



Environment and
Climate Change Canada



Ontario

Ministry of Agriculture,
Food and Rural Affairs



ANIMUS PROSPERITAS BELISSIMA

UNIVERSITY
of GUELPH



ses
school of environmental sciences

Quantifying the Flows of Phosphorus in Ontario

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Summary

What we know: Phosphorus is a finite resource, a limiting nutrient to plant growth, and is the cause of eutrophication of many lakes, most notably, Lake Erie.

Project Goal:

Create flow maps of phosphorus through and between the different sectors of Ontario, quantifying P where possible.

Industry

Imports

- Transportation Parts
- Electrical and Electronic Products
- Chemicals
- Phosphate Compounds
- Cereals
- Fertilizers and Pesticides
- Livestock and Livestock Products
- Food products

P in Industry

- Fertilizers and Pesticides
- Motor Vehicles
- Chemicals
- Plastics and Rubber
- Steel and Metal
- Electrical and Electronic Parts
- Machinery
- Soft drinks
- Meat, fish, and dairy products
- Food processing by-products
- Cosmetics
- Wood and paper products
- Food products

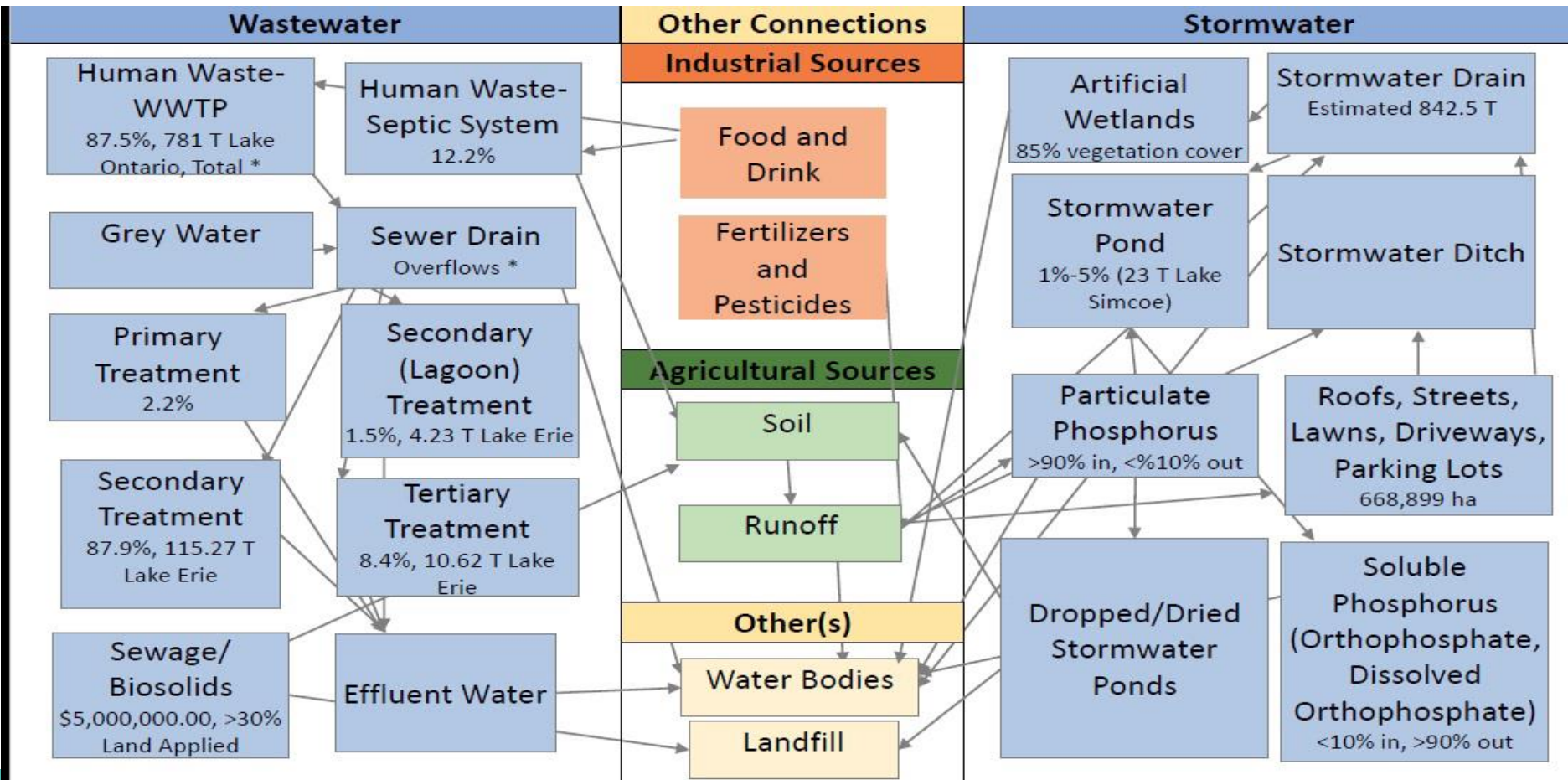
Exports

- Metals
- Chemicals
- Electrical and electronic products
- Wood and paper products

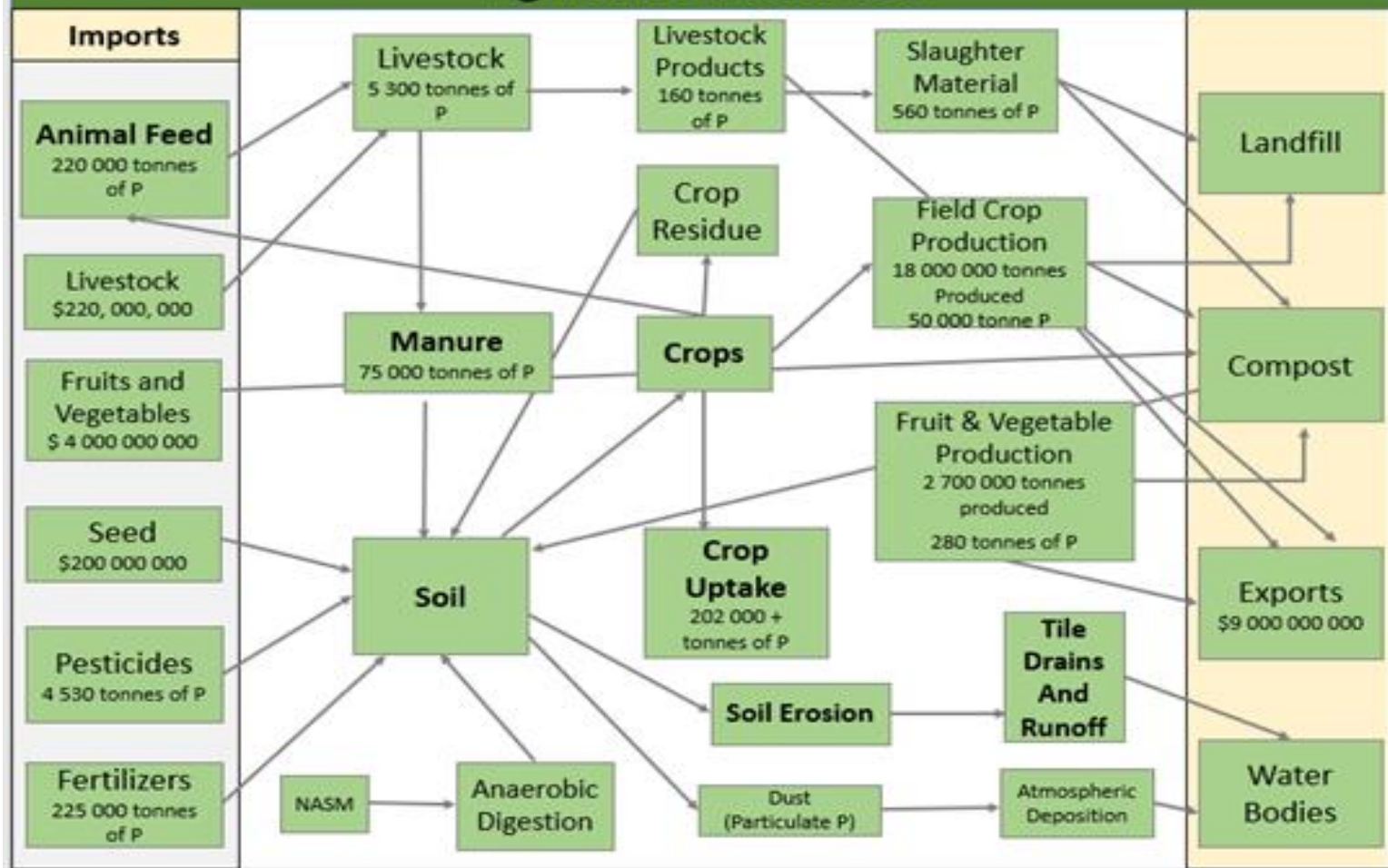
Landfill

Industrial Waste

Wastewater and Stormwater



Agricultural Sources



Major Inputs

Seed

Seed Coating contains a portion of P

200 Million Dollars in Ontario Sale

Fertilizer

MAP and DAP

225 000 Tonnes of P

Feed

P additives to increase animal growth

220 000 Tonnes of P

Pesticides

Some break down in the soil into P compounds

25 000 tonnes of Active Ingredient P Pesticides

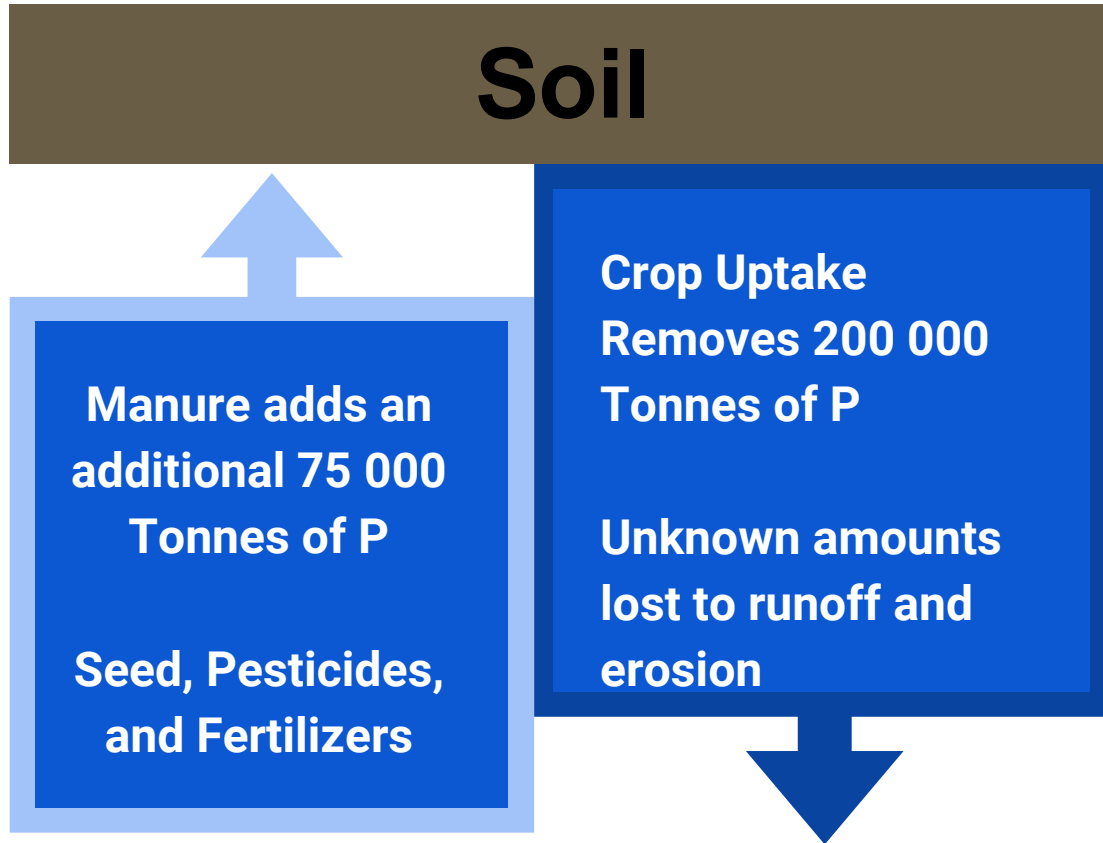
Within the System

Products

Livestock
150 Tonnes

Fruit and Veg
280 Tonnes

Field Crops
1800 Tonnes+



Soil

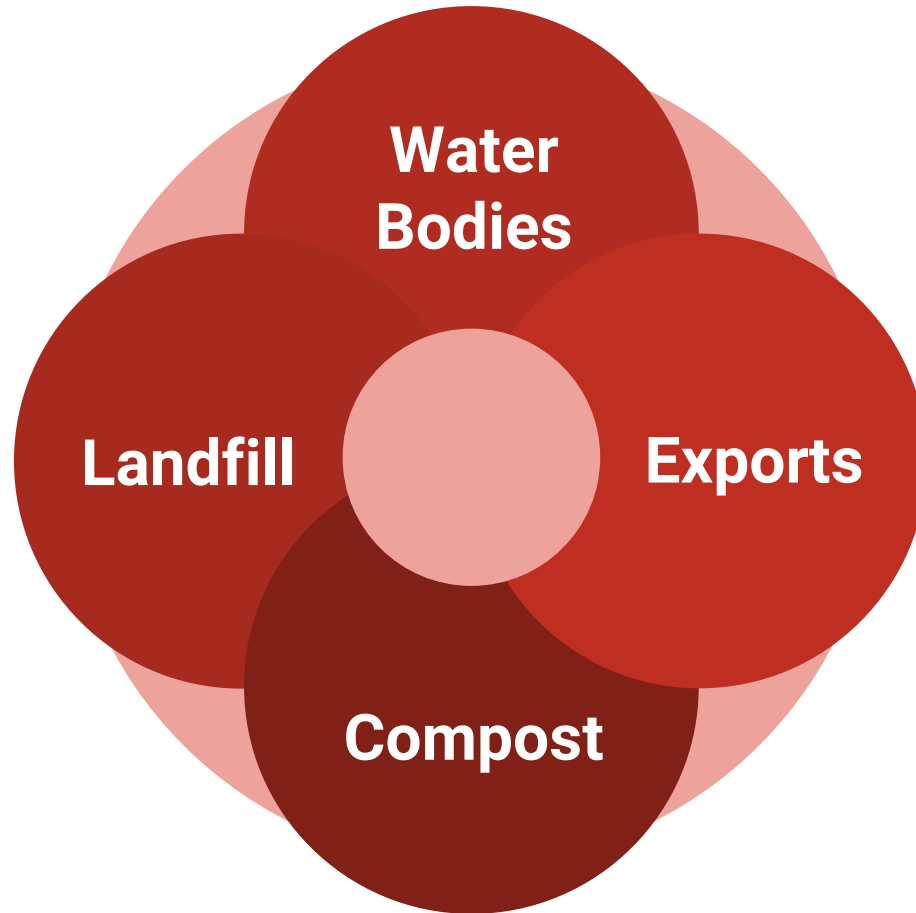
**Crop Uptake
Removes 200 000
Tonnes of P**

**Unknown amounts
lost to runoff and
erosion**

**Manure adds an
additional 75 000
Tonnes of P**

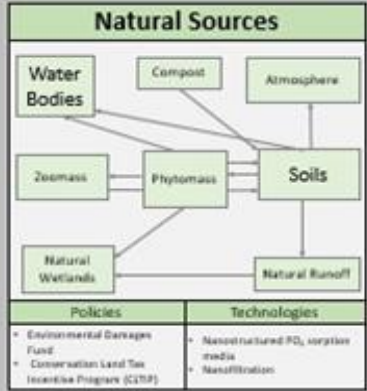
**Seed, Pesticides,
and Fertilizers**

Outputs



Changes from 2011 to 2016

Ag Product	Change- 2011-2016/17
Cropland Area	Increase (Corn and Soy)
Livestock	Increase (Poultry and Pigs)
Total Manure Production	Decrease (Dairy and Beef)
Fertilizer Sales	Decrease (DAP)
Fruit and Veg Production	Increase (Field)
Exports	Increase (Grains and Veg)
Imports	Increase (Feed and Fruit)



Global Phosphorus Reserves and Production

Fig 1: Percentage of World Phosphorus Reserves

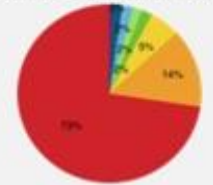
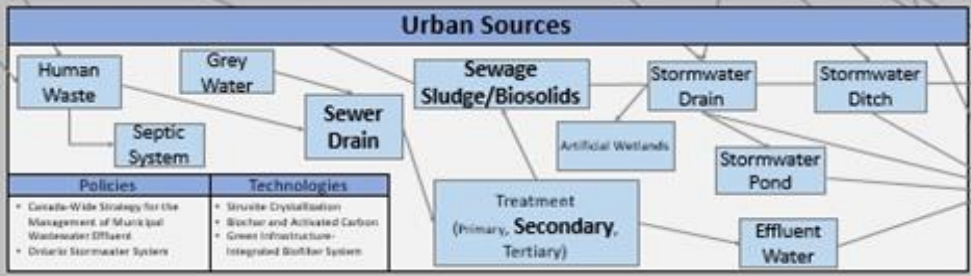
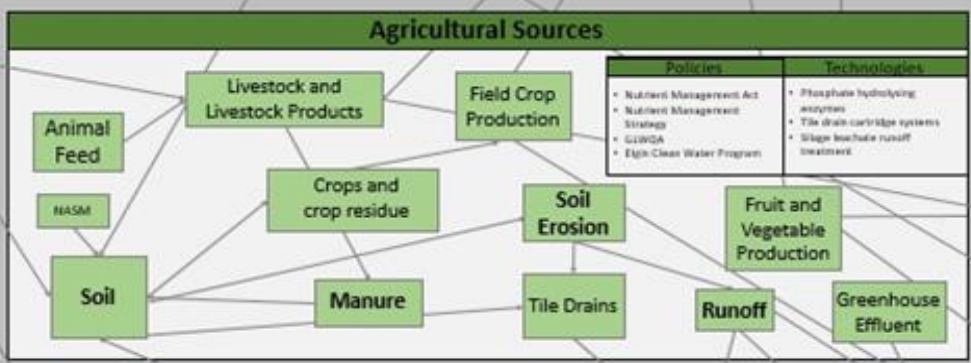
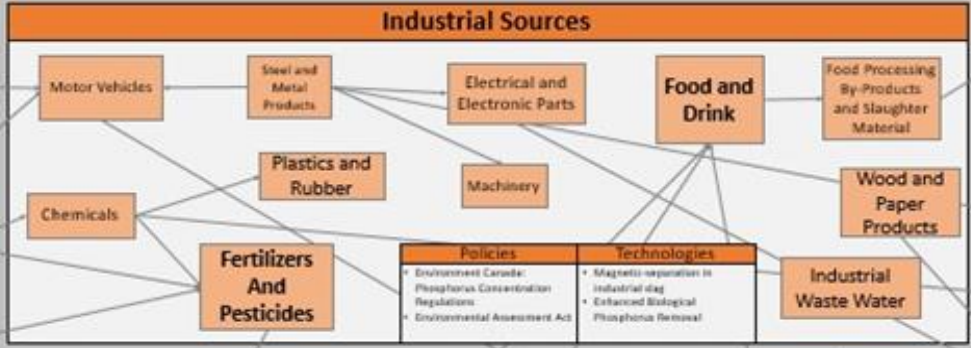
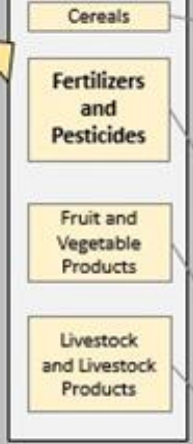
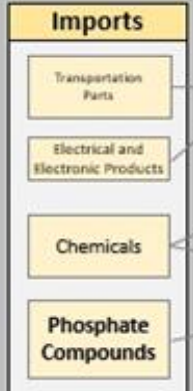
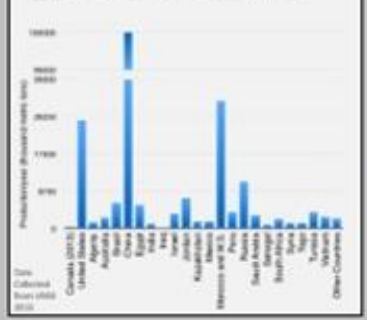


Fig 2: World Phosphorus Production per Year



Final Thoughts

- Phosphorus flows in Ontario are complex and dynamic
- Data on total numbers and quantities are hard to find
- Phosphorus is in everything
- Many opportunities along the way to implement policy and technologies to target specific flows
- Need to focus reduction and reuse efforts on all areas not just one