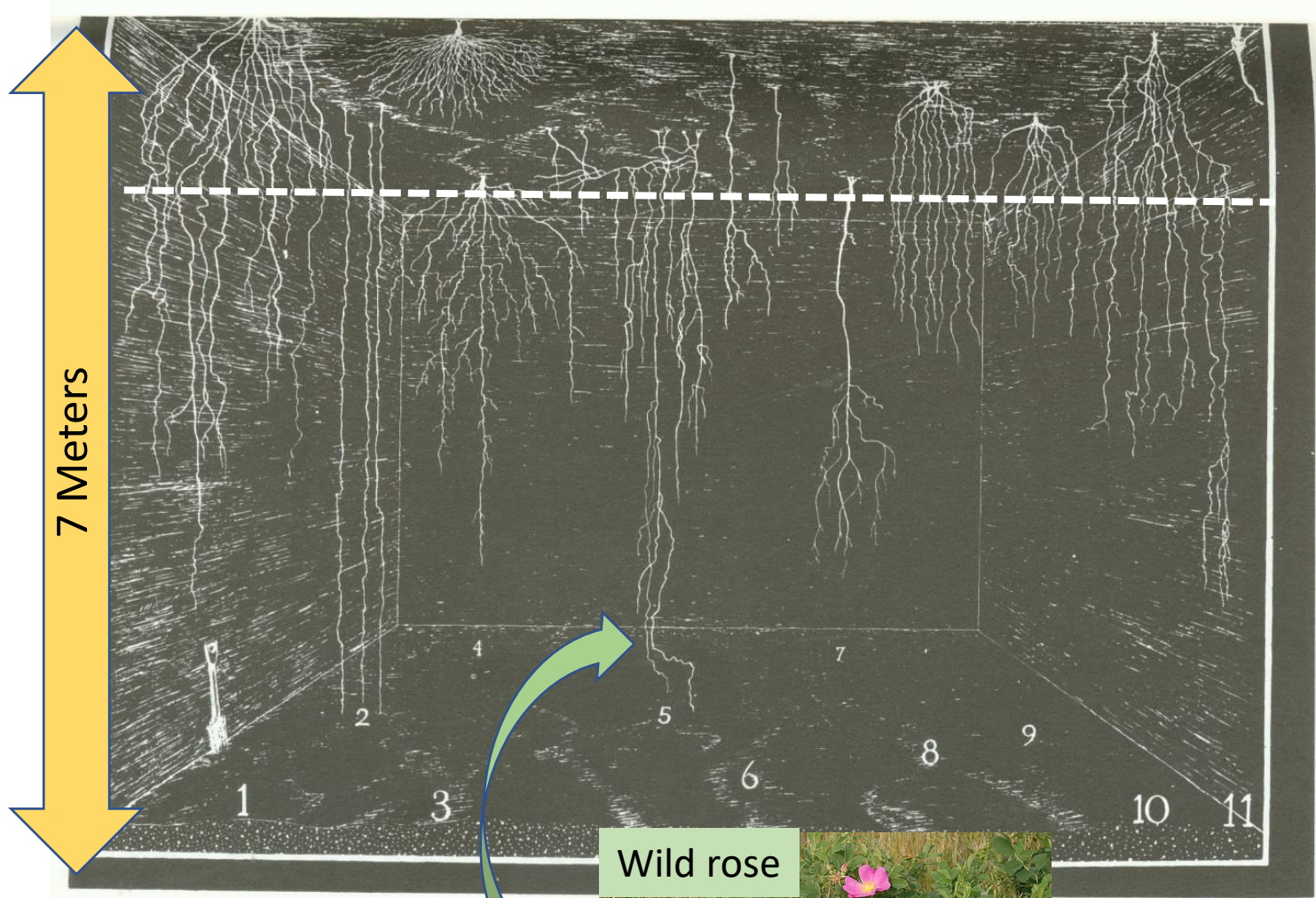
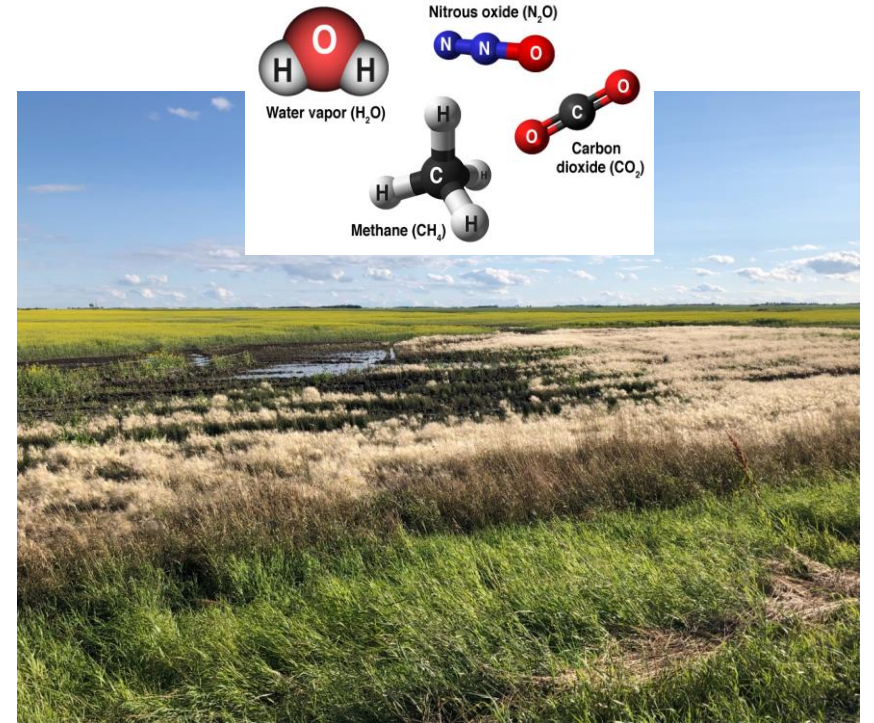


Prairie plant root systems – before grain agriculture

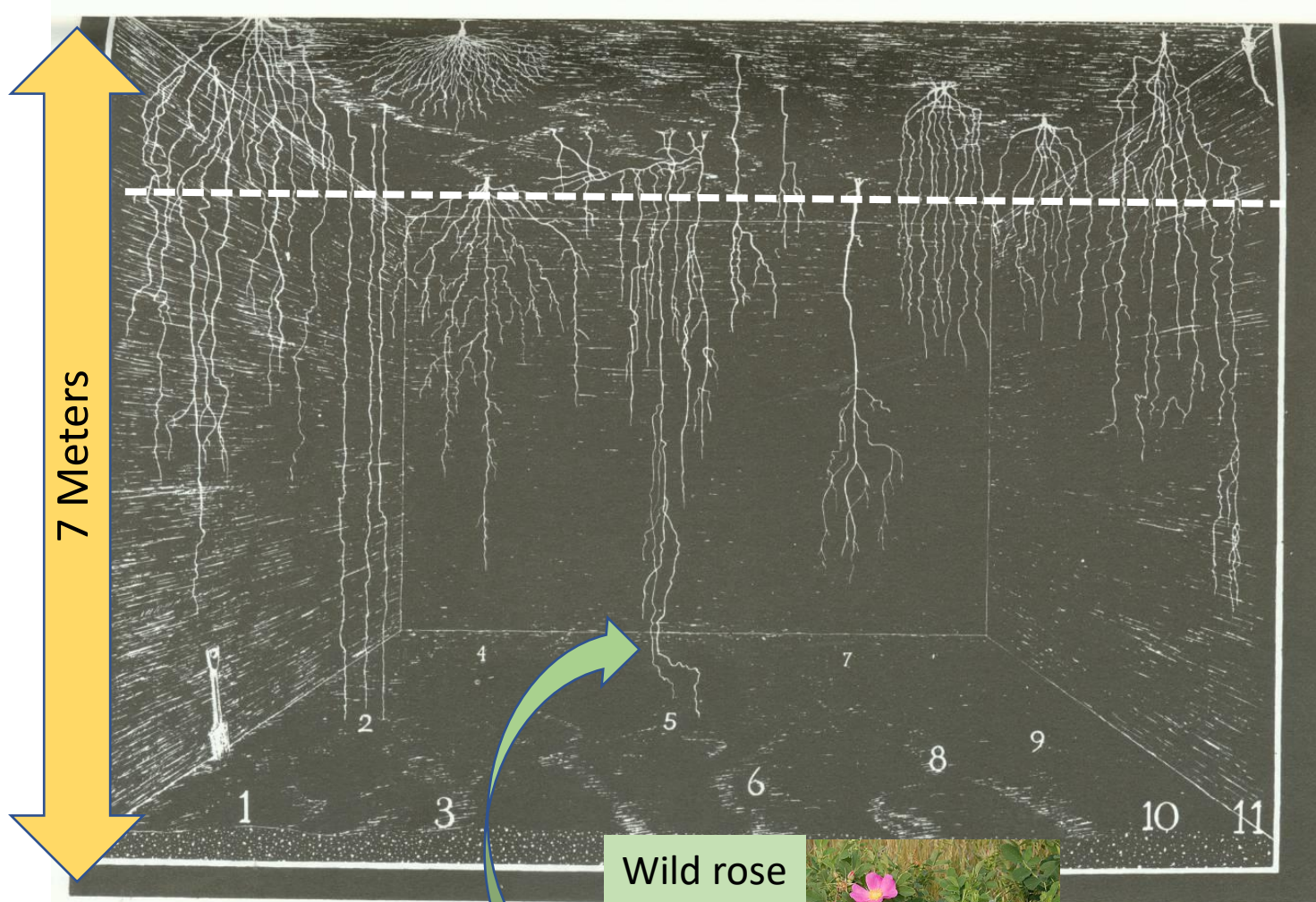


Elimination of "perennialism" causing..



- More vulnerable
 - Less resilient
- ➔ Not sustainable

Prairie plant root systems – before grain agriculture



Weaver, 1926

Wild rose



How can we mimic this?
-practically, economically

- Cover crops (Service crops)
 - Extend plant growth in shoulder period in annual grain production
 - Intercrops and relay crops
- Increase landbase planted to perennials
 - Forage/pasture
 - Perennial grains
 - Pollinator habitat with perennials
- Landscape approach
 - Precision agroecology
 - Wetlands
 - Agroforestry

Spatial, temporal, trophic diversity
“Diversity lends stability” (Elton 1958)



Multipurpose agriculture through perennialization

A leap to net zero farming systems in Canada



Actions

Goals

- Increase role of perennial crops in Canadian crop and livestock agriculture
- Reduce fertilizer and pesticides
- Increase on farm and landscape biodiversity
- Climate mitigation and adaptation
- Harness synergies of crop-livestock integration
- Recycle nutrients
- Increase soil health
- Increase soil C in eroded field zones
- Produce energy
- Reduce ¹vulnerability
- Increase ²resilience
- Other?

- Include the perennial grain crop Kernza IWG in Cdn farming systems
- Register Canada's first Kernza IWG variety for dual use (grain and forage)
- Document GHG benefits of perennial grains in real life farming situations and in existing long-term field studies
- Integrate ruminant production into the dual purpose Kernza production system. Monitor animal productivity and health
- Fertilizer perennials with 1) recycled nutrients from urban and other waste streams; 2) through co-production with legumes (eg. sainfoin); and 3) with manure from other animal enterprises
- Co-design farming systems that include dual purpose Kernza IWG with farmers using established co-design processes (social science)
- Document biogas potential of Kernza systems
- Add pollination habitats to existing perennial and annual crops and investigate the animal health benefits of grazing more diverse plant community
- Consider cover crops as "semi-perennial" systems and investigate their role in farm management for net zero
- Model perennial-emphasized farming systems for multifunctionality – "Future-scaping"

Metrics

- C footprint
- Crop and animal productivity
- On-farm, landscape and regional biodiversity
- Energy efficiency
- Energy production potential
- Economic performance
- Farm and community health
- Soil health
- Weather proofing farm systems
- ²From the ground up resilience
- Other?

¹Vulnerability = Biophysical Exposure* Socio-Economic Sensitivity* Adaptive Capacity

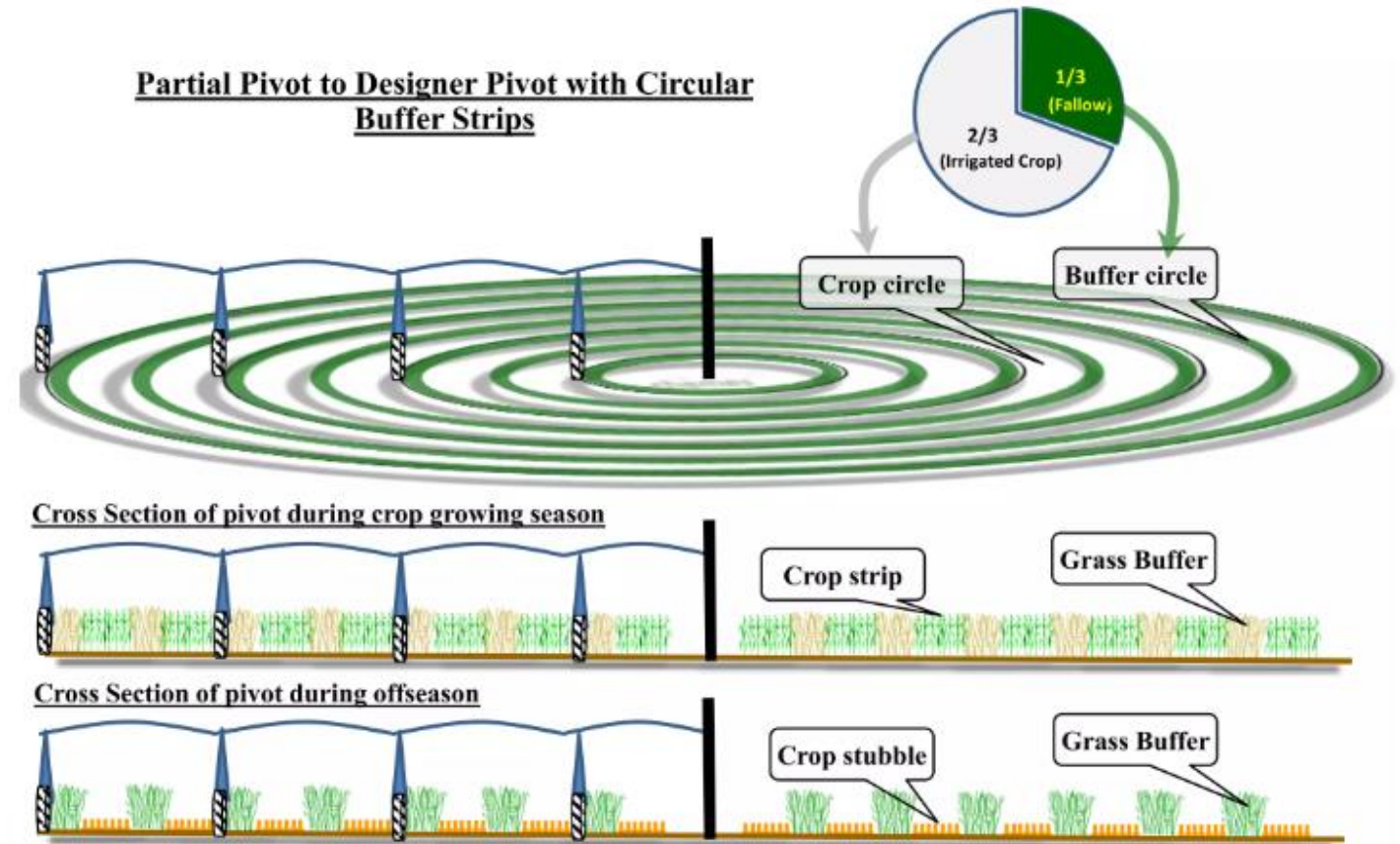
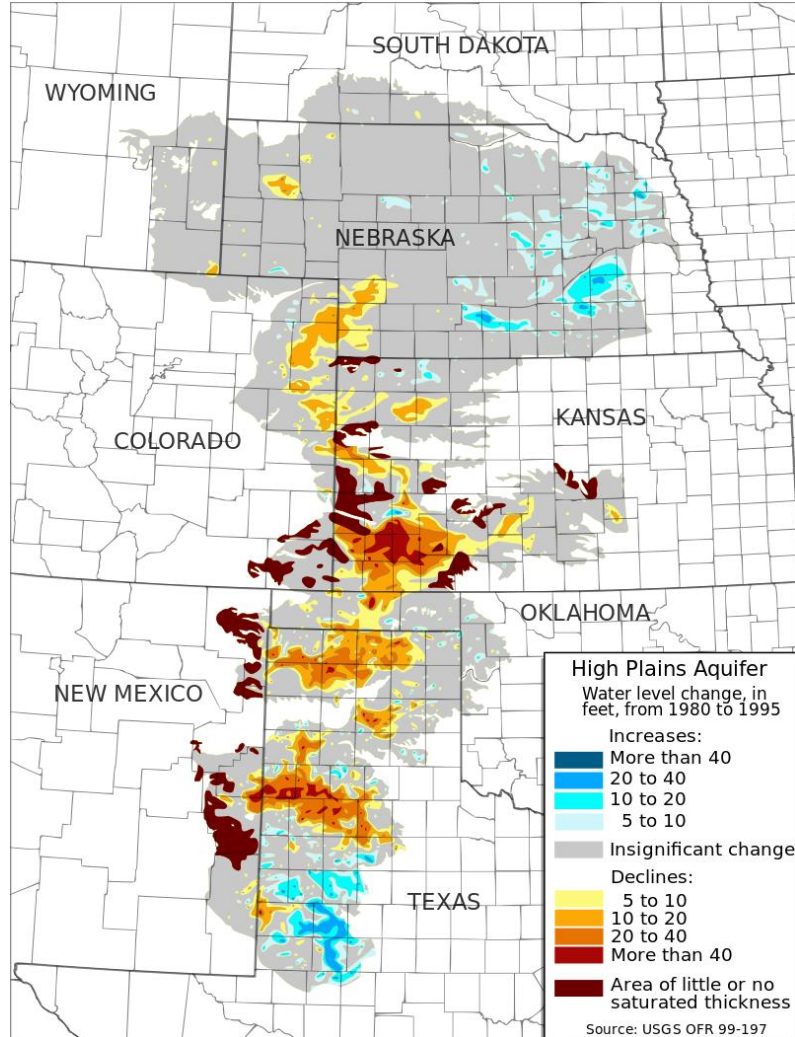
Perennials facilitate transition from vulnerability to resilience

²Ground up Resilience = f (context specific nature-based sol'ns + best fit technologies + enabling environment + sustainable landscape management + indigenous knowledge)

Example of unconventional "perennialized" system



Partial Pivots:
Can we look this as an opportunity?





Partial Pivot to Circular Buffer Strip Pivot

Conventional Partial Pivot

Circular Buffer Strip Pivot

The diagram is a pie chart divided into two sections. The larger section, representing 2/3 of the circle, is light blue and labeled "2/3 (Irrigated Crop)". The smaller section, representing 1/3 of the circle, is green and labeled "1/3 (Fallow)". An arrow points from the "Irrigated Crop" section to a box labeled "Crop circle". Another arrow points from the "Fallow" section to a box labeled "Buffer circle".

Rainfed/Minimally Irrigated crop

Traditional Irrigated crop

Rainfed Perennial Grass

Traditional Irrigated crop

Dr. Sangamesh Angadi



Grass strips reduce wind flow through crops, resulting in less evaporative water loss and higher WUE

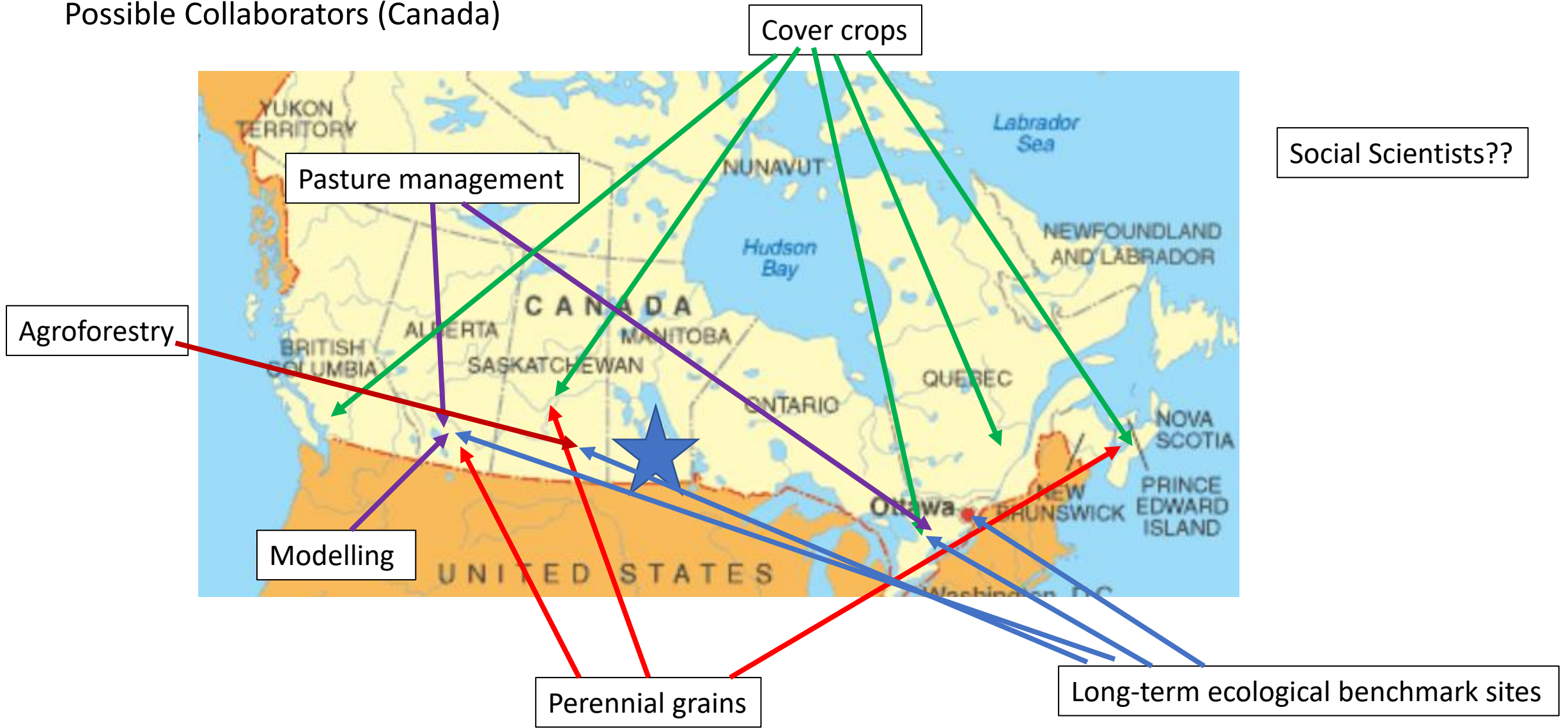
Control



Circular Buffer Strip



Possible Collaborators (Canada)



Summary of "Research Model" from last meeting

A Nutrient recycling

Trophic diversity

Intervention

- C. Crops
- Habitat
- Perennials

- how
the
inter
affect
system?

Adoption

- future
casting

net \emptyset



modeling →
policy →