A snapshot of agroforestry research in Canada

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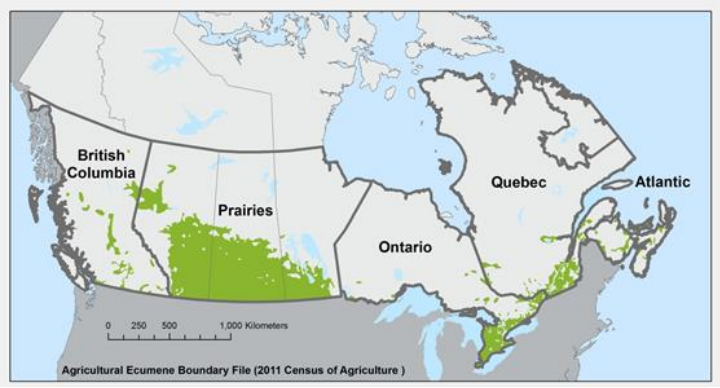
Linkage of agroforestry between Canada and the United States

- Common landscapes, climate, soils, wildlife, land management and farming systems.
- Utilize the classification of agroforestry systems of the Association for Temperate Agroforestry (AFTA).
- MOU signed in 2012 between AAFC Agroforestry Development Centre and USDA National Agroforestry Center.

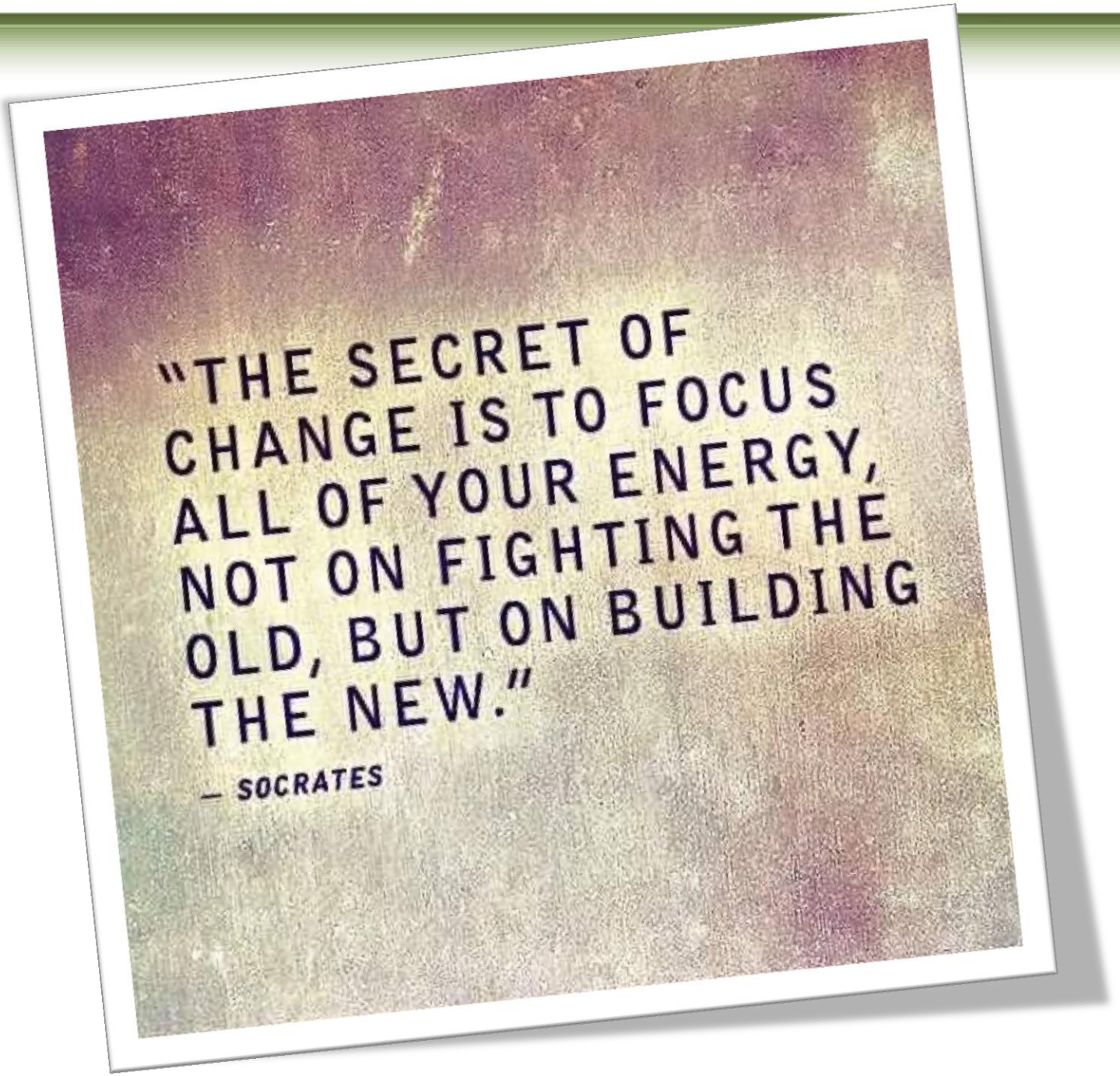

WHAT
do we produce?
Top commodities by province and territory
Yukon
cattle, forage
Northwest Territories
greenhouse crops, farmed sod
Nunavut
caribou, musk ox
Newfoundland and Labrador
dairy, eggs
Prince Edward Island
horticulture, dairy
British Columbia
horticulture, dairy
Alberta
cattle, grains and oilseeds
Saskatchewan
grains and oilseeds, cattle
Manitoba
grains and oilseeds, hogs
Ontario
grains and oilseeds, dairy
Quebec
dairy, hogs
New Brunswick
horticulture, diary
Nova Scotia
dairy, horticulture

The agricultural landscape in Canada



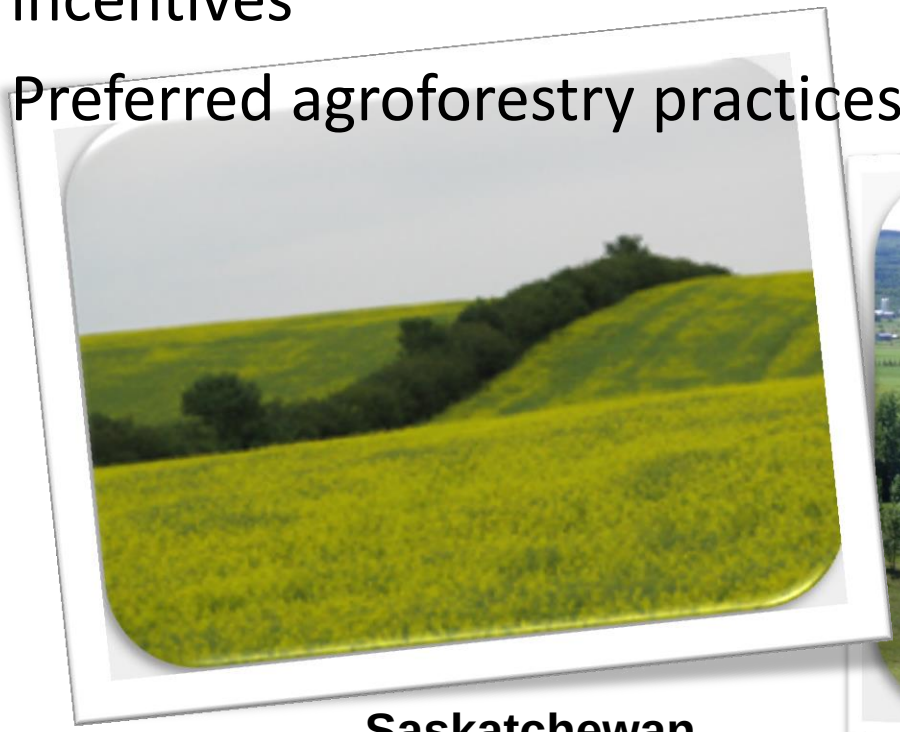
- Historically, diversified farming systems were the norm in Canadian agriculture, however with increasing farm size, crop specialization, increased inputs and an aim to maximize crop profitability agro-ecosystems have been simplified.
- Average farm in Canada is 800 acres.
- Associated habitat reduction has contributed to a loss of diversity and is negatively impacting pollinators and other beneficial insects, particularly on the Prairies.

Conquest, Saskatchewan


"THE SECRET OF CHANGE IS TO FOCUS ALL OF YOUR ENERGY, NOT ON FIGHTING THE OLD, BUT ON BUILDING THE NEW."
– SOCRATES

Regional adoption trends and constraints

- Lack of agroforestry knowledge
- High initial capital and labour costs
- Farm operations and land resource tenure
- There is a need for viable long range markets and adoption incentives
- Preferred agroforestry practices and designs differ regionally



Saskatchewan

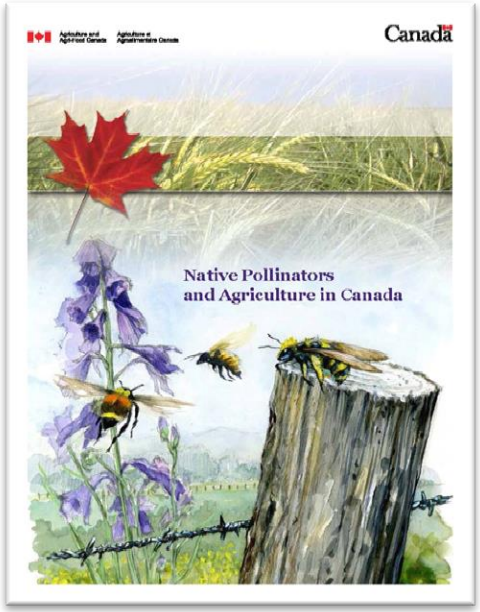
Quebec

The way forward

- Address environmental concerns
  - Water quality
  - Carbon sequestration
  - Habitat for pollinators
- Economic interest
  - Biomass harvest
  - Emerging commodity crops

Agroecosystem productivity and health

- Increase agricultural productivity
- Improve environmental performance
- Improve attributes for food and non-food uses
- Address threats to the value chain

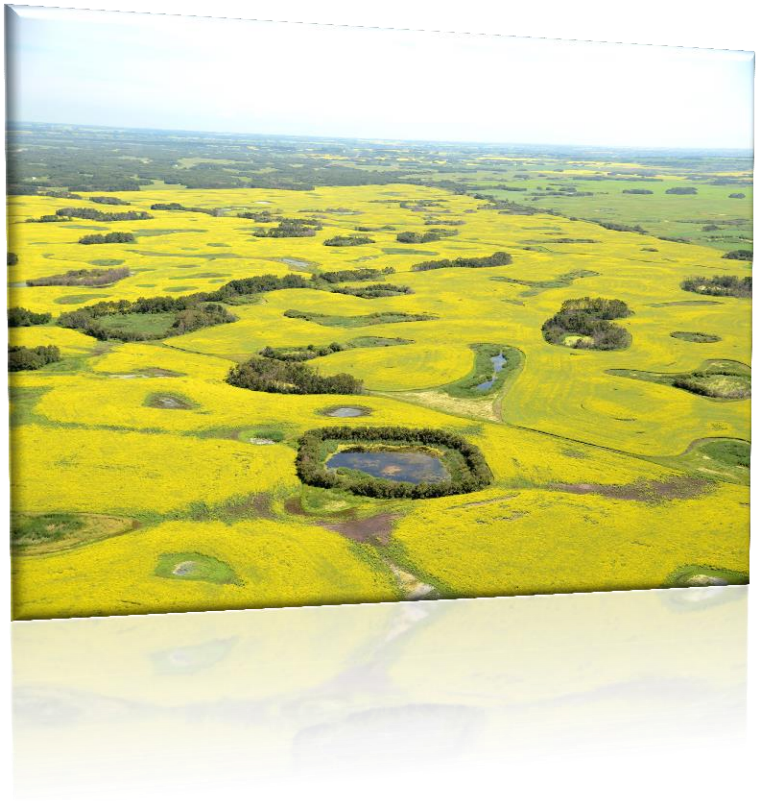


Potential pollinator habitats

Willow Riparian Buffers

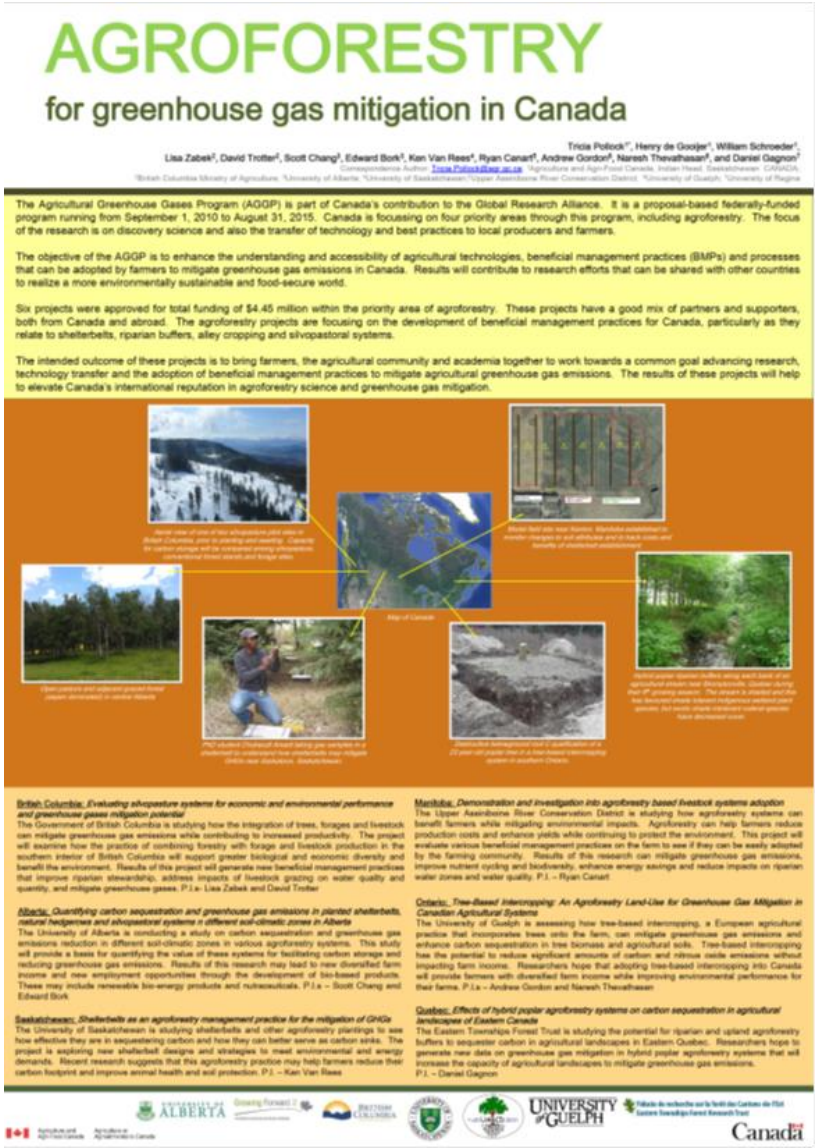
- Field trials in PEI 2006-2012
- Regular harvest of willow biomass is an effective nutrient management tool for potato production systems
- Harvested biomass exports intercepts nutrients and sustains buffer function
  - up to 7 tons per acre per year
- Over 3 years, a 1-acre willow buffer can intercept 120 lbs N and 18 lbs P

Wetland willow rings for sustainable small scale feedstock and bioenergy production



- Significant areas of under utilized land
- Periodic flooding, inaccessible field locations and irregular field shapes, salinity impacting production, or unfavourable soil textures or topography
- Small scale agroforestry willow systems have the potential to provide a sustainable and renewable clean energy resource

Agricultural Greenhouse Gases Program



- Part of Canada's contribution to GRA
- Proposal-based
- First time in research funded proposals that agroforestry has appeared
- Extended to March 31, 2016
- 6 projects were funded for $4.85 million (CAD)

Engagement and collaboration is necessary for successful agroforestry projects

Evaluating silvopasture systems for economic and environmental performance and GHG mitigation potential

Premier's Award for Interior/Northern BC Region in the category of Partnerships

Trees Can Help Save the World

https://www.youtube.com/playlist?list=PLeR2DZtnlTQtik4SxT9unDrVP5Gu2aEPb

Tree-based intercropping:
An agroforestry land-use for
GHG mitigation in Canadian agricultural systems

Emerging Commodity-Based Agroforestry Crops in Canada

- Increased consumer demand for “super-fruits”
- Agroforestry systems undervalued for their economic contribution to the agricultural sector

Seabuckthorn
Hippophae spp.

Buffaloberry
Shepherdia argentea Nutt.

3-pronged approach

Agronomic trials

Metabollite profiling

Genomics

Seabuckthorn

- Dioecious, berry producing shrub
- Mature height of 16 ft, mature width of 12 ft
- Lifespan of 30 to 40 years
- Tolerant of extreme temperatures (-45°F to 104°F), drought and salinity
- Low fertility requirements
- N-fixing
- All plant parts (bark, leaves, berries and seeds) have either nutritional or medicinal value
- 3.5 M planted in the Prairies from 1970-2013

Timeline of seabuckthorn in Canada

Hippophae spp. **(Seabuckthorn)**

1950s
- **AAFC Tree Nursery receives seabuckthorn accessions from Morden Research Station, Manitoba**

1962
- **Seabuckthorn trial sites established in regional test sites**

1969
- **Improved seabuckthorn seed strain identified**

1970s
- **Nursery production of seabuckthorn and distribution to farmers for shelterbelt planting initiated**

1995
- **AAFC-PFRA Shelterbelt Centre initiates seabuckthorn breeding and orchard management research program**

1997
- **Indian-Summer seed strain released**

1998
- **North America's largest seabuckthorn germplasm collection established at Indian Head, Saskatchewan**

2005
- **Release of AAFC developed cultivars Harvest Moon and Orange September**

2012
- **Quantification of phytochemical profiles and N-fixing capacity**
- **Release of cultivars AC Autumn Glow and AC Prairie Sunset**

2013-15
- **New project to explore transcriptome, metabolome, propagation and alley cropping production system initiated.**

AAFC Breeding accomplishments

- High yielding cultivars with few thorns
- High pollen producing male
- Extremely hard cultivars adapted to cold, semi-arid continental climate
- High sugar content and low titrable acidity
- Cultivars trademarked and available through licensing agreements
  - ✓**AC Harvest Moon**
  - ✓**AC Orange September**
  - ✓**AC Autumn Glow™**
  - ✓**AC Prairie Sunset™**
- Main nursery supplier is PrairieTech Propagation

  www.prairietechpropagation.com

Emerging Product Industry

Pet Food Supplement

Before

After

Assessing woody plants for bio-active compounds and bioenergy

- Genetic improvement of willows:
  - Study the physiology, wood chemistry and genetics of Salix focusing on opportunities toward utilization of the genus as bio-energy feedstock.
- Cultivar release and bio-prospecting:
  - Demand for bio-active compounds of natural origin and energy alternatives has progressed sharply recently.
  - Over 600 million trees and shrubs have been planted in prairie agriculture, providing a large potential resource for extraction.
  - Assessing wood, bark, flower, seed and foliage from 120 genotypes of woody cultivars of the genera *Acer*, *Crataegus*, *Fraxinus*, *Hippophae*, *Larix*, *Quercus*, *Picea*, *Pinus*, *Populus*, *Prunus*, *Rosa*, *Salix*, *Sherpherida*, *Sorbus* and *Symphoricarpus*

- In the 1970's there were only a handful of individuals in North America working in agroforestry including John Bene (BC) and Gene Garrett (MO), and now there is AFTA, EURAF, etc. An agroforestry network will continue to emerge.
- Many older editions of agroforestry books are in their 2nd edition including Temperate Agroforestry Systems (Gordon & Williams eds.) which will be published in 2016.
- Awareness of agroforestry will increase and garner more respect as long-term data accumulates and papers continue to be published.
- While promoted as a tool for climate change mitigation and adaption, agroforestry species and systems will likely be negatively impacted.

Keep Moving Forward

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