Action Plan for the International Year of Rangelands and Pastoralists (IYRP): The Case for the United States, Canada, and Mexico

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Abstract

The GAP analysis (A Case of Benign Neglect: Knowledge gaps about sustainability in rangelands and pastoralism) points to several gaps that are relevant to the US, Canada and Mexico. North American rangelands span the ecological continuum of polar to hot deserts and arid to humid climates that exhibit highly variable ecological and forage production potential across time and space. Although there is a great deal of rangeland research, extension, and inventory capacity in all three countries, a weak link is the dissemination of information to North American pastoralists (conventionally referred to as ranchers or producers). Although the extension system in the US and Canada are similar, there are distinct differences. Public lands in the US are managed at the national level by federal agencies (e.g., Bureau of Land Management and Forest Service) while private land management assistance is provided by the Natural Resource Conservation Service. In Canada, Crown land is managed by departments within each province and there is no national extension service. In Mexico, the majority of the lands are managed by local communities or ejidos, 15% are privately owned and managed and the remaining 5% is government owned. The three countries support national research organizations and have a well-developed system of colleges and universities that have range management or related disciplines containing staff that specialize in teaching and/or research (and cooperative extension at land grant universities within the US). All three countries must attempt to bridge gaps between an urban industrial society that is increasingly disconnected from extensive agricultural production on rangelands. Promoting ecological goods and services provided by rangelands is a relatively new paradigm for US, Canadian and Mexican research and extension. During the IYRP, the focus in the US, Canada and Mexico is likely to be in 2 directions; providing North American pastoralists/ranchers with the social license to continue to ranch or farm while educating the massive urban population about the sustainability, multiple uses, and benefits of ecological services produced on rangelands and native grasslands.

Introduction

The United Nations Environment Programme Gap Analysis (Johnsen et al., 2019) will act as a backbone for an International Year of Rangelands and Pastoralists (IYRP). It contains a general description for the United States, Canada and Mexico about gaps in information and resources required for the wise use and stewardship of rangelands. Prior to focusing on a GAP or group of GAPs it is important to understand the evolution of sustainability of North American rangelands and pastoralists/ranchers. Although there are several ways in which sustainability can be classified a conceptual discussion for the US, Canada and Mexico can be framed through the following sequence:

1. Production
2. Ecological
3. Social and Cultural (local community)
4. Societal (national and/or global)

The Search for Sustainability of North American Rangeland

Historically, production, ecological, and social and cultural facets of rangelands and pastoralists/ranchers have been sustained on a local scale. North America has developed in the last 500 years with a colonial philosophy that resulted in dramatic change from a mosaic of basic subsistence and sophisticated surplus based Indigenous societies to an agricultural production-based society dominated by people of European origin. African Americans and Indigenous peoples also contributed significantly to the development of North American ranching despite widespread discrimination (Katz 2019). An expansionist colonial ideology and perceptions of open land with almost unlimited production capability led to violent removal and subjugation of Indigenous populations followed by an explosion in livestock numbers throughout the western states and provinces, as well as throughout Mexico. Due to unregulated open access to grazing resources, and investment of foreign capital that incentivized mismanagement, overstocking at the

end of the 19th century resulted in overgrazing, loss of production and ecological capacity to such an extent that sustainability of a fledgling livestock industry was uncertain (Specht 2019). The majority of the damage to rangelands during this time was in the more arid and semi-arid regions of the United States west of the 100th meridian and Northern Mexico. Canadian and northern US rangelands were also overstocked, but the damage was mitigated somewhat by severe winters (livestock numbers were controlled) that were not a factor at lower North American latitudes and by the relatively shorter time frame of exposure because European invasion and settlement occurred at a later date. Range management as a discipline originated in the early 1900's.

The first goal of rangeland research was to reverse the downward trend in rangeland productivity and condition and return damaged rangelands to a suitable level of production. Stocking rate restrictions in western North America through legislative control probably occurred first in Canada. In 1881, through an Order in Council the Canadian government established a grazing lease system that was applied immediately to rangelands along the eastern slopes of the Rocky Mountains, in what is now southwestern Alberta. The lease system established the initial framework for leases throughout western Canada. Stocking rates, although high by present standards, were controlled by legislation and regulation. The Taylor Grazing Act provided the first permitted grazing leases and regulation of stocking rates in the United States in 1934, about the same time that control of natural resources was transferred from the Canadian federal government to the provinces in 1930. The management of the majority of public land rangeland in the western US has continued to be administered at the federal level mostly through the Department of the Interior (Bureau of Land Management and National Park Service) and Department of Agriculture (Forest Service). Canadian rangelands continue to be administered at the Provincial level. Stocking rate control and a grazing permit system administered by a government agency are strengths of North American regulatory systems. Length of lease tenure may be used as an incentive, reward, or penalty as deemed appropriate. Large scale rangeland assessments carried out in the mid 60´s in Northern Mexico (CFAN, 1965) reinforced growing concerns related to land degradation through overgrazing. These drivers, operating also in South and SW USA, led to ecosystem level shifts from perennial grasslands to desert scrub since the mid 1800's. Despite Mexico´s federal response of establishing carrying capacities, "índices de agostadero," the condition of grasslands has continued to decline. together with the rampant (largely illegal) land use change to crops (Poole et al., 2014).

Production stability of North American rangelands has improved slowly but steadily from the lows of the late 1800's. Improvements in production sustainability resulted in concomitant improvements in ecological sustainability. Research emphasis and extension into the pastoralist/ranching community from a more ecological viewpoint coincided with the founding of the Society for Range Management in 1948 (Sayre 2016). Research on the interaction of livestock grazing on watersheds and wild ungulate herbivores appeared in research journals in the 1950s. The discipline of Range Management adapted from a focus on improvements in production and began to take on the second prong of its character, ecological sustainability. That trend continues today, with more difficult to measure ecological contributors to rangelands becoming drivers of adaptive management decisions over time. This includes bird censuses that track grassland birds revealing their steep decline, an ominous sign for this ecosystem shared by all three countries. This worrisome trend has led to various binational and trinational multi-sectorial initiatives (e.g. Gauthier *et al*. 2003; Guzmán *et al*. 2012), the latest being the Grasslands Roadmap www.grasslandsroadmap.org. Past research and extension focus on reducing soil erosion has been augmented with current interests in the influence of soil microbiology on rangeland productivity and sustainability. Rangeland ecological research and extension have followed a scale trend from large, visible, and largely economic to small, difficult to measure and quantify, and in some cases where an obvious economic linkage has yet to be shown.

Throughout both the development of rangeland management and the use of knowledge by the North American ranching community there has also been an evolution in local social and cultural networks (local community). Early on, many Indigenous communities incorporated European-origin livestock into their cultures and economies (Iverson 1994) while Hispano communities maintained distinct cultural, land and livestock management traditions in the southwest (Peña 1999). African Americans brought livestock knowledge from Africa, helped establish ranching in the southeast (Sluyter 2012), and later founded numerous communities on the Great Plains, though many did not survive the Depression, Dust Bowl, and discrimination (Katz 2019). Euro-American family ranching evolved in the late 19th and early 20th centuries, displacing existing Indigenous communities. Community pillars that were once dominated by ranch families and staff (churches, community leagues, equipment dealerships, schools, eateries, etc.) have in some cases ceased to exist or amalgamated or assimilated into larger but farther apart entities.

As North America has developed the influence of agriculture in general and ranching in particular has declined. During the last century, urban populations have increased at a rapid rate, and even if rural

populations have remained stable, which few have, the population has shifted to become urban, urbanized, and/or industrialized. Agriculture in Canada and the United States contributes 2.1 and 1.2% of the national GDP, respectively, while this sector represents slightly over 4% of Mexico´s GDP (Trading Economics 2021). Change, and the need to adapt to change by North American ranchers, including the aging and de-population of rural areas, has led to the development of the social science and environmental side of range management by most western and Mexican agriculture-related universities as part of their academic core. That was not the case at the dawn of the discipline when producing and selling maximum pounds of meat from rangelands was often a primary goal.

Despite a wealth of knowledge generated by the North American rangeland scientific community (e.g. Derner and Augustine, 2016; Gauthier *et al.,* 2003) and extended to the ranchers through various agencies, associations, and NGO's at national to local levels, rangelands and ranchers are suffering from a wide variety of challenges. Invasive plants and animals, industrial disturbance, fragmentation, cultivation for annual crops and urban creep are a few examples of current problems that will affect rangeland productivity and ecological balance into the future. Complex interactions between all these factors and the short and long-term trajectories of climate change will require a continued and continual research and extension focus throughout US, Canada and Mexico´s rangelands. Although the issues vary by region, climate change will be a central theme driving research and extension.

A relatively recent focus regarding ranching communities is carbon sequestration. Throughout most of the settlement history in North America individual rangeland managers have mostly been concerned with challenges that are relatively local in extent and they adapted their operations to those local conditions based on local and traditional knowledge, applicable research and extension. Climate change and in particular the production of greenhouse gases (mainly through ruminant fermentation for rangeland livestock) and the potential to mitigate challenges in the atmospheric carbon cycle through carbon sequestration in rangeland soils and vegetation has burst into prominence. North American society is currently engaged in an active discussion that is pushing towards a choice between a demonstrable sustainable land use practice (grazing livestock on rangeland) and a new global paradigm that livestock grazing in general has negative effects on the earth's carbon cycle and the earth's climate.

This brings the discussion to the 4th level of sustainability; national and/or global societal impacts on pastoralists/ranchers from Canada, the US, and Mexico and to what will likely be a focus in preparations and outcomes for the IYRP. Although the North American system of rangeland research, extension, and advanced education has produced tangible effects on the sustainability of rangelands and pastoralists, there are structural issues. Cuts in funding at all levels has been a common practice in the three countries. Former Departments of Range Science in universities have amalgamated with Environment or Agriculture as they cannot stand alone in the current funding models. Range research stations have closed or been downsized, and extension agencies have been reduced, eliminated, or absorbed. An extreme example of this has played out in Canada in the last 10 years. The Prairie Farm Rehabilitation Administration, the Canadian equivalent of the Natural Resource Conservation Service was closed in 2012 after a series of cuts and absorption the previous 5 years. Although there are also cuts and vacancies in research, management, and extension positions in the US, the degree of change from the past appears to be thus far less than in Canada.

Reduced resources for range management throughout North America is happening at the same time when global concerns about the environment and the effect of agriculture on the environment are rapidly increasing. Public interest in ecological goods and services (EGS) and especially carbon emissions, sequestration, and atmospheric cycles is increasing. North American ranchers face a new and powerful detractor or opportunity, one that is taking the discussion directly to the urban consumer. Ranchers and farmers produce far more meat products than they consume; they are net exporters of food, mostly to urban areas within the continent. Although the US does export a small portion of its domestic beef production, it imports about the same amount mostly from Canada and Mexico (CEC, 2015). Market availability to ranchers is where past similarities between Canada and the US are likely to diverge, mostly because of the difference between populations (the US has about 10x the population that Canada has) and the size of the livestock industry in each country. Cattle population in western Canada is much larger than the demand for beef, meaning western Canada is export driven in terms of markets for beef; beef exports hover around 50% of production. All North American ranchers are subject to a marketplace that is mostly urban, with areas of low local human population but a large rangeland area (and therefore large red meat production) being most susceptible to a changing marketplace.

The Immediate Future

To varying degrees future research and extension directions will likely be largely driven by EGS. Of course, red meat production is an EGS and has a long history of sustainability and an

equally long history of research, teaching (university and college level), and extension. But carbon, and to a lesser extent other EGS, are driving current narratives for the importance of rangeland sustainability. The knowledge system on rangelands will likely be driven by ranchers (as in the past) but increasingly to respond to or challenge information being spread to the urban majority, who are the consumers of most red meat. It is a challenge for North American ranchers because they are engaged in a media scrum with a subset of the urban side of the population, the same demographic that is their primary marketplace. When the urban environmental movement points to the destruction of ecosystems that is eminent due to cattle ranching the livestock industry counters with messages showing how essential their industry is to rangeland sustainability (Irwin 2019). Hence, there is an opportunity for ranchers and pastoralists to promote the inherent value of proper rangeland management for sustainable livestock production in balance with multiple EGS. This will and has led to yet another term common in US and Canadian media: social license to operate. Social license to operate for the North American rancher is not a legal term; it bears little similarity to legal rules of rangeland use such as grazing dispositions on public rangeland or rigid standards put on the meat production chain. Social license is determined by the consumer and their willingness to purchase products. The consumer can and does choose alternate products based on their perceptions of the environmental sustainability of that products production process. Currently in North America there are numerous rangeland ranchers already engaged in capturing market share from an informed consumer base. The challenge for the informed consumer base is acquiring its information from a variety of sources, not all of which follow scientific rigor in developing conclusions. A common example is the proliferation of organic, ethically raised, regenerative agriculture (term implies that anything not claiming this label is suddenly ecologically damaging), and a myriad of other terms used to market to a niche portion of the consumer population. Recently, carbon sequestration has been a major topic in the social license to operate debate. Claims of healthier food resulting from organic production methods have not been conclusively proven in scientific literature (Novella 2016), proof of claims of regenerative agriculture resulting in 4-5 fold increases in soil organic matter (carbon sequestration) have been elusive (Ghosh and Mahanta 2014), and the advantages of grass-fed beef (higher polyunsaturated fatty acids (PUFA) and omega-3 fatty acids) are not enough to result in significant improvements in human health (Novella 2016). It appears that North America is at a time and place where extension and science are not always aligned. Although marketing claims may be proven by future research many current claims that are presented to and absorbed by the consuming public are ambiguous from a scientific standpoint.

Conclusion and Implications for an IYRP

There has been a long history of scientific study, extension, and instruction in sustainability of North American rangelands and pastoralists/ranchers. Rangeland Management as a science developed from a time of drastic overuse of rangelands and degradation in the late 19th and early 20th centuries. North America has moved through eras where production from rangelands, ecological stability of rangelands, and maintenance of ranchers social and cultural lifeways have been major topics of interest for research, extension, and education. The current situation is one where an interesting dichotomy exists between past pillars of sustainability and urban consumers which in the end may negatively impact the sustainability of ranchers and farmers. A reasonable conclusion might be that when marketing becomes a dominant avenue in rangeland extension an increase of scientific studies might hopefully become common place. The future, and a major general topic for an International Year of Rangelands and Pastoralists from a North America standpoint might be a catchup phase, where science and extension will either enforce, support, or deny current trends evident in marketing of goods and services from rangelands. The future will likely involve integrating and balancing the nexus of extension and science to support pastoralists'/rancher´s science-based social license to sustainably provide economic and ecological goods and services on the largest land type (rangelands) in the world.

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