



Realistic Regenerative Nutrient Management

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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

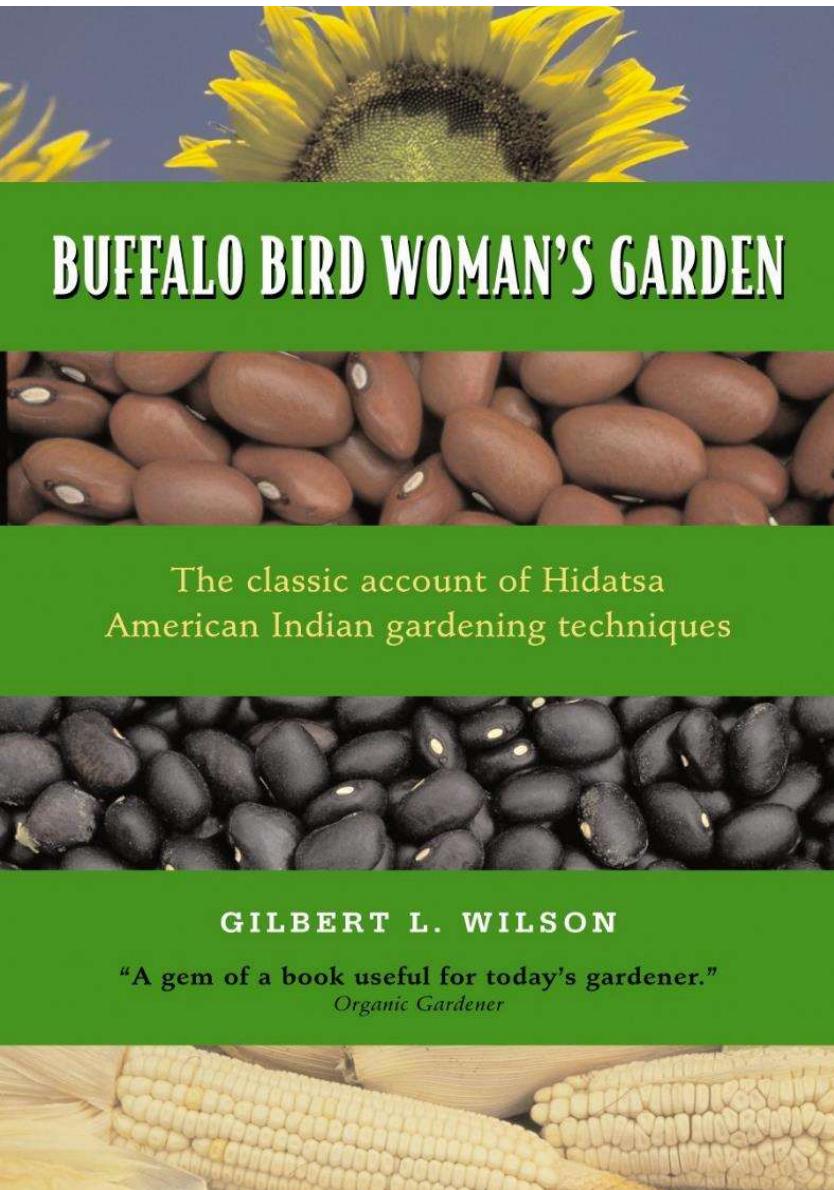




Human Management of the Soils

- ▶ 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

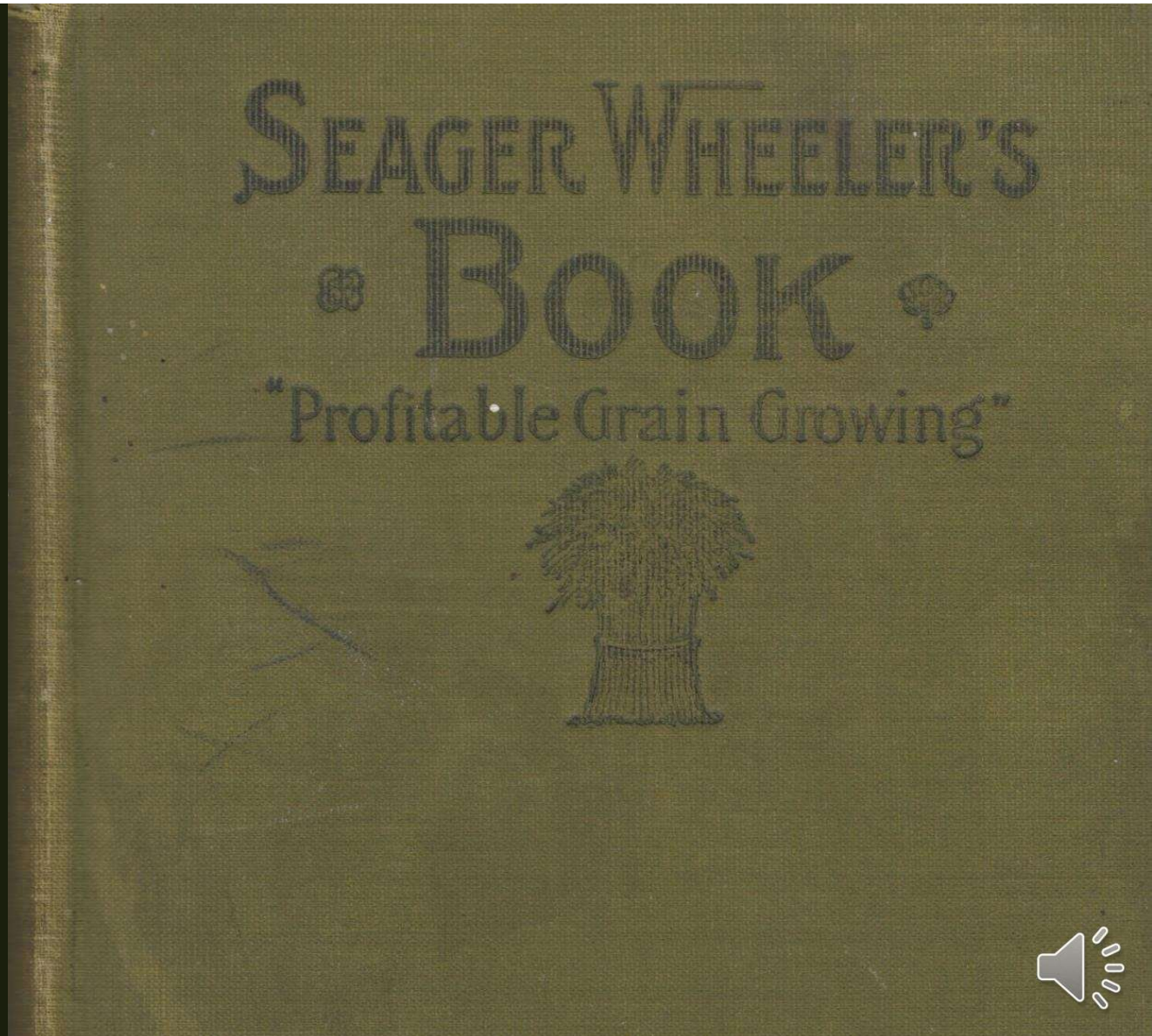
Buffalo Bird Woman

- 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



Three Pillars Propping Regenerative Agriculture

- Inflated expectations of microbial mining of soil particles
- Mining of the legacy nutrient applications
- Faulty accounting of nutrient flows



The screenshot shows the header of a Washington State University (WSU) website. On the left is the WSU logo. On the right, it says 'COLLEGE OF AGRICULTURAL, HUMAN, AND NATURAL RESOURCE SCIENCES' and 'CSANR Center for Sustaining Agriculture and Natural Resources'. Below this is a navigation menu with links for HOME, ABOUT, BLOG, PUBLICATIONS, GRANTS, PROGRAM AREAS, and EDUCATION. The main content area shows a breadcrumb trail: 'Home » How does regenerative agriculture reduce nutrient inputs?'. The article title is 'How does regenerative agriculture reduce nutrient inputs?' in bold. Below the title, it says 'Posted by Andrew McGuire | February 4, 2020'. A quote is displayed in a light blue box: '“When you start farming regeneratively, you rely a lot less on external inputs, such as fertilizers...” – Tom Tolpitt'. The article text begins with: 'One of regenerative agriculture's extraordinary claims is that it can drastically reduce or even eliminate nutrient inputs, fertilizers. How is this possible? The go-to explanation is often “soil biology” – revved up soil biology makes nutrients available that plants can't normally access. As it often the case, there is a bit of truth here. Regenerative ag can reduce inputs, and soil biology is involved along with other natural processes, but the whole truth may be much more ordinary.'

Microbial Mining of Soil Particles

- No mention anywhere in the book of microbial rates

Other sources:

- Dr. Monika Gorzelak from AAFC Lethbridge could not find any rates in literature searches

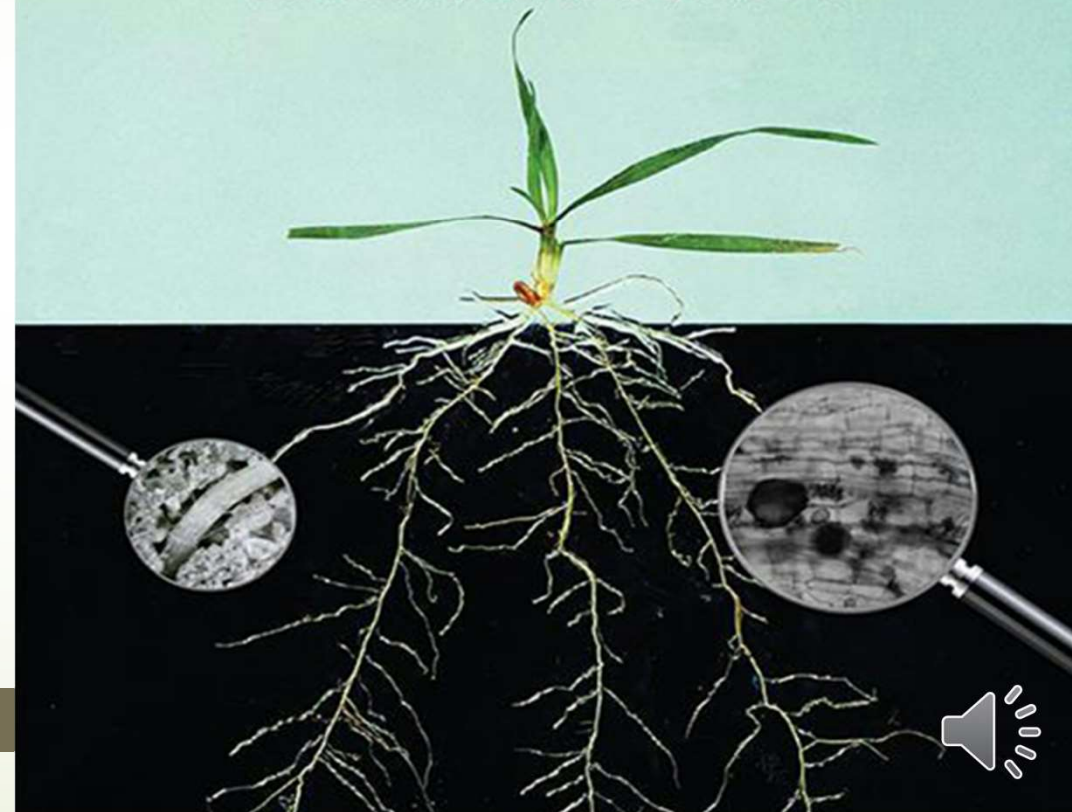
- Dr. Andrew McGuire says it may be higher than previously thought but nowhere near export rates for annual cropping systems.

#RealisticRegenAg

Functional Diversity of Mycorrhiza and Sustainable Agriculture

Management to Overcome Biotic and Abiotic Stresses

Michael J. Goss, Mário Carvalho, Isabel Brito



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%
- ▶ Dr. Cynthia Grant – 15-30% of applied phosphorus goes to current cash crop
 - ▶ Rest of crop's supply comes from soil test P and the weakly bound P coming back into the soil solution



“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
- Using the legacy phosphorus is a good way to use excess nutrients but it's not a sustainable way



Faulty Accounting of Nutrients

Crop	Yield (bu/ac)	Nitrogen (lb/ac)	Phosphorus (lb/ac)
Peas	50	0	35
Wheat	40	60	25
Canola	35	65	35
Barley	60	60	35
Total	---	185	130
Average	---	47	33
Cow-Calf Grazing	1 pair / 5ac	2	1





Regenerative Nutrient Management

- ▶ Buffalo Bird Woman used fallow and depleted nutrients for farming
- ▶ However the time scale and the amount of people made it regenerative
- ▶ If it were farmed for 50 years and then left for 500 years it could regenerate

The only way that I can see our farming to get truly regenerative is to cut the exports of nutrients off the land to match what we can import.



Regenerative Nutrient Management

- ▶ Celebrity farmers and ranchers appear to have massive success
 - ▶ They have converted to a grazing based system which cuts nutrient exports
 - ▶ They can afford to do this because they:
 - ▶ Direct market to consumers
 - ▶ Vertically integrate the processing, distribution, and wholesale side of the business
- ▶ Cash crop farming whether grain or hay exports much more nutrients
 - ▶ Some stays here but most harvested crops end up across the ocean
We can't get the manure (or sewage) back
 - ▶ Use manure/compost if you have it nearby; don't be afraid to use urea & MAP





Cover Crops

- ▶ Living roots as long as possible are a great way to start
 - ▶ Moisture must always be monitored so as not to hurt the cash crop
 - ▶ In the very dry areas there will be years when no cover crop is possible
- ▶ Priority #1 is always to hold onto the soil
 - ▶ If your soil is blowing it really doesn't matter what is going on below the surface
- ▶ Priority #2 is scavenging nutrients, unlocking legacy P, & fixing N
 - ▶ Seed costs can quickly get higher than the nutrient return



Cover Crops

- ▶ Monoculture vs Diverse Mixture
 - ▶ In 9 of 10 studies no statistical difference
 - ▶ In the remaining 1 of 10 studies the statistical difference was **in favour of the monoculture** over 80% of the time





Supercharging The System

- ▶ Wide row cropping – started with 60" corn (yes – 5' row spacing)
 - ▶ Sacrifice some yield on the cash crop
 - ▶ Tend to gain 2-3x the amount of cover crop biomass
 - ▶ Works well when animals can graze the residue & cover crop in the winter
- ▶ Biostimulants & Humic Acids
 - ▶ Not worth the money – yet.
 - ▶ Must do better than native biology and/or hold nutrient more efficiently
- ▶ Top up your hail insurance
 - ▶ Don't put any money into rescue products (well proven there is no value)
 - ▶ Instead – be happy – you are getting paid to grow a green manure crop!



Summary

- These soils took millennia to develop and supported humans for just as long
- Fertilizer was able to replace what can't be cycled back into the system.
- Regenerative agriculture is using this legacy fertilizer
 - It thinks it is mining new nutrients from the soil particles, but the rate is much too slow
 - Eventually it will need to replace them and/or drastically cut the exports.
- Cost effective monoculture cover crops are as good or better than cocktails
- Transcript with references available at: www.plantsdigsoil.com/media

www.plantsdigsoil.com – podcast / newsletter / consulting

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