Contract: EDF-CA-2021i023

Duration: 6 years, (April 1st, 2022 – March 31st, 2027)

Title: **Wetlands as nature-based solutions:**
Quantifying carbon-capture potential
while building a stronger
green economy.

Status: Year 3

Date: October 29, 2024

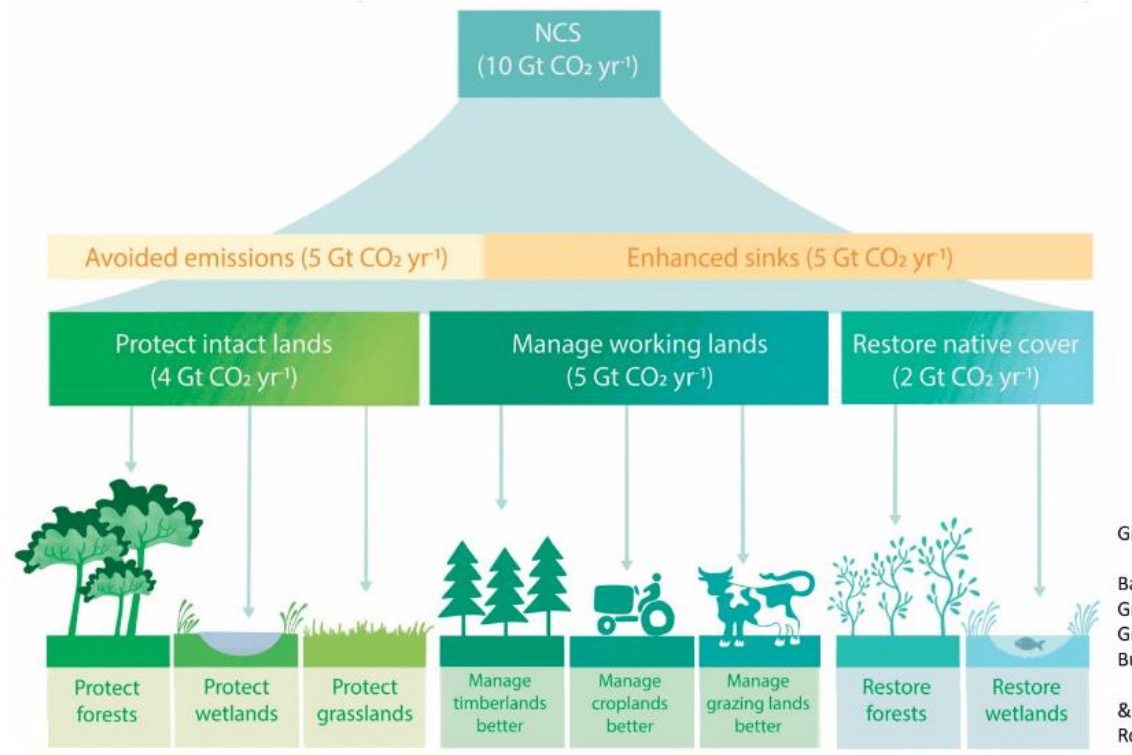
Pascal Badiou
Ducks Unlimited Canada
p_badiou@ducks.ca

Irena Creed
University of Toronto
irena.creed@utoronto.ca

1 Wetlands as natural climate solutions: Quantifying carbon-capture potential while building a stronger green economy.

Thesis:

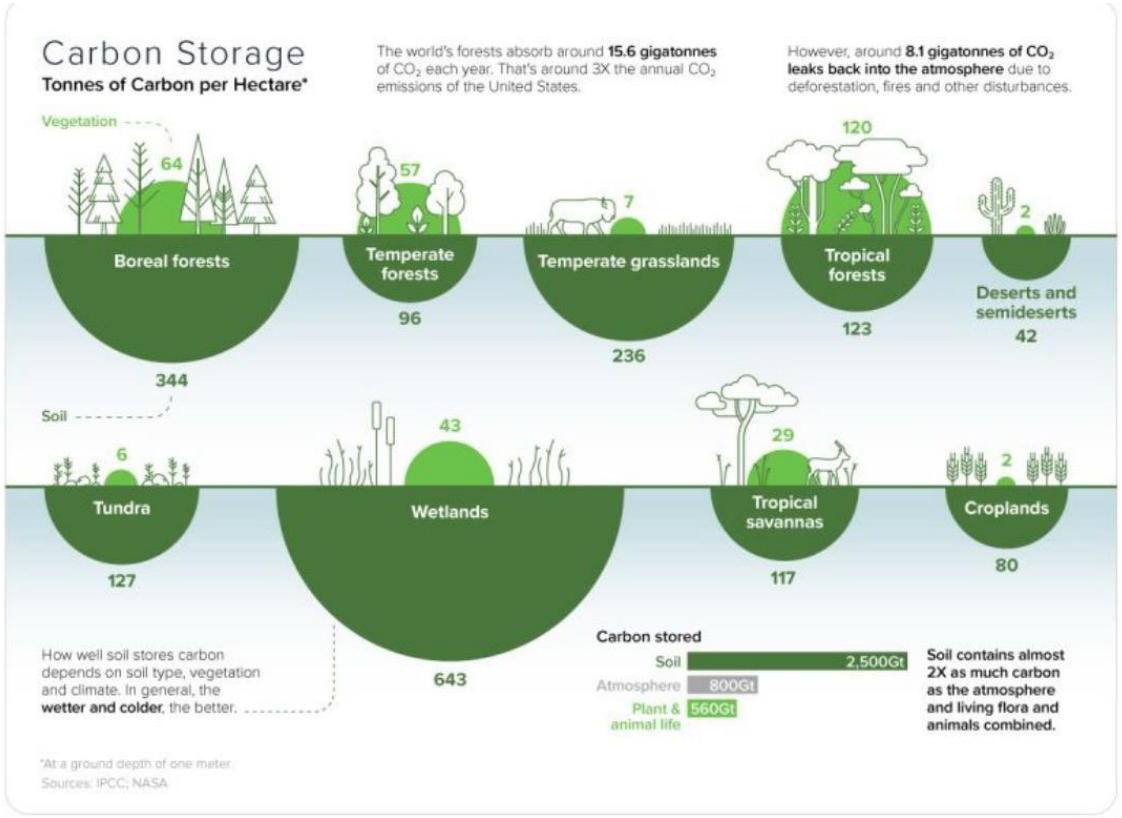
Protected and restored inland wetlands on agricultural landscapes are major natural climate solutions for Canada.



Girardin et al., in review

Based on estimates from
Griscom et al., 2017
Griscom et al., 2020
Busch et al., 2019

& consistent with
Roe et al., 2019



1 goal and 5 objectives

Goal:

To reduce uncertainty in carbon storage and reduction in GHG flux estimates in protected and restored inland wetlands on Canada's agricultural landscapes

1. Develop authoritative estimates of landscape-scale density of wetland coverage for agricultural landscapes.
2. Develop authoritative estimates for rates of organic carbon accumulation, GHG fluxes to the atmosphere.
3. Develop robust estimates of process controls on organic carbon accumulation and greenhouse gas fluxes.
4. Develop robust estimates of wetlands as nature-based solutions for carbon storage vs. other benefits.
5. Policy and practice tools to incentivize the use of wetlands as nature-based solutions for multiple benefits in agricultural landscapes.

5 policy/practice tools

a. **CREATE** a repository to compile databases, protocols, information, guidelines, will be displayed in a public and openly accessible repository. This repository will include standardized estimates of wetland inventories and wetland carbon fluxes at the scale of individual wetlands, wetlandscapes, and watersheds. We also examined the importance of using different GWP metrics.

b. **DEFINE** managed wetlands and work to get them included into the National GHG Inventory.

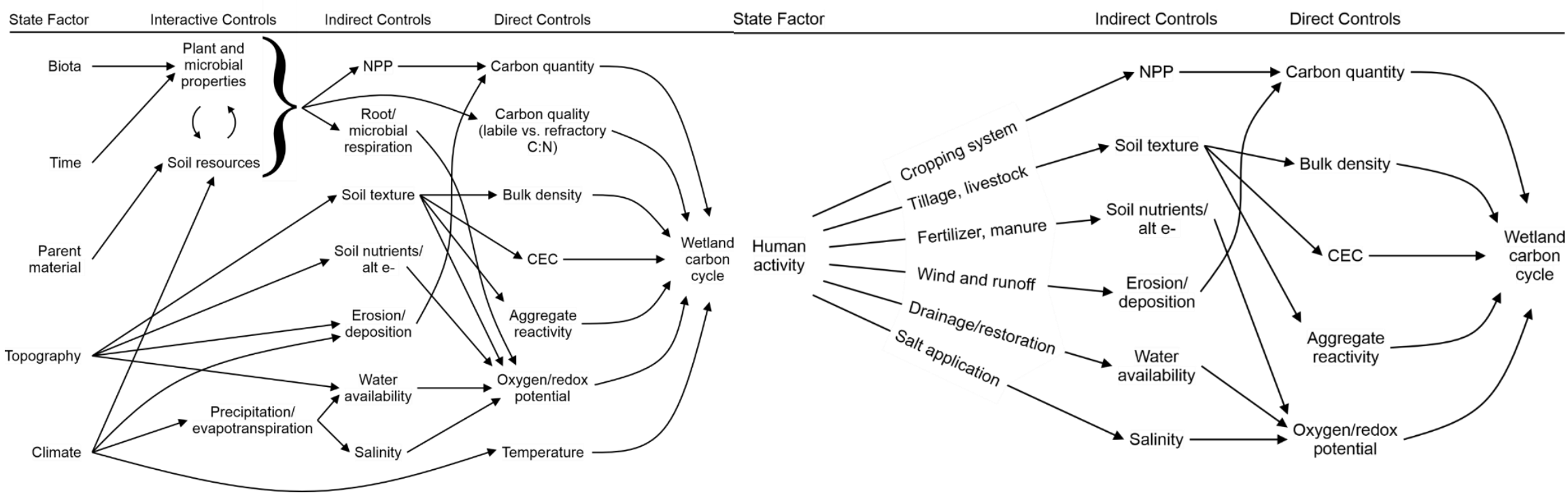
c. **IDENTIFY** agricultural impacts on wetland carbon storage and GHG emissions to enable farmers to make land management decisions that are consistent and quantifiable at the national scale.

d. **IDENTIFY** socioeconomic factors that influence wetland conversion and restoration.

e. **INFORM** Canada's proposed National Index On Agri-food Sustainability

2 Data and Evidence based insights

We **synthesized evidence** to create conceptual models of controls on carbon storage and fluxes in intact wetlands.

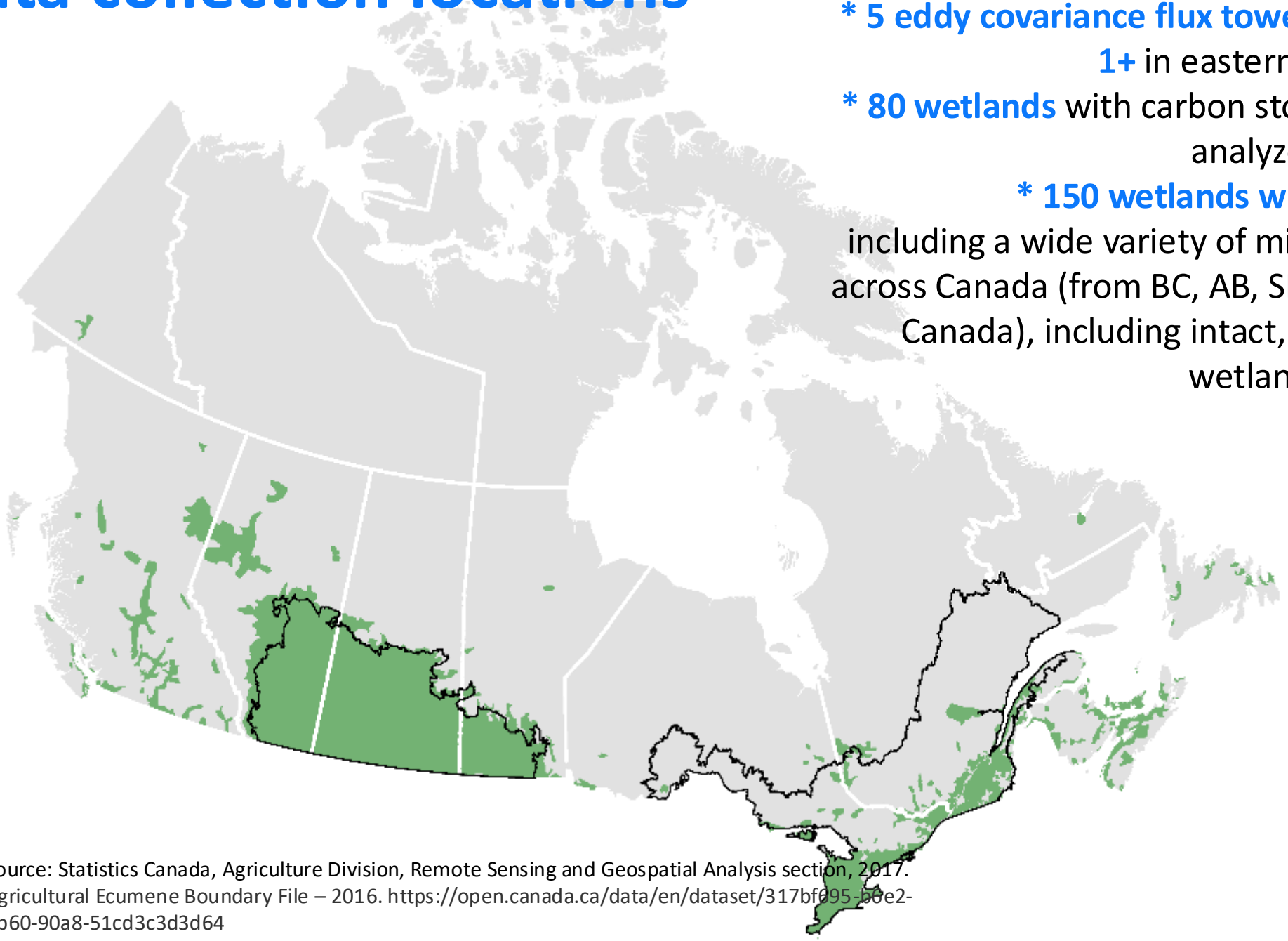


We **collected** data and **analyzed** these data using statistical and numerical modelling approaches to test these conceptual models.

Data collection locations

* **5 eddy covariance flux towers** in western Canada and **1+** in eastern Canada,
* **80 wetlands** with carbon storage (via sediment cores) analyzed,
* **150 wetlands with GHG fluxes**

including a wide variety of mineral wetlands sites from across Canada (from BC, AB, SK, MB, ON, QE and Atlantic Canada), including intact, drained, and restored wetlands,



Source: Statistics Canada, Agriculture Division, Remote Sensing and Geospatial Analysis section, 2017. Agricultural Ecumene Boundary File – 2016. https://open.canada.ca/data/en/dataset/317bf095-b0e2-4b60-90a8-51cd3c3d3d64

3 Challenges encountered to date and innovations

DATA COLLECTION (obj 2):
Locating flux towers is challenging (Permissions, accessibility, seasons, etc.). But we are on track to complete the flux tower network, and collaboration with new researchers may enable us to extend the flux tower network coverage (e.g., into Quebec).

DATA REPOSITORY (obj 5.1):
Developing a data repository has been challenging (responsibilities, accountabilities, sustainability). But we have a new flexible and agile solution that meets the needs of the research program.

FUNDING CHANGES (obj 5.4):
Finding funds to fulfill the interests of a ECCC partner (NSCSF) was needed to complete Obj 5.4. We applied for and received two "extension grants" to cover additional research that was a priority of the federal government.

PARTNER COMMITMENTS (obj 5.5):
Continuing conversations to receive funding from a University partner (USask, GIFS) was needed – including the development of an MOU that had to go through legal at both universities – to receive funds committed. We now have a fully executed MOU and the funds are coming.

4 Collaboration and stakeholder engagement

2 Annual General Meetings

2 International Workshop

USA – Washington DC workshops (July 16-17, 2024):
Workshop on Building a roadmap to integrating inland wetlands into the U.S. National Greenhouse Gas Inventory

USA – Washington DC workshop (Jan 14-15, 2025):
Workshop on Developing Remote Sensing-Based Approaches to Quantify Wetland Functions

SWEDEN – Wallenberg professorship and 2 Swedish EPA funded research projects

2 International Collaborations

Eklöf K and collaborators (including Creed IF). 2023-2025. Rewetting of drained forest wetlands: strategies for implementation and adaptation to future climate. Sustainable climate transition and adaptation. Swedish Environmental Protection Agency.

Eklöf, K and collaborators (including Creed IF). 2024. Long-term evaluation of wetland restoration - effects on hydrology, biodiversity, water quality, and green-house gas balance. Swedish Environmental Protection Agency.

100s meetings with ECCC, AAFC and others

4 Collaboration and stakeholder engagement

1 PROPOSED NEW RESEARCH DIRECTION.

Collaboration that brings together multiple knowledge systems and benefits all Canadians

- ECCC CAAF focuses on avoiding conversion.
- We need to expand our focus on innovative science and technology to maximize carbon sequestration and minimize greenhouse (GHG) emissions from restored wetlands.
- We are building a new collaboration with Indigenous leaders to create an evidence base from diverse sources on the potential of restored wetlands to sequester carbon while minimizing GHG emissions and advancing co-benefits. We plan to use this evidence base to design and test innovations using wetlands as natural climate solutions.
- We plan to scale up-and-out science and technology these innovations for restoring wetlands, especially on private lands which account for the bulk of wetland loss in agricultural landscapes.

Irena Creed
University of Toronto Scarborough

Pascal Badiou
Ducks Unlimited Canada

Ali Ameli
University of British Columbia

George Arhonditsis
University of Toronto Scarborough

Matthew Bogard
University of Lethbridge

Gail Chmura
McGill University

Larry Flanagan
University of Lethbridge

Sara Knox
McGill University

David Lobb
University of Manitoba

Christian von Sperber
McGill University

Jay Famiglietti
GIWS, University of Saskatchewan

Steven Webb
GIFS, University of Saskatchewan

Lauren Bortolotti
Ducks Unlimited Canada

James Paterson
Ducks Unlimited Canada

Kevin Bishop
Swedish University of Agricultural Sciences

Sheel Bansal
United States Geological Survey

Tim Moore
McGill University

Patrick Lloyd-Smith
University of Saskatchewan

John Pattison - Williams
University of Alberta

Roy Brouwer
University of Waterloo

Jie He
University of Sherbrooke

Lota Tamini
University of Laval

Genevieve Ali
McGill University

Ben de Vries
University of Guelph

5 Project Scalability

What is the potential for scaling/sustaining the project long-term?

- HIGH RISK. Substantial investment of federal funds into building a world-class wetland monitoring and research network that will end in three years.

What resources will be required?

- To continue the early success and momentum that is growing, we need to plan for new resources to continue the project. An early estimate is a minimum funding of $500,000-1 million/year to sustain the research network activities; these resources will be used to continue monitoring, continue building the data base, protocols, models, and sharing with end users.

What other repositories can be leveraged?

- We are working with USA and Europe to build an international network where we can leverage data repositories from other countries to benefit Canada.

6 Any other project updates or findings to share

Metric	Goal (FY2)	Actual (FY2)	Notes
Number of PIs	**14**	**21**	
Number of HQP	**20**	**61**	
Number of communication activities	**20**	**47+**	17+ publications, 30+ presentations, 190+ meetings
Number of tools and datasets created	**3**	**3 (+1 extra)**	Method for mapping wetlands, Static wetland maps for PPR Region, Dynamic wetland map of hydrologic connectivity, Wetlands conversion rates estimates Protocol to classify wetland as managed/unmanaged
# downloads	**0**	**0**	Starts Y3.

7 Concluding remarks

Canada's investments in natural climate solutions have been **transformative**.

These contributions have not only enhanced our national capabilities but also elevated our research to the international stage.

As we reach the midpoint of the project, we remain energized and committed to continuing this vital work.

However, to sustain and build upon our momentum, we will require additional funding opportunities in the near future.