Value Estimates Report

Prepared For

Alberta Grazing Leaseholders Association

Prepared By

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& Associates

July 2020

July 27, 2020

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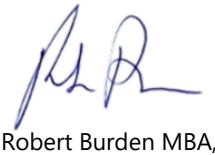
RE: VALUE ESTIMATES REPORT
OUR FILE #1371A20.1

We are pleased to provide the updated version of our work assigning economic values to the stewardship role of disposition holders on public land for the Alberta Grazing Leaseholders Association. Based on our own background research and the consultation process, we feel that the following is a comprehensive report on the economic values provided by grazing disposition holders.

We recognize that there are a significant number of challenges in this analysis, especially considering the complications that were a result of COVID 19. In addition, there are some differences in opinion as to the extent of the analysis and the project scope as outlined. It is our opinion that we have met the objectives for this specific project as outlined in the Letter of Engagement (LOE) dated February 20, 2020. On the other hand, there is little doubt that continual monitoring and reporting on the benefits of AGLA need to be a priority.

Please do not hesitate to contact me directly with any questions about the report.

Yours truly,
SERECON INC.



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1.0 Summary

Context

Crown lands in Alberta used for grazing include more than 8 million acres and are managed on behalf of the public by approximately 5,700 disposition holders. Grazing disposition holders have certain legislatively mandated legal requirements they must adhere to, many of which represent costs that otherwise would be borne by the province. The following report assigns economic values to the costs borne by disposition holders through their stewardship role on public land, developed through careful background research and stakeholder consultations.

Disturbance, either fire or grazing, is a necessary ecological function in Alberta's rangeland ecosystems. The Great Plains co-evolved with an historic disturbance regime dominated by bulk grazers in the form of bison. Given the insufficient numbers of wild grazers (e.g. bison, elk, and deer), and the liability issues associated with using fire as a disturbance tool, cattle are now the primary mechanism that provides this necessary ecosystem process. Modern rangeland management practices seek to imitate the disturbance patterns of the natural system by using well-managed livestock grazing to maintain ecosystem health.

There is significant interest on the impact of grazing on carbon storage and sequestration. However, it is critical to understand the specific stage of development of this information. While this information needs to be assessed and presented, it is critical that it be considered in context and used appropriately. The purpose of this document is to provide an objective opinion on rather than the development of science and a market.

Key Value Considerations

Grazing leases are the public land grazing instrument assessed in this report as they represent the most common grazing disposition found across Alberta. Other grazing instruments, such as grazing licences, grazing permits, head tax permits, and forest reserve grazing permits, were not assessed in this report as they represent different rights and responsibilities for the holders of those dispositions.

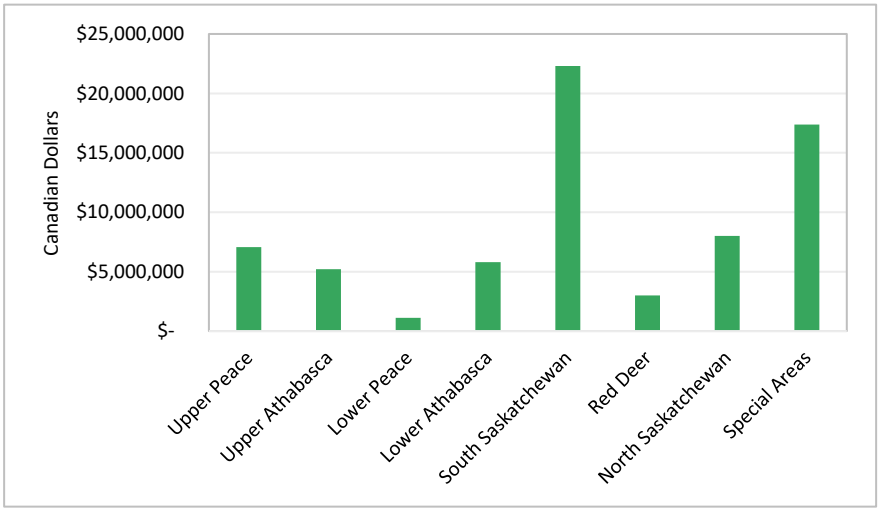
Consultations with leaseholders revolved mainly around overseeing recreational and industrial users, including oversight of reclamation activities. However, leaseholders also discussed the time spent managing invasive weed species, tracking species at risk on public land and offering various other value-added services to ensure that the land they oversee is managed appropriately. Leaseholders spent an average of 75 hours per year overseeing recreational access and upwards of 2 hours per day, 6 months per year spent on reclamation oversight, liaising with oil and gas companies, fixing fences, clearing filled cattleguards, and repairing road damage, all resulting from oil and gas activity on grazing leases. While these costs vary by region and individual operation, consultations revealed that leaseholders spend considerable time throughout the year managing these activities.

While the research on carbon storage, sequestration, and grazing is still developing, the value of carbon pools (carbon stored in the ecosystem) is increasingly becoming a priority for mitigating climate change. Conservation of existing carbon pools and

increasing carbon storage through effective management represents two tangible and positive impacts of grazing cattle on Alberta's rangelands. Carbon storage in rangelands and grasslands is primarily below ground in soil organic carbon and root matter. Using land for grazing livestock provides an opportunity for economic returns without converting the land to other uses with less carbon storage potential (CRSB, 2016). While we have chosen not to include the carbon sequestration value provided to the province by leaseholders in our total value estimates, at current carbon prices there is potentially an economic value. Using leading estimates on the tonnes of carbon per year being removed from the atmosphere by rangeland carbon sinks, we provide an example of how well managed grazing may contribute to an estimated economic value of $16 million in carbon storage. This figure has been provided as an example of how the grazing leases could be providing an economic value in the form of carbon storage, however, further research is required before any strong conclusions can be drawn, and thus we have not included carbon storage values in our final value estimates.

Not factoring in the potential value provided by leaseholders in the form of carbon storage and sequestration, this work concludes that $70 million in value is provided to the province of Alberta on an annual basis by leaseholders managing grazing on public land. Overseeing public land for the purpose of grazing cattle requires leaseholders to manage multiple uses, maintain fences, improve rangeland, develop watering systems and various other costs factors that are required to continue using the land in the manner as required by legislation and to effectively steward the resource. These legislative requirements have been carefully researched and outlined, to illustrate how the costs described in this document are legal requirements for using the land, and include services provided to the province by public land grazing leaseholders. The total value estimates for each region are broken down in Figure 1 below.

Figure 1: Value Provided to Province



Source: Own estimates
Note: Above estimates do not include grazing fees.

Report Structure

The following report begins with an introduction, moves onto the literature review, provides an overview of the results from the stakeholder consultations, and finishes with the value estimates. The value estimates section provides a detailed breakdown of the methodology behind the estimates to ensure that the results are sound and replicable.

2.0 Literature Review

2.1 Introduction & Purpose

Crown lands in Alberta used for grazing are comprised of over 8 million acres under various forms of dispositions, managed by approximately 5,700 disposition holders. Grazing disposition holders have certain legal requirements that they must adhere to for the duration of the term of the disposition, many of which represent costs to the disposition holder that otherwise would be borne by the province.

Although the province outlines legislative requirements that disposition holders must meet, it also employs a stewardship model to incentivize management above those requirements. A component of this stewardship model is adaptive management and the ability to provide input on land use decisions, such as recreational access and industrial exploration/use.

The multiple use pressures on public lands and their cumulative effects represent challenges the disposition holder must manage their operation around while endeavouring to properly steward range and riparian resources. The cumulative effects management services provided to the people of Alberta by public land disposition holders requires significant collaboration between all parties.

It is critical to understand that the purpose of this report is to use the best information available in order to objectively assess the net benefit of public land grazing lease utilization. For this purpose, we have assessed and presented the scientific information currently available and provided our objective opinion of the scientific outcomes.

2.2 Rangeland Ecology

Rangelands are complex ecosystems, and their health and function are affected by many variables, both environmental (timing and amount of precipitation, growing season length and temperature, etc.) and those related to land use decisions, such as industrial use, stocking rates, grazing intensity, etc. Successful management of the rangeland resource depends on effective management of these variables, their interactions, and the cumulative effects of them on the resource. The importance of stewardship to manage these complex ecosystems is outlined in Alberta's Grazing Lease Stewardship Code of Practice, which outlines many of these variables and management strategies to address them (Alberta Sustainable Resource Development, 2007).

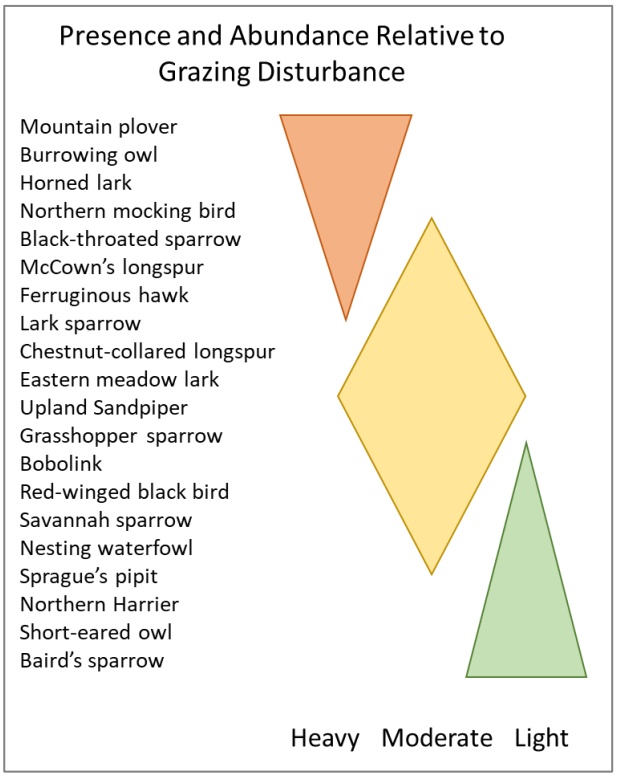
Alberta's rangelands developed under an historic disturbance regime dominated by grazing and fire, where grazing is a vital ecosystem process that maintains health and function (Dormaar et al., 1997; Morgan, 1980; Willms et al., 2002). Disturbances were historically non-uniform and provided a patchwork of habitat types supporting an array of wildlife species that co-evolved with this disturbance regime. Some wildlife species prefer habitat with a high disturbance impact at an early seral stage, while other wildlife species may prefer habitat with little to no disturbance that are at late seral/climax stages, and a large number prefer an intermediate amount of disturbance. Due to the differences in wildlife habitat requirements across species, there is no universal

grazing approach that would benefit all wildlife, although severe and widespread overgrazing is generally harmful to most wildlife species (Krausman et al., 2009).

An example of this is seen in the habitat requirements of grassland birds. These indicate that it is important to maintain a mosaic of habitat types across the landscape, where some species prefer lightly used grasslands, others heavily disturbed habitat, and a number find their preferred habitat in areas of moderate disturbance (Adams et al., 2004; Bock et al., 1993; Krausman et al., 2009; Prescott et al., 1993).

Observation of bird species in prairie grasslands (Figure 2) indicate that they evolved and adapted to variation in grazing intensity and timing.

Figure 2: Observations of Bird Species in Prairie Grasslands



Source: Adapted from Bock et al. 1993, Prescott et al. 1994 and Adams et al., 2004

Modern rangeland management practices seek to imitate the disturbance patterns of the natural system by using well-managed livestock grazing to maintain native rangeland ecosystem health. Additionally, tame pasture systems and forested rangelands that include range improvements (broken and seeded pastures) provide habitat heterogeneity through disturbance across the landscape, and provide enhance forage resources with subsequent benefits to wildlife.

In Alberta, cattle are now the primary tool used to provide grazing disturbance to rangeland ecosystems as fire is no longer a socially acceptable and appropriate tool, and wild grazers (e.g. bison, elk, and deer) are not abundant enough, and do not fill the appropriate niche (Great Plains rangelands co-evolved with bulk grazers in the form of bison) to provide necessary disturbance pressure required for maintaining rangeland ecosystem health. In cases where grazing is removed reductions in biodiversity values and habitat heterogeneity have been found (Fuhlendorf & Engle, 2001; Henderson & Davis, 2014). This relationship has been documented in Alberta, where grazed areas were found to exhibit higher levels of plant diversity than non-grazed areas (Lyseng et al., 2018) and moderately grazed areas expressed higher diversity relative to heavily grazed or light/non-grazed areas (Bai et al., 2001), both demonstrating that biodiversity is higher under some level of grazing relative to no grazing.

Alberta's rangelands include habitat for much of the province's species at risk (Species at Risk Registry, 2020). Critical grassland habitat for species at risk represents the same areas used for livestock grazing, leading to the perception that livestock are responsible for their decline in numbers. However, livestock use in these areas represents an economically viable land use compatible with maintaining native ecosystems, resulting in conservation of critical species at risk habitat rather than development and changes in land use, such as conversion to annual cropping, that are not compatible with maintaining species at risk habitat (Carlyle, 2019; CRSB, 2016; Rimbey et al., 2015).

The successful long-term management of Alberta's rangelands was recognized in the South Saskatchewan Regional Plan (Government of Alberta, 2017), which highlighted the historic and continuing stewardship role that livestock producers have on biodiversity conservation on private and public grazing lands, noting that:

> *'…carefully managed cattle grazing and traditional ranching practices on long-term grazing leases contribute to the ecological health of large tracts of the continent's finest remaining native grasslands. Good stewardship and proper grazing management has helped to retain much of the existing healthy native and intact rangelands.'* (pg. 62-63)

Grazing dispositions are a time-tested mechanism to conserve rangeland landscapes and their ecological goods and services. Grazing disposition stewardship is unique as management of the resource depends on the disposition holder.

2.3 Carbon

Climate change discussions have generally focused on carbon emissions as carbon is the most abundant greenhouse gas contributing to climate change (IPCC, 2014). Rising carbon levels are well documented, and an understanding of carbon pools and their value in climate change mitigation is becoming priority as climate change becomes a larger concern globally (Betts, 2000; IPCC, 2001; Petit et al., 1999). Discussions on soil carbon storage describe both: (1) conservation or (2) sequestration. Conservation refers to maintaining the current carbon stores, while sequestration is the rate at which carbon is added to existing pools by plant and microbial processes (Harrower, 2014). The most effective carbon storage approach is

through conservation of existing carbon pools, a strategy directly related to land use decisions.

Carbon storage and in rangelands and grasslands in particular is primarily below ground in soil carbon and root organic matter, and represent significant sinks where carbon is stored in a more stable form than in forested ecosystems (Burke et al., 1997). Carbon stored in rangelands is not as susceptible to loss from stochastic events such as drought, fire, or disease because of its below ground nature.

Soil organic carbon is reduced by between 30-50% when land is cultivated (Burke et al., 1995; Lal, 2002) and declines in soil carbon have been found when native rangelands are converted to introduced perennial forages (Whalen et al., 2016). Using land for grazing livestock provides an opportunity for economic returns without converting them to other land uses with less carbon storage potential (CRSB, 2016).

Carbon storage in rangelands is linked to the historic ecological processes of grazing and fire disturbance (Harrower et al., 2012; Teague et al., 2013). Specific adaptations to grazing disturbance and resource (moisture and nutrient) limitations has resulted in much of rangeland plant resources directed to producing deep and extensive root networks that contribute significantly to soil carbon storage through root turnover and above ground litter deposition (Follett et al., 2001; Jackson et al., 1996; Silver et al., 2010).

Across the literature grazing effects on soil carbon pools have shown varied results, some indicating that grazing increases soil carbon, others that grazing decreases soil carbon, and others showing no effect (Derner & Schuman, 2007; McSherry & Ritchie, 2013). A recent meta-analysis undertaken in Canada's prairie region illustrated that grazing increased soil carbon, providing a carbon sink that removed CO_2 at an average rate of 0.19 tonnes/ha/year with net carbon storage estimated at 5.64 tonnes/ha across the Canadian grasslands (Wang et al., 2014). A large-scale study in Alberta used 108 long-term exclosures across six natural subregions to compare soil organic carbon on grazed vs. non-grazed sites and found that moderate grazing resulted in an average increase in soil organic carbon concentrations by 12% in the upper 15cm of the soil (Hewins et al., 2018). Soil organic carbon concentrations varied from an average of 15.6 g/kg (upper 15cm of soil profile) in the Dry Mixedgrass Natural Subregion to an average of 56.4 g/kg in the Montane Natural Subregion, representing significant carbon stores across Alberta's rangelands (Hewins et al., 2018).

The research on soil carbon storage and sequestration and the impact of grazing is still in its early stages, and as a result we are unable to draw strong conclusions regarding the economic value generated by grazing cattle on grasslands across the province. However, there is potentially greater economic value being generated by leaseholders through the carbon sequestration benefits grazing cattle could have on public lands. For example, current carbon pricing in Alberta prices CO_2e (carbon dioxide equivalent) at $30 per tonne in 2020 (Greenhouse Gas Pollution Pricing Act, 2018). Based on the estimates from Wang et al. (2014), that maintaining the carbon sinks in the prairie region removes CO_2 at an average rate of 0.19 tonnes/ha/year, and the current price of carbon ($30/ton), we provide the following broad example:

$$Grazing\ Leases\ (GRL) = 2{,}063{,}178\ hectares$$
$$Special\ Areas\ = 760{,}785\ hectares$$
$$SUM = 2{,}823{,}963\ hectares$$

$$Estimated\ Annual\ Value\ of\ Carbon\ Sequestration = 2{,}823{,}963_{ha} \times 0.19_{tons/ha/year} \times \$30_{\$/ton}$$
$$Estimated\ Annual\ Value\ of\ Carbon\ Sequestration = \$16\ Millon$$

However, more research is needed on the regional differences in carbon sequestration potential, and the viability of a carbon market before strong conclusions can be drawn between grazing livestock and carbon values. In this way, while we strongly believe there is economic value being generated through the benefits of carbon storage and sequestration generated by grazing cattle on public lands, but we have chosen to focus the quantitative elements of this report on those economic variables that are well documented and measurable, which have allowed us to generate strong conclusions on the economic value being generated by leaseholders. The $16 million calculation above is simply to illustrate how grazing cattle on public lands could potentially be providing greater value to the province, but further work is needed in this field.

2.4 Economic Considerations

There is a perception that public land grazing opportunities are subsidized by taxpayers, with comparisons made to fees charged for private land grazing opportunities and the discrepancy in cost between private and public fees a point of criticism. Although this discrepancy may appear substantial at first blush, these comparisons do not take into consideration the differences in rights, services, regulatory requirements, and costs associated with public land management unique to public land grazing dispositions (Bartlett et al., 2002).

Studies have shown that private pasture rental fees often include significant 'landlord services', such as development and maintenance of fences and facilities, watering developments, and even livestock care, comprising approximately 30% of the average rental cost (Fowler et al., 1986; Rimbey et al., 1992; Torell & Fowler, 1992). Lease rate studies used to estimate the market values of New Mexico State Trust Lands (similar to provincial Crown lands as they are held and administered by the state) found that landlord services on private lands comprised approximately 30% of the average rental rate (Torell & Fowler, 1992). A comparable study in Idaho noted the value of landlord services on private land to average between 36%-39% of the average lease rate (Rimbey et al., 1992).

In addition to this discrepancy in services, higher non-fee grazing costs have been found on public lands (Alberta Environment and Parks, 2017; Bartlett et al., 1993; USDI/USDA, 1977). Cost surveys illustrate the additional costs undertaken by public land lessees to fulfill the obligations required by the Crown that are not required on private lands. Review of these results has shown that the cost of managing livestock on a per unit basis is as much or more on public lands than on private lands due to the additional requirements borne by public land lessees (Alberta Environment and Parks, 2017; Bartlett et al., 1993; Rimbey & Torell, 2011; Van Tassell et al., 1997; Whittlesey et al., 1993).

Private pasture rates in Alberta vary widely (Alberta Agriculture and Forestry, 2020), as do the responsibilities of the lessee and the landowner. There exists a full spectrum, with one end where the landlord may be responsible for everything, from pasture upkeep, infrastructure maintenance, water, tax payment, etc., along a gradient to situations where the lessee takes on responsibility for all costs and upkeep. In areas of high value and interest the tenant may be responsible for all developments, maintenance, and taxes.

In Alberta, private pasture rental fees are not formally recorded, but voluntary custom rate surveys are undertaken on a regular basis to assess private rates. These often have a wide range of responses and small sample size. The most recently available was undertaken in 2019 with a sample size of 19 respondents. In 2019, private pasture rental rates varied between a maximum of $45.00/AUM and a minimum of $0.32/AUM, with a median rate of $23/AUM. The 'Alberta Public Land Grazing Lease 2016 Cost Survey Results' report found that the average total public land grazing costs for holding a public land grazing disposition in Alberta was $42.52/AUM (Alberta Environment and Parks, 2017).

The economic costs of grazing on private of public land are differentiated by the what the lessee receives in exchange (Table 1). On private land, the lessee pays a grazing fee and receives the rights to access the land and graze cattle. On public land, the lessee pays a much smaller grazing fee relative to what they would pay on private land; however, they are then required to develop and maintain infrastructure and water sources, manage invasive species, and many other additional costs.

Table 1: Comparison Matrix – Public vs. Private Land Grazing Fees and Costs

Private Land		Public Land	
Lessee Pays	**Lessee Receives**	**Lessee Pays**	**Lessee Receives**
Grazing Fee	Grazing rights	Grazing Fee	Grazing Rights
	Infrastructure & infrastructure maintenance	Cost & time to build & maintain infrastructure	Occupancy Rights
	Water sources & maintenance	Cost & time to develop & maintain water sources	
		Cost & time to manage invasive species	
		Cost & time to engage with industrial users	
		Cost & time to engage with recreational users	
		Cost & time to engage in conservation efforts	

Source: Adapted from Public Lands Council (2014).

Similarly, in 2010 an analysis was undertaken by Rimbey and Torell (2011), which found that the total cost for public land grazing on lands administered by the Bureau of Land Management and the USDA Forest Service was $33.24/AUM, while comparable private land costs were $32.04/AUM. Another large scale study by Van Tassell et al. (1997) used 394 data points across Idaho, New Mexico, and Wyoming, to determine that 34% of cattle producers on Bureau of Land Management land, and 62% of cattle producers on Forest Service Land paid more to graze public lands than comparable privately leased lands when total costs were taken into account. Total non-fee grazing costs were estimated at $15.41/AUM for cattle on Bureau of Land Management lands and $21.98/AUM for cattle on Forest Service Land, in comparison to an average cost of $19.04/AUM on privately leased lands, including the private lease rental rate. Nearly all cost categories were higher on public lands than privately leased lands.

A project by the Ranchers Stewardship Alliance (2013) reviewing the value of native grasslands included an assessment of stewardship management costs of private or publicly owned native grasslands in the Great Plains managed for the purposes of conservation. These properties are not managed for livestock production, but rather for biodiversity and conservation purposes. This assessment found that the average cost to effectively steward these lands ranged between $5.20 to $13.88 per acre, with an average of $7.96 per acre. Much of these costs were associated with infrastructure maintenance, weed control, restoration, and other property maintenance costs. Good stewardship requires inputs, and a lack of management would result in degradation of these lands and the conservation/biodiversity values they provide.

Alberta differs from other Canadian jurisdictions with large Crown land grazing programs in that fencing and improvements are paid for and owned by the disposition holder. In other jurisdictions the Crown purchases either materials or funds materials and labour for infrastructure developments and owns all infrastructure. This represents a significant capital investment on the part of the Albertan grazing leaseholder in infrastructure that is used for the effective stewardship of public lands, and a considerably different requirement than in other jurisdictions.

Holders of Crown grazing dispositions operate on lands with a multiple use mandate, and are required to maintain public land, manage recreation and industrial access, and ensure that lands meet stewardship standards as a condition of their disposition. These activities and requirements are undertaken at their cost and are generally not requirements borne by private land grazing lessees. Cost survey data illustrates that when the full scope of costs are considered it becomes apparent that there is significant economic value above and beyond the grazing fee provided by public land grazing disposition holders. This report will assess those costs.

2.5 Summary

The review has demonstrated how modern rangeland management practices use well-managed livestock grazing to maintain rangeland ecosystem health. As fire is no longer a socially acceptable and appropriate tool, and wild grazers are not abundant enough to provide necessary disturbance pressure required, cattle are now necessary to maintaining a healthy rangeland ecosystem.

The literature review also included a section on carbon. It shows that the most effective carbon storage approach is through conservation of existing carbon pools, a strategy directly related to land use decisions. However, grazing effects on soil carbon pools have demonstrated varied results, some indicating that grazing increases soil carbon, others that grazing decreases soil carbon, and others showing no effect (Derner & Schuman, 2007; McSherry & Ritchie, 2013). As the science on carbon and cattle grazing is inconclusive, we have not incorporated carbon values into our final value estimates.

The final section focused on Economic Considerations underpins the value estimates produced in this report. Holders of Crown grazing dispositions operate on lands with a multiple use mandate, and are required to maintain public land, manage recreation and industrial access, and ensure that lands meet stewardship standards as a condition of their disposition. These activities and requirements are undertaken at a cost to the leaseholder. The cost survey data used to produce the value estimates in this report demonstrate that when the full scope of costs are considered it becomes apparent that there is significant economic value above and beyond the grazing fee provided by public land grazing disposition holders.

The remainder of this report is broken down into two main sections. The following section outlines the results from the stakeholder consultation process and the final section present the value estimates.

3.0 Stakeholder Consultations

3.1 Overview & Purpose

The following section gives an overview of the stakeholder consultations. The purpose of the stakeholder consultations was to (1) allow us to identify trends and emerging challenges faced by leaseholders, (2) gain a current and more complete understanding of stewardship costs, and (3) ensure we conducted due diligence by triangulating the data we were sourcing for our valuation results. In this way we used the stakeholder consultations to help guide the research for our literature review and to ensure the accuracy of the per unit costs used for the valuation estimates.

Based on our background research in the literature review and the evaluation of the survey results of 2015, we focused the stakeholder consultations on four key elements: (1) recreational access, (2) industrial use, (3) weed management and (4) range improvement. The feedback we received from stakeholders varied considerably across the province, but it helped to provide greater context into how leaseholders are providing value in the day-to-day management of public lands.

The consultations revealed that leaseholders spend a significant amount of their summer and fall overseeing recreational access on public lands, as well as overseeing industrial use. Weed management in some northern regions was minimal in comparison with brush control, whereas in other regions (e.g. Area D) weed control was found to be substantial. This roughly aligns with the results from the 2015 cost survey. Finally, water development and fencing were consistently the largest costs focused on range improvement. These costs are all broken down and specific examples are provided from the consultation process.

This process was critical for validating the accuracy of the leaseholder costs gathered in an Alberta Environment and Parks and MNP_{LLP} survey that took place in 2015, and for providing additional context around these costs. While the results provide a breakdown of the costs faced by leaseholders, we used the stakeholder consultation process to gather more detailed estimates of some of the key costs and to validate some of per unit costs described in the survey report.

3.2 Recreational Access

The consultations revealed that leaseholders in Alberta provide considerable value to the province by partially overseeing and managing recreational access to public grazing lands. Without leaseholders, it is likely that the cost of managing recreation on public lands would increase for the province through increased staffing requirements for monitoring and enforcement, and capital investment in infrastructure along with ongoing infrastructure maintenance. Leaseholders have an interest in ensuring that the land is overseen and used in an appropriate manner, implying that hunters and other recreational users are partially monitored and managed by leaseholders on grazing lease land through contact requirements and access conditions as provided by *Public Lands Act* 62.1 and Recreational Access Regulation 6(1). While the time requirements devoted to managing recreational access varied by region, with those either located near a large urban area or

containing a popular recreational destination (e.g. a lake) increased recreational use, all leaseholders spent hours per year on this element.

On top of the legislative requirement to provide reasonable access to recreational users, leaseholders were found to routinely provide additional value to recreational users by provided highly localized beneficial information. This includes ensuring that hunters are aware of species at risk, when there is a potentially high conflict animal in the region (e.g. a bear or wolves), and other tasks that require considerable effort and time. To manage this without leaseholders would cost the province a considerable sum on an annual basis.

For example, we received feedback from a leaseholder in the High Prairie region that spends roughly one hour per day for 60 days during the fall hunting season dealing with hunters. This time is spent on the phone, exchanging emails, speaking to hunters when the arrive on the property, and following up afterwards to ensure that gates have not been left open. Another example comes from the Stavely region of the Alberta, which is a popular hunting destination for both Calgary and Lethbridge residents. This leaseholder documented upwards of 400 requests to hunt during the 2019 hunting season. They suggested that they spend an hour every night during hunting season responding to emails in addition to time spent every day dealing with hunters stopping at the ranch. In addition, two to three times per hunting season the leaseholder spends half a day chasing cattle because gates have been left open by hunters. With the introduction of applications like “iHunter”, requests have only increased, and the administrative time required to oversee the leased land has gone up.

Another example was provided by a leaseholder in the Grand Prairie region, where the public land contains a popular lake for recreational use. The leaseholder explained how they spend between 2-6 hours per week during the summer months ensuring motorized access is not damaging the range resource. Recreational users often need to be told not to drive through grasslands. On top of monitoring use during the summer, the leaseholder spends hours picking up garbage and fixing fences after the end of the season. While it is difficult to attach a value to this service provided by the leaseholder, it is likely that the service is being provided at a lower cost to the province than any other method of oversight. Without the contributions of leaseholders, the recreational site would rapidly begin to become overwhelmed with garbage, the landscape would be degraded by motorized use, and it would no longer provide the utility to recreational users or habitat values to wildlife.

3.3 Industrial Use

As with recreational access, the time required for industrial use varied by region. Those regions with forest resources or oil and gas activity spent much more administrative time overseeing activity.

In the Suffield region of Alberta, a leaseholder spends considerable time liaising with oil and gas companies, ensuring that industrial uses on their lease do not degrade the range resource, are undertaken with care, and ensuring that weed issues and reclamation activities are addressed. The leaseholder suggested that during the summer months they spent 2-3 hours per week overseeing industrial use. This time was spent on several activities, including ensuring cattleguards and roads are

maintained following industrial user access, which are often damaged by heavy equipment. This damage can make the roads unusable or no longer keep cattle in their designated location, generating a cost to leaseholders if the problem is not fixed, and representing a loss in value to the public when access roads are no longer useable. While the cost of fixing these problems lies with the industrial user, there is considerable time spent monitoring and following up to ensure issues are dealt with. In this way, ensuring that fences around oil and gas sites are well maintained is also time consuming. Leaseholders suggested that time is spent driving around the public land to ensure that cattle (especially calves) have not been trapped inside the oil and gas site, or even disentangling livestock from poorly maintained fences.

On top of the oversight work by leaseholders to ensure that industrial users are maintaining the sites in good order, for the purpose of ensuring the economic viability of the cattle operation itself, leaseholders are also often engaged on reclamation activities, and may have to deal with environmental issues associated with abandoned wells. This can require considerable time, especially when the industrial user responsible has gone bankrupt or has been sold to another company. Leaseholders suggested that this is a growing issue, especially after the downturn in the oil and gas sector in Alberta, and the costs and time requirements necessary to address industrial activities are expected to increase in respect to current oil and gas market trends.

3.4 Weed Management

Stakeholder consultations revealed that time spent on weed management was much less than with overseeing recreational access and industrial use. Often weed management and overseeing industrial use went hand-in-hand, as leaseholders were required to follow up with industrial users to ensure that weeds surrounding oil and gas sites were sprayed. In other cases, leaseholders simply sprayed the weeds at their own cost, rather than wait for industrial users to address weed issues at the expense of increased spread and abundance of weedy species. Supply costs varied by leaseholder from under $100 to upwards to $2000 annually, but it was the cost of time that added up. Leaseholders spent days out on public lands spraying invasive weed species such as burdock, hawkweed, and spotted knapweed. This on the ground management results in fast detection and effective control of weedy species. The value of this rapid detection and control is difficult to quantify, but it has likely resulted in lower abundance and distribution of weedy species across grazing lease land than if weed management were the responsibility of other entities that were not on the land on a regular basis.

3.5 Species at Risk

Nearly every consultation revealed that leaseholders are spending considerable time providing information to users of public land regarding species at risk (SAR). The knowledge the leaseholder gathers on SAR is as good as it is because they are the on the ground manager and they have an interest in maintaining the land in the long run, which may not be the case if this service was contracted out. Someone without the long-term viewpoint, or that is only present a fraction of the time, may not provide the same service.

In the High Prairie region, a leaseholder has populations of nesting sharp-tailed grouse, of which they alert hunters and recreational users. The leaseholder explained

how sharp-tailed grouse are often mistaken for spruce grouse, and alerting hunters to their presence helps to avoid accidental harvest of sharp-tailed grouse. Another leaseholder in the Suffield region ensures that they alert users to species at risk areas on the land and advises them to avoid certain areas, and will even flag these areas to provide visual identification of areas for recreational and industrial users to avoid. Burrowing owls are a species that can often be disrupted by recreational users.

Another leaseholder made a point of alerting recreational and industrial users to grizzly bear locations on the lease, reducing human/bear conflict and the potential of problem bear issues.

3.6 Other Value

Leaseholders provided many other examples of how they deliver value to the province for their role on public lands. One leaseholder located near the Badlands region in Alberta explained how they advise recreational users of active paleontological digging sites on their lease, and work to ensure that sites aren't disturbed, and paleontological resources aren't removed. They also flag cultural and historical sites on the lease such as teepee rings and homestead sites so that objects are not disturbed or removed. This acts as a historical resource protection and maintains a 'living museum' for future generations.

Another example of values difficult to quantify and prescribe economic value to is the monitoring or wildlife populations. A leaseholder in Brazeau County discussed their experience with significant reductions in songbird populations on their lease land following sour gas drilling and flaring in the area. This observation was resulted in them working closely with government to reduce sour gas flaring in the area, which allowed songbird populations to rebound.

3.7 Summary

The feedback we received in this section was critical for providing real-world examples of how leaseholders are providing value in the day-to-day management of public lands, as well as validating the per unit costs used to produce the value estimates in the following section.

Regarding recreational access, the consultations revealed that province-wide leaseholders spent an average of 75 hours per year overseeing recreational access (under 10 full 8/hr days). Responses varied from very little recreational use in some regions to upwards of 400 hunting requests per year in Grazing Zone A. With the introduction of new applications like "iHunter", requests in regions close to urban centres have increased considerably.

Industrial use revolved around oil and gas activity and forestry. Some responses indicated that liaising with the forestry was time consuming in their region, but to a far lesser extent than the responses focused on oil and gas activity. In some regions considerable time (e.g. upwards of 2 hours per day, 6 months per year) are spent on reclamation oversight, liaising with oil and gas companies, fixing fences, clearing filled cattleguards, and repairing road damage, all resulting from oil and gas activity on grazing leases.

Weed management in some northern regions was minimal in comparison with brush control, whereas in other regions (e.g. Area D) weed control is substantial. Weed growth surrounding abandoned oil wells requires investment in herbicides and labour. Other regions expressed the need to spray for noxious weeds including burdock, buttercup, oxeye daisy and scentless chamomile.

Water development and fencing were consistently the largest costs focused on range improvement. Water developments ranged from $3,500 to $4,500 per installment, and fencing costs ranged from $1,200 to $1,500 per mile for single strand high tensile electric fences to $7,500 per mile for barbed wire (labour and material). Some leaseholders spend upwards of $30,000 per year on fence maintenance.

4.0 Value Estimates

4.1 Introduction

The following section breaks down our methodology for calculating the value provided on behalf of grazing leaseholders in Alberta to the province of Alberta. The premise is that in the absence of the leaseholders, the government of Alberta would be required to maintain grazing leases in much the same way as they are currently being maintained in order to effectively steward the lands. We have built the foundation for this assumption in the previous sections of the report, primarily through noting the requirement for grazing disturbance to maintain rangeland ecosystems.

The Methodology section below provides an overview of how we have started with work previously completed and accepted by stakeholders in Alberta.[1] As explained throughout this report, we have produced the value estimates from a combination of primary research (literature review and stakeholder consultations) and secondary research (cost survey). Our task was to update these per unit costs and apply them to current statistics on Animal Unit Months (AUM's) [2] on provincial Crown Grazing Lease (GRL) land and Special Areas grazing leases in Alberta. The literature review and stakeholder consultations were focused on providing context to these results and validating the information.

4.2 Methodology

The methodology adopted to produce value estimates uses a combination of primary and secondary research. We conducted a literature review to determine the legislative requirements for maintaining public grazing leases, sourced secondary research for the purpose of establishing per unit cost estimates for those legislative requirements, and triangulated the results using the stakeholder consultations.

The per unit costs have been sourced from a previous survey conducted in 2015 for Alberta Parks and Environment by MNP_{LLP}. The results are presented in a $/AUM format, but not all the costs included in the cost survey are legislatively mandated. Part of the literature review was for the purpose aligning legislative requirements with costs born by the leaseholder. For instance, there is no legislative requirement that a leaseholder must make capital investments in roads on leased land. While this cost was included in the original MNP_{LLP} report, because it is often a cost associated with maintaining the land, we have not used this data point to produce the value estimates in the report. Only those costs that are legislatively mandated have been included. These are costs which would be borne by the province in the absence of a leaseholders. Grazing these lands is currently a legislative requirement noted in section 17 of the Public Lands Administration Regulation, and highlighted in *Public*

[1] MNP_{LLP} prepared a report titled: Alberta Public Land Grazing Lease 2016 Cost Survey Results. The report was based off survey results from 2015. It was prepared for Alberta Environment and Parks and can be found here.
[2] An Animal Unit Month is defined as the amount of forage (food) needed by an "animal unit" (AU) grazing for one month. The quantity of forage needed is based on the cow's metabolic weight, and the animal unit is defined as one mature 1,000-pound cow with or without calf at foot.

Lands Act section 102(1) which states that 'The director may in accordance with this Part lease public land for a term not exceeding 20 years for the purpose of grazing livestock when, in the director's opinion, the best use that may be made of the land is the grazing of livestock.' As such, to fulfill legislative requirements and maintain rangeland ecology it is a logical conclusion that the province would be required to graze Crown grazing lands if leaseholders did not fulfill that role, and this analysis includes those costs in the valuation process. While livestock purchases could also be considered an additional cost the province would need to undertake, this element was not included in this exercise.

Other examples of costs include fuel, insurance and utilities. These are all costs included in the original MNP_{LLP} results, because they are costs faced by the leaseholder to maintain the public land, but they are not included in our value estimates because they are not legislative requirements.

The original cost survey differentiates between Northern and Southern Alberta and Association and Individual Leases. An "individual leaseholder" is an individual farmer or rancher that holds a public land grazing lease, whereas an "association leaseholder" is a grazing lease association that manages the public land grazing lease.

For our value estimates, we have included the Upper and Lower Peace regions and the Upper and Lower Athabasca regions in Northern Alberta category. Southern Alberta includes South Saskatchewan, Red Deer and North Saskatchewan. We have also used the per unit cost estimates from Southern Alberta for Special Areas, given its location in the south. To provide an example of the effect of a Northern or Southern location on per unit costs, in northern Alberta an individual leaseholder spends nearly double on annual fence repairs and maintenance compared to an individual leaseholder in southern Alberta. The main reason behind this difference is the extensive forested area, tree clearing, and uneven terrain that leaseholders must contend with when building and repairing fences.

Regarding the individual to association split, in Northern Alberta 84% are managed by individual leaseholders and 16% by associations. In Southern Alberta 86% are managed by individual leaseholders and 14% by associations. This division of individual to association leases in the north and south. These estimates are shown below.

The legislative responsibilities associated with holding grazing lease have been carefully sourced, and they are provided in table 3 below.

The costs are brought to present day values using the Bank of Canada inflation rate to bring the per unit costs from 2015 to 2019. These were then applied to the latest grazing lease statistics from Alberta Environment and Parks and AUM statistics provided by the Special Areas Board.

4.2.1 Grazing Leases

In 2017, Alberta Environment and Parks and MNP_{LLP} produced a report outlining the results from a public land grazing lease cost survey.[3] From now on referred to as "the survey". This was an independent survey of financial and in-kind costs incurred by Alberta's farming and ranching industry in respect of their operations on public lands grazing leases for fiscal years that ended in 2015. While there are various different forms of grazing leases, within the province of Alberta, the survey focused on Grazing Leases (GRL) only. While total grazing dispositions in the province of Alberta include Cultivation Permits, Farm Development Leases, Forest Grazing Leases, Grazing Permits, Provincial Grazing Reserves, licenses under Protective Notation, all in addition to Grazing Leases, the latter make up the majority of total AUMs for the province.

The survey of grazing leaseholders listed common cost categories for investments and operating expenses that are incurred by farmers and ranchers that graze cattle, horses or bison on grazing leases and for each category sought information on the direct and indirect costs. The survey was conducted through mail, email, and fax with follow-up telephone calls to clarify issues of interpretation.

Direct costs were defined as those labour, service or contract costs that could be fully attributed to a leaseholder activity, whereas indirect costs included owner/operator, family or paid labour from the ranch or farm that was not accounted for in direct costs. To develop labour costs, the report uses the total of 2015 family wages and net cash farm income for Alberta beef cattle ranching and mixed farming operations reported by Statistics Canada. This total farm income was divided by the average number of person years worked on the farm as reported by the individual farmers or ranchers to arrive at a cost per person year.

The following table presents all the capital and operating costs associated with maintaining grazing leases. It is important to note that not all the costs in the table below are legislative requirements, i.e. some of the in-kind costs are purely associated with the individual's or the association's business and would not need to be maintained by the province in the absence of the leaseholders managing the land. This is an important point because the focus of this report is determining the value provided by the leaseholders to the province of Alberta through maintaining the grazing leases, which would need to be maintained in the absence of leaseholders. Table 2 presents all the costs associated with maintaining the grazing leases, whether or not they are a legislative requirement, as they are shown in the MNP report. Table 3 shows the legislative requirements associated with maintaining grazing leases, and Table 4 presents only those costs from Table 2 that have are legislative requirements. Only those costs that we have outlined as having a legislative requirement are used to calculate the value provided by leaseholders.

[3] Alberta Public Land Grazing Lease 2016 Cost Survey Results Alberta Environment and Parks (link).

Table 2: All In-Kind Costs from MNP Report

Capital Costs	Fence Built or Rebuilt Range Improvement Building/Corral Road Construction Fire Protection Dugout Development Watering System Development Other[4]
Operating Costs	Allocated Farm/Ranch or Association Member Labour Direct Labour Interest Expense Utilities Fuel Insurance Supplemental feed Building / Corral maintenance Road Maintenance Fence Maintenance Range Maintenance Property Taxes Multiple-Use Building / Equipment Lease Cost Fire Protection Other[5]

Table 3: Legislative Requirements

Requirement	Legislative Authority
Grazing Livestock: Disposition holders must utilize the disposition	Public Lands Administration Regulation 17
Fencing: Disposition holders must adequately fence the disposition to confine livestock, with fences in a good and serviceable state of repair	Public Lands Administration Regulation 53(3) *Stray Animals Act* 37(1)
Weeds: Disposition holders must control any noxious weeds and destroy any prohibited noxious weeds found on their dispositions as listed in the Weed Control Act	*Public Lands Act* 63(b) *Weed Control Act* 2 and 3
Recreational Access: Disposition holders must allow reasonable access to the land for recreation, and have the ability to set recreational access conditions	*Public Lands Act* 62.1 Recreational Access Regulation 6(1)
Grazing Timber Integration: Grazing and timber disposition holders jointly develop a Grazing Timber Agreement to integrate the activities	Public Lands Administration Regulation 60(1)

[4] Other costs include items such as miscellaneous equipment purchases (brush mowers, water hauling), veterinary costs, salt/minerals, power installations, gates and security, miscellaneous buildings, and fence line clearing.
[5] Other includes legal, accounting, banking, secretarial and administrative costs including office supplies; member meeting expenses; miscellaneous equipment expenses including solar and windmill power generators; cattle loss (wolves, poison weeds), watering fees; fence line brush control; fly control; fertilizing and spraying (weeds); and, wildlife damage (e.g. beaver dam removal).

Requirement	Legislative Authority
Exploration Access: Exploration approval holders are entitled to access grazing dispositions if they meet the requirements of the Exploration Dispute Resolution Regulation. Those requirements include advance notice, an opportunity for the grazing disposition holder to identify operational or land-use concerns, and a requirement for consent.	Public Lands Administration Regulation 9(1) & 11(2)
Stewardship and Range Management Requirements: Disposition holders are responsible for understanding and applying the four principles of range management to maintain healthy functional rangeland and riparian ecosystems on public land	Public Lands Administration Regulation 53(1)
Rent and Taxes The grazing disposition holder must pay all rents or fees applicable to the disposition	Public Lands Administration Regulation 21(1)(2)

From 'Operating Standards for Alberta's Public Land Grazing Dispositions' (2019).

Table 4: Select In-Kind Costs Based on Legislative Requirements

Capital Costs	Fence Building/Repair[6] Range Improvement Building/Corral Construction Fire Protection Dugout Development Water System Development
Operating Costs	Allocated Farm/Ranch or Association Member Labour Direct Labour Building/Corral Maintenance Fence Maintenance Range Maintenance Property Taxes Multiple-Use Building/Equipment Lease Costs Other

The MNP report provides statistics on grazing leases broken down into individual leases and association leases as well as into northern or southern Alberta. The statistics for grazing leases in 2015 are provided in Table 5. The table shows that in Northern Alberta there are a total of roughly 430,000 AUMs, of which 84% are managed by individual leaseholders and 16% by associations. In Southern Alberta there are a total of roughly 840,000 AUMs, of which 86% are managed by individual leaseholders and 14% by associations.

[6] Alberta is the only jurisdiction where fencing and improvements are paid for and owned by the disposition holder. In other jurisdictions the Crown pays for and owns all fencing and improvements. This represents a significant capital investment that is used for the effective stewardship of public lands, and a considerably different requirement than in other jurisdictions.

Table 5: 2015 Grazing Lease Statistics from MNP Report

Individual Leases	Number of Leases	Acres	AUMs
North	2,858	1,615,013	360,727
South	2,949	2,797,479	724,766
Overall	5,807	4,412,492	1,085,493
Association Leases			
North	32	277,566	70,741
South	45	511,651	115,158
Overall	77	789,217	185,899
Total	**5,884**	**5,201,709**	**1,271,392**

Source: Grazing lease statistics from MNP report. Percentages calculated based on number provided.

Based on the results from the literature review we made the assumption that the individual leaseholder to association leaseholder split is relatively constant year to year, we applied the same ratios of individual to association leases to the 2019 grazing lease statistics as were applied to the 2015 survey results (Table 6). The total acres and total AUMs for Northern and Southern Alberta have been provided by Alberta Environment and Parks.

Table 6: 2019 Grazing Lease Statistics from Alberta Environment and Parks

Individual Leases	Acres	AUMs
North	1,281,262	297,418
South	3,077,918	788,365
Overall	4,359,180	1,085,783
Association Leases		
North	251,264	58,326
South	489,050	125,263
Overall	740,314	183,589
Total	**5,099,494**	**1,269,372**

Source: Grazing lease statistics from Alberta Environment and Parks. Percentages calculated from MNP report.

The next step was to update the per unit costs from 2015 and bring them to current dollar value estimates. All costs are provided in a dollar per Animal Unit Month (AUM) of lease capacity format. Having established legislative backing for the costs outlined above in, we only updated the costs. The select costs outlined in Table 4 ($/AUM/year) from the MNP report were inflated to current dollar value estimates using the Bank of Canada inflation rate (Table 7). The annual rate of inflation from 2015 to 2019 was 7.77%.

Table 7: Grazing Lease Cost Breakdown – Individual, Association, North, South

	$/AUM/Yr		$/AUM/Yr	
	Individual		Association	
Annualized 20-Year Capital Costs	**North**	**South**	**North**	**South**
Fence Built or Rebuilt	5.99	3.90	2.86	2.02
Range Improvement	5.82	0.89	5.61	2.34
Building/Corral	0.82	1.76	1.12	1.50
Fire Protection	0.24	0.43	0.06	0.04
Dugout Development	1.14	1.01	0.77	0.85
Watering System Development	0.36	1.09	0.47	0.36
Total Capital Costs Provided to Province	14.37	9.09	10.90	7.10
Annual Operating Costs				
Allocated Farm/Ranch or Association Member Labour	11.81	5.29	1.29	1.06
Direct Labour	2.08	1.82	3.84	8.23
Building/Corral Maintenance	-	-	1.40	5.03
Fence Maintenance	10.08	5.32	3.91	4.07
Range Maintenance	10.03	3.67	4.81	1.29
Property Tax	1.94	2.88	1.48	1.82
Multiple-Use	3.20	4.01	0.59	0.34
Building/Equipment Lease Costs	1.68	2.09	0.10	0.38
Other	2.63	2.61	5.54	5.18
Total Operating Costs Provided to the Province	43.45	27.70	22.96	27.42
Total Public Land Grazing Costs				
Annualized 20-Year Capital Costs	14.37	9.09	10.90	7.10
Annual Operating Costs	43.45	27.70	22.96	27.42
Total Leaseholder Value Provided to Province	**57.82**	**36.78**	**33.85**	**34.52**

Using 2019 Provincial data on grazing leaseholder dispositions from Alberta Environment and Parks, we are able to calculate that grazing lease disposition holders in Alberta provide $52.49 million dollars in value to the Province of Alberta (Table 8).

Table 8: Leaseholder Value to the Province: Northern and Southern Alberta

	$/AUM/Yr		$/AUM/Yr	
	Northern Alberta		Southern Alberta	
Annualized 20-Year Capital Costs	**Association**	**Individual**	**Association**	**Individual**
Fence Built or Rebuilt	166,573	1,782,134	252,443	3,075,627
Range Improvement	327,488	1,730,849	292,942	705,185
Building/Corral	65,372	243,601	187,645	1,384,882
Fire Protection	3,771	70,516	5,400	339,848
Dugout Development	44,629	339,759	106,647	798,643
Watering System Development	27,657	105,774	44,549	858,117
Total Capital Costs Provided to Province	635,491	4,272,634	889,625	7,162,303
Annual Operating Costs				
Allocated Farm/Ranch or Association Member Labour	75,429	3,512,983	132,296	4,171,638
Direct Labour	223,773	618,618	1,031,371	1,435,859
Building/Corral Maintenance	81,715	-	630,432	-
Fence Maintenance	228,173	2,996,934	510,285	4,197,126
Range Maintenance	280,345	2,984,113	161,995	2,897,207
Property Taxes	86,115	576,950	228,144	2,268,487
Multiple-Use	34,572	951,967	43,199	3,160,589
Building/Equipment Lease Costs	5,657	500,023	47,249	1,648,264
Other	323,088	782,088	649,332	2,056,082
Total Operating Costs Provided to the Province	1,338,868	12,923,676	3,434,302	21,835,253
Total Public Land Grazing Costs				
Annualized 20-Year Capital Costs	635,491	4,272,634	889,625	7,162,303
Annual Operating Costs	1,338,868	12,923,676	3,434,302	21,835,253
Total Leaseholder Value Provided to Province	1,974,358	17,196,309	4,323,927	28,997,556
	North Total	**$ 19,170,668**	**South Total**	**$ 33,321,483**
Alberta Total			**$ 52,492,151**	

GRL data from Alberta Environment and Parks is provided for each location in northern and southern Alberta. The costs have been further disaggregated into the different grazing zones in Northern and Southern Alberta:

Northern Alberta:
Upper Peace
Upper Athabasca
Lower Peace
Lower Athabasca

Southern Alberta:
North Saskatchewan
South Saskatchewan
Red Deer

Applying the same ratio of individual to association leases used for Table 5, we are able to estimate the value provided by each region in northern Alberta (Table 9) and southern Alberta (Table 10).

Table 9: Leaseholder Value Estimates: Northern Alberta

	$/AUM/Yr		$/AUM/Yr		$/AUM/Yr		$/AUM/Yr	
	Upper Peace		Upper Athabasca		Lower Peace		Lower Athabasca	
Annualized 20-Year Capital Costs	**Association**	**Individual**	**Association**	**Association**	**Individual**	**Individual**	**Association**	**Individual**
Fence Built or Rebuilt	61,298	655,816	45,174	483,311	9,691	103,679	50,410	539,328
Range Improvement	120,514	636,944	88,814	469,403	19,052	100,695	99,108	523,808
Building/Corral	24,057	89,644	17,729	66,064	3,803	14,172	19,784	73,721
Fire Protection	1,388	25,950	1,023	19,124	219	4,102	1,141	21,340
Dugout Development	16,423	125,030	12,103	92,142	2,596	19,766	13,506	102,822
Watering System Development	10,178	38,924	7,501	28,686	1,609	6,154	8,370	32,010
Total Capital Costs Provided to Province	233,857	1,572,308	172,344	1,158,729	36,971	248,568	192,319	1,293,029
Annual Operating Costs								
Allocated Farm/Ranch or Association Member Labour	27,758	1,292,760	20,456	952,713	4,388	204,374	22,827	1,063,136
Direct Labour	82,347	227,648	60,687	167,768	13,018	35,989	67,721	187,213
Building/Corral Maintenance	30,071	-	22,161	-	4,754	-	24,729	-
Fence Maintenance	83,967	1,102,857	61,880	812,762	13,274	174,352	69,052	906,964
Range Maintenance	103,166	1,098,138	76,029	809,285	16,310	173,606	84,841	903,084
Property Taxes	31,690	212,315	23,354	156,468	5,010	33,565	26,061	174,603
Multiple-Use	12,722	350,319	9,376	258,171	2,011	55,382	10,462	288,094
Building/Equipment Lease Costs	2,082	184,006	1,534	135,605	329	29,090	1,712	151,322
Other	118,895	287,804	87,621	212,100	18,796	45,499	97,776	236,684
Total Operating Costs Provided to the Province	492,697	4,755,848	363,098	3,504,873	77,891	751,856	405,182	3,911,099
Total Public Land Grazing Costs								
Annualized 20-Year Capital Costs	233,857	1,572,308	172,344	1,158,729	36,971	248,568	192,319	1,293,029
Annual Operating Costs	492,697	4,755,848	363,098	3,504,873	77,891	751,856	405,182	3,911,099
Total Leaseholder Value Provided to Province	726,554	6,328,155	535,442	4,663,602	114,862	1,000,424	597,501	5,204,128
	UP Total	**$ 7,054,709**	**UA Total**	**$ 5,199,043**	**LP Total**	**$ 1,115,286**	**LA Total**	**$ 5,801,630**
Northern Alberta Total							**$ 19,170,668**	

Table 10: Leaseholder Value Estimates: Southern Alberta

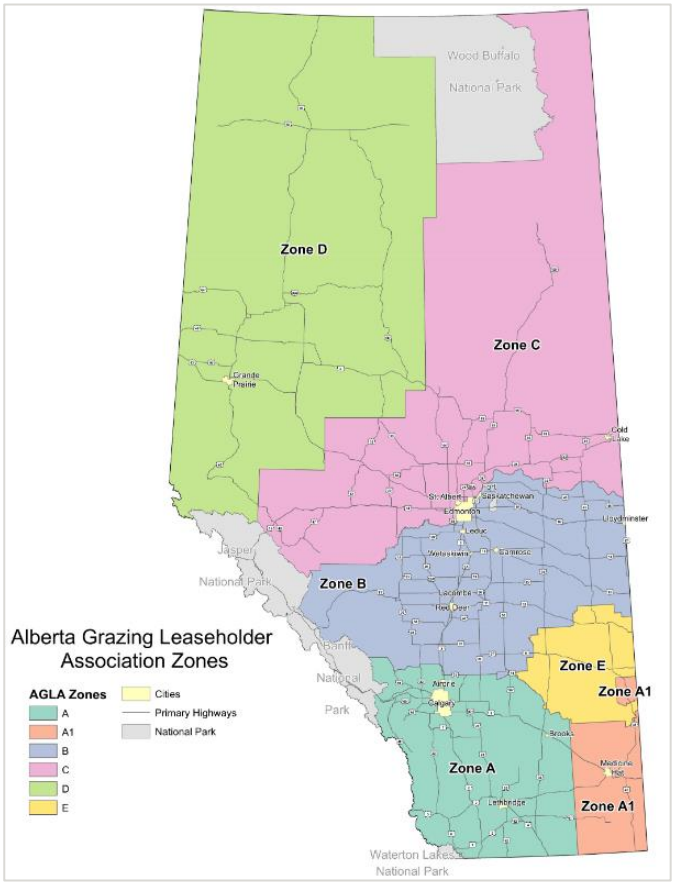
	$/AUM/Yr		$/AUM/Yr		$/AUM/Yr	
	South Saskatchewan		Red Deer		North Saskatchewan	
Annualized 20-Year Capital Costs	**Association**	**Individual**	**Association**	**Association**	**Association**	**Individual**
Fence Built or Rebuilt	169,037	2,059,456	22,702	276,593	60,704	739,579
Range Improvement	196,155	472,196	26,344	63,418	70,442	169,572
Building/Corral	125,648	927,324	16,875	124,543	45,122	333,015
Fire Protection	3,616	227,564	486	30,563	1,298	81,721
Dugout Development	71,411	534,776	9,591	71,822	25,645	192,045
Watering System Development	29,830	574,600	4,006	77,171	10,712	206,347
Total Capital Costs Provided to Province	595,697	4,795,915	80,004	644,109	213,923	1,722,279
Annual Operating Costs						
Allocated Farm/Ranch or Association Member Labour	88,586	2,793,350	11,897	375,157	31,813	1,003,130
Direct Labour	690,611	961,459	92,752	129,127	248,008	345,273
Building/Corral Maintenance	422,141	-	56,695	-	151,596	-
Fence Maintenance	341,690	2,810,417	45,890	377,450	122,705	1,009,259
Range Maintenance	108,473	1,939,984	14,568	260,547	38,954	696,675
Property Taxes	152,766	1,518,991	20,517	204,006	54,860	545,490
Multiple-Use	28,926	2,116,347	3,885	284,233	10,388	760,009
Building/Equipment Lease Costs	31,638	1,103,686	4,249	148,229	11,362	396,349
Other	434,796	1,376,763	58,395	184,904	156,141	494,415
Total Operating Costs Provided to the Province	2,299,626	14,620,998	308,848	1,963,655	825,827	5,250,601
Total Public Land Grazing Costs						
Annualized 20-Year Capital Costs	595,697	4,795,915	80,004	644,109	213,923	1,722,279
Annual Operating Costs	2,299,626	14,620,998	308,848	1,963,655	825,827	5,250,601
Total Leaseholder Value Provided to Province	2,895,324	19,416,912	388,853	2,607,764	1,039,750	6,972,880
	SS Total	**$ 22,312,236**	**RD Total**	**$ 2,996,617**	**NS Total**	**$ 8,012,630**
Southern Alberta Total					**$ 33,321,483**	

Grazing leaseholders in Northern Alberta provide the Government of Alberta $19.17 million in in-kind services to maintain their leases, while Southern Alberta provides $33.32 million (total of $52.49 million). Associations in Northern Alberta provide $1.97 million and in Southern Alberta they provide $4.32 million in value. Individual leaseholders provide $17.20 million in Northern Alberta and $28.10 million in Southern Alberta. In Northern Alberta the grazing zone that provides the most value is the Upper Peace River Region at $7.05 million, and in Southern Alberta it is the South Saskatchewan Region at $22.31 million. The value provided by the leaseholders includes their improvement of rangeland, steps taken to protect against fire, general rangeland maintenance, overseeing multi-use activities, and various other ways they maintain the land.

4.2.2 Special Areas

Special Areas is located in Zone E in Figure 3. Roughly half of the Special Areas are public lands administered by the Special Areas Board, which includes 1,879,940 acres of Special Areas Public Lands used for grazing. Statistics on the total acres and AUMs in Special Areas are sourced from the Special Areas Board.

Figure 3: Public Lands Grazing Leases in Alberta



Source: Alberta Grazing Leaseholders Association

The following Special Areas total acres and AUMs have been provided by the Special Areas Board in Alberta (Table 11). Special Areas provides the second most value to the province after the South Saskatchewan grazing region.

Table 11: Special Areas Land

	Acres	AUMs
Special Areas Public Lands	**1,879,940**	**483,383**

The per unit costs below have been produced in the same way as the previous outputs (Table 12).

Table 12: Leaseholder Value Estimates – Special Areas

	$/AUM/Yr Special Areas
Annualized 20-Year Capital Costs	
Fence Built or Rebuilt	1,557,616
Range Improvement	682,434
Building/Corral	802,250
Fire Protection	140,654
Dugout Development	463,638
Watering System Development	395,916
Total Capital Costs Provided to Province	4,042,509
Annual Operating Costs	
Allocated Farm/Ranch or Association Member Labour	1,823,297
Direct Labour	1,995,207
Building/Corral Maintenance	875,182
Fence Maintenance	2,354,657
Range Maintenance	1,364,868
Property Taxes	1,208,585
Multiple Use	1,302,355
Building/Equipment Lease Costs	708,481
Other	1,708,689
Total Operating Costs Provided to the Province	13,341,321
Total Public Land Grazing Costs	
Annualized 20-Year Capital Costs	4,042,509
Annual Operating Costs	13,341,321
Total Leaseholder Value Provided to Province	**$ 17,383,830**

4.3 Public Land Management Values

Although this report has framed the value provided to the province by public land grazing leaseholders within the context of the current management framework and land use allocation, it could be argued that removing livestock use from public lands would reduce the need for infrastructure and labour associated with managing those leases. This would represent a shift in management, but as discussed in the literature review there are still management costs associated with properly

stewarding lands even in cases where livestock and livestock management infrastructure are removed from consideration (Ranchers Stewardship Alliance Inc., 2013). Relative to the costs assessed by MNP_{LLP} in 2015 Multiple Use and Fire Protection costs could be considered separately from the grazing operation and would represent a total value of $6,052,871 to the province.

If these responsibilities were assumed by the province it may be at higher cost than is currently provided by leaseholders. For example, the Rancher's Stewardship Alliance (2013) found that stewardship management costs for conservation properties ranged from $5.20 to $13.88 per acre, with an average of $7.96 per acre, which if extrapolated to Alberta's public grazing lands using the average of $7.96 per acre, represents a stewardship cost of approximately $56 million.

Removing the public land grazing program would also represent a loss in grazing fees and property taxes collected by the province and municipalities, estimated at just under $8.76 million.[7]

Alberta's rangelands require a form of disturbance to maintain ecosystem function and wildlife habitat values. Removing cattle grazing without a plan to introduce another bulk grazer on the landscape is not recommended as it is likely to result in ecosystem degradation and loss of critical habitat values. Additionally, removing the public land grazing program may result in some form of compensation to individuals currently holding grazing disposition contracts with the province if those contracts are terminated.

4.4 Summary

Grazing disposition holders in Alberta bring considerable value to the province at their own expense by:

- managing weeds,
- liaising with industrial and recreational users,
- protecting against fire,
- conducting ongoing general rangeland maintenance,
- maintaining resource health and function

This assessment has shown that grazing disposition holders provide upwards of $70 million in value (Table 13).

Table 13: Value Estimates Summary

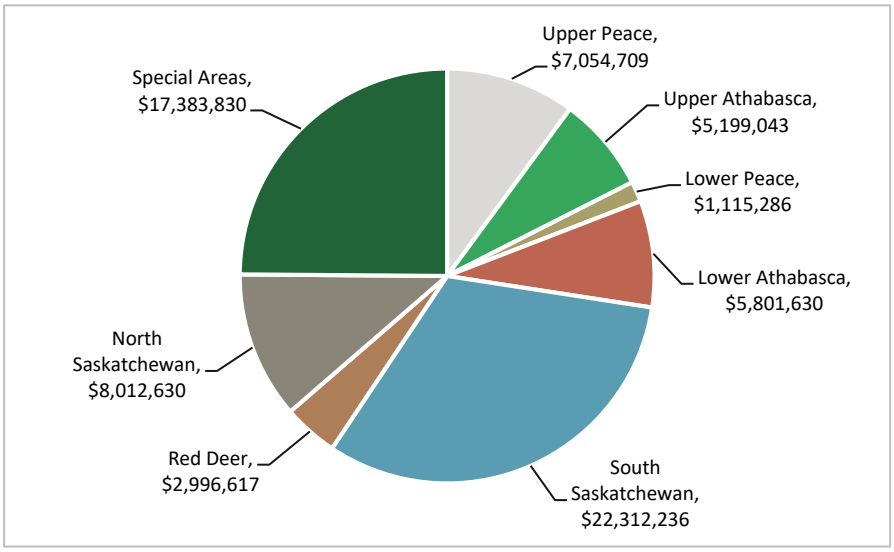
Description	$ Value (million)
Grazing Lease (GRL)	$52.49
Special Areas	$17.38
Total	**$69.88**

Regarding Grazing Leases, northern Alberta provides the province $19.17 million in value, while southern Alberta provides $33.32 million in value for a total of $52.49 million. Associations in Northern Alberta provide $1.97 million and in Southern

[7] 2020 grazing fees are $2.73 in the south and $1.63 in the north, respectively. Based on the current AUM estimates used for this report, 2020 grazing fees paid to the province are estimated at $4.39 million. Property taxes have been calculated at $4.37 million.

Alberta they provide $4.32 million in value. Individual leaseholders provide $17.20 million in Northern Alberta and $28.10 million in Southern Alberta. In Northern Alberta the grazing zone that provides the most value is the Upper Peace River Region at $7.05 million, and in Southern Alberta it is the South Saskatchewan Region at $22.31 million. Special Areas Provide a total value of $17.38 million. Total for Grazing Leases and Special Areas by region is broken down in Figure 4.

Figure 4: Grazing Leases and Special Areas – Value Estimates



4.5 Conclusions

This report has carefully outlined how grazing disposition holders have certain legislative requirements they must adhere to for the duration of the term of the disposition. One of the key legislative requirements is that disposition holders must utilize the disposition (Public Lands Administration Regulation 17). Utilizing the disposition means the leaseholder is using the disposition for grazing livestock. The land cannot be used for other purposes like cultivation and farming. Therefore, through our research we have not only established that grazing livestock is a legislative mandate on public grazing leases, we have also shown that some form of disturbance (grazing) on the land is vital to maintain ecosystem function and wildlife habitat values. In the absence of leaseholders, the province would have to bear the cost of providing this management. Modern rangeland management practices by leaseholder steward rangeland health, and leaseholders act as stewards of public lands, and, as we have demonstrated throughout this report, provide considerable value to the province.

We also provided a brief overview of the current literature relative to carbon and rangelands earlier in this report. While carbon storage and sequestration is a growing field and the link between grazing and soil health is becoming more understood, we have chosen not included this element in the final value estimates. The science on this is not yet developed to the point where one can say with certainty what the net effect of grazing cattle is on carbon resources. This report

used the best information available in order to objectively assess the net benefit of grazing lease utilization. We have assessed and presented the scientific information currently available and provided our objective opinion of the scientific outcomes.

Through the iterative process of thorough background research, stakeholder consultations and data work to produce the value estimates in this report, our estimates suggest that leaseholders provide upwards of $70 million in value to the province of Alberta for their role overseeing public land. As grazing cattle are vital to maintain ecosystem function and wildlife habitat values on public lands, it is difficult to see a scenario where this value could be provided in any other way that would be more cost effective. For all of the oversight leaseholders provide in addition to maintaining this vital ecosystem function, the $70 million per year in value is a service that would be hard to replicate in any other way that does not diminish the value provided, or increase the cost of management significantly.

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