



Carbon Building: Realistic Expectations

Scott Gillespie M.Sc. P.Ag. CCA

Regenerative Agriculture Consultant

Plants Dig Soil Consulting Ltd.



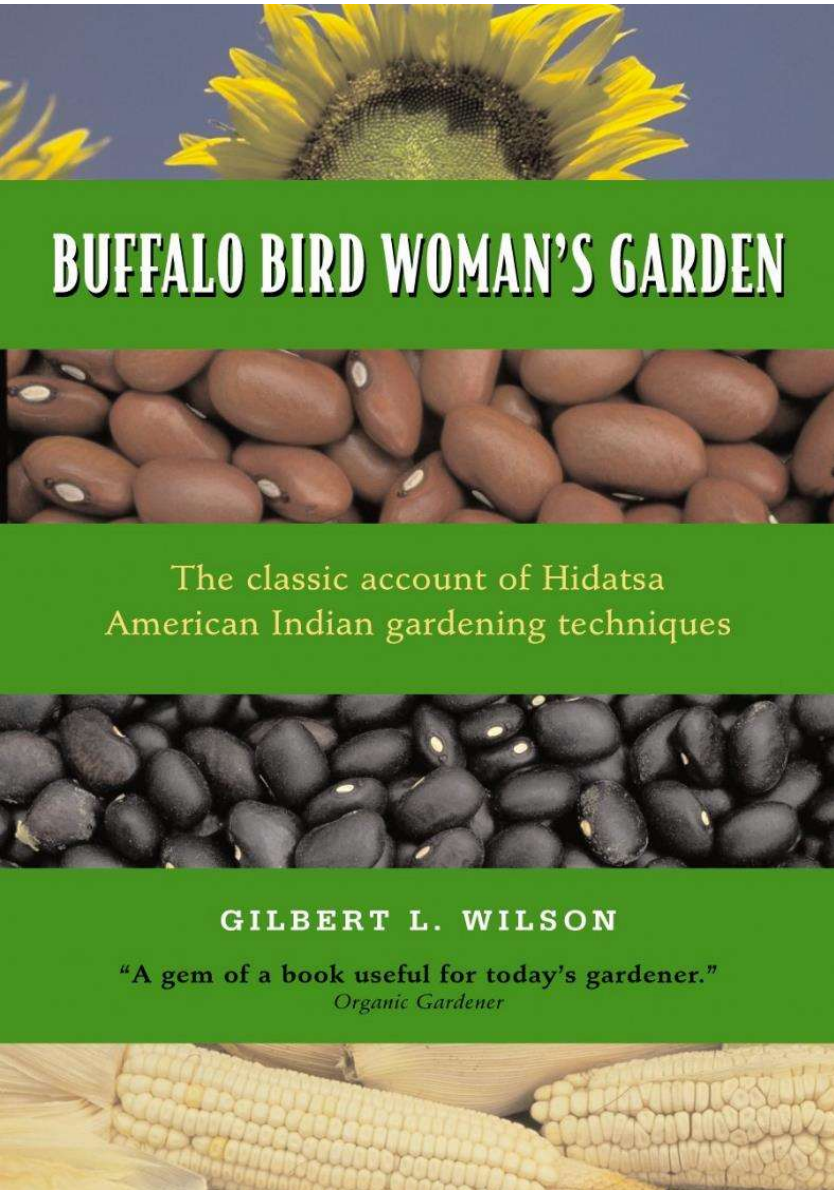
Timeline of Southern Alberta Soils

- ▶ Geologically young soil estimated to be 10000 years old
- ▶ If every day represented one year in the life our soils it would take 27 years to see them develop
- ▶ Agriculture has been here for only 150 years
 - ▶ Condensing that to the timeline of 1 year = 1 day that represents 5 months
 - ▶ In perspective, that is a typical growing season: mid-April to mid-September
- ▶ The bar on the bottom of the slides represents this visually
 - ▶ The green is for the entire length of the existence of our soils
 - ▶ The red on the right end represents the time of agriculture



Human Management of the Soils

- ▶ Up until the 1700's the soils were managed sustainably
 - ▶ The number of people that could live on it was directly tied to what it could give
- ▶ Horses and guns allowed a greater and more efficient harvest of buffalo
- ▶ Colonists opened new trade networks for the excess
- ▶ Accelerated change lead to the collapse of the buffalo herd in late 1800's
- ▶ None of us were around when decisions were made that forced the Indigenous to sign treaties and move onto reserves
- ▶ But we can work to understand what happened & work to a better future



BUFFALO BIRD WOMAN'S GARDEN

The classic account of Hidatsa
American Indian gardening techniques

GILBERT L. WILSON

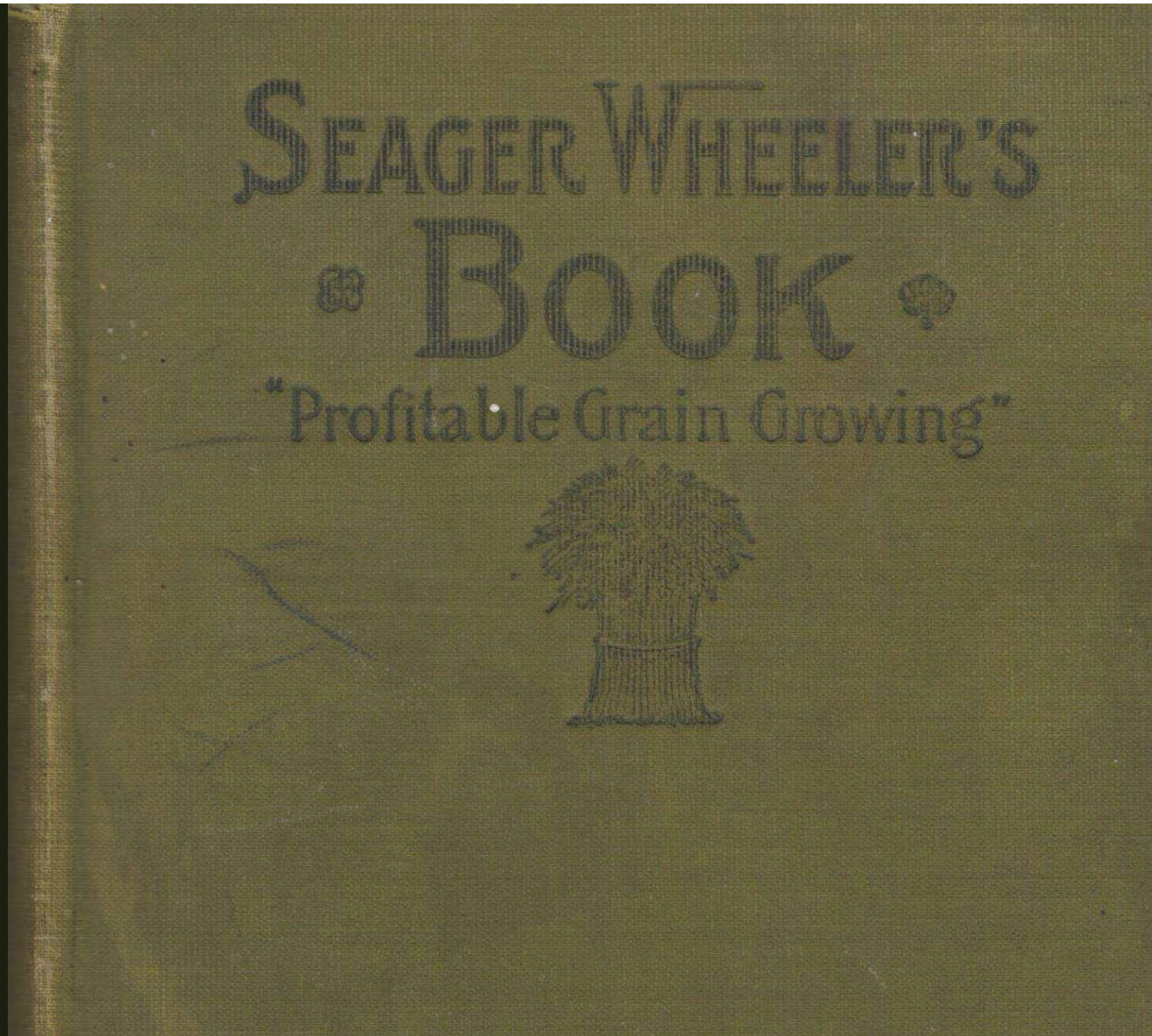
"A gem of a book useful for today's gardener."
Organic Gardener

Buffalo Bird Woman

- Indigenous agriculture in what is now known as the Dakota's (United States)
- Adamantly kept up with weeding
- Carefully selected seed
- Broke new land and grew as long as they were productive
- Fallowed land to restore it
- Believed to have developed in the 12th century and ended with colonialism in the 19th century

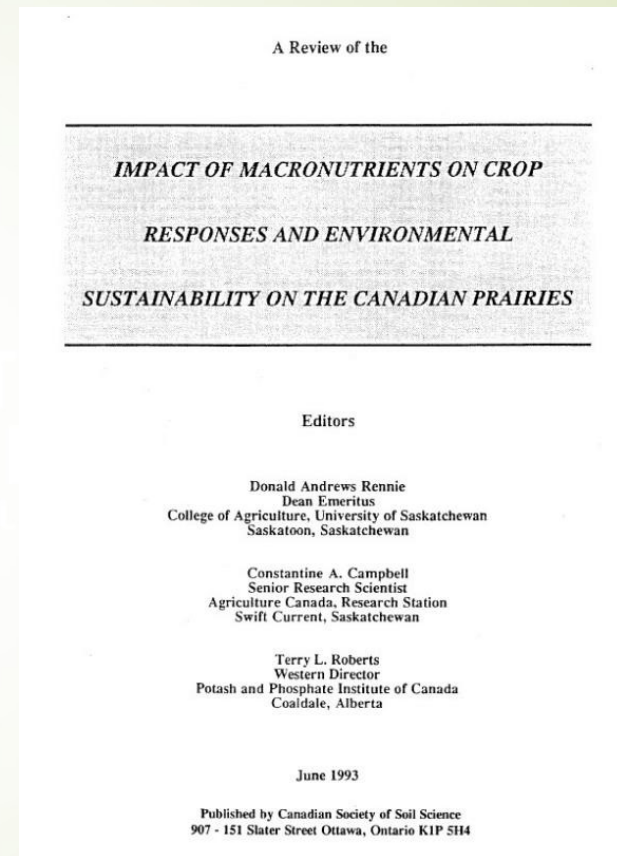
Seager Wheeler

- ▶ One of the early settlers north of Saskatoon
- ▶ Widely known for his prize winning wheat
- ▶ Similar in advice to that of Buffalo Bird Woman
- ▶ Differed from her in expectations of the fallow system
 - ▶ Believed that proper tillage would unlock an inexhaustible supply of plant food
 - ▶ Appears to have subscribed to the theory that plants took up the mineral components of the soil and that you needed to pulverize the soil to powder



Fertilizer Inputs

- Nitrogen response research not initiated until the 1950's
- Phosphorus was the first major limiting nutrient
 - <1970 >90% chance of a response when adding fertilizer
 - >1970 response drops to 30-50%
 - Fertilizer is what saved agriculture in the Prairies and allowed it to intensify



“No Fertilizer Needed”

- ▶ Many claims that diverse cover crops grow with no fertilizer.
- ▶ Instead of tillage being the tool, it appears cover crops will do it for us
- ▶ They believe they are tapping into microbial mined phosphorus
- ▶ In reality they are tapping into the legacy fertilizer applications

If depleting organic matter was able to access free nutrients, building organic matter must tie up nutrients





Building Carbon in our Soils

Ways to Build Carbon

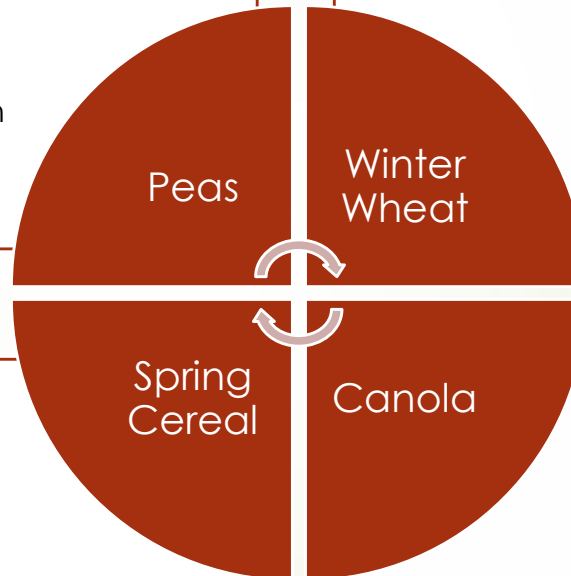
- ▶ A living root in the ground for as long as possible
- ▶ The only time carbon is being added to the system is when photosynthesis is creating sugars from CO₂
- ▶ I shorten this to: Plants dig soil.
- ▶ Grazing animals increases the efficiency of the system
- ▶ Manure & compost import carbon

How we can Start

- ▶ If grazing and/or manure/compost are readily available and cost effective they are a way to start
- ▶ If not the best way is going to be to grow it with cover crops
- ▶ Moisture must always be taken into account – it is our greatest limiter
- ▶ Relay cropping mimics nature – think of weeds growing after you have harvested a field

Example Rotation

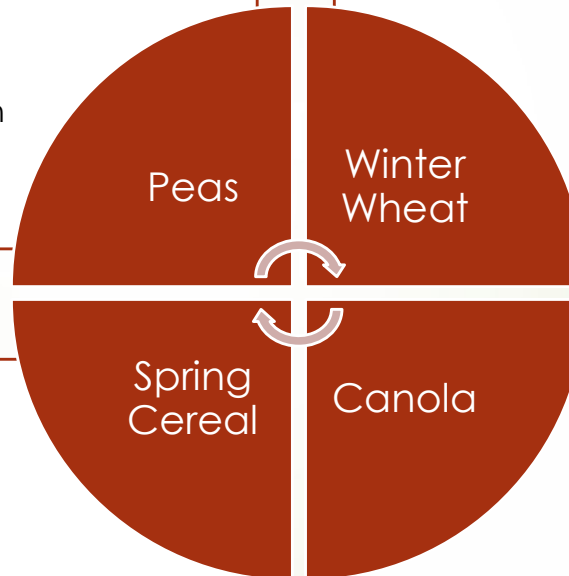
- No relay crop
- Option for burndown prior to seeding winter wheat
- Take the opportunity to clean up perennial weeds



• Canola is a winter crop
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Example Rotation

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- Clover relay crop in spring
- Broadcast at thaw
 - No herbicide option then
 - Interseed after herbicide

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Gemstone Interseeder

- Valmar blows seed to the shanks between rows
- Small harrow that the seeds blow onto
- Chain behind that drags over the seed
- 22" spacing for corn
- Irrigated application so may not cover enough of the seeds on dryland



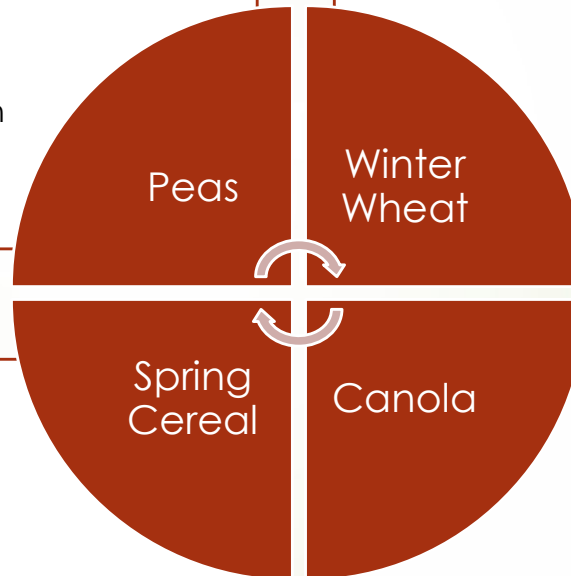
Josh Beck's Interseeder

- ▶ Valmar blows seed to disc openers
- ▶ Packer behind to ensure good seed-to-soil contact
- ▶ 10" rows to go between air seeder rows
- ▶ Clover established between the wheat but is in no way competing with it



Example Rotation

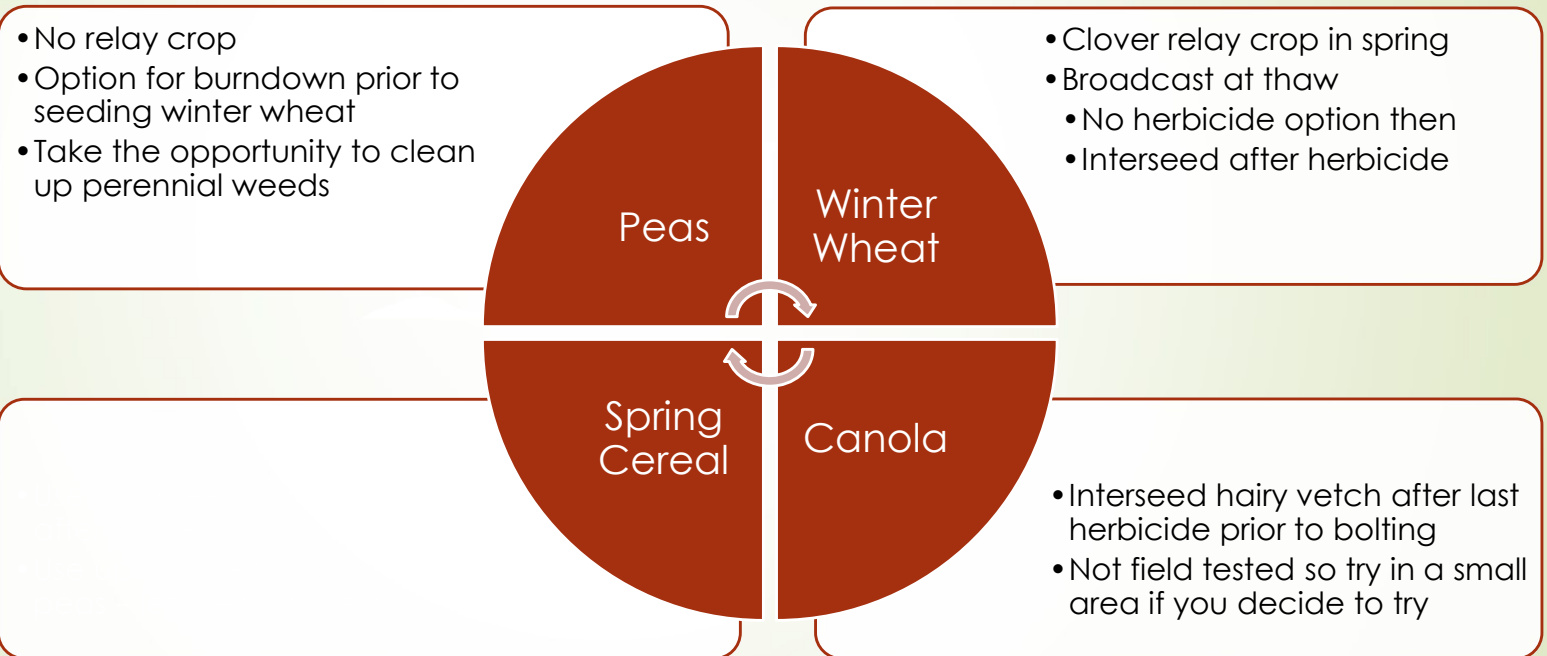
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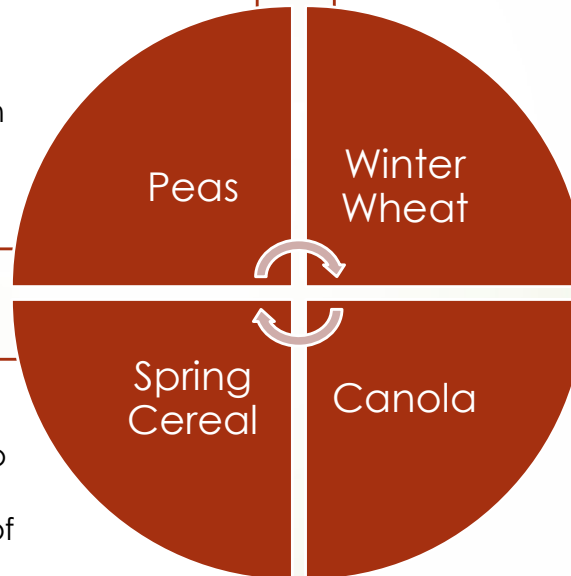
• No herbicide option in winter fall
• No herbicide option in spring
• No herbicide option in a small
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Example Rotation



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- Use volunteers as a relay crop after harvest
- Use up nitrogen in advance of peas – let them make it

- Interseed hairy vetch after last herbicide prior to bolting
- Not field tested so try in a small area if you decide to try



Summary

- ▶ Building carbon in the brown soils must be seen as a marathon, not a sprint
 - ▶ You will be passing on an improving resource to the next generation
- ▶ Moisture will be the biggest limitation and must be monitored
 - ▶ As carbon builds it will infiltrate and hold moisture better
- ▶ Carbon built up over millennia was depleted to provide nutrients
 - ▶ Nutrients will be needed – use the legacy first and then add more
- ▶ Transcript with references available at: www.plantsdigsoil.com/media

www.plantsdigsoil.com – podcast / newsletter / consulting
scott@plantsdigsoil.com – [403-654-3096](tel:403-654-3096) (mobile)