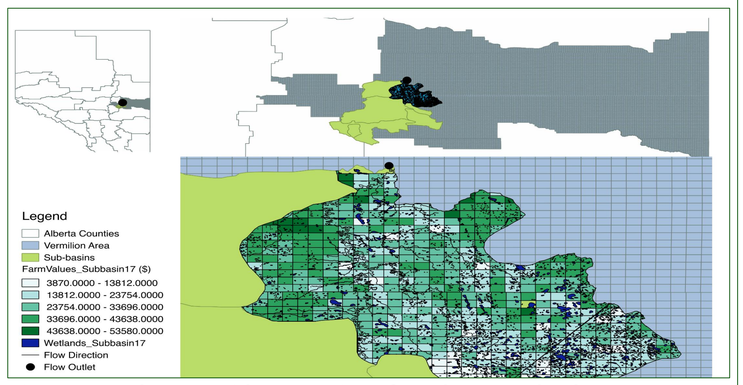

Figure 1. Study Area with a Mapping of Land Assessed Values

2.1. Methodology

- We plan to drain wetlands located in the top 10%, top 25%, and 50% of land sale values which are estimated from land assessed values.
- Reference scenario is no drainage .
- The benefit/cost implication of each scenario is estimated.
- The unit of analysis is quarter section (160 acres).
- Year of analysis is 2018/2019

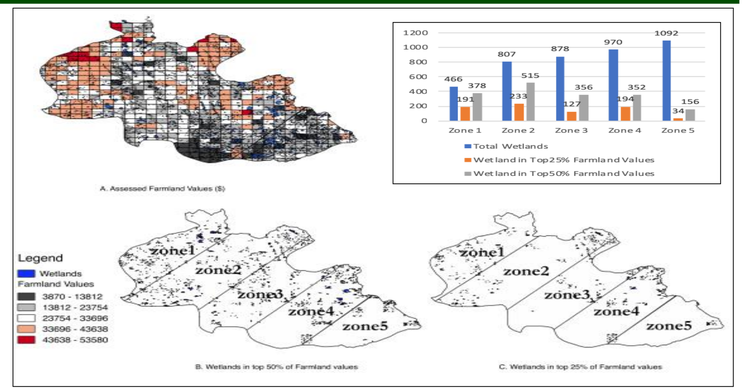

Figure 2. Wetlands in top 10%, 25% and 50% of land assessed values, and Wetland distribution

The Net-Benefit (NB) in Canadian dollars ($) per quarter section is given by:

$$NB = (Onsite\ Benefit - Drainage\ Cost) - (Offsite\ Cost + Value\ of\ Wetland\ Ecological\ Services)$$
$$= Net\ private\ benefit\ - Social\ cost$$

$$Onsite\ Benefit = \sum_i (SP + \text{EVAO})$$

Following Lawley (2014), sales price (SP) is given as equation1, below, and will be estimated with random forest:

$$SP = \text{f}\,(\text{LAV}, \text{DC}, \text{DGE}, \text{LAT}, \text{LOG}, \text{CIRF}, \text{WLA})$$
$$Drainage\ Cost = CDD + CDM + CDR + NC$$
$$VWES = \sum_j WES\ ; \quad \text{j: nutrient removal, pesticide removal, biodiversity}$$
$$Offsite\ Cost = \sum_i SP + CID$$

2.1. Methodology Continued

Where:
i is the ith quarter section
EVAO is expected value of agricultural output
LAV is land assessed values
DC is distance to city center, population >250,000
DGE is distance to grain elevator
LAT is latitude, LOG is longitude
CIRF is crop insurance risk factor, binary variable
CDD is cost of drainage ditches, $
CDM is cost of drainage maintenance, $
CDR is cost of drainage replacement, $
NC is nuisance cost, $
VWES is value of wetland ecological services
CID is cost of infrastructure damage

3.0. Expected Results

- Social cost will be greater than net-private benefit of drainage.
- Society would prefer the no drainage scenario.

4.0. Policy Implications

- Depending on the magnitudes of private benefits relative to social cost of wetland drainage, a policy tool (mechanism) would be proposed to conserve wetlands on agricultural lands.

5.0. References

City of Minburn. 2019. Agricultural Information. https://minburncounty.ab.ca/departments/agricultural-service-board/agricultural-information/. Accessed

De Groot, R., Brander, L., van der Ploeg, S., Costanza, R., Bernard, F., Braat, L., . . . van Beukeringh, P., 2012. Global estimates of the value of ecosystems and their services in monetary units. Ecosystem Services, 1(1), 50-61. doi:10.1016/j.ecoser.2012.07.005.

De Laporte, A., 2014.Effectsofcropprices, nuisance costs, and wetland regulation on Saskatchewan NAWMP implementation goals. *Can.J.Agric.Econ*.62(1), pp. 47–67.

Lawley, C. (2014). Changes in implicit prices of prairie pothole habitat. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, *62*(2), 171-190.

Watmough, M. D., & Schmoll, M. J. (2007). Environment Canada's Prairie and Northern Habitat Monitoring Program Phase II: recent habitat trends in the PHJV. Environment Canada. Canadian Wildlife Service, Edmonton, AB.