September 28, 2021

A grass is not a grass and a weed is not a weed

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Join me on an un-scientific discussion on how I adjusted a grazing schedule on a highly invaded rangeland to utilize heavy density areas of spotted knapweed and other weeds as a resource instead of avoiding the area. Recent research has suggested that Spotted knapweed is more palatable to cattle than previously thought and is significantly more nutritious than graminoids during early summer. By paying attention to the grass and weed species on a range we can improve forage utilization, range health and employ some weed control just by grazing cattle at the appropriate time.

October 5, 2021

Restore into the future: selecting plant material for post-fire restoration in the Great Basin

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Post-fire restoration is an important practice to counter the positive feedback loop of cheatgrass invasion and wildfires. However, with projected increase in drought frequency and cheatgrass abundance, what is planted now may not survive in the future. To brace for anticipated environmental changes, we may need to select plants pre-adapted to future environmental conditions. We are conducting a common garden experiment at the Northern Great Basin Experimental Range in Oregon to test this hypothesis. Our preliminary results indicate that bottlebrush squirreltail (*Elymus elymoides*) seeds sourced from drier sites have higher seedling success rate when grown in a common garden than seeds from local or wetter sites.

October 12, 2021

Virtual Fencing: The Future of Livestock Management

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The British Columbia Cattlemen's Association has partnered with A4 Systems, TELUS, and Two Story Robot to develop and test prototype virtual fencing technology in conventional range and pasture settings in British Columbia.

The Problem: Increasing costs and intensive labour requirements associated with fencing large areas of remote and rugged terrain for the purposes of livestock management. Concurrently the public has become increasingly engaged and critical of the environmental impacts, whether real or perceived, of beef production in British Columbia.

The Solution: A 'made in Western Canada' virtual fencing product with functionality both within and outside of cellular service, takes advantage of existing cellular and satellite infrastructure. Virtual fence boundaries will be established and maintained by the rancher/ranch manager through a programming interface via a combination of GPS technology and LTE networks. Physical collars placed on cattle will enforce this virtual fence system through audible alarms and electric pulses delivered by the collar.

This technology will:

- Reduce conflict, costs, and labour associated with building, replacing, and maintaining physical fences
- Improve stewardship, enhancing environmental and social values

This will allow industry to address large and reoccurring fencing costs in a novel way by providing fire and flood proof virtual fencing, supporting economic recovery following wildfire events.

2021 represents Phase 1 of this project and is focused on technology development and assuring utility on cattle in conventional range and pasture settings in British Columbia. This will see the development and deployment of 15 prototype collars for testing in partnership with Thibeault Ranch in Cranbrook, BC. Prototype testing will occur over September 2021, and preliminary results relative to technology efficacy and animal health and welfare considerations will be presented

October 19, 2021

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Ross Range and Reclamation Services

Forest ingrowth and encroachment continue to reduce the size of the grazable area in many pastures on Crown range in the Rocky Mountain Trench. Ecosystem restoration treatments have been touted as the long-term solution to the problem. However, increases in forage production, forage quality and grassland condition are needed in the short-term on existing grasslands. The project is designed to investigate the efficacy of range fertilization to increase forage production and forage quality, and improve range condition on grasslands in the Grassland, Ponderosa Pine and Interior Douglas-fir bio-geoclimatic zones.

The project was initiated on five sites on Crown Land in the St. Mary's Prairie Range Unit, which is located east of Kimberley, BC. Pre-treatment monitoring described the existing plant communities, evaluated grassland condition, determined forage production, described forage quality and determined soil fertility. Control and treated areas were established at each site. A fertilizer blend was developed to correct for soil nutrient deficiencies. The fertilizer treatment was applied in June, 2019.

The most common bunchgrasses encountered at these sites were Idaho fescue, bluebunch wheatgrass and needle-and-thread. Other bunchgrass species included prairie Junegrass, rough fescue, Columbia needlegrass and Sandberg's bluegrass. Bunchgrass frequency increased from 73% to 100% between 2018 and 2020.

Other grasses include Canada bluegrass, Kentucky bluegrass, slender wheatgrass, western wheatgrass, western needlegrass and smooth bromegrass. Frequency decreased from 53% to 25%.

The most prominent native forbs were graceful cinquefoil, silky lupine, rosy pussytoes, timber milkvetch and daisy species. Native forb frequency was similar among years. Invasive forbs include silvery cinquefoil, sulphur cinquefoil and mustard species. Invasive forb frequency was similar among years.

Total forage production at treated sites averaged less than 340 kg/ha in 2018, but increased to 970 and 1700 kg/ha in 2019 and 2020, respectively. Bunchgrass production responded to the year and grazing treatments, but did not show a fertilizer response. Other grasses production responded to the fertilizer treatment as well as the year and grazing treatments. Forb response was similar to bunchgrasses. No increases in production were detected for invasive species. Growing season precipitation and distribution may have affected fertilizer response as it was 79% of the long-term normal in 2018, 122% in 2019 and 65% in 2020.

The fertilized areas attracted grazing animals to the sites. Forage use of total production averaged 50% among sites at both the control and treated areas in 2019. Forage use averaged 60% when the invasive species contribution was excluded. In 2020, forage use was 39% at the treated sites and 26% at the control. With invasive species excluded forage use was about 40% of total production at both the control and treated sites.

Foliar analysis determined that the average nitrogen content among sites was 0.96%, 1.36% and 0.90% for bunchgrasses, other grasses and forbs, respectively, in 2018. Post-treatment data show levels have risen to 1.7%, 2.1% and 2.2% for bunchgrasses, other grasses and forbs, respectively. These data indicate that crude protein levels were approximately 10 to 13%, exceeding maintenance level forage quality for beef cattle. The Ca:P ratio is adequate for ungulates that are grazing bunchgrasses, other grasses and forbs. Potassium levels were higher in 2019, exceeding maintenance levels for bunchgrasses, other grasses and forbs.

Evaluating which ecosystem restoration treatments have been successful in restoring grassland ecosystems is critical. It is necessary to confirm the effectiveness and efficiency of these treatments to fully ensure whether project objectives are being met and to enable an adaptive management approach to grassland ecosystem restoration operations. This project makes a valuable contribution to the knowledge base required to successfully manage rangeland values.

October 26, 2021

Response of rangeland plant species to different sources of mycorrhizal inoculum

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Rangelands in the intermountain West have faced multiple types of disturbance such as wildfires, overgrazing and an increase in exotic annual grass invasions, which degrade the plant cover. An alternative to reestablish the native plant cover is a restoration program. However, exotic annual grasses have currently changed many of the successional processes and any restoration project require a different approach to be successful. Two tools that are gaining a lot of interest are the utilization of biochar and arbuscular mycorrhizal fungi (AMF). However, a lack of knowledge regarding AMF inoculation makes this approach complicated, particularly its effect on the invasive species. We tested 3 different sources of AMF inoculum (commercial AMF inoculum, AMF from an early seral ecosystem, and AMF from a late seral ecosystem) with and without addition of biochar on its ability to colonize and influence growth on one late seral species (*Pseudoroegneria spicata*), and two early seral species (*Taeniatherum caput-medusae*, and *Ventenata dubia*). We expected that colonization and biomass production of each different seral species will be better on their respective AMF seral source. Ignoring biochar treatments, colonization of *P spicata* and *V. dubia* followed our original hypothesis: *P. spicata* colonization was greater on late seral soils, while for *V. dubia* was greater in early seral soils. In general, both *V. dubia* and *T. caput-medusae* were the species that produced more biomass along treatments. Biomass production was not significantly affected by colonization or biochar applications. These differential results might indicate that each different species is adapted to different mycorrhizal communities conditioned by the seral status and possibly hidden nutrient gains.

November 2, 2021

Testing Targeted Cattle Grazing to Suppress Spotted Knapweed

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Invasive species pose a significant threat to the livelihood of British Columbia (BC) ranchers. Spotted knapweed (Centaurea stoebe), in particular, can reduce native plant diversity, form dense monocultures and overwhelm the native seed bank. Integrated rangeland management strategies are therefore needed to suppress weeds and restore ecological function as a whole. Our research took place in Merritt, BC, and tested the efficacy of targeted cattle grazing to help control C. stoebe in native, semi-arid rangelands. We found that targeted cattle grazing was effective in controlling C. stoebe seed production; cattle readily consumed C. stoebe at the late bud-flowering stage and reduced the number of mature seeds by 88% and seed heads by 79%. At the point of targeted grazing, C. stoebe also contained more crude protein and total digestible nutrients than the grass community. Research results will generate targeted cattle grazing protocols for C. stoebe control, and we will assess whether intensive grazing practices can create productive invasive-free rangelands in BC's Southern Interior.

November 9, 2021

Post-wildfire recovery of forest understory plant communities

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The record-breaking 2017 wildfire season in British Columbia caused significant impacts to forest ecosystems and the diversity of ecological, social and cultural values these ecosystems support. Since 2017, land-based recovery of these ‘mega-fires’ has focused on rehabilitating disturbed soils, replanting burnt and salvaged forest stands, and managing the impacts of cattle on recovering forested rangelands. However, there is a limited understanding of the impacts of wildfires on forest understory plant communities, particularly in the dry forest ecosystems in southern and central interior BC. To better understand these impacts, since 2018 we have partnered with St'uxwtéws (Bonaparte First Nation) to monitor understory plant recovery across elevation gradients and fire severities throughout the 2017 ‘Elephant Hill’ fire area. In this presentation we will share preliminary findings from this collaborative research, as well as guidance to inform ongoing forest, range and fire management in BC.