

# Wetlands and Lake Water Quality Management

*Tracy Scott,  
Ducks Unlimited Canada*



*Conserving  
Canada's  
Wetlands*

# Wetland Functions and Values



- Store carbon
- Water Quality - Filter water and remove excess nutrients
- Water Quantity - Store surface water and reduce flooding and drought
- Recharge groundwater
- Provide habitat for wildlife and support biodiversity
- Provide recreational opportunity for people

# Wetland Facts:

- **50% of the worlds wetlands have been lost in the last century (IUCN, 2007)**
- **6% decline in global wetland extent between 1993-2007 (Prigent et al., 2012)**
- **an estimated 25% of the worlds wetlands are found in Canada (NRCAN, 2007)**
- **a significant amount of the wetlands in developed areas of Canada have been lost (>90% in some regions)**



# WETLAND LOSS

**In Alberta** approximately 64% of wetlands have been lost in the settled area (white zone).

80-90% of wetlands adjacent to urban centers lost

Losses continue at about 0.5% annually.

Comparatively, 0.4% of the Amazon rainforest is lost annually.



# Why is wetland loss happening?

- Landowners strive to:  
*Increase production*  
*Increase efficiency*



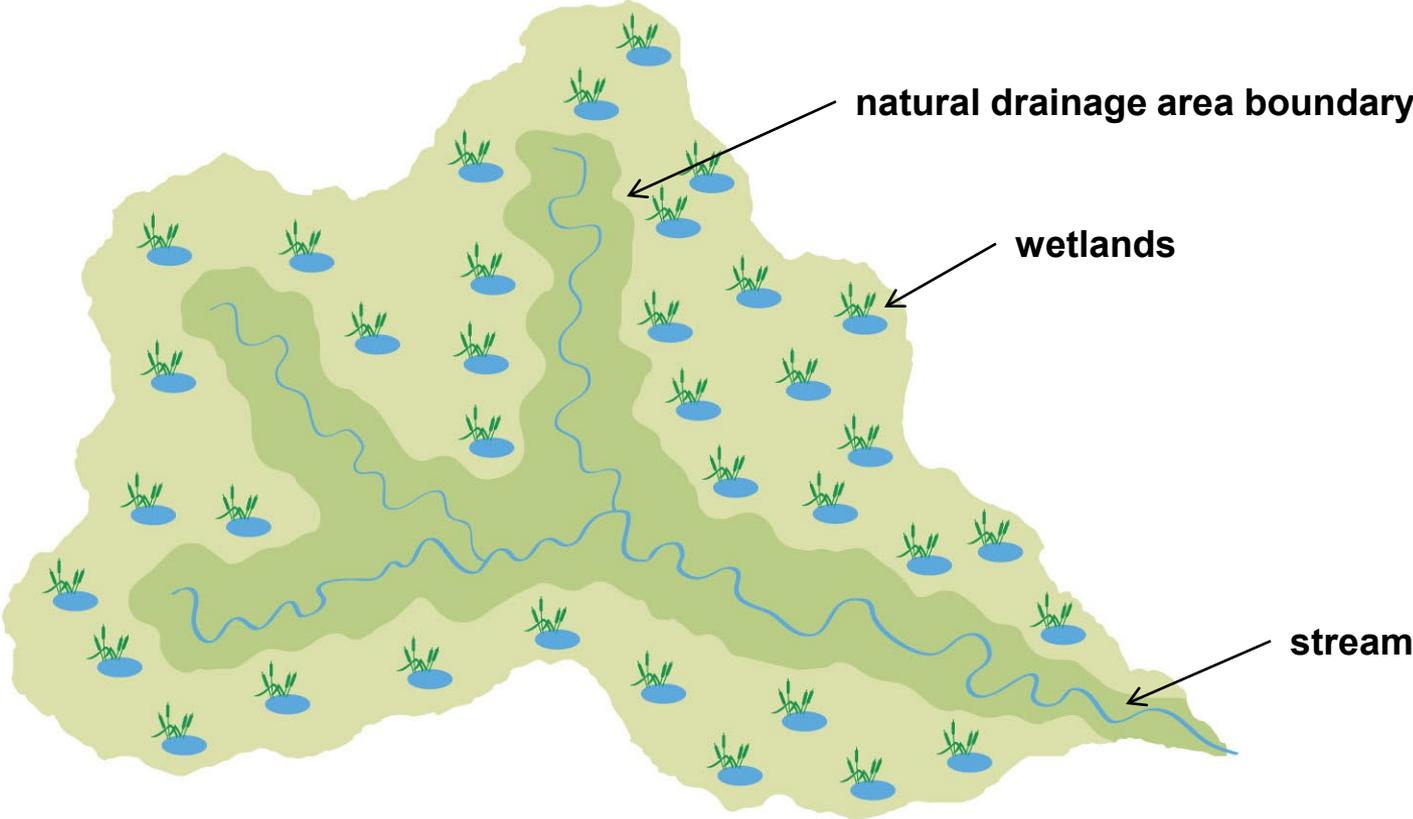
- Government and society undervalue wetlands
- Wetland policy and legislation is inadequate or not implemented
- Wetland restoration incentive programs cannot keep pace with rate of loss
- Little regionally specific quantitative evidence of benefits (EGS)



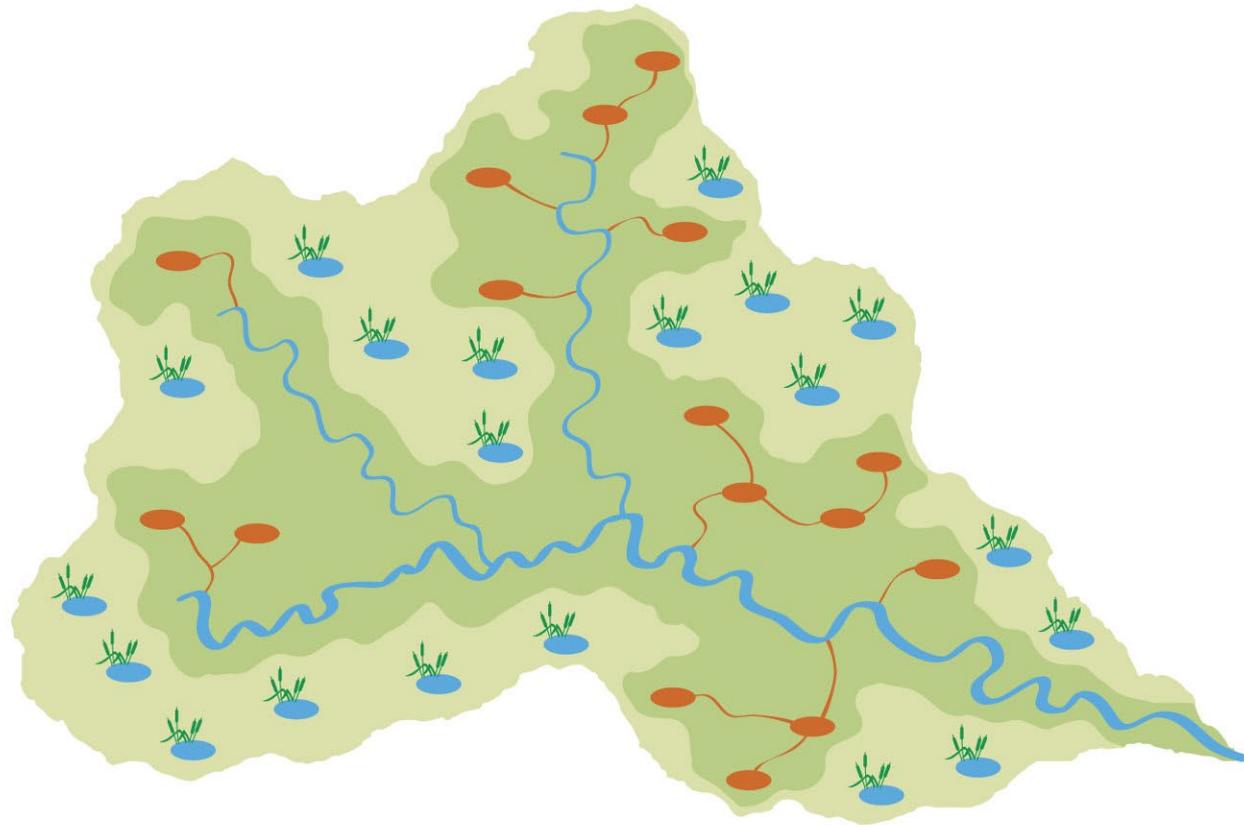
## **“Wetland Hydrologic Function 101”**

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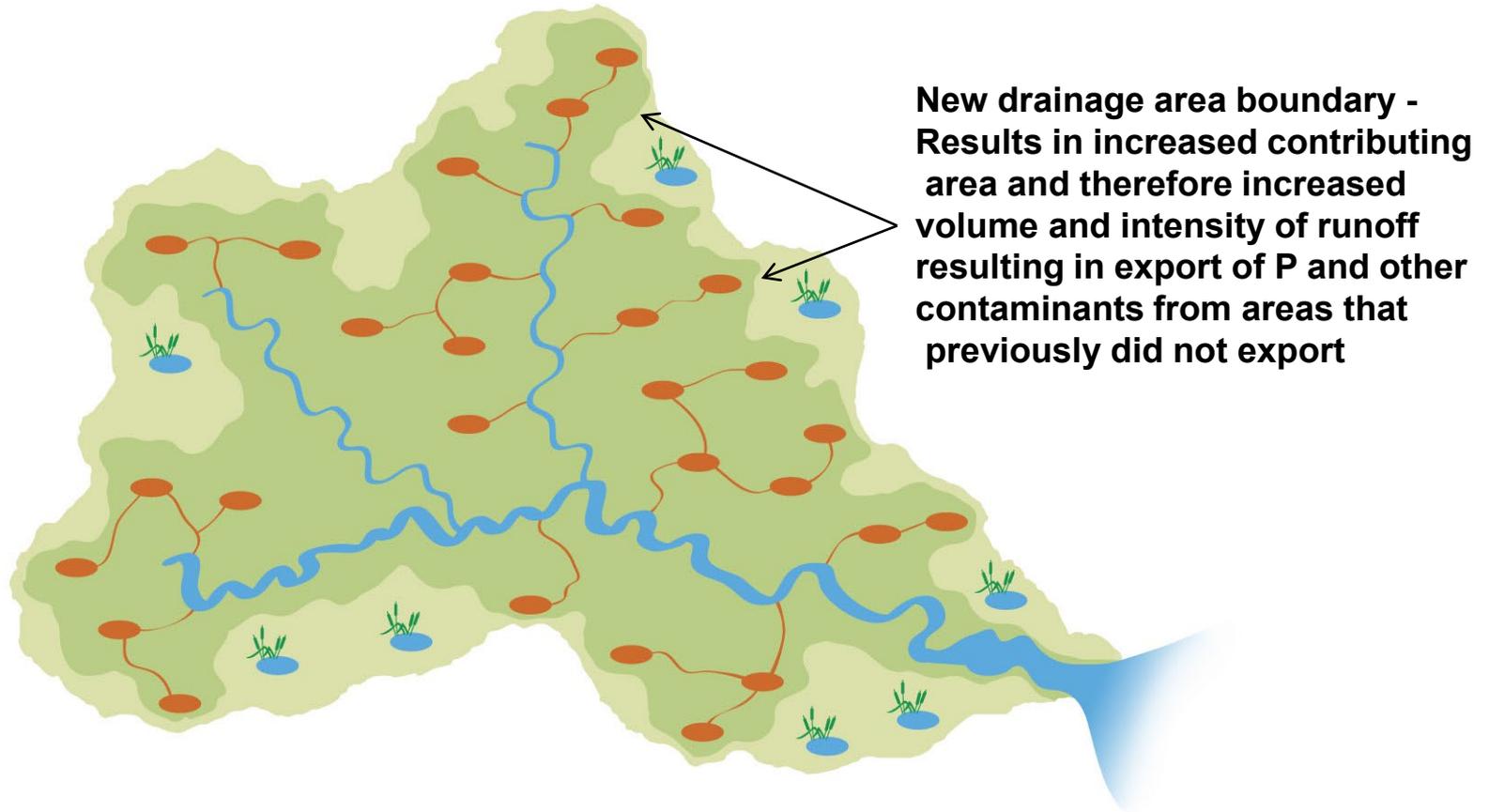
# Hydrologic Response To Draining Wetlands



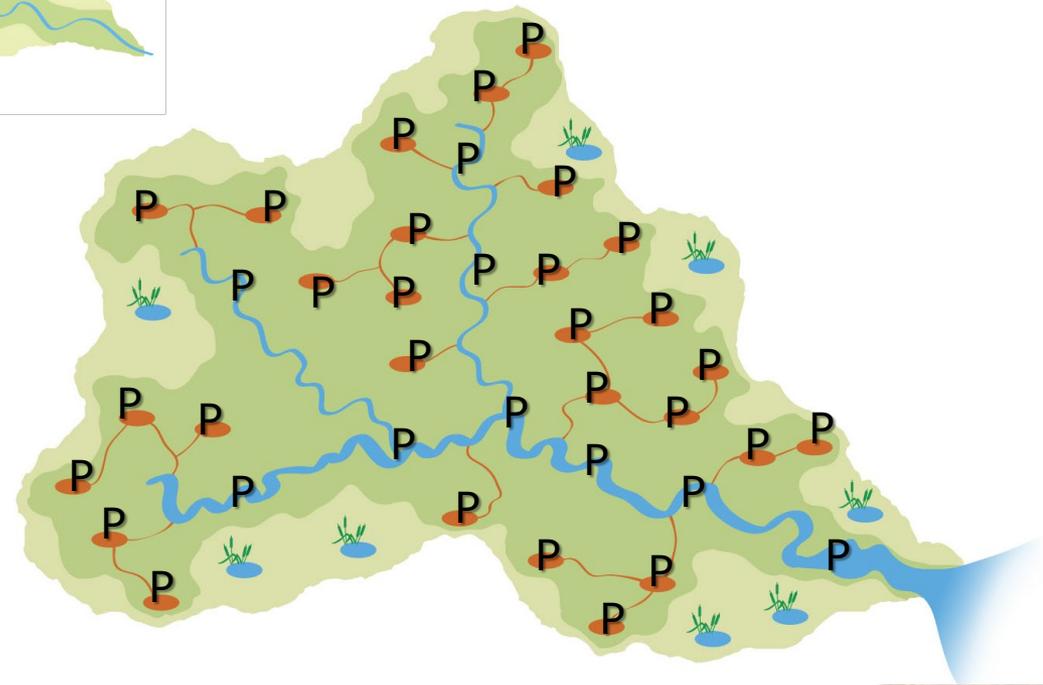
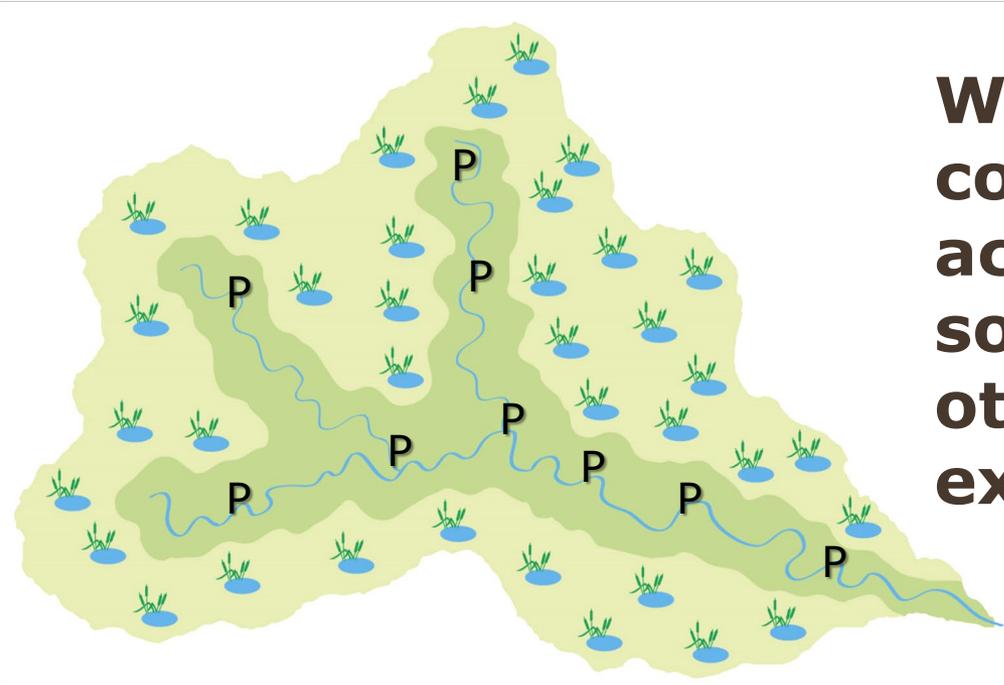
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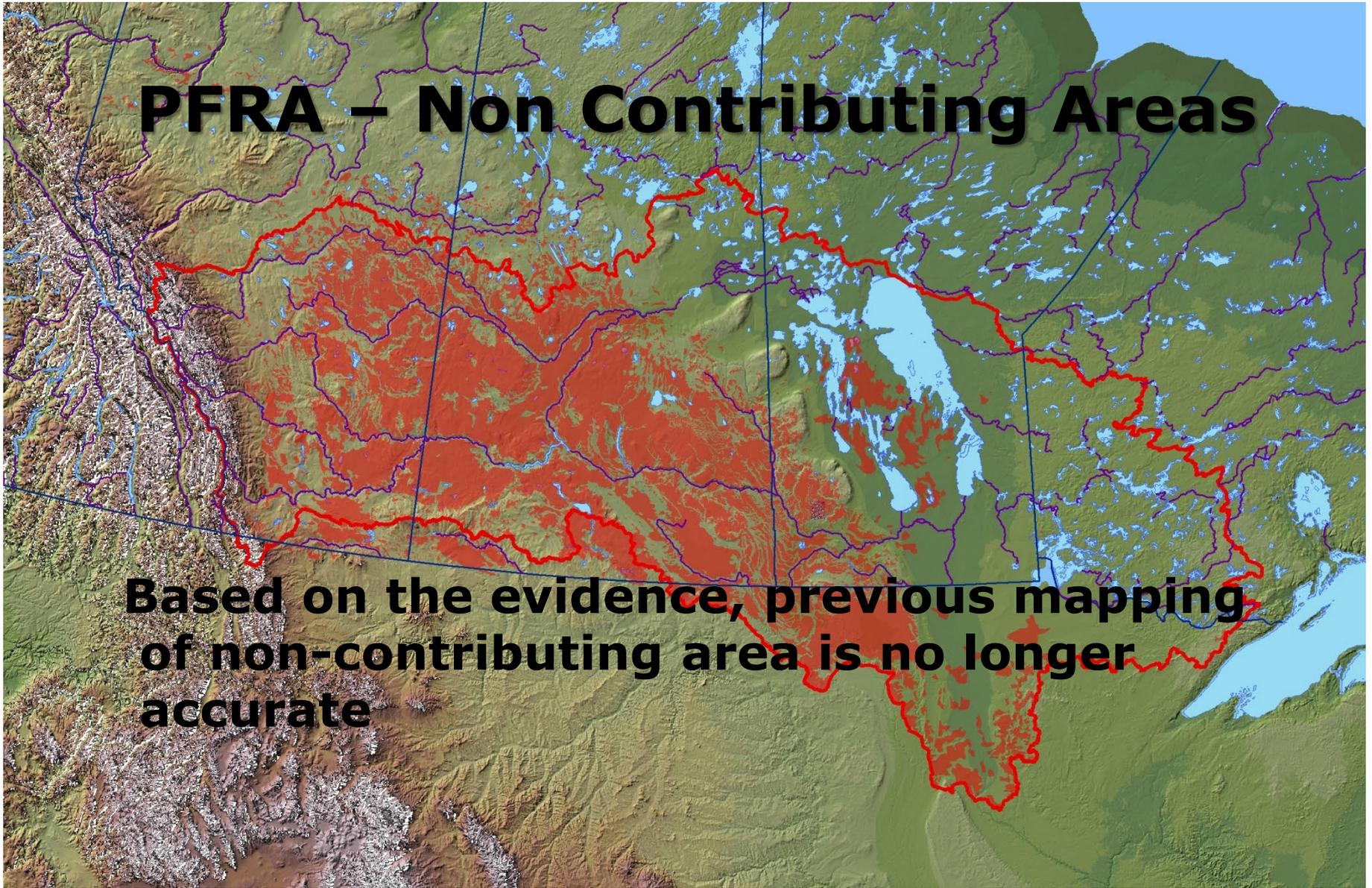


**Wetland drainage  
converts areas that were  
acting as P sinks to critical  
source areas for P (and  
other contaminants)  
export**



# **PFRA – Non Contributing Areas**

**Based on the evidence, previous mapping of non-contributing area is no longer accurate**



# Local and National Research Findings



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# ES of Wetlands Pilot AB

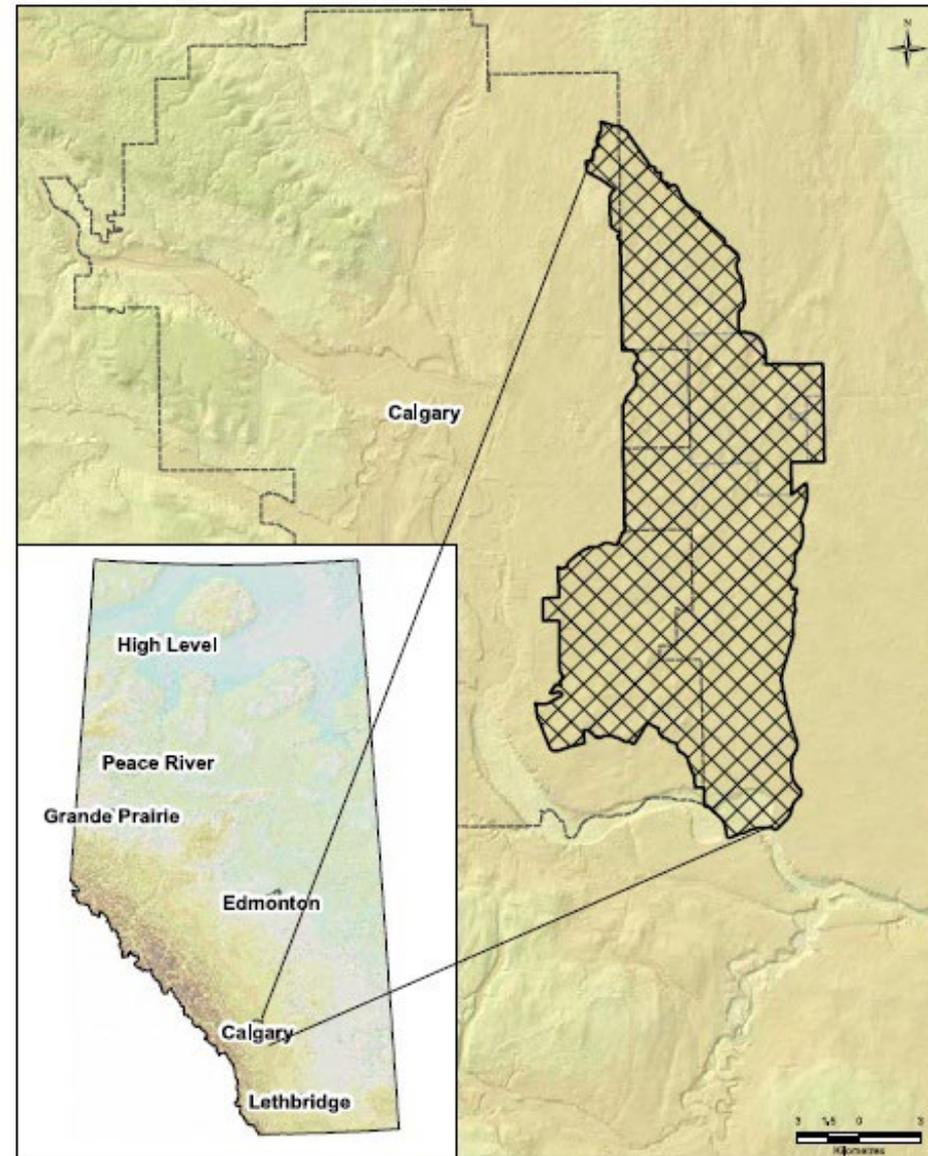


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# Study Area

## “Shepard Slough”



Government of Alberta

The information on this map is for informational purposes only. It is not intended to be used for any other purpose. The Government of Alberta is not responsible for any errors or omissions in this information. For more information, visit [www.alberta.ca](http://www.alberta.ca).

Legend

-  Shepard Slough Boundary
-  Calgary Boundary

ES WETLAND PILOT PROJECT  
STUDY AREA OVERVIEW

Version	Author	Date	Scale
01/2014	ESR	01/2014	1:50,000

ESR/2014/01/01

# **ES of Wetlands Pilot (2010)**

## **GOA Leads ES Research:**

**“Within Alberta, Cumulative Effects Management has become an environmental management priority through the *Alberta Land Stewardship Act* and the *business plan priorities of AENV and other departments.*”**



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# Desired Pilot Outcome:

**“The ES Approach developed for the Alberta context provides a framework to help identify and quantify – (qualitatively, quantitatively and monetarily) – the benefits provided by wetland ecosystems.”**



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Ecosystem Services

***“And integrate them into provincial  
governance, policy, programs and  
decision making”***

***Like the Bow PMP and the Land Use  
Framework for example***



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Ecosystem Services

# Priority Gaps Identified for Case Study

- 1. There is insufficient evidence to support avoidance, mitigation and compensation decisions on wetlands.**
- 2. There is insufficient consideration of cumulative effects and long-term consequences of decision making**
- 3. There is limited ability to communicate the 'values' of wetlands.**



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Ecosystem Services

# Priority Ecosystem Services Studied in Pilot:

**Water Storage/Supply**

**Flood Control**

**Water Purification/Quality**

**Carbon Storage**



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# Study Findings relative to Water Quality:

The majority (87%) of wetland complexes within Shepard Slough have a medium to high capacity to purify water.

(estimated using a water purification model.)



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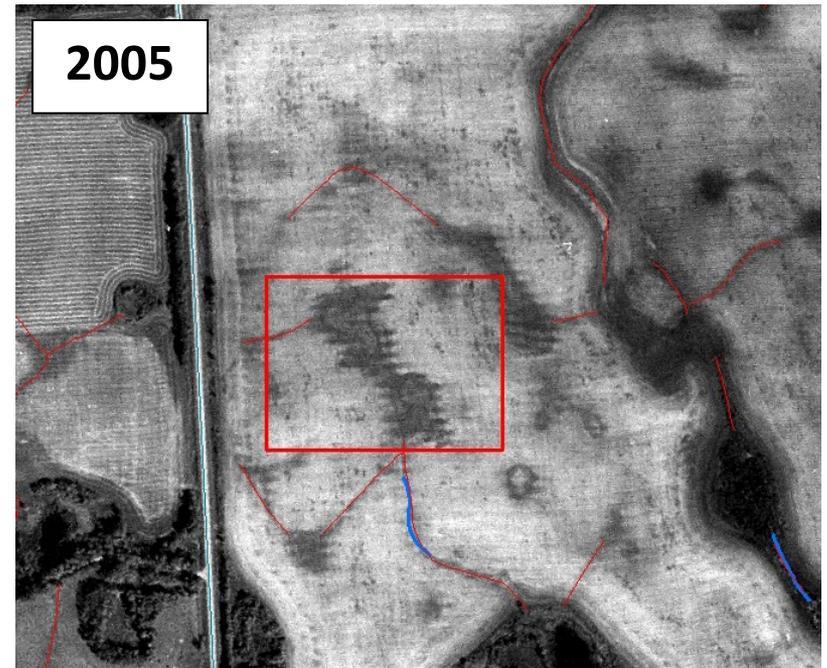
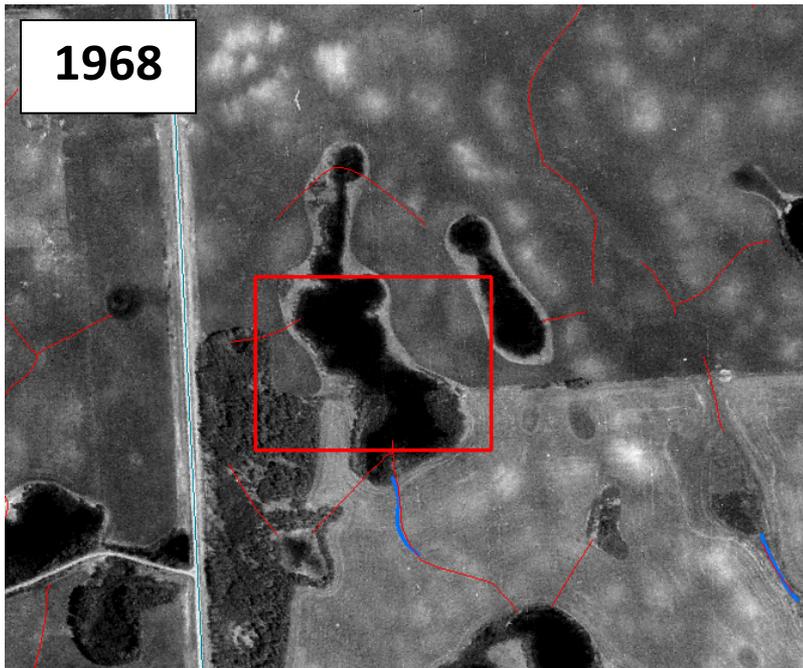
# What research has been done elsewhere in Canada?



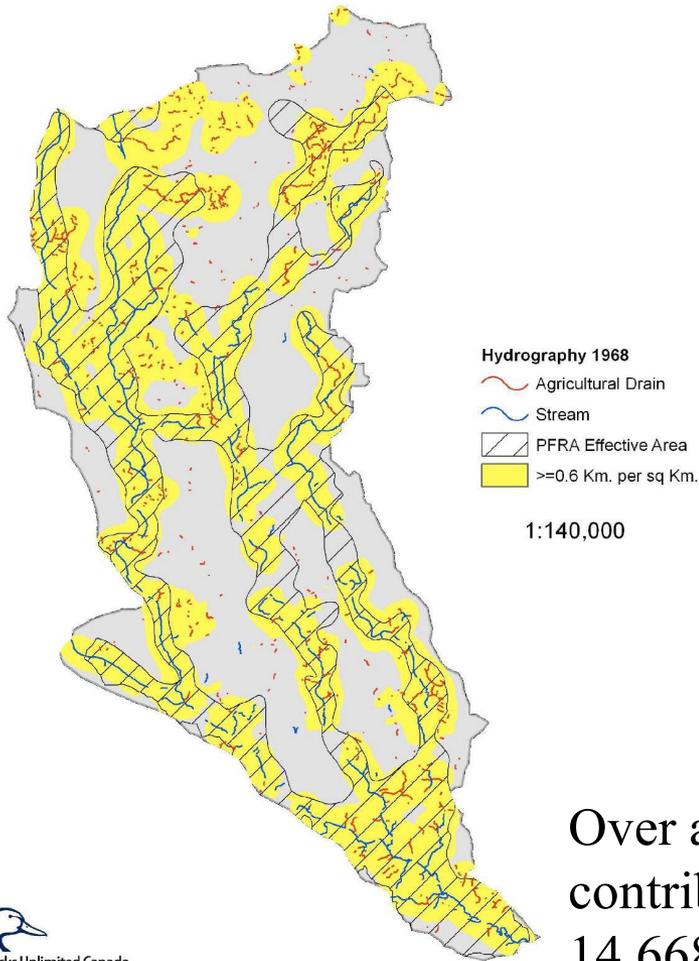
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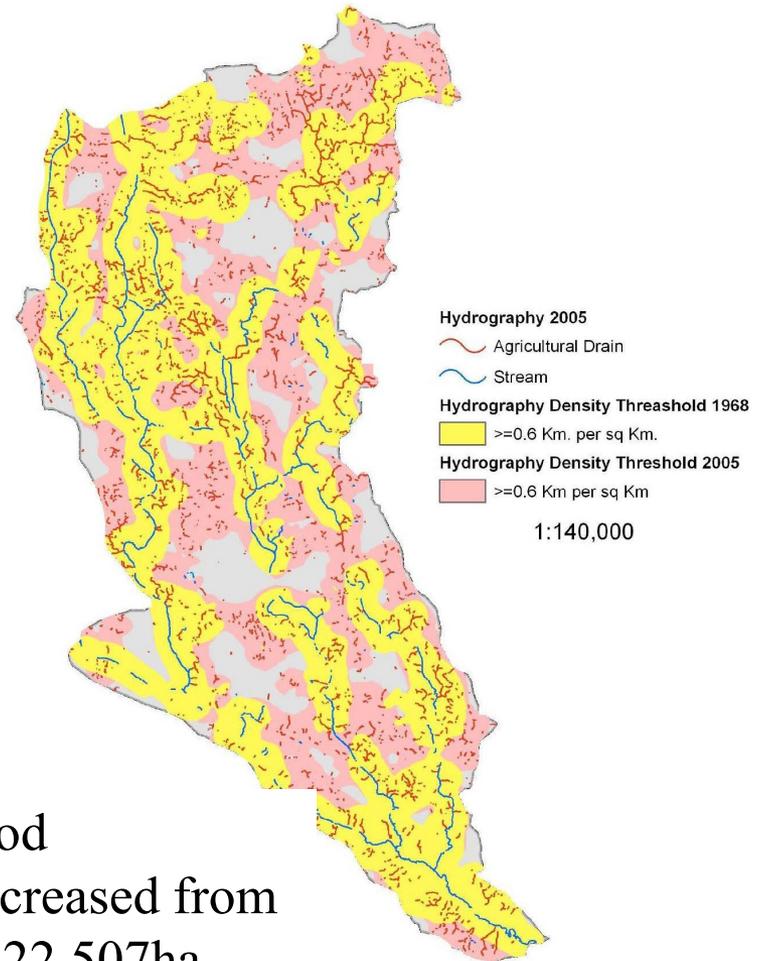
# Broughton's Creek Research: Impacts of wetland loss on water quality and quantity in a prairie watershed



### PFRA Effective Area Historic Hydrography Density Threshold



### Hydrography Density Threshold 1968 Vs. 2005



Over a 37 year period  
contributing area increased from  
14,668ha (1968) to 22,507ha  
(2005), **an increase of 53.4%**  
over the 1968 condition

# Impacts of 37 yrs of drainage in BCW: Phase II modeling results

- **62% increase in total stream flow**
- **37% increase in peak flow**
- **32% increase in phosphorus (P) load**
- **57% increase in nitrogen (N)**
- **85% increase in sediment export**

# Water Quality Findings from Drained Wetlands:

- Nutrient export measured from drained wetlands is much higher than those measured from cropland in MB
- P concentrations at the outlets of drained wetlands were always very high (5 to 30x guideline for hypereutrophic systems)
- Nearly all P present in dissolved form
- More bioavailable P in drained wetland soils relative to intact wetland soils



# Water Quality Findings from Retained Wetlands:

What does the research tell us?

- **that a lot of P comes off of cultivated fields where wetland drainage has occurred**
- **Intact wetlands in cultivated landscapes capture and store a lot of P that would otherwise be exported via runoff**



# Water Quality Findings from Retained Wetlands:

To be fair, there is a lot more P applied to cultivated fields than pasture or hay land – that’s what we need to do to grow crops – **this is not a judgment of the cropping sector.**

**This work merely demonstrates the great importance of retaining and restoring wetlands in cultivated landscapes for nutrient mgmt.**



# Conclusions



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# Conclusions

- **Wetland loss in the settled area of AB has been significant and is ongoing**
- **Wetland loss has had a major *cumulative* effect on water quality and quantity across the Canadian prairie/parkland region**



# Conclusions

- **NPS contamination has been determined to be the primary source of P loading in the Lake Winnipeg Watershed** (*Salvano, Flaten, Rousseau, and Quilbe – Journal of Environmental Quality 38: 2096-2015*)



# Conclusions

- **Wetland drainage increases the effective or contributing drainage area**, thus exporting excess nutrients from areas that were previously non-contributing – existing estimates of non-contributing areas are no longer accurate



# Conclusions

- **Wetland loss is a primary cause of NPS nutrient export by increasing the movement of water off of the landscape**
  - More drained wetlands = greater water yield.
  - Greater water yield = greater P export
  - Result? - wetland drainage increases P export at the watershed scale



# Conclusions

- **Retention and restoration of wetlands in rural landscapes are critical to reducing the export of dissolved P:**
  - Cons tillage is effective in reducing sedimentary P but can actually increase dissolved P (University of MB research – Tiessen et al., 2010)
  - If dissolved P export is increased under current tillage practices, retaining and restoring wetlands in cultivated land is even more important in stopping its export



# Conclusions

- **Retention of existing wetlands is critical to NPS management**
- **Some level of net restoration is also very important**



# Conclusions

- **Alberta Wetland Policy implementation MUST address BOTH halting further wetland loss AND achieving the 3:1 mid-point mitigation ratio targetted by the policy**
- **Wetland restoration must remain a priority of mitigation allocation – funds invested in other practices means less resources directed at policy priorities**



# Conclusions

## The Bottom Line:

**If wetland loss continues in AB, past, current, and future investments in expensive infrastructure such as water treatment facilities and additional flood mitigation will become increasingly less efficient**

**AND**



# Conclusions

**The Alberta Wetland Policy will fail to achieve its policy goal and objectives**



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## So what is DUC's role:

**We actively support AWP implementation and the work of municipalities, ABNAWMP, WPACS and other partners in their efforts to conserve and restore wetlands**



## So what is DUC's role:

**DUC restores an average of 900 wetland ac (364 ha) per year through voluntary paid agreements with private landowners.**

### **This work**

- **puts ES dollars in landowner's pockets (diversifying their income),**
- **supports the sustainability of the agriculture sector (Social Licence)**
- **Supports watershed health and function**
- **and HELPS TO REDUCE NPS CONTAMINATION.**



# Thank You!

# Questions?

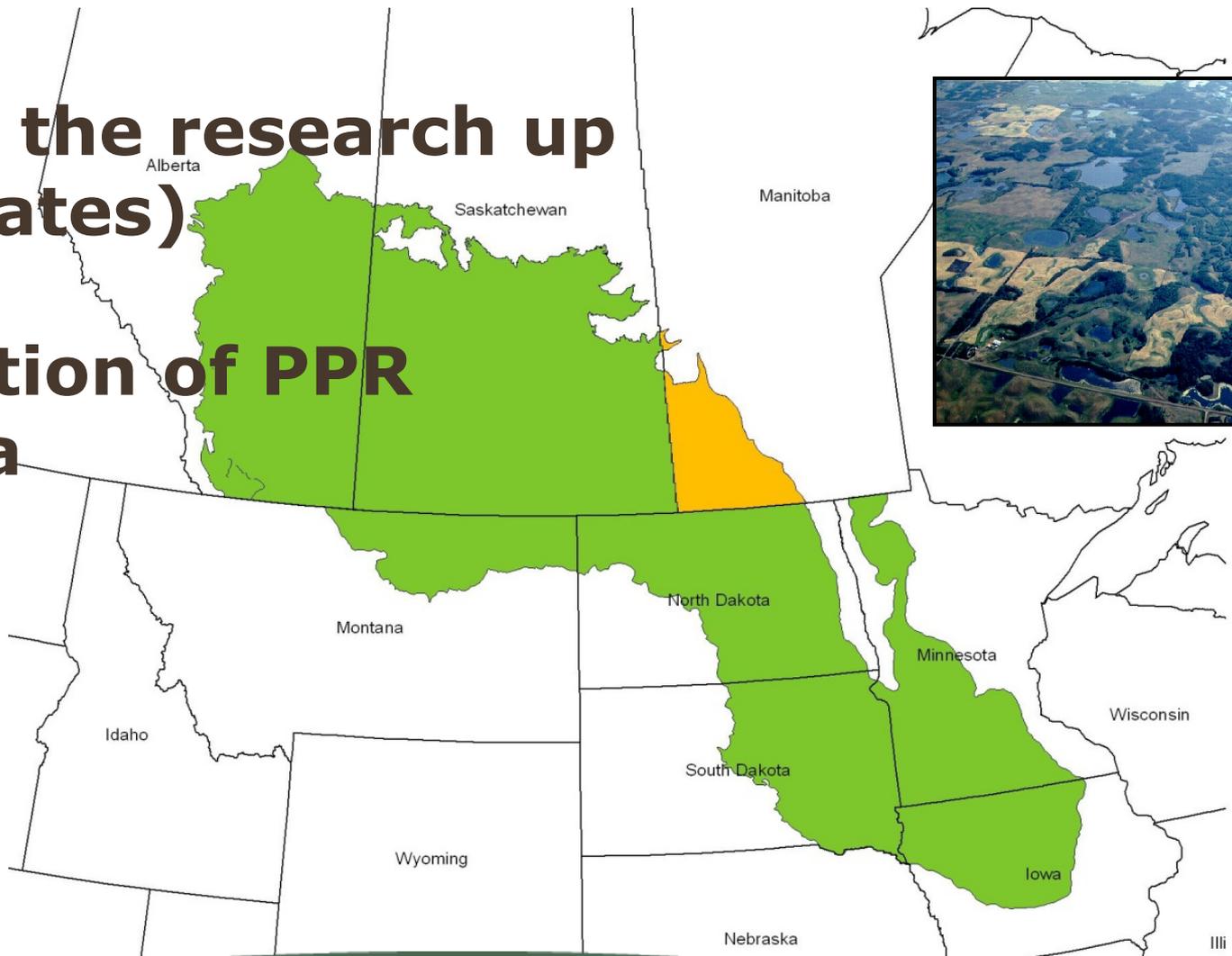


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# Scaling the research up (estimates)

**MB Portion of PPR**  
**3.7M ha**



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**75 YEARS OF  
CONSERVATION  
EXCELLENCE**

# Significance of scaling exercise

- Based on conservative estimates of drainage based on routed basins in Broughton's Creek
- Assuming similar P export across PPR in southwestern MB
- An additional 1,800 tonnes of P reaching surface waters in the Lake Winnipeg watershed



# Conclusions

And if we prove to the world that we're serious about wetland conservation and restoration we can also tell a very good news story about what we're doing for biodiversity, flood management, drought management, management of pesticide export and a whole bunch of other good things while we're at it!

**Social License!**



# Conclusions

What's our opportunity to turn this apparent threat to agriculture into a win?

By showing the world what we're doing to reduce P export off of ag. lands by undertaking the most effective BMPs we can –

**Wetland conservation and restoration are two of the most effective BMPs we have at our disposal to do that.**



What does the Ag industry have to say about corporate responsibility regarding wetlands?



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*"As a manufacturer and distributor of agricultural nutrients, Agrium takes its social responsibility for nutrient stewardship very seriously. Agrium understands that wetlands are the kidneys of the environment managing surface water runoff, filtering nutrients and improving overall water quality. It is vital that we protect wetlands because they are an essential component of both rural and urban best management practices. That's why we support wetland conservation and restoration through our partnership with Ducks Unlimited Canada."*

– Doug Beever  
Senior Director Sustainability  
and Stakeholder Relations, **Agrium**