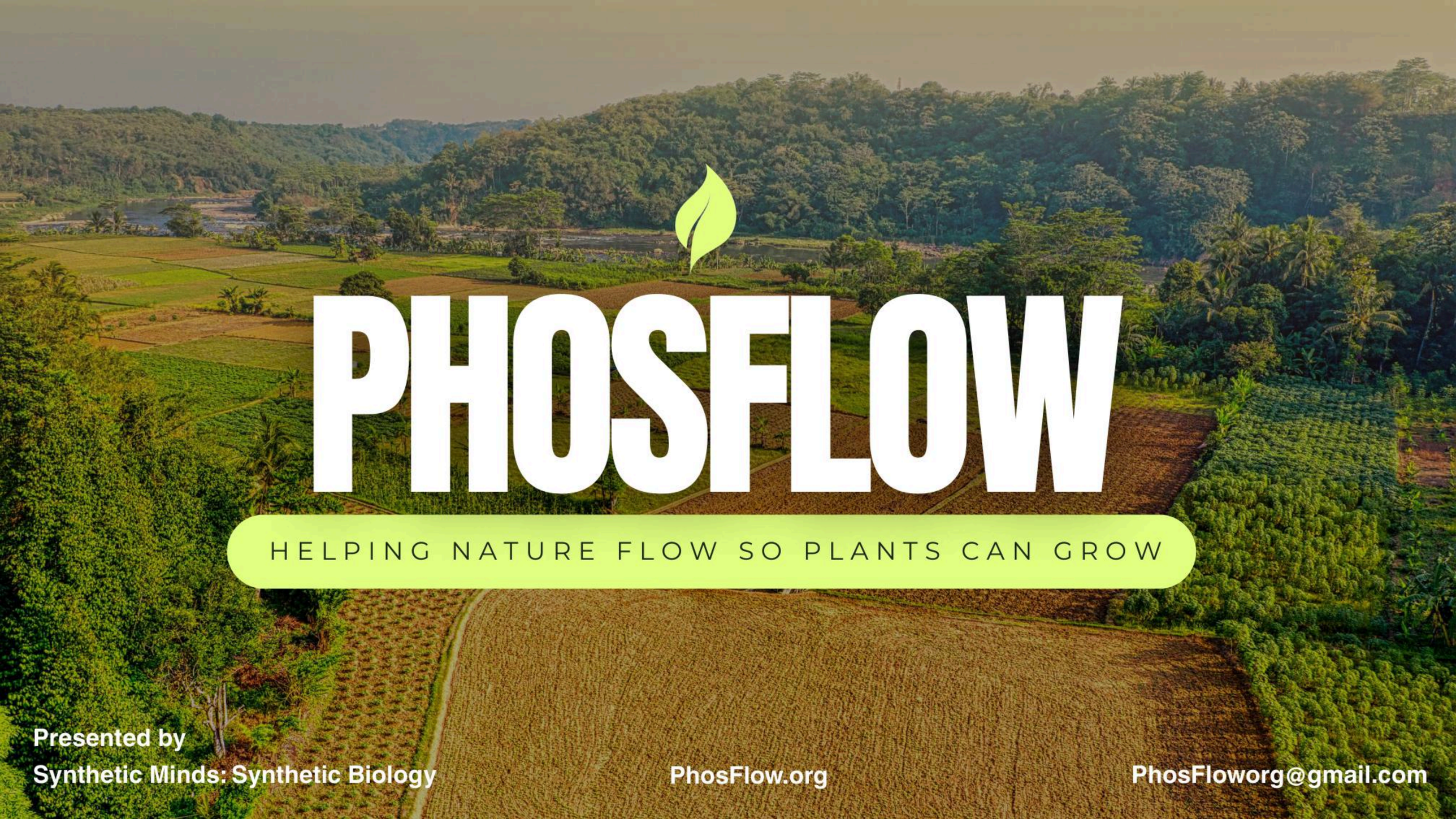
PHOSFLOW
HELPING NATURE FLOW SO PLANTS CAN GROW
Presented by
Synthetic Minds: Synthetic Biology
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OUR TEAM MEMBERS



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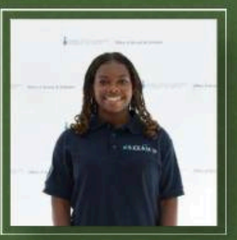

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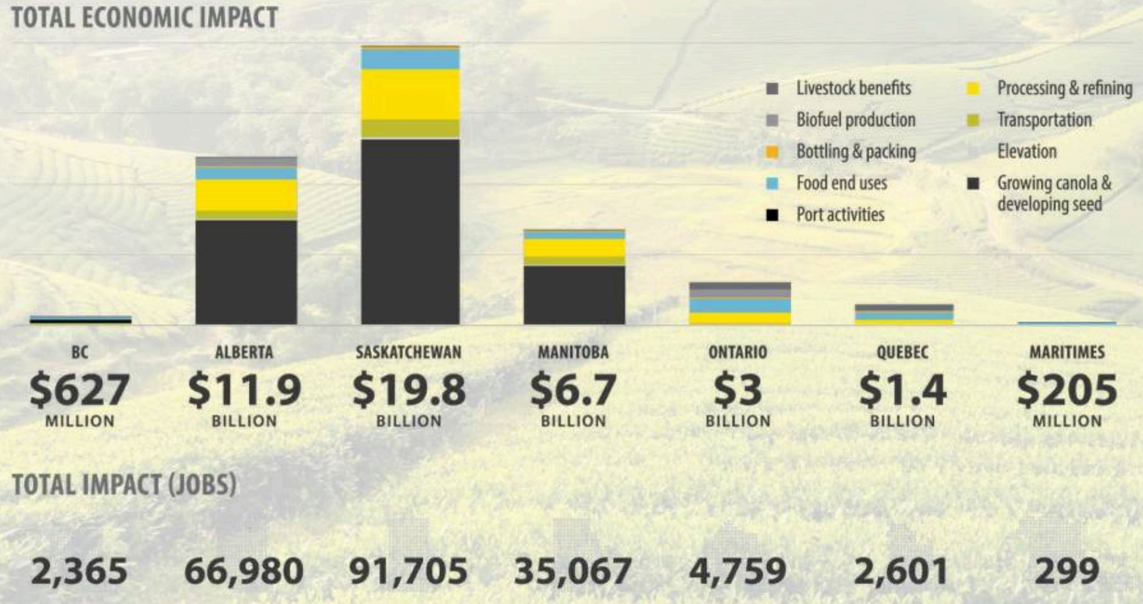
Table of Contents

1. Introduction
2. The Problem
3. Our Solution: PhosFlow
4. Bioengineering & Development
5. Field Reality
6. Regulations & Budget
7. Conclusion

PHOSFLOW

Introduction

The Canadian Canola Industry



$43.7B

Annually

The Canola industry generates $43.7 Billion for the Canadian economy every year, with **$38 Billion** coming from the Praires alone.

99%

21.4 Million Acres

The Prairies grow 99% of the country's Canola, spanning over 21.4 Million Acres.

194 000

Jobs

Provides employment to 194 000 people living in the Prairie provinces.

The Problem





The Soil & Fertilizers

- Canola needs **Phosphorus** for early establishment and winter hardiness
- **80%** of Prairie soils bind phosphorus into insoluble, unabsorbable forms (high in calcium)
- Farmers spend **>$1 Billion annually** on phosphate fertilizers to compensate

Environmental & Health Impacts

Fertilizer Runoff

- Harsh Prairie winters increase runoff and phosphorus mobilization during rainfall and snowmelt
- Dissolved Phosphorus enters freshwater
- Contributes to eutrophication (the over encrichment of phosphorus in freshwater), toxic algae blooms & loss of aquatic life



Health Risks

- Nearby residents & **194 000** canola agricultural workers constantly exposed
- Severe burns & pulmonary inflammation
- Can cause multi-organ toxicity if systematically absorbed
- Inequality between those exposed and general population



Introducing:

PhosFlow



Synthetic Minds

PhosFlow

Products in the Market

Existing Bio-Inoculants

- **Jumpstart:** Uses live fungus to enhance phosphorus uptake.
- **XiteBio® Tuber+:** Uses live bacteria to boost solubilization



Key Drawbacks

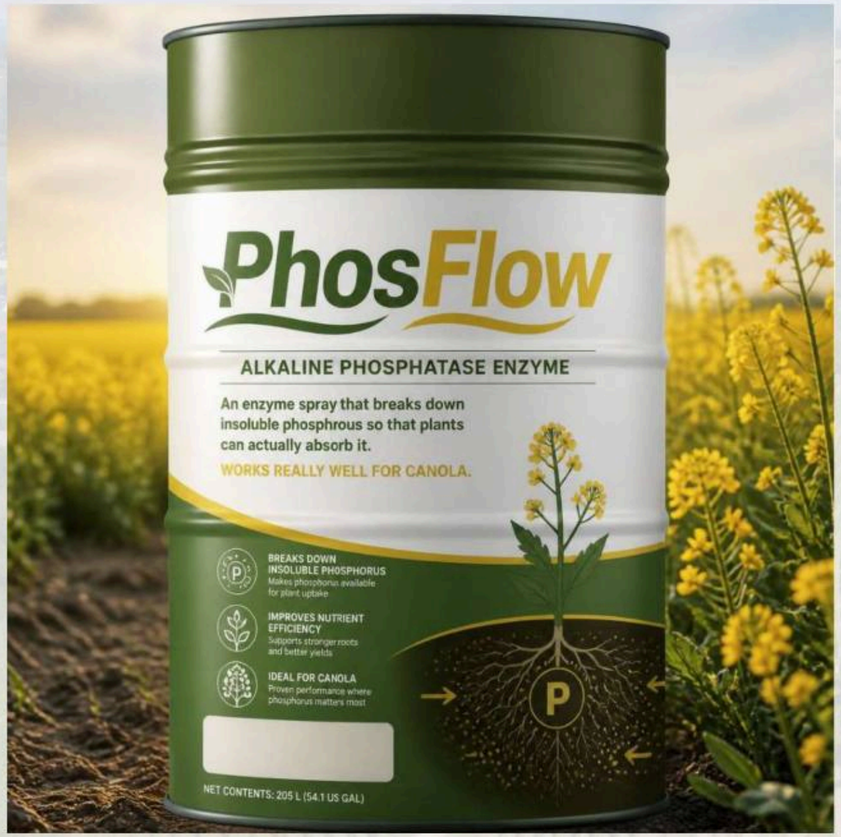
- Not Standalone Replacements
- Cost-Additive
- Live microbes struggle to survive extreme Prairie winters and scorching summer heat, limiting their real-world effectiveness.



Our Product

PhosFlow and How it Works

- An Alkaline Phosphatase based spray used to help promote growth
- Utilizes the enzyme phosphatase to make phosporus useable for plants
- Meant to help reduce fertilizer use on canola



Industrial Size



Individual Size



Why is PhosFlow Important?

- Improves plant growth and function
- More resilient in extreme prairie weather
- Cost effective
- Reduces the chemical runoff that pollutes waterways and does not jeopardize the health of individuals

Bioengineering &

Development



Synthetic Minds

PhosFlow



saccharomyces cerevisiae

Modifying Organisms

- Identify target enzyme to replicate.
- Start with fungi base (yeast) with potential for expression.
- Run various Yeast Assays to assess activity rate of expressed enzyme.
- Choose best overall performers for further industrialization .
- Add simple stabilizers such as cryoprotectants to shield against environmental conditions.
- Run tests to measure product shelf life, performance, and enzyme vitality.

Product Development

- Begin with measuring products idealized environment to maintain enzyme effectiveness and viability.
- Add chemical buffers, including cryoprotectants, phosphate buffers, and basic buffers to preserve idealized pH.
- Utilize microencapsulation methods to protect against environmental degradation.
- Store product in pioreactors to reach short-term manufacturing goals.
- Transfer product into spray bottle for consumer use, or store in barrels for industrial usage.




Field Reality
Synthetic Minds
PhosFlow



Benefits

- Makes existing soil phosphorus available to crops
- Reduces the need for synthetic phosphate fertilizers
- Lowers fertilizer costs for farmers
- Improves fertilizer efficiency
- Can reduce phosphorus fertilizer use by up to **50%** with only about a **2%** reduction in plant growth
- Reduces phosphorus runoff into lakes and rivers
- Supports stronger root development and healthy crop growth
- More sustainable and environmentally friendly

Challenges

- Less effective in dense grass systems
- Enzymes may not reach deep enough into the soil
- Performance decreases during drought conditions
- High temperatures reduce enzyme activity
- Heavy metal contamination limit effectiveness



Solution

- Apply PhosFlow before planting
- Use aerial spraying for better field coverage
- Target the root zone for maximum phosphorus release
- Apply when soil moisture is adequate for better enzyme activity
- Combine with good nutrient management practices to improve results




Registration & Budget
Synthetic Minds
PhosFlow





Product Registration

- File a NSN due to alkaline phosphatases not being on the DSL.
- PhosFlow filed under “supplement” due to its capabilities of improving plant growth.
- PhosFlow is not a fertilizer.
- Send a registration package for further scientific review to the CFIA.

New Substances Notification Form (NSN)

↓

Domestic Substance List (DSL)

↓

Canadian Food Inspection Agency Registration (CFIA)



Costs of Equipment

Initial cost of equipment is $2,700- $6,050 to cover one acre of land:

  - Buffers
  - Pioreactor
  - Incubator
  - Lab Materials
  - Many more!
- Academic collaboration with professors UofG & UofT
  - Hugh Earl & Kimberly Schneider (UofG)
  - Professor Dastmalchi (UofT Scarborough Campus)
  - Steve Shirtliffe (USask)
- Request to use lab equipment.
- Results in $1,800 - $3,450 of equipment.

CARP Funding

Once our initial prototype is verified, we will:

- Target specific funding to continue research and commercial upscaling.
- Pitch our project to the Canola Council of Canada.
  - Canadian Agronomic Research Program funded 11 projects in 2025
    - $4 Million dollars in total.
  - About $363,636 was funded into each project in 2025.
  - Cover material costs and resources.



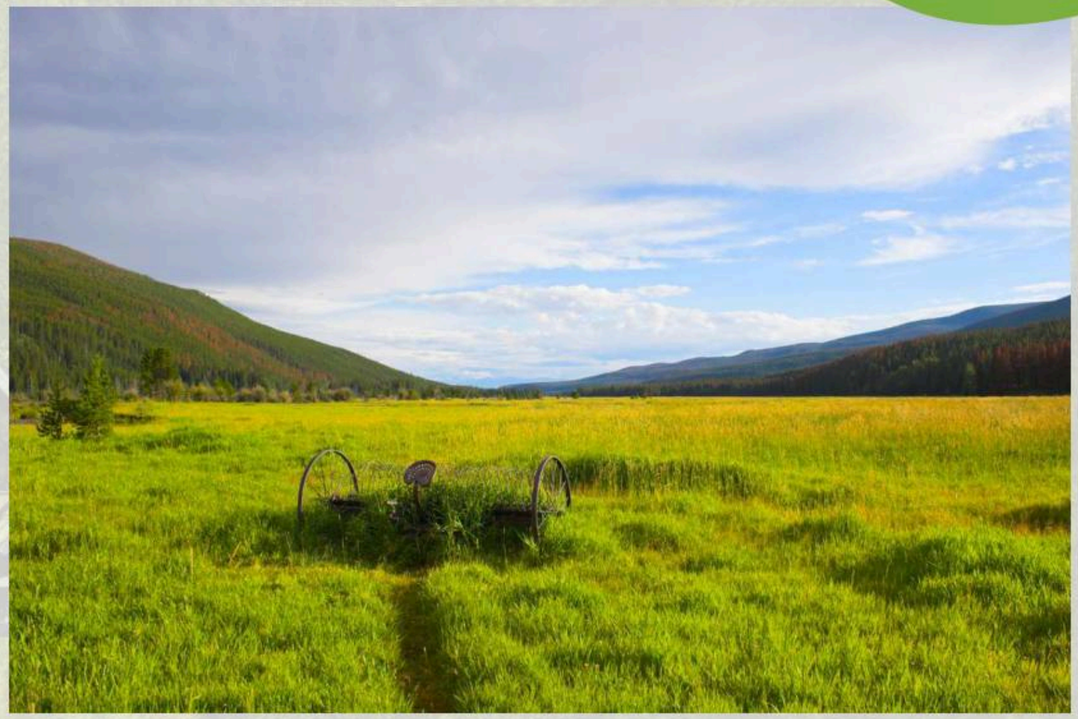


Conclusion



Why PhosFlow Matters

- Uses phosphatase enzymes
- Unlocks existing soil phosphorus
- Makes nutrients available for plant uptake



Environmental & Economic Impact



For Farmers

- Lower fertilizer costs
- Better phosphorus efficiency
- Maintains and improves crop productivity

For Communities

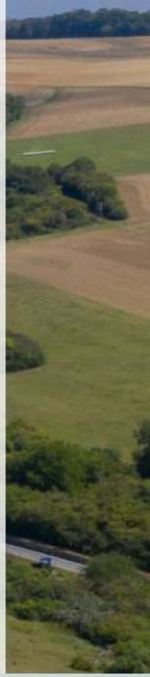
- Cleaner lakes and rivers
- Reduced phosphorus runoff
- Improved environmental health



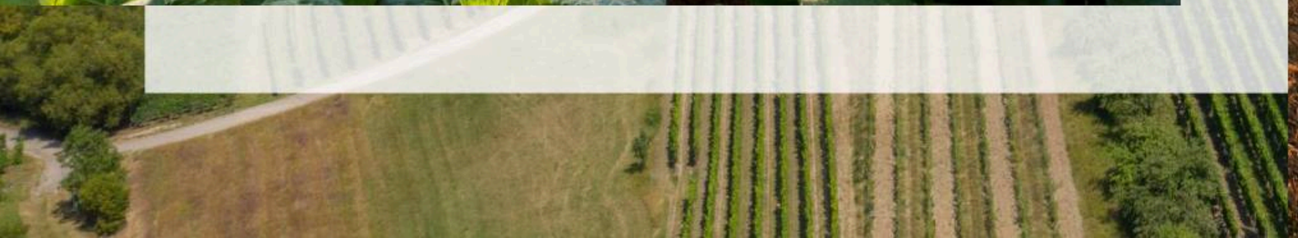
PhosFlow

Helping Nature Flow so Plants Grow

- Sustainable Canadian agriculture
- Protecting the environment
- Supporting future food production







QUESTIONS?

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Research Proposal & References

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