FOOTHILLS GRASSLANDS CONSERVATION TARGET ASSESSMENT REPORT

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SOUTHERN EASTERN SLOPES CONSERVATION COLLABORATIVE

The Southern Eastern Slopes Conservation Collaborative (Collaborative) is a coordinated group of conservation-based environmental organizations working together to create a bold, detailed, proactive land use vision for public and private lands along Alberta's Eastern Slopes that prioritizes conservation, and unites ENGOs to work more strategically to change policy, and landscape protection and management.

The Collaborative comprises four core organizations:

- Canadian Parks and Wilderness Society – Southern Alberta Chapter
- Miistakis Institute
- Southern Alberta Land Trust Society
- Yellowstone to Yukon Conservation Initiative

While the core group is driving the process, other conservation organizations and individuals are critical to the process and have been engaged throughout. Organizations that attended at least on of the full-day workshops include:

- Alberta Native Plant Council
- Alberta Riparian Habitat Management Society (Cows and Fish)
- Bragg Creek Environmental Coalition
- Bow River Basin Council
- Elbow River Watershed Partnership
- Foothills Land Trust
- Ghost Community
- Ghost Watershed Alliance Society
- Nature Conservancy of Canada
- Oldman Watershed Council
- Trout Unlimited Canada

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SUMMARY OF FINDINGS

The foothills grasslands target represents 23% of the landscape in the southern eastern slopes region. Grasslands were selected because they support a variety of ecological goods and services, economic livelihoods and biodiversity. We are concerned about grasslands because there are limited remaining intact grasslands relative to their historic distribution, and there are numerous ongoing threats reducing health of remaining grasslands.

The foothills grasslands target is represented spatially by the Alberta Biodiversity Monitoring Institute (ABMI) grassland and shrubland categories, which we felt best represented grasslands occurring along the Eastern Slopes as it enabled us to include grasslands in the Montane Natural Region.

The current health of the foothills grassland target was rated as fair, defined as outside acceptable range of variation, and requires human intervention. The score was derived from the following key ecological attributes (KEAs):

- Total extent of the foothills grassland (not including montane) compared with a historical reference extent, indicates 65% loss in the study area.
- The vascular plant intactness score from ABMI for the region is 59%, based on an assessment of 36 native vascular species found in plots (not including montane).
- The biodiversity intactness score from ABMI for the region is 67%, based on the expected occurrence of 194 species (not including montane).
- Range health scores on public lands indicate the majority of scores were either healthy (39% of assessments) and healthy with problems (30% of assessments). Only 0.2% of assessments scored as unhealthy. In this assessment 30% of sites were not evaluated.
- Intactness of grasslands (areas remaining with no human footprint) was assessed by percentage of foothills grassland target that contributes to native habitat patches ≥10 km2 in the study area. Only 26% of the foothills grassland target falls in native habitat patches ≥10 km2. Grasslands around Calgary and around Cardston were the least intact. Geographically, there are intact patches south of the Highwood River, in and around the Porcupine Hills and Whaleback, on the Piikani First Nation and southwest of Cardston.

Of the **10 critical threats identified** that affect the health of the foothills grassland target, three were ranked as high, five were ranked as medium and two were ranked as low (see Table 1):

- A high ranking threat is likely to seriously degrade the conservation target over some portion of the target's occurrence at the site.
- A medium ranking threat is likely to moderately degrade the conservation target over some portion of the target's occurrence at the site.
- A low threat is likely to only slightly impair the conservation target over some portion of the target's occurrence at the site.

Table 1: Critical Threats to Foothills Grasslands

Critical Threat		Foothills Grasslands
1	Linear disturbance (roads, rails, and transmission lines)	High
2	Residential development (rural residential growth)	High
3	Terrestrial invasive species	High
4	Conversion to cropland	Medium
5	Motorized recreational activities	Medium
6	Renewable energy	Medium
7	Surface disturbance (mining)	Medium
8	Surface disturbance (oil and gas)	Medium
9	Altered fire regime	Low
10	Unsustainable range management	Low

Climate change was identified as an **emerging threat** for the foothills grassland conservation target, with predictions of increased temperature, changes in precipitation, and increased frequency of both flooding and drought conditions. Strategies that promote resilience of the ecosystem by improving the state of grassland health will be important considerations in strategy development.

Indirect threats are factors that influence the direct threats for the foothills grassland target. The following indirect threats were identified:

- Lack of coordination (policies) around one road network that services different industries.
- Competitive land-use markets – value of crops vs. value of beef influencing conservation of native grasslands.
- Demographics of current ranching families.
- Land values not agricultural-based but based more on recreational value (rural residential development).

A number of **opportunities** were also identified that could influence target health:

- Government of Alberta Land Trust Grant Program, which enables land trust organizations to maintain foothills grasslands in a natural state.
- Government of Alberta implementation of SSRP, which makes foothills grassland conservation a priority. In addition, other regional plans are being developed.
- Government of Alberta is developing a Linear Footprint Management Plan for the Livingstone–Porcupine Hills area, which will set limits on roads and trails accessible to motorized vehicles on Crown land.
- Public desire to purchase products from local conservation landscapes that support maintaining natural state.
- Ecotourism potential of iconic landscape as a revenue-generating opportunity to maintain land in its natural state.
- Government of Alberta desire to meet conservation targets for the Upper and Lower Foothills Natural Subregions.

These results will be used to form strategies, including objectives and actions, aimed at improving the health of the foothills grassland target. The following four goals were identified to improve foothills grassland target health and reduce critical threats:

1. Maintain current extent of foothills grassland target.
2. No additional linear disturbance in large parcels (>10 km2) of foothills grassland.
3. Protect and enhance structural connectivity between foothills grassland patches.
4. Achieve range health scores on public and private land of at least 60% healthy, no more than 35% healthy with problems, and no more than 5% unhealthy.

BACKGROUND

The Collaborative is developing a conservation plan or blueprint for conservation groups to work toward maintaining a healthy landscape along Alberta's southern eastern slopes. The Collaborative is using The Nature Conservancy Conservation Action Planning (TNC CAP) process as the foundation for developing conservation strategies. Steps in the process include:

1. Scope and target identification workshop: held in Calgary in May 2016 with the broad conservation community, where the study area was agreed to and conservation targets were identified, including foothills grassland, riparian areas, white spruce and lodgepole pine forest, wide-ranging mammals and native fish species.
2. Conservation target health and critical threat assessment: conservation target assessment approach developed for the first three conservation targets to determine current health of the target, and critical threats affecting the target.
3. Goal setting and strategy development: facilitated workshops held in Calgary in November 2016 and February 2018 with the broader conservation community to set conservation goals and develop strategies.
4. Target assessment report: Foothills Grasslands Conservation Target Assessment Report drafted to inform development of goals and conservation strategies to maintain and restore the foothills grassland target.

FOOTHILLS GRASSLANDS CONSERVATION TARGET

In the defined study area, the foothills grasslands conservation target occurs in the Grasslands Natural Region (Foothills Fescue and Mixedgrass Natural Subregions), Parkland Natural Region (Foothills Parkland and Central Parkland Natural Subregions) and Montane Natural Subregion. Figure 1 shows the foothills grassland target using the ABMI grassland and shrubland categories and Figure 2 shows the target with natural subregions.

Remaining foothills grasslands are found mainly in the Foothills Fescue and Foothills Parkland Natural Subregions. There is a sizable area of native grasslands on the eastern flank of the Livingstone Range, extending westward across the Montane Natural Subregion to its boundary with the Subalpine Natural Subregion. Native grasslands remaining in the small portions of the study area in the Central Parkland Natural Subregion (north of Calgary) and the Mixedgrass Natural Subregion (along Highway 2 south of Nanton) are scarce and highly fragmented. Of the foothills grasslands in the study area, 79% occurs on private land, and the remaining 21% on public land – forest reserve and Crown grazing leases (see Figure 3). This

heavy weighting toward private land has important implications for the conservation goals and strategies for the foothills grasslands target.

Foothills Fescue Subregion

The Foothills Fescue Natural Subregion occupies an irregular south–north belt between 15- to 100-km-wide, extending north from the Alberta–Montana border to northwest of Drumheller (Natural Regions Committee 2006). According to Adams et al. (2005) and others, the Foothills Fescue Natural Subregion is the moistest of the four natural subregions that comprise the Grassland Natural Region. Further, the Foothills Fescue Subregion is defined by orthic black chernozemic soils with potential natural vegetation dominated by foothills rough fescue (*Festuca campestris*, also referred to as mountain rough fescue), Parry oatgrass (*Danthonia parryi*), Idaho fescue (*Festuca idahoensis*) and wheatgrasses. Summer aridity and frequent winter Chinooks limit the persistence of woody species; as a result, forest and shrub communities are limited to riparian areas and sheltered sites (Adams et al. 2003).

Foothills Parkland Subregion

According to the Natural Region Committee (2006), the Foothills Parkland Natural Subregion is a thin band (5- to 50-km-wide) occupying a discontinuous belt along the foothills, containing the highest elevations (1025 to 1400 m) in the Parkland Natural Region, and dominated by rolling hills. The Foothills Parkland Natural Subregion is climatically characterized by the highest precipitation, warmest winters, and shortest and coolest growing season of all Parkland subregions, also seeing a greater incidence of chinooks. On the driest south- and west-facing slopes, foothills rough fescue–Idaho fescue–needle and thread grass (*Hesperostipa comata*) communities are found on well to rapidly drained black chernozems (DeMaere et al. 2012).

Sites on somewhat moister southerly slopes are typically vegetated by herb-rich foothills rough fescue–Idaho fescue grasslands in the southern part of the natural subregion, and by similarly diverse foothills rough fescue–Parry oatgrass grasslands in the northern part. Aspen stands and willow groves occur on north-facing slopes and in seepage areas.

Montane Subregion

The Montane Natural Subregion of the southern foothills occurs in the Porcupine Hills, on lower slopes of the Front Ranges and extends west into the Rocky Mountains along major valleys, including Crowsnest Pass and the Bow Valley (Natural Regions Committee 2006). Summers are cool, and winter cold is moderated by frequent chinooks. Vegetation is characterized by complex mosaics of forests, shrublands, grasslands and wetlands varying in response to slope, aspect and elevation (Natural Regions Committee 2006). Grasslands occur on moderately dry south- and west-facing slopes and into open stands of Douglas fir (*Pseudotsuga menzesii*), limber pine (*Pinus flexilis*) and lodgepole pine (*Pinus contorta*). Dominant grasses in grassland communities are typically foothills rough fescue, Idaho fescue, bluebunch wheatgrass (*Pseudoroegnia spicata*) or Parry oatgrass (Willoughby et al. 2007).

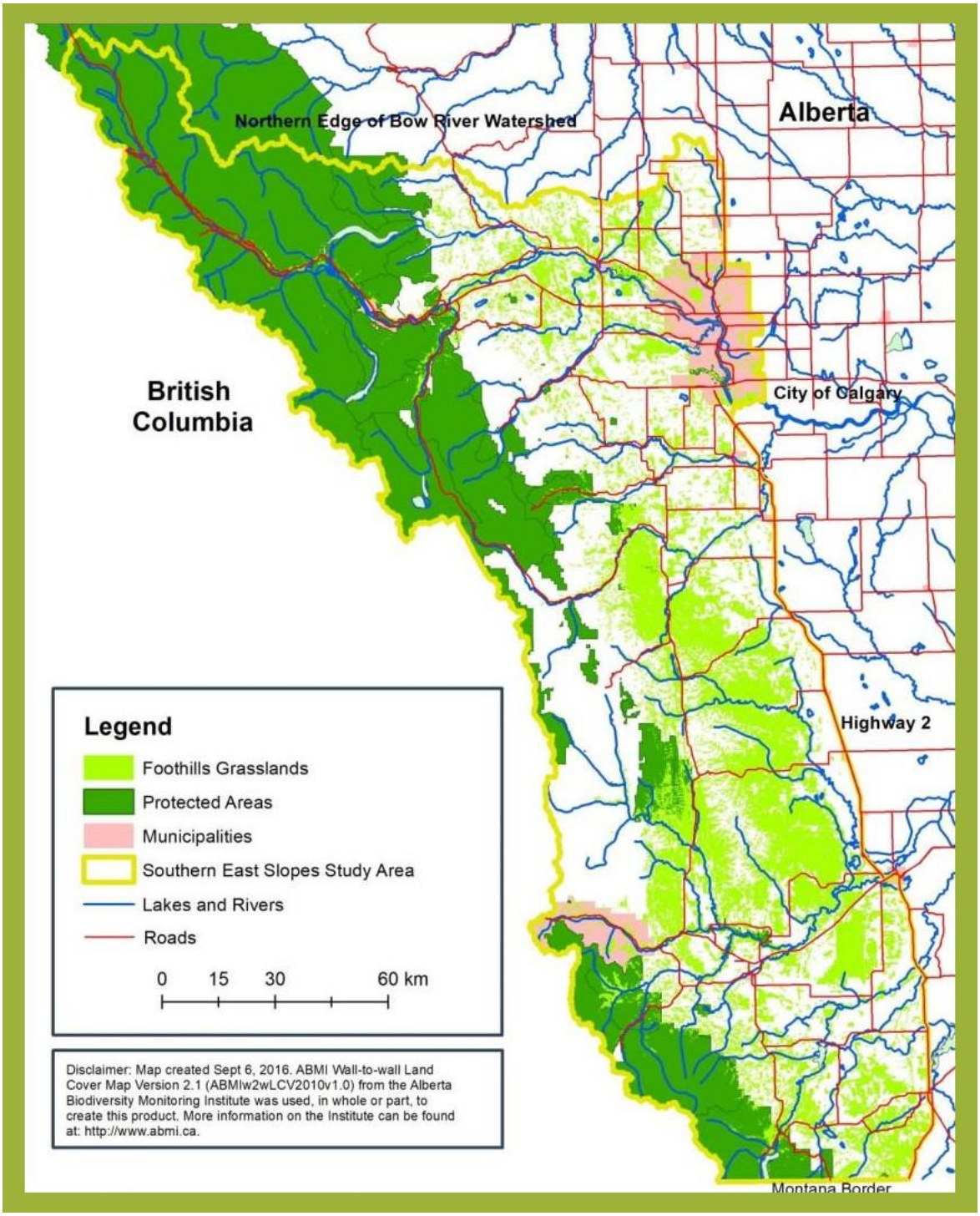

Figure 1: Foothills Grassland Target – Represented by AMBI Land Cover Data

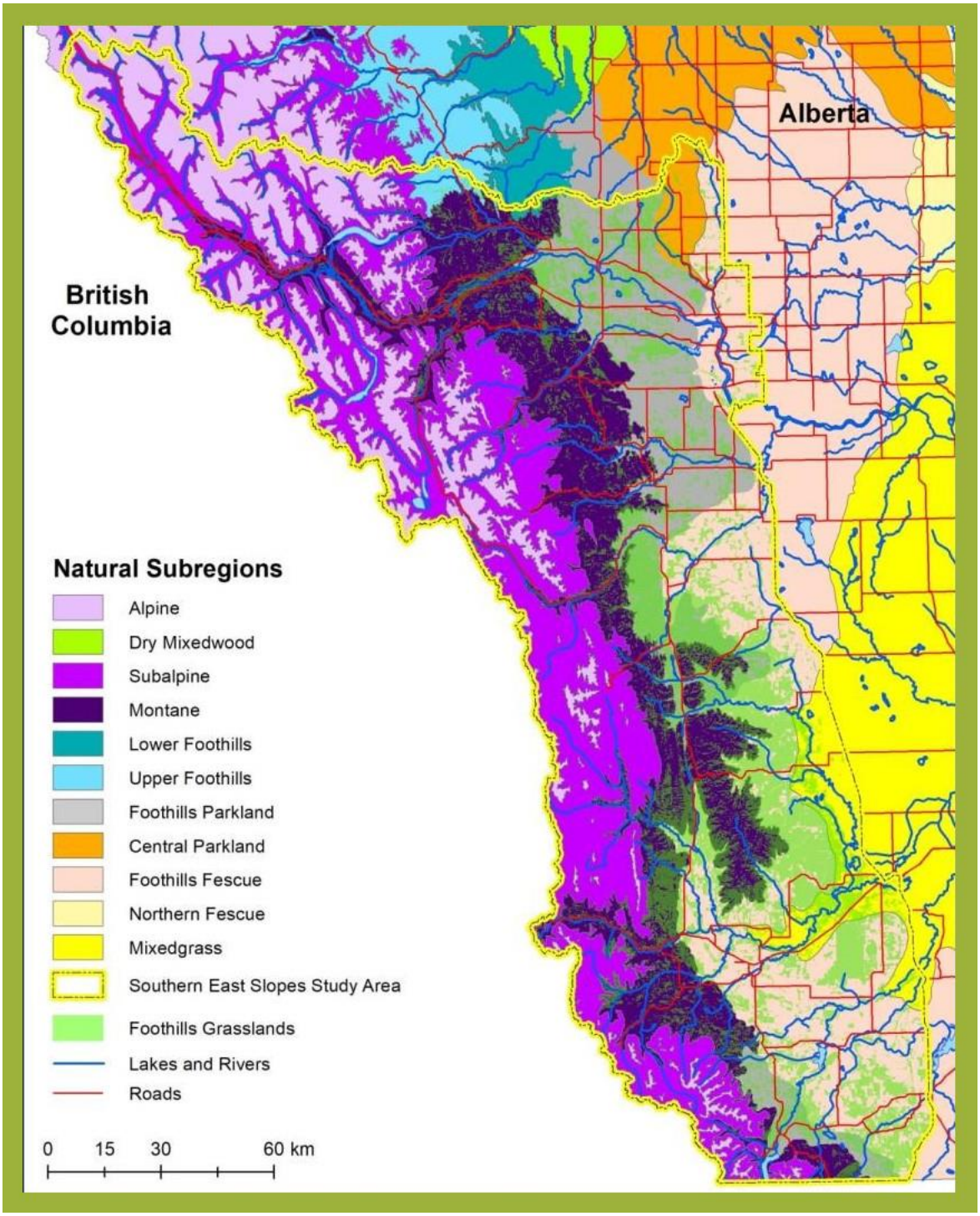

Figure 2: Foothills Grassland Target and Natural Subregions

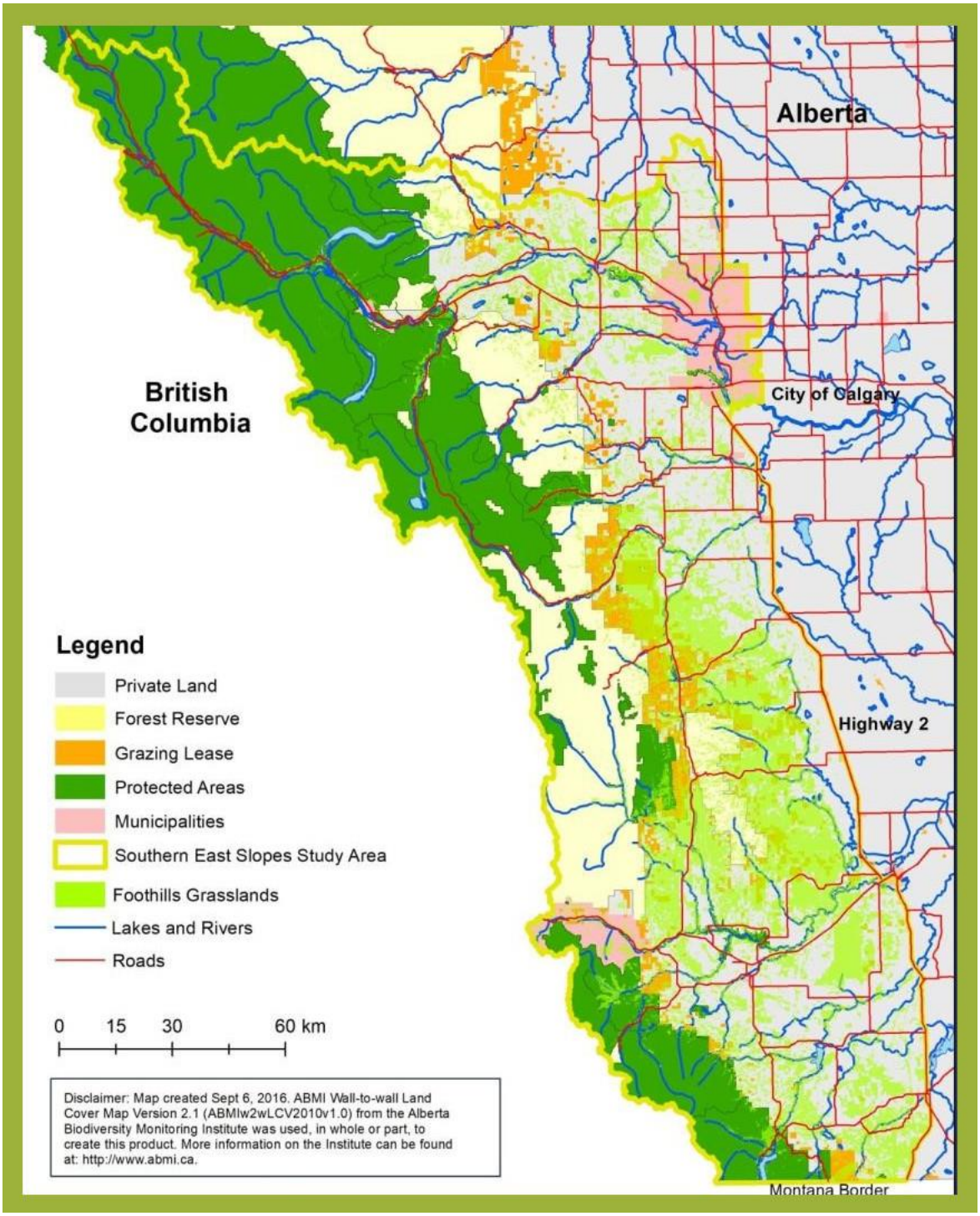

Figure 3: Foothills Grassland Target and Land Ownership

ECOLOGICAL AND ECONOMIC IMPORTANCE

Grasslands provide many environmental, economic and social benefits to Albertans. Grasslands are an important ecosystem that is adapted to a specific climate and provides habitat for a wide variety of wildlife and plant life that are well-adapted to live there. From an ecosystem goods and services perspective, grasslands provide water cycling and regulation, pollination, habitat, climate regulation, food, and spiritual and cultural value to name a few (ABMI 2015; Good and Haddock 2012). Grasslands are also very important agriculturally, supporting livestock production.

Grasslands are one of the most imperilled ecosystems on the planet (Samson and Knopf 1994) and only one-third (34%) of the Canadian prairie and parkland remain in natural cover; two-thirds are under cultivation or development for mineral extraction and settlement (Riley et al. 2007).

The importance of native grasses and grasslands to Albertans and the particular benefits of rough fescue grasslands were recognized through the designation of rough fescue (foothills, plains and northern) as Alberta's official grass emblem in 2003. According to Alberta Sustainable Resource Development (2010), fescue grasslands provide ecological goods and services that are critical to the economic and public interests of Alberta. This system is under stress from loss of grasslands due to agriculture crop production, industrial development, and urban and rural infrastructure (Alberta Sustainable Resource Development 2010). The following sections explore the value of maintaining this important grassland community as it supports ecosystem resilience, biodiversity and our economy along the southern eastern slopes.

Supporting Ecosystem Resilience

Grasslands play a role in maintaining both surface and groundwater resources in the region. Desserrud (2006) noted that the litter produced by rough fescue plays a critical role in improving moisture retention and infiltration, while its fibrous root structure retains moisture in the soil profile, making it resistant to drought and fire. The growth cycle of rough fescue allows the plants to endure the heat of the summer months, relying on moisture stored deep in the soil when there is less surface moisture.

In Canada, temperate grasslands, like those found in the Great Plains of Alberta, Saskatchewan and Manitoba, play a significant role in the global carbon cycle because of their vast areas and high soil carbon density (Prairie Conservation Forum n.d.). Janzen et al. (2002) suggested that soils under native grasslands in western Canada could contain up to 200 t/ha of carbon within the first metre under fescue prairie. The amount of carbon stored beneath 1 ha of unbroken foothills grassland is equivalent to removing approximately 150 cars from the surface of the earth for one year (Prairie Conservation Forum n.d.).

Supporting Biodiversity

The remaining areas of the foothills grassland are an important component of a diverse ecosystem sandwiched between the plains and the mountains that provides a rich variety of habitats for plants and animals. The diversity of plants and plant communities is especially high in this southwest portion of Alberta due to the rapid changes in elevation and climate variation from east to west (DeMaere et al. 2012). Numerous bird species occupy the diverse habitats (Natural Regions Committee 2006). Foothills grasslands provide key winter habitat for elk and bighorn sheep and support their seasonal movement along the mountain front and along valleys extending into the

mountains. Movement corridors for large carnivores also overlap with native grassland and shrubland communities in the transition zone between the Rocky Mountains and the historic grassland range (Natural Regions Committee 2006; Apps et al. 2007; Killeen et al. 2014).

ABMI reports that the percentage of native vegetation remaining in the Grassland and Parkland Natural Regions of southern Alberta is 37% – varying from 24% in the Central Parkland Natural Subregion to 55% in the Dry Mixedgrass Natural Subregion. In the Foothills Fescue Natural Subregion, 35% of native vegetation remains and 52% remains in the Foothills Parkland Natural Subregion (ABMI 2015a). Though the Grasslands Natural Region comprises only 14.6% of Alberta's total land surface, about 60% of the bird, fish and mammal species, 37% of the invertebrate species and 52% of the vascular plants recorded by the ABMI are found in this natural region (ABMI 2013).

Supporting Economic Livelihoods

Beginning in the 1870s, ranchers moved large herds of cattle into Alberta to take advantage of the ample forage that provided year-round grazing (Prairie Conservation Forum 2016). Native prairie, when used as rangeland for cattle, adds millions of dollars each year to the provincial economy; beef production provides valuable protein for human consumption, and keeps native grasslands open for other uses (Prairie Conservation Forum 2016). Some types of agriculture (e.g., extensive grazing) are compatible with natural grassland functions, but might not immediately provide the same high economic return as other more intensive land uses (Good and Haddock 2012). As a result, grasslands have historically been undervalued compared with other land uses, which has increased their conversion and development.

Well-managed fescue grasslands are important for livestock in southwestern Alberta. Rough fescue plays a critical role in providing important fall and winter forage for livestock and wildlife given that the plants maintain their nutritional value in the winter, unlike tame grasses. Fescue grasses are also tolerant of winter grazing and can be accessed by grazers in deep snow (Alberta Sustainable Resource Development 2010).

The economic value of fescue grasses extends beyond their productivity, as there are cost savings by maintaining native fescue. Fescue reduces dependence on expensive machinery as cattle feed themselves, and there is less weeding expense compared with early disturbed grass communities (Bradley et al. 2002).

As the urban population continues to grow, the appeal of farm and ranch vacations, and other forms of rural and prairie tourism is flourishing. This brings revenue to rural residents and small communities (Prairie Conservation Forum n.d.). This form of economic activity is supported by healthy grasslands. Further, grasslands offer many recreational opportunities for hunters and other outdoor activities, including bird-watching and other wildlife viewing (Prairie Conservation Forum n.d.).

CURRENT STATUS OF CONSERVATION TARGET

KEAs were identified to determine the current status of the foothills grasslands target, including size, condition and landscape processes that are important to target health. Table 2 lists the KEAs, indicators and health ratings (and justification for the ratings) of each foothills grasslands KEA. Health scores were derived from expert opinion, and were informed by spatial analysis and literature review. For the analysis approach and results (including maps), threshold levels and important limitations and data gaps for this process, see Appendix A.

Table 2: Target Viability Assessment – Foothills Grasslands Target

Conservation Target	Category	KEA	Indicator	Poor	Fair	Good	Very Good
Foothills Grasslands	Size	Extent of foothills grasslands	Percentage foothills grasslands remaining without human footprint	0–25%	26–50%	51–75%	76–100%
Foothills Grasslands	Condition	Health of foothills grasslands	Alberta Environment and Parks range health scores	Unhealthy	Majority healthy with problems	Majority healthy	All healthy
Foothills Grasslands	Condition	Intactness of native plant species	ABMI grassland vascular plants intactness score	<50%	50–75%	76–89%	90–100%
Foothills Grasslands	Condition	Intactness of biodiversity	ABMI biodiversity intactness scores	<50%	50–75%	76–89%	90–100%
Foothills Grasslands	Landscape Context	Foothills grasslands connectivity	Percentage of foothills grasslands with no human impact and patches >10 km2	<25%	<50%	>50%	>75%

Size and landscape context were rated as fair, each with one KEA. The condition KEA range health values received a good rating and intactness of biodiversity was rated fair. The **good** rating for range health values was due to a slim majority of healthy sites. Overall, the current health of the foothills grassland target is **fair,** defined as outside acceptable range of variation, and requiring human intervention. The goals for the foothills grassland target should therefore focus on conserving remaining grasslands and improving landscape condition and connectivity.

CRITICAL THREATS

To determine the critical threats for foothills grasslands, the sources of stress affecting KEAs were first determined. Sources of stress are typically degraded KEAs, so for the foothills grasslands target, reduced foothills grassland extent, increased fragmentation, and altered condition and structure were identified as key sources of stress. Each of the sources of stress was ranked for severity and scope based on expert opinion.

Critical threats were identified as issues or activities (factors) that affect the source of stress, such as linear disturbance, which directly affects fragmentation of foothills grasslands. Each critical threat was ranked based on its contribution and irreversibility. Lastly, threats that might have a future impact on foothills grasslands were identified.

For more information on stress and critical threat ratings, see Appendix B. Of the 10 threats identified for the foothills grasslands conservation target (see Table 3), 3 were ranked **high** – linear disturbance, residential development and terrestrial invasive species.

Table 3: Foothills Grasslands Threats and Ratings

Threats		Foothills Grasslands
1	Linear disturbance (roads, rails, and transmission lines)	High
2	Residential development (rural residential growth)	High
3	Terrestrial invasive species	High
4	Conversion to cropland	Medium
5	Motorized recreational activities	Medium
6	Renewable energy	Medium
7	Surface disturbance (mining)	Medium
8	Surface disturbance (oil and gas)	Medium
9	Altered fire regime	Low
10	Unsustainable range management	Low

Current Threats

Linear Disturbance (Roads, Rails and Lines) – High Threat

Few grassland landscapes remain in North America that are of a size to properly sustain biodiversity and ecological processes that are native to the landscape (Samson et al. 2004). Indeed, grasslands in Canada are heavily fragmented by linear features such as roads (Roch et al. 2014). It is recognized that fragmentation jeopardizes the ecological health, function and operability of remaining fescue grasslands (Alberta Sustainable Resource Development 2010).

According to the Southern Foothills Study[1], the landscape is becoming increasingly fragmented due to new roads, industrial development from the energy and forestry sectors, and new residential acreages (ALCES 2007). Road length is projected to increase from some 7,136 km in 2005 to more than 16,200 km in 2055 (ALCES 2007). Roads are one of the most damaging anthropogenic features to intact landscapes, particularly regarding hydrological function and habitat fragmentation (Forman and Alexander 1998).

This threat was rated as **high** because of the proliferation of roads in the study area and because roads are rarely remediated to a natural state.

Residential Development (Rural Residential Growth) – High Threat

Results of the Southern Foothills Study suggest that the number of residential acreages will almost triple from 500 to 1400 by 2055 (ALCES 2007). The majority of potential growth is expected to continue southwest of Calgary and between Cochrane and Airdrie to the northwest. This trend will increase the current road density and add roads into previously undisturbed areas (ALCES 2007).

This threat was rated as **high** because once housing developments are in place they are typically permanent. Intact grasslands are lost directly to rural residential development; the ecological impacts, however, extend far beyond the actual footprint of the development (Bradley and Good 2016). Rural residential acreages use significant volumes of groundwater, encourage expansion of invasive plants, lead to overgrazing by horses and other livestock confined in small spaces, and can result in unregulated year-round off-highway-vehicle (OHV) use (ALCES 2015).

[1] The Southern Foothills Study area is very closely aligned with the Collaborative's study area, so the results of the Southern Foothills Study are presented as an important source of information throughout this section.

Terrestrial Invasive Species – High Threat

Terrestrial invasive species can affect the community structure (Gratton and Denno 2005) and biodiversity of an ecosystem (Brown and Gurevitch 2004) through displacement of native species (Tayeh et al. 2015). Invasive plant species can compete directly with native species and might cause changes in ecosystem processes that have profound effects on native species (Mack 1989; Howe and Knopf 1991; D'Antonio and Vitousek 1992; Christian and Wilson 1999) by altering the ecosystem dynamics and processes of an ecological community (Bart and Hartman 2000). Control and eradication methods are time-consuming and costly, and are often only able to keep the plants at a tolerable level. As human activity continues to increase in the area, this threat will remain present, and will continue to grow without proper management (Nature Conservancy of Canada 2016).

Linear corridors, such as seismic lines, roads and pipelines are "sources and vectors for non-native species invasion" (Bradley 2003b). Intensive human disturbances and activities continue to result in the loss of fescue grassland and encourage the spread of non-native species. Native grasses have difficulty re-establishing when competing with non-native perennials (Clark 1998). Once disturbed, they are easily displaced by introduced species with shallow roots, such as bluegrass and wheatgrass (Bradley 2003b). These disturbances, combined with the sensitivity of fescue grassland, and the great length of time fescue takes to establish, has made restoration to the reference plant community virtually impossible (Holroyd 2008).

According to Alberta Sustainable Resource Development (2010), we currently lack the tools and knowledge to restore foothills fescue grasslands after they are disturbed by land-use activities (e.g., road construction, oil and gas development, mineral exploration developments and cultivation). Historically, a number of invasive non-native species, such as Kentucky bluegrass, smooth brome and timothy, were used to reclaim industrial disturbances and provide additional winter forage for livestock on cultivated hay land. These species are prolific seed producers, the seeds are easily dispersed and the seeds germinate where soil disturbance has occurred (Alberta Sustainable Resource Development 2010). Long-term restoration success has yet to be demonstrated and documented on industrial sites subject to the complete range of production and operational disturbance-related activities (Alberta Sustainable Resource Development 2010).

Though invasive species can affect pollinators and small mammal movements, the timeframe for invasive species to contribute to reduced grassland connectivity is very likely longer than 10 years – the timeframe for this plan (Bradley and Good 2016).

This threat was rated as **high** because invasive species are widespread across the study area. While restoration can be done, it is not practicably affordable. Also, land managers use very specific management techniques for specific species; there is no one solution to the threat. Climate change adds another level of uncertainty to management and restoration of native grasslands and therefore contributes to the high rating.

Conversion to Cropland – Medium Threat

According to the Natural Regions Committee (2006), 50% of the Foothills Fescue Natural Subregion has already been cultivated. The majority of native prairie (80%) in southern Alberta is occurring at higher elevations. Additional loss of grassland through cropland conversion was deemed to be a highly irreversible threat (Bradley and Good 2016). Grassland restoration is a big challenge, especially for fescue grasslands (Bradley 2016). However, the bulk of conversion to cropland has already occurred and has been declining in the region since the 1960s, with projections that cropland conversion will continue to decline (ALCES 2015). Although this is a declining threat, it has affected the current health score and efforts to restore grasslands must be considered.

Motorized Recreation Activities – Medium Threat

Motorized recreation is spatially widespread on public lands in the study area, and recreation use continues to increase with little effect from the implementation of Beneficial Management Practices (BMPs) (ALCES 2015). The effects of motorized recreation are detrimental to terrestrial and aquatic systems. Known risks associated with motorized vehicles in wilderness areas include erosion, river access, spread of invasive plants, constant and repetitive soil disturbance, and negative impacts on mammals, reptiles, amphibians and fish (Boyle and Samson 1985; Alberta Conservation Association 2010). The need to better manage motorized use was stressed during public consultation for the South Saskatchewan Regional Plan (SSRP) and during the ongoing recreation management planning process for the recreation management plans mandated by the SSRP.

This threat was rated as **medium** because ranchers in the Porcupine Hills and landscapes adjacent to public land are very concerned about this issue. This is an activity that has been left largely unmanaged on forest reserve grasslands and now has profound impacts (Bradley 2016). The forest reserve grasslands are at greater risk because of the access the forest reserve and its multiple-use mandate provides. Roads and their use by recreationists can lead to changes in drainage patterns. Also, undesirable activities like mud bogging are occurring on these landscapes, causing significant environmental damage.

Renewable Energy – Medium Threat

The Government of Alberta recently committed to invest in renewable energy. Paired with announcements from the Paris COP 21 meetings, this commitment to renewable energy might lead to increased pressure to develop solar and wind farms on foothills grasslands. There is potential for solar farms to be a significant land use in southern Alberta within the next 10 years.

This threat was rated as **medium** given that there are limited proposals for renewable energy development across the study area, compared with areas farther east. However, there are permanent effects on vegetation stemming from wind towers, transmission infrastructure and access roads (Bradley and Good 2016). It was challenging to rate the potential impact of solar farms on foothills grasslands given that this land use is in a nascent stage in Alberta. It is a land use trend to track.

Surface Disturbance (Mining) – Medium Threat

There is no active coal mining in the study area, though the industry has a legacy in the region. The Riversdale Resource group is planning to extract coal from the Grassy Mountain area, plans three exploratory expeditions in Bellevue, Adanac and Lynx Creek, and has a separate freehold land package near the Grassy Mountain site that might be used for infrastructure for the other mining projects (Riversdale Resources 2014).

Gravel mining is the most common type of surface excavation, as aggregate product is used for the construction of all land-use footprints (i.e., roads, wellsites, residential, industrial). Though their individual size is small, these features are generally not reclaimed, cause a loss of topsoil and are common sites for the introduction of invasive plants (ALCES 2015).

Mining infrastructure often leads to the introduction of invasive species, a major concern for native prairie (Bradley et al. 2002). Non-native seed mixes are used to help stabilize soil as quickly as possible and to reduce costs (Maynard and Hill 1992), therefore increasing the likelihood of non-native species becoming established. Often, after reclamation, soil organic moisture and microbial activity are found to be lower than the surrounding undisturbed sites (Viall et al. 2014). This is thought to be the reason why plant communities fail to re-establish to pre-disturbance levels (Viall et al. 2014).

This threat was rated as **medium** because numerous gravel mines are planned for the region, though the impacts will be localized. The surface mining disturbance will serve as a vector for the spread of invasive species. Reclamation is possible, but restoration to native condition is challenging if not impossible (Bradley 2016).

Surface Disturbance (Oil and Gas) – Medium Threat

ALCES (2007) projected that producing wells in the study area by 2055 will comprise 1104 conventional gas, 378 conventional oil, 1972 CBM and an additional 1500 other wells (delineation, dry). A number of global forces, however, including global oil prices and a transition to renewable energy, might now result in a more conservative projection. If the price of oil returns to previous values, there is potential for existing licences to be reopened, leading to an increase in activity. Even more important for the southern eastern slopes will be the price of natural gas, which is also currently depressed and is the more abundant fossil fuel in the study area.

Despite the small size of the actual footprint of the hydrocarbon industry in the study area, its effects on water quality, landscape fragmentation and wildlife habitat are large (ALCES 2015). The infrastructure associated with oil and gas development often leads to the introduction of invasive species, a major concern for native prairie (Bradley et al. 2002). Non-native seed mixes are used to help stabilize soil as quickly as possible and to reduce costs (Maynard and Hill 1992), therefore increasing the likelihood of non-native species becoming established. Often, after reclamation, soil organic moisture and microbial activity are found to be lower than the surrounding undisturbed sites (Viall et al. 2014). This is thought to be the reason why plant communities fail to re-establish to pre-disturbance levels (Viall et al. 2014).

Though some of this sector's footprint has been reclaimed in past decades, the pace of new features has outpaced reclamation rates (ALCES 2015). Additionally, there is the burgeoning issue of abandoned wells. As of 2009, there were over 45,000 wells that have been abandoned in Alberta but not certified as reclaimed (Horner 2014).

Relative to the "business as usual" scenario, the footprint of the hydrocarbon industry can be reduced by adopting BMPs, including smaller seismic lines, greater spatial overlap between existing linear features and new pipelines, using multi-well pads where feasible, and an aggressive approach to reclaiming existing linear features. In combination, these BMPs result in a reduced footprint and mitigation of damage to water, landscape, and wildlife (ALCES 2015).

This threat was rated as **medium** given current lagging oil prices, and that BMPs could lead to reduced impact for new development. However, restoration of existing oil and gas disturbances to native grassland is challenging (Bradley 2016).

Altered Fire Regime – Low Threat

Fire is deemed to have been the primary vector for disturbance in grassland systems, with an estimated return interval of 15 to 25 years for naturally occurring fires (Samson and Knopf 1994). The presence of agriculture and ranching, and increased housing and recreation use, are major factors in promoting fire suppression (Nature Conservancy of Canada 2016). Fire suppression is seen as a threat to the long-term viability of grassland systems due to the reduction in fire frequency, which disrupts natural disturbance patterns and successional processes, thereby encouraging the encroachment of woody vegetation (Anderson 2006). Additional impacts of fire suppression on the landscape can include larger, more intense fires, reduced landscape and community diversity, frequent insect and disease epidemics, and loss of biodiversity resulting from reduced habitat diversity (Nature Conservancy of Canada 2015).

Despite the ecological impacts, this threat was rated as **low** because the ecological effects of an altered fire regime can be partially mitigated through grazing management and mechanical thinning/removal of woody vegetation where encroachment is occurring (Good pers. comm.). Letting fires burn and using prescribed burns are challenging for the foothills grasslands given their proximity to people and settlements. However, Parks Canada, the Government of Alberta and some ranchers do engage in prescribed burns on lands they manage.

Unsustainable Range Management – Low Threat

Inappropriately managed grazing can result in negative impacts on the ecosystem, including degraded soil and water quality, or the conversion of the poorly managed land to a less-productive grassland community (Adams et al. 2005). Impacts can occur over an entire pasture (through overgrazing or overstocking), or be focused around watering sources, riparian areas or other localized areas where cattle tend to congregate (Nature Conservancy of Canada 2015).

Livestock grazing affects species composition through active selection by herbivores for or against a specific plant taxon, and differential vulnerability of plant taxa to grazing (Szaro 1989). Ecosystem function can be affected by commercial grazing through disruption of successional processes and prevention of seedling establishment (Longhurst et al. 1982), and structure can be affected by soil compaction, introduction of invasive species, and removal of key plant species and litter layer (Fleischner 1994).

This threat was rated as **low** given the extent of the study area and that range improvements can be easy to realize through training and management actions. It is recognized that some local areas are more heavily affected, and there was discussion about how close certain rangeland systems are to tipping points that would cause an irreversible state change (Bradley and Good 2016).

Note: A rating of low was assigned because unsustainable grazing in riparian areas will be addressed in the riparian areas conservation target report.

Emerging Threats

Climate Change

It is challenging to rate the threat presented by climate change to foothills grasslands given the 10-year timeframe for the conservation action planning process. The literature indicates that the Rocky Mountains might experience shorter, warmer winters (estimates range from 40–50% decrease in annual snowpack and increased fall precipitation), resulting in diminished spring/summer runoff (Leung and Ghan 1999; Lapp et al. 2005).

Conversion of native prairie is also linked to climate change. Any time that native grass is ploughed it exposes the soil to sun, wind and air, and allows the accumulated carbon in the soil to oxidize (ALCES 2007). Ploughing also exposes the landscape to invasion of non-native plant species,

which replace the native fescue grass. This compromises the ability of the fescue grass to sequester and hold carbon in the soil (ALCES 2007).

Indirect Threats

Indirect threats are contributing factors that drive direct threats and must be considered in strategy development as they represent an aspect of a threat where groups, organizations and individuals can attempt to incite change. For the foothills grasslands target, the following indirect threats were identified:

- Lack of coordination (policies) around one road network that services different industries.
- Competitive land use markets – value of crops vs. value of beef influencing conservation of native grasslands.
- Demographics of current ranching families.
- Land values not agricultural-based but based more on recreational value (rural residential development).

OPPORTUNITIES

The following opportunities were identified as important to consider for strategy development:

- Government of Alberta Land Trust Grant Program, which enables land trust organizations to maintain foothills grasslands in a natural state.
- Government of Alberta implementation of SSRP, which makes foothills grassland conservation a priority. Other regional plans are also being developed.
- Government of Alberta is developing a Linear Footprint Management Plan for the Livingstone–Porcupine Hills area that will set limits on roads and trails accessible to motorized vehicles on Crown lands.
- Public desire to purchase products from local conservation landscapes that support maintaining natural state.
- Ecotourism potential of iconic landscape as a revenue-generating opportunity to maintain land in its natural state.
- Government of Alberta desire to meet conservation targets for the Upper Foothills and Lower Foothills Natural Subregions.

STRATEGIES

The next step in the process is to develop goals/objectives and strategic actions to address critical threats and/or improve target health. Objectives tend to be measurable statements of what we as a community want to achieve relative to the foothills grassland target. Objectives can include activities related to policy and law, stewardship protection of land, water or species management, education and awareness, and livelihood, economic and other incentives.

Goals, objectives and example actions were identified through a workshop with ENGOs, community members and stakeholders interested in protecting the southern eastern slopes. Participants were asked to review KEAs, critical threats, indirect threats and opportunities for the foothills grasslands target.

Goals

Goals and objectives and strategic actions developed to address critical threats/improve target health include the following:

1. Maintain current extent of foothills grassland target.
2. No additional linear disturbance in large parcels (>10 km2) of foothills grassland.
3. Protect and enhance structural connectivity between foothills grassland patches.
4. Achieve range health scores on public and private land of at least 60% healthy, no more than 35% healthy with problems and no more than 5% unhealthy.

Goal 1: Maintain current extent of grassland target.

Objective 1: Increase the rate of private land conservation on foothills grasslands (given that 79% is on private land).

Example Actions:

- Create a target for percentage of private grassland to be protected per year.
- Create a reliable, long-term funding source for conservation of private foothills grasslands.

Data Gaps:

- Determine total percentage of private foothills grasslands currently protected.
- Determine rate of current annual loss of foothills grasslands and areas at highest risk.
- Determine budget resources required to fund the protection target.

Objective 2: Ensure regulators (Alberta Utility Commission and Alberta Energy Regulator) adhere to guidelines for avoiding disturbance of native prairie (e.g., information letter to AER).

Example Actions:

- Coordinate/support Prairie Conservation Forum (PCF) outreach regarding best practices.

Objective 3: Apply appropriate designations on grasslands under Crown grazing leases to avoid additional linear disturbance.

Example Actions:

- Determine current status of protective designations on grazing leases in foothills grasslands.
- Work with AEP to determine best designation to accomplish the objective.

- Work with AEP and stakeholders to get appropriate designation implemented.

Objective 4: Apply appropriate designations to protect grassland in the forest reserve to avoid additional linear disturbance.

Example Actions:

- Determine status of protective designations on forestry allotments in foothills grasslands.
- Work with AEP to determine best designation to accomplish the objective.
- Work with AEP and stakeholders to get appropriate designation implemented.

Objective 5: Work toward greater inclusion of grassland conservation goals in municipal planning.

Example Actions:

- Engage municipalities on the values of foothills grassland conservation.
- Support municipal planning efforts with data/mapping/expertise on grassland conservation.

Objective 6: Reduce current recreational/industrial footprint on grassland in the forest reserve.

Example Actions:

- Ensure stakeholders engage in current and future regional planning for land footprint plans.

Goal 2: **No additional linear disturbance in large parcels (>10 km^2) of foothills grassland.**

Several of the objectives identified for Goal 1 apply directly to Goal 2. These have been reiterated below as they apply to Goal 2 without repeating the example actions and data gaps listed under the objectives in Goal 1.

Objective 1: Increase the rate of private land conservation in large parcels of foothills grasslands.

Objective 2: Ensure regulators (AUC and AER) adhere to guidelines for avoiding disturbance of native prairie on large parcels.

Objective 3: Apply appropriate designations on grasslands under Crown grazing leases to avoid additional linear disturbance on large parcels.

Objective 4: Apply appropriate designations to protect grassland in forest reserve to avoid additional linear disturbance on large parcels.

Goal 3: **Protect and enhance structural connectivity between grassland patches.**

Objective 1: Develop a strategy to protect or enhance priority areas for connectivity between patches, including targeted protection or reclamation of key linkages (e.g., cropland planted to permanent cover).

Data Gaps:

- Determine a metric that represents grassland connectivity from a broad biodiversity standpoint for foothills grasslands. Some of this work might be underway by PCF.
- Based on the metric above, create map showing areas of highest priority and probability for protecting or enhancing connectivity between patches.
- Determine what type of restoration/land use on non-grasslands best facilitates connectivity between grassland patches.

Goal 4: **Achieve range health scores across public and private land of at least 60% healthy, no more than 35% healthy with problems and 5% unhealthy.**

Objective 1: Reduce the rate of spread and extent of invasive weeds into foothills grasslands.

Example Actions:

- Encourage a coordinated approach between municipalities, ENGOs and provincial agencies in reducing the spread of invasive weeds.
- Secure more resources for municipalities to determine extent of and manage invasive weeds.
- Have invasive weed management plans in place for each watershed in the Southern Eastern Slopes by 2020.

Objective 2: Improve understanding of range health in foothills grasslands on private land

Example Actions:

- Create confidential dataset (non-landowner specific) quantifying current state of range health on private grasslands to determine potential strategies for improving range health.

Data Gaps:

- Currently there is no consistent data (spatially or the type of data collected) on range health on private lands in the foothills grasslands.

Objective 3: Support implementation of BMPs for grazing on private and public grasslands.

Example Actions:

- Create a coordinated approach between municipalities, ENGOs and provincial agencies on education and outreach around BMPs for grazing of grasslands.

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APPENDIX A: FOOTHILLS GRASSLANDS TARGET VIABILITY ASSESSMENT

This appendix describes the KEAs and indicators used to measure the health of the foothills grasslands conservation target. Indicators were developed considering the target's size (extent), condition and landscape processes, as described in the TNC CAP process. KEA analysis was undertaken by Ken Sanderson, and health scores for all indicators were rated based on the expert opinions of Cheryl Bradley, Kim Good, Rachelle Haddock and Tracy Lee.

Health score rating thresholds were developed for each indicator following defined categories in the TNC CAP process:

- Very Good – Ecologically desirable status; requires little intervention for maintenance.
- Good – Within acceptable range of variation; some intervention required for maintenance.
- Fair – Outside acceptable range of variation; requires human intervention.
- Poor – Restoration increasingly difficult; could result in extirpation of target.

The following data sets were used in the analysis: Alberta Biodiversity Monitoring Institute. 2014. Manual for Species Modeling and Intactness, Version 2014-09-25. Alberta Biodiversity Monitoring Institute, Alberta, Canada. Report available at: http://www.abmi.ca.

- ABMI Wall-to-wall Land Cover Map Version 2.1 (ABMIw2wLCV2010v1.0) was used, in whole or part, to create the foothills grasslands target. More information on the Institute can be found at: http://www.abmi.ca.
- ABMI Human Footprint Inventory for 2012 conditions (Version 3) was used, in whole or part, to inform indicators used in this report. The Alberta Biodiversity Monitoring Institute (ABMI) Human Footprint was used to represent anthropogenic features on the landscape. This data layer is updated by ABMI every 2-3 years and can therefore help monitor anthropogenic changes on the landscape at a provincial scale. More information on the Institute can be found at: http://www.abmi.ca.
- 2005 Natural Regions and Subregions of Alberta, Government of Alberta.
- Government of Alberta's Grazing Disposition Health data set.

KEY ECOLOGICAL ATTRIBUTES – FOOTHILLS GRASSLANDS TARGET

SIZE: Extent of Characteristic Communities/Ecosystem

To understand the loss of foothills grasslands over time we compare current extent of the foothills grasslands target to its original extent before settlement as represented by the area of the natural subregions in the study region that are characterized as predominantly grassland – Mixedgrass, Foothills Fescue, Foothills Parkland and Central Parkland. We calculated the area of grassland remaining without human impact and presented it as a percentage of the reference area to understand degree of grassland loss over time. There has been documentation of extensive loss of grassland to a variety of land uses (Alberta Sustainable Resource Development 2010). ABMI (2015) provides a detailed breakdown of the remaining native vegetation by natural subregion: 35% of Foothills Fescue, 35% of Mixedgrass, 52% of Foothills Parkland and 24% of Central Parkland remains as native vegetation.

Methods

The size of the foothills grasslands target before settlement was calculated in km^2 in a GIS environment by consolidating the area of the Central Parkland, Foothills Parkland, Foothills Fescue, and Mixedgrass Natural Subregions (not including grasslands in the Montane Subregion) occurring within the study region. This area was then modified by subtracting Broadleaf Forest and Mixed Forest from the landscape using ABMI Wall-to-Wall Land Cover. This represents the best estimate of a reference extent for the foothills grasslands target. Next, the current extent of the foothills grasslands target was mapped. The difference between these two areas (reference and current foothills grasslands area) provides us with an estimate of the extent of the target that has been lost. Finally, the total area remaining as foothills grasslands was calculated and converted into a percentage of the reference extent.

Results

Figure A-1 displays the reference layer (pre-settlement) in light yellow and foothills target in light green.

- Total size of the foothills grasslands target reference layer was **10,419 km2**.
- Total size of foothills grasslands excluding human footprint is **3,677 km2.**
- Foothills grasslands not affected since pre-settlement is **35%, or 65% lost.**

The size/extent of characteristic communities/ecosystems KEA was rated as **fair** given that the analysis indicates only 35% of the foothills grasslands target remains. This estimate aligns with the literature (e.g., Samson and Knopf 1994, Riley et al. 2007) and expert opinion (Bradley and Good 2016) that we are on the cusp between a poor and fair indicator rating.

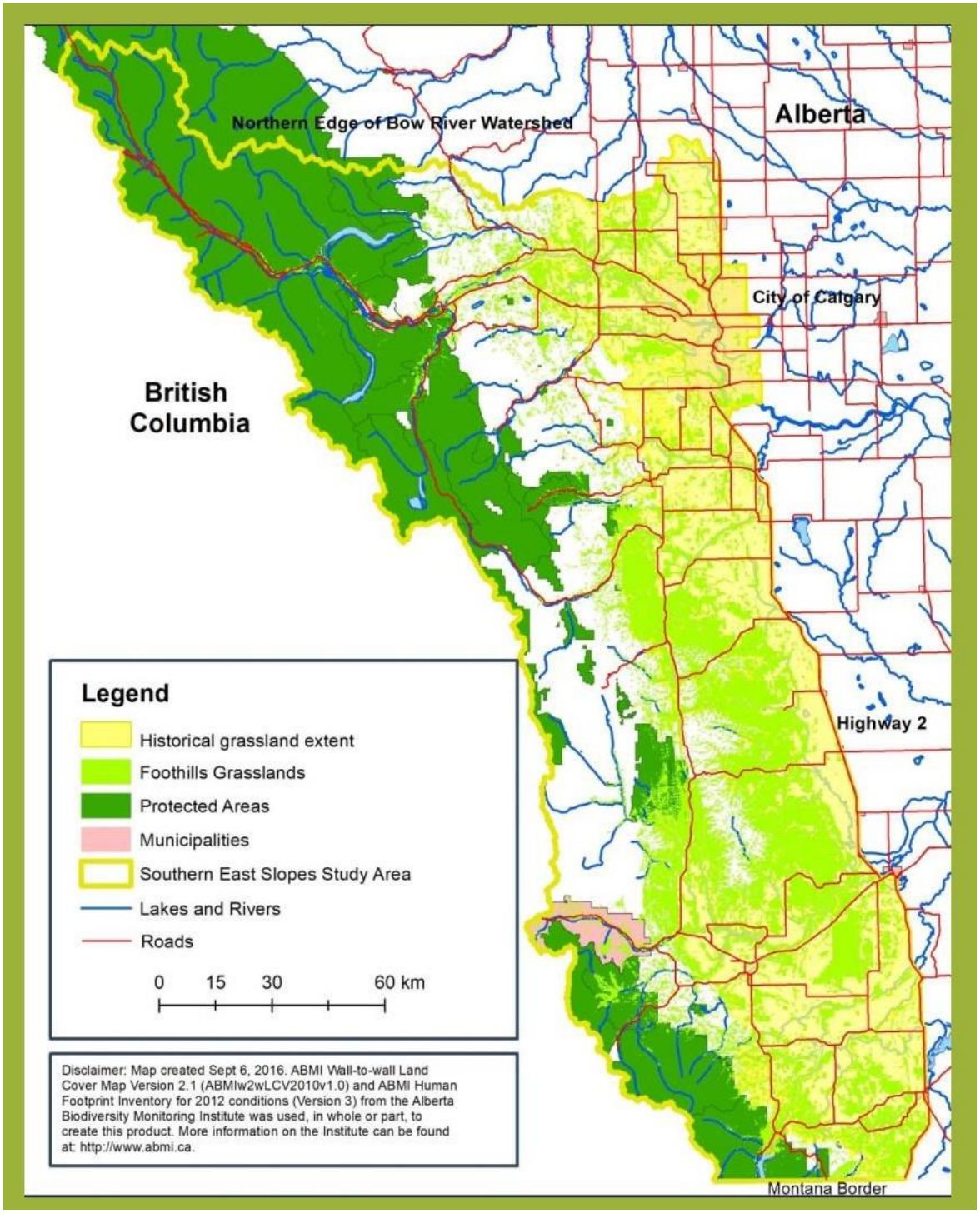

Figure A-1: Extent of Foothills Grasslands Target and Reference Condition

CONDITION: Grassland Vascular Plants Intactness Score

To understand the current health of the foothills grasslands target, we assessed the intactness of the landscape using the ABMI grassland vascular plants intactness score. Intactness of native vegetation is evaluated based on a measure of expected occurrence of 36 native grasslands species in plots throughout the region. A higher percentage of native plant species represents a more intact landscape. See the ABMI Status of Biodiversity in the Grassland and Parkland Regions of Alberta supplementary report (ABMI 2015b) for details on the intactness measure.

The ABMI indices are designed primarily as a proactive tool used to identify the status, trends and correlative relationships among common species, habitats and human footprint. The ABMI indices are based on establishing current, intact reference conditions that are statistical predictions designed to account for human footprint. These reference conditions and subsequent ABMI analyses and reporting do not account for historical changes in the overall abundance of a species (i.e., the ABMI cannot account for changes in a species before 2003).

This indicator and analysis does not include grasslands in the Montane Natural Subregion because the ABMI intactness layer did not include data for the Montane Natural Subregion.

Methods

ABMI intactness data was converted from asci to raster for all vascular plants. The raster was clipped to the foothills grasslands target, and then summary statistics were used to identify the mean per grid cell for the study area. Grid cells with no data were removed from the analysis.

Results

The grassland vascular plants KEA was rated as **fair** given that the vascular plant intactness is 59% (Figure A-2). If almost 40% of native plants are missing from the ABMI plots, terrestrial invasive species are likely occupying their habitats (Bradley 2016).

CONDITION: Biodiversity Intactness Scores

To understand the current health of the foothills grasslands target, we assessed the biodiversity intactness of the landscape using ABMI biodiversity intactness scores. This measure evaluates the intactness of biodiversity based on a measure of the expected occurrence of 194 species. A higher percentage of native species represents a more intact landscape. Please see ABMI's Status of Biodiversity in the Grassland and Parkland Regions of Alberta supplementary report for details on the creation of the intactness measure.

This indicator and analysis does not include grasslands in the Montane Natural Subregion because the ABMI intactness layer did not include data for the Montane Natural Subregion.

Methods

The ABMI Biodiversity intactness data was converted from asci to raster. The raster was clipped to the foothills grasslands target and summary stats were used to identify the mean per grid cell for study area. Grid cells with no data were removed from the analysis.

Results

The biodiversity key attribute was rated as **fair** given that the intactness score for the target area is 67% (see Figure A-3).

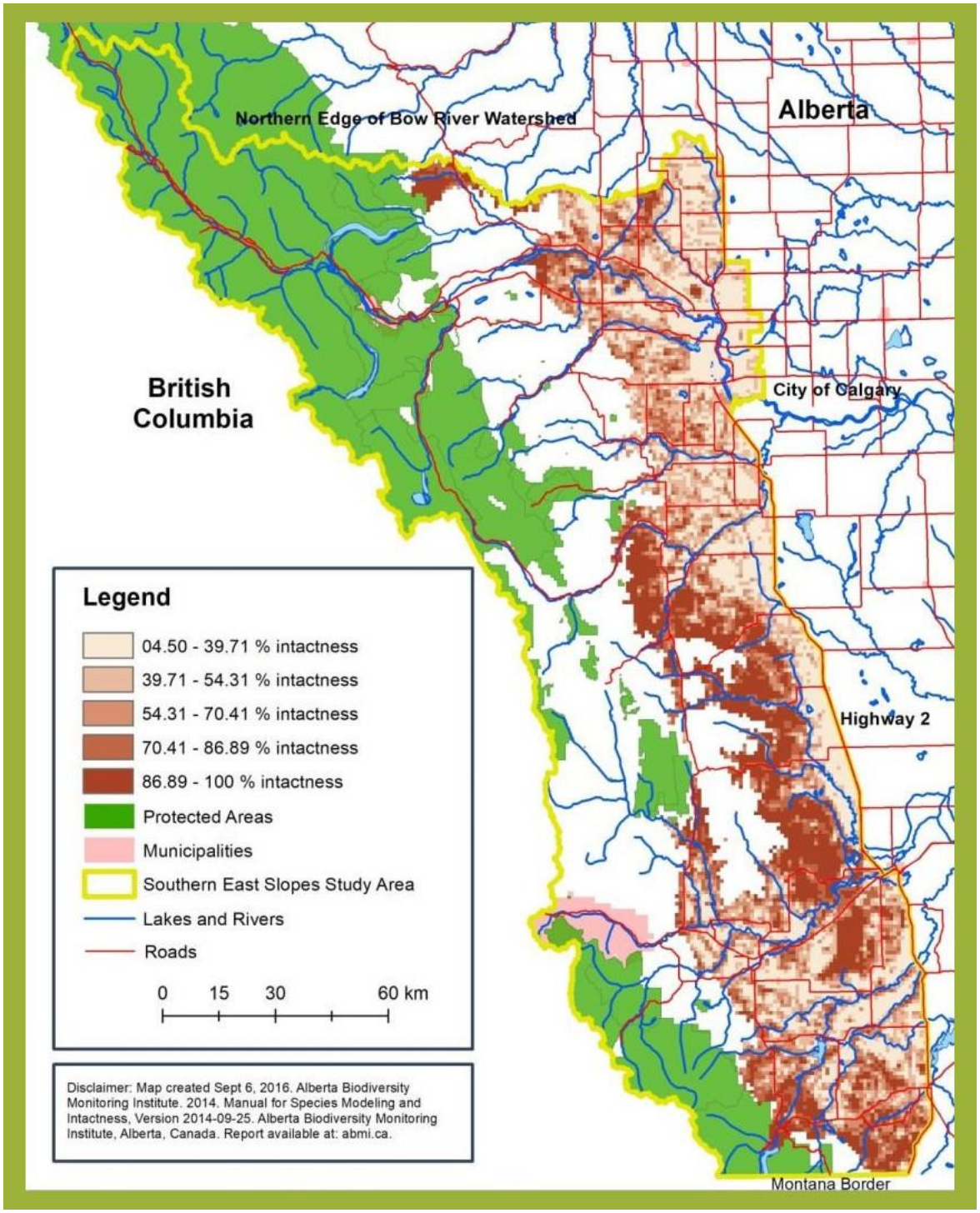

Figure A-2: Foothills Grasslands Target Vascular Plant Intactness

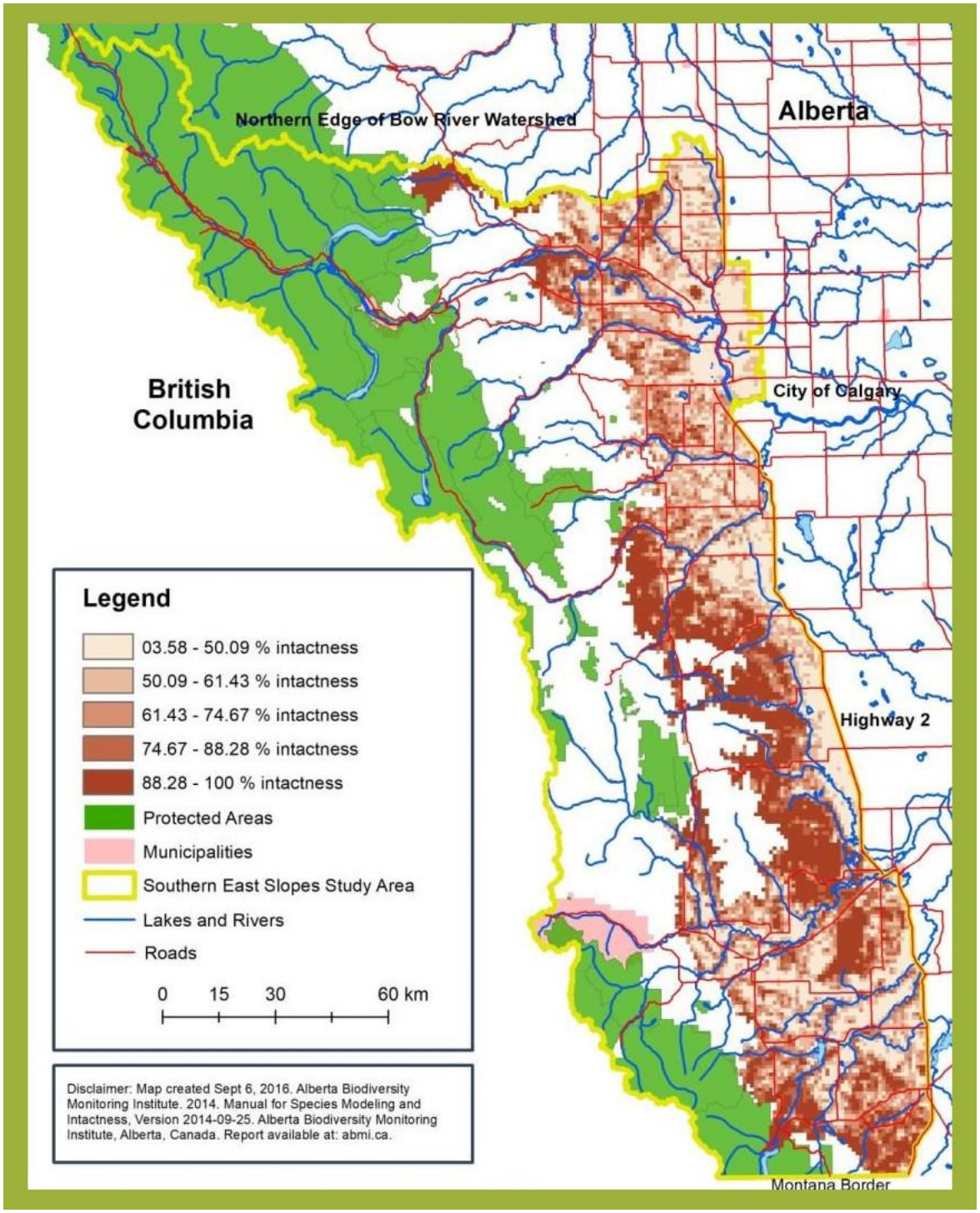

Figure A-3: Foothills Grasslands Target Biodiversity Intactness

CONDITION: Range Health Scores

Alberta Environment and Parks (AEP) monitors range health on crown lands to help inform cattle socking rates. Health is a measure of functions important to the maintenance of range lands and includes:

- Net primary production;
- Maintenance of soil/site stability;
- Capture and beneficial release of water;
- Nutrient and energy cycling; and
- Functional diversity of plant species.

Range health values were provided from AEP, and included grasslands occurring on crown land in the Eastern Slopes study area.

Methods

The range health values were determined for foothills grasslands by clipping the Grazing Disposition Range Health dataset with the Foothills Grasslands polygons created with ABMI Wall-to-Wall Landcover and Alberta Natural Subregions datasets. Areas were calculated in km^2 for the results.

Results

Figure 6 displays the distribution of where range health has been assessed in relation to foothills grassland target and also displays the range health score categories.

- Total foothills grasslands covered by range health database is 1220 km2, representing only 20% of our target.
- Range health is listed as healthy in 39% of the sites, healthy with problems in 31% of the sites and unhealthy in 0.2% of the sites (30% of the sites have not been evaluated).

The rating of the foothills grasslands target for the condition key attribute of range health scores was **good** (Figure A-4). The majority of sites with range health scores were either healthy or healthy with problems. It is important to note range health of grassland on private lands was not considered. Grasslands on private land are greater in area than those on Crown land. There is increasing recognition by private landowners of the economic value of maintaining healthy grasslands versus more degraded ones. However, range health on private lands can vary dramatically. Given that privately owned grasslands are often closer to land use disturbances and are currently or have historically been used for winter supplemental feeding with hay, they can be significantly affected by both invasive agronomic species and noxious weed species. Also, private grasslands are more likely than Crown grasslands to have been exposed to periods of overgrazing during droughts or tough economic times. The lack of data and factors affecting private grasslands mentioned above should be a significant qualifier to the "good" rating for this key attribute.

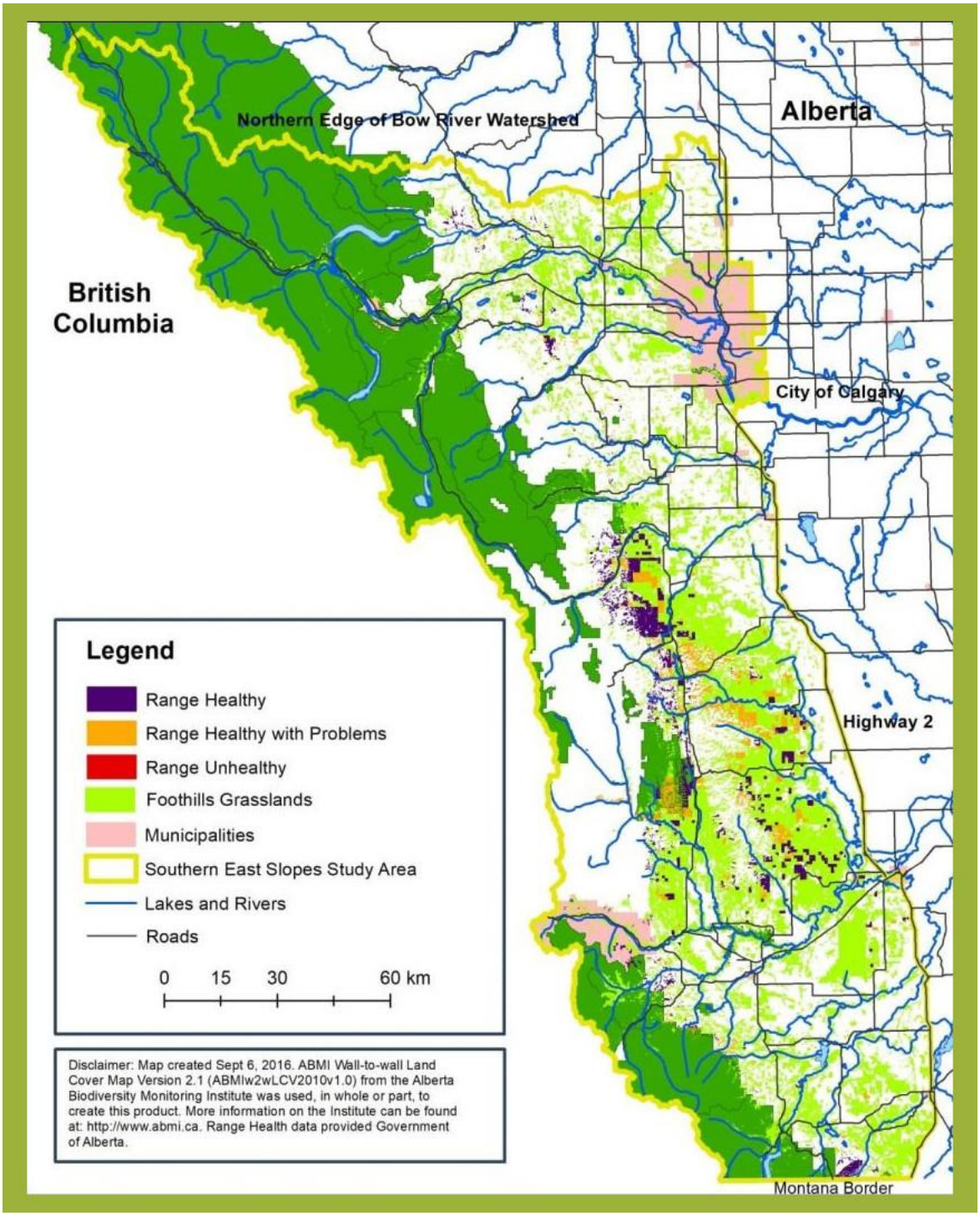

Figure A-4: Foothills Grasslands Range Health Scores

LANDSCAPE CONTEXT: Intactness of Native Habitat

Intactness of habitat or the degree of structural habitat connection between grassland patches is affected by habitat loss and landscape fragmentation. To assess the level of fragmentation occurring for the foothills grasslands target, percentage of foothills grassland contributing to native habitat patches of greater than 5 km^2 and10 km^2 in the study area was assessed. The foothills grasslands occur in a mosaic landscape of woodland, shrubland, grassland and wetland and we considered fragmentation in relation to the landscape mosaic as opposed to the individual target of foothills grassland. Although the patch sizes of 5 and 10 km^2 is somewhat arbitrary, we were operating under the principle that larger patch sizes represent better opportunities for biodiversity and ecosystem services to persist over time than more numerous smaller patches. In addition 5 and 10 km^2 was identified by ABMI (2015a) as the patch size to identify areas of high habitat value for grasslands.

Methods

Using ABMI Wall to Wall Landcover we selected the following classes to represent native habitat within the study area: shrubland, grassland, coniferous forest, broadleaf forest and mixed forest. Then, the AMBI human footprint layer was buffered by 100m and used to erase the target layer to create core areas (defined as areas equal to or greater than 5 and 10km^2).

Results

Figure A-5 and A-6 displays the resulting native habitat patches greater than 5 km^2 and10 km^2 in dark green, the foothills grassland target is displayed in a lighter green. An overlap of 1596 km^2 of the foothills grassland occurs within the native habitat patches. Therefore 26% of the foothills grassland conservation target in contributes to 10 km^2 native habitat patches.

The rating of the foothills grasslands target for the intactness key attribute was **fair**. Only 31% of the foothills grasslands target is occurring in native habitat patch sizes larger than 5 km^2 and 26% in patch sizes larger than 10 km^2. Geographically, though there are intact patches south of the Highwood River in and around the Porcupine Hills and Whaleback, on Piikani First Nation and southwest of Cardston, the remaining foothills grasslands target is not well intact. The areas north of the Highwood River in the vicinity of Calgary and near the Highway 2 corridor along the east boundary of the study area are particularly problematic from an intactness perspective (Bradley 2016).

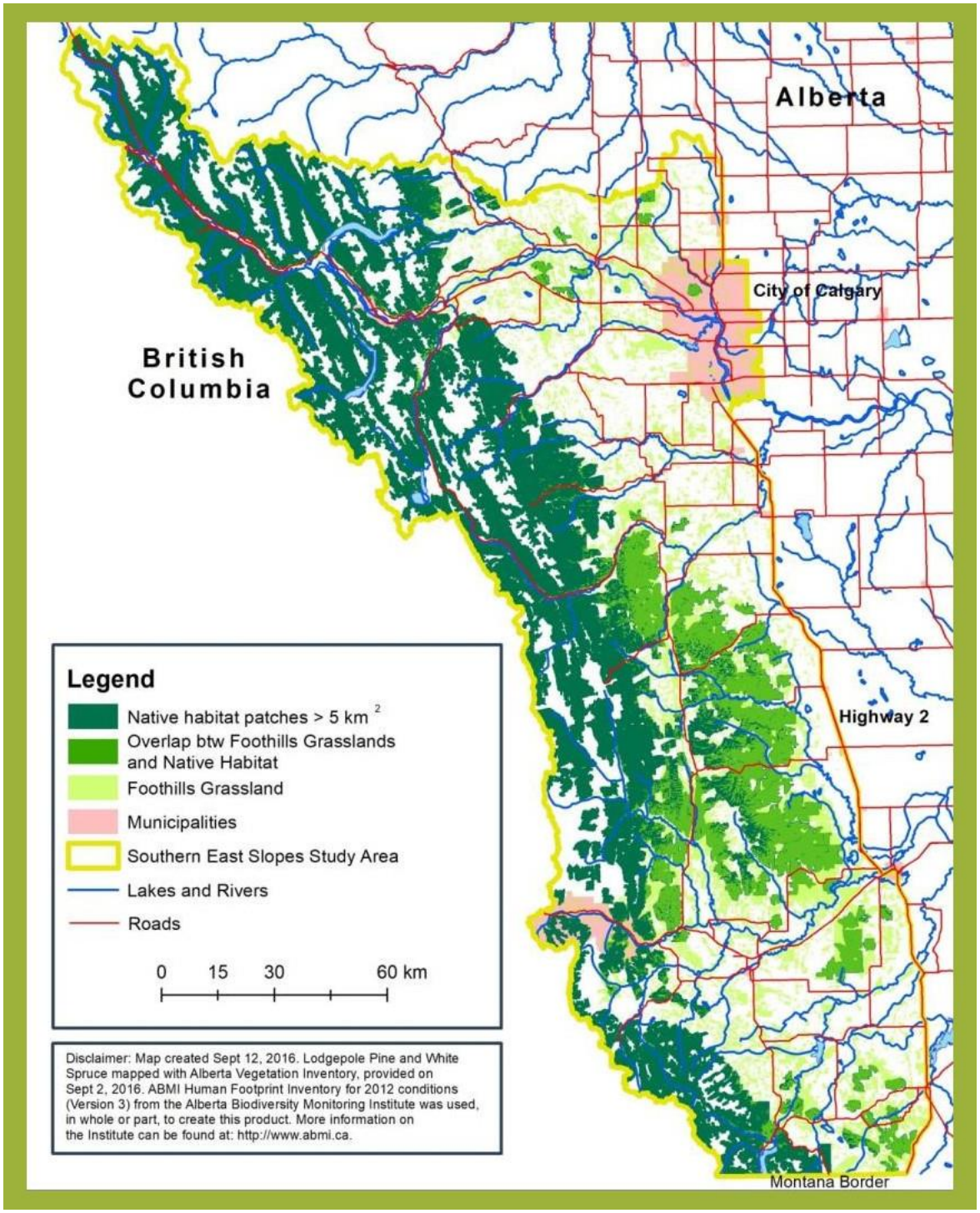

Figure A-5: Native Habitat Patches >5 km2

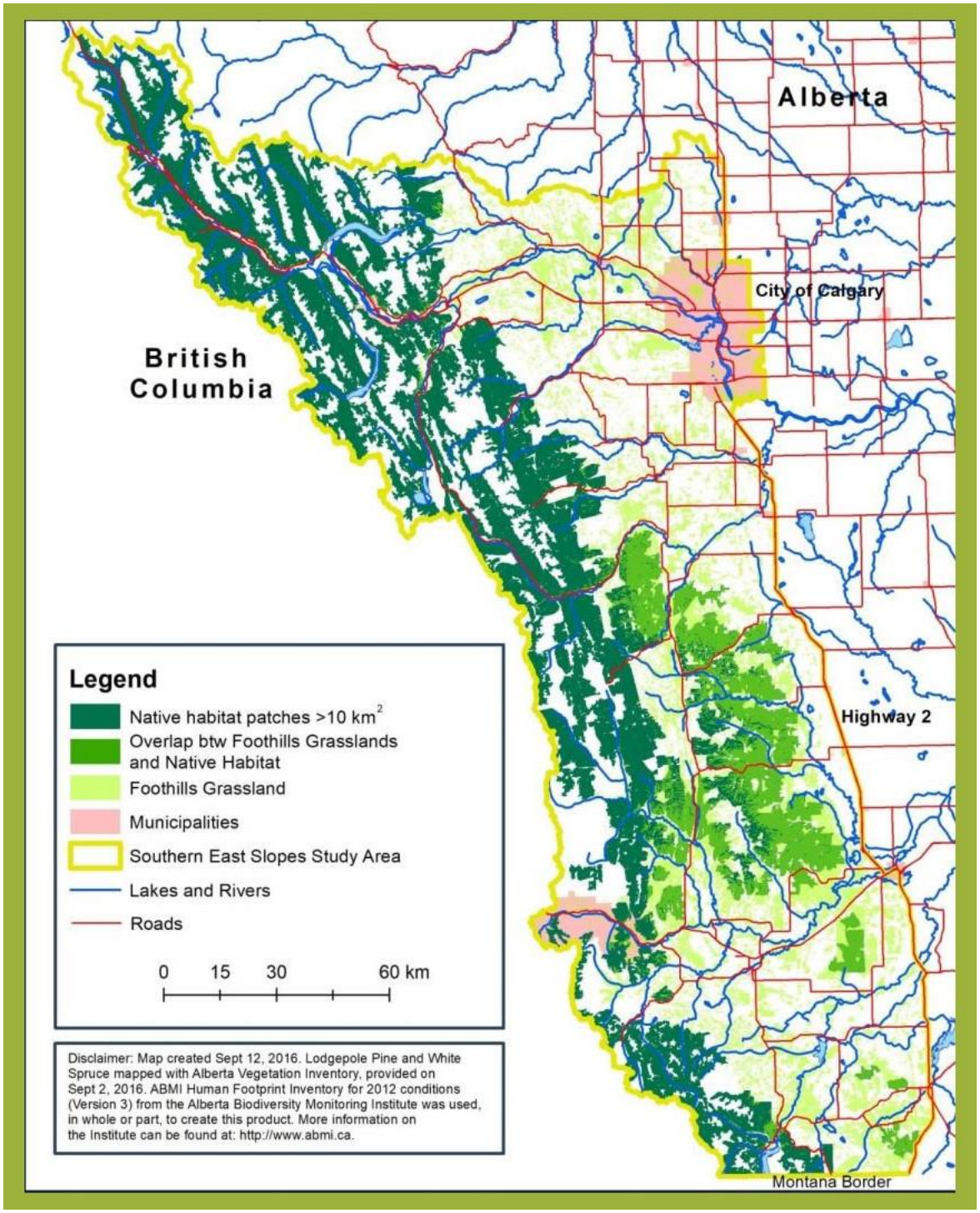

Figure A-6: Native Habitat Patches >10 km2

APPENDIX B: STRESSES AND THREATS – FOOTHILLS GRASSLANDS TARGET

For each KEA identified for foothills grassland, sources of stress were identified and rated for severity and scope based on categories defined by the TNC CAP process (TNC 2007). Stresses (see Table B-1) and threats (see Table B-2) were rated based on the expert opinions of Cheryl Bradley, Kim Good, Rachelle Haddock and Tracy Lee.

Each source of stress was rated in terms of its contribution and irreversibility.

Contribution is defined (TNC 2007) as the expected contribution of the source, acting alone, to the full expression of a stress under current circumstances:

- Very High: The source is a very large contributor of the particular stress.
- High: The source is a large contributor of the particular stress.
- Medium: The source is a moderate contributor of the particular stress.
- Low: The source is a low contributor of the particular stress.

Irreversibility is defined as the degree to which effects of a source of stress can be restored:

- Very High: Source produces a stress that is not reversible.
- High: Source produces a stress that is reversible, but not practically affordable.
- Medium: Source produces a stress that is reversible with reasonable resource commitment.
- Low: Source produces a stress that is easily reversible at relatively low cost.

Table B-1: Sources of Stress for Foothills Grasslands Target

Stresses	Severity	Scope	Stress Rank
Reduced foothills grassland extent	High	High	High
Altered species composition and structure	High	High	High
Reduced grassland connectivity	Medium	High	Medium

Severity considers the level of damage to the conservation target that can reasonably be expected within 10 years under current circumstances (i.e., given continuation of the existing situation).

- Very High: The threat is likely to destroy or eliminate the conservation target over some portion of the target's occurrence at the site.
- High: The threat is likely to seriously degrade the conservation target over some portion of the target's occurrence at the site.
- Medium: The threat is likely to moderately degrade the conservation target over some portion of the target's occurrence at the site.
- Low: The threat is likely to only slightly impair the conservation target over some portion of the target's occurrence at the site.

Scope is defined as the geographic scope of the impact on the conservation target at the site that can reasonably be expected within 10 years under current circumstance (i.e., given continuation of the existing situation):

- Very High: The threat is likely to be widespread or pervasive in its scope and affect the conservation target throughout the target's occurrence at the site.
- High: The threat is likely to be widespread in its scope and affect the conservation target at many of its locations at the site.

- Medium: The threat is likely to be localized in its scope and affect the conservation target at some of the target's locations at the site.
- Low: The threat is likely to be very localized in its scope and affect the conservation target in a limited portion of the target's location at the site.

Table B-2: Threats for Foothills Grasslands Target

Threats – Sources of Stress		Reduced Foothills Grassland Extent	Altered Species Composition and Structure	Reduced Grassland Connectivity
Stress		1	2	3
Rank		High	High	Medium
1	Conversion to cropland			
	Contribution	Low	Low	Low
	Irreversibility	High	High	High
	Threat Rank	Medium	Medium	Low
2	Terrestrial invasive spp.			
	Contribution	N/A	High	Low
	Irreversibility	N/A	High	High
	Threat Rank	N/A	High	Low
3	Linear disturbance (roads, rails, transmission lines)			
	Contribution	Medium	High	High
	Irreversibility	Very High	Very High	Very High
	Threat Rank	High	High	Medium
4	Altered fire regime			
	Contribution	N/A	Medium	-
	Irreversibility	N/A	Low	-
	Threat Rank	-	Low	-
5	Surface disturbance (mining)			
	Contribution	Low	Low	Low
	Irreversibility	High	High	High
	Threat Rank	Medium	Medium	Low
6	Unsustainable range management			
	Contribution	-	Medium	-
	Irreversibility	-	Low	-
	Threat Rank	-	Low	-
7	Residential development (rural growth)			
	Contribution	High	High	High
	Irreversibility	High	High	High
	Threat Rank	High	High	Medium
8	Renewable energy			
	Contribution	Low	Low	Low
	Irreversibility	High	High	High
	Threat Rank	Medium	Medium	Low
9	Surface disturbance (oil and gas)			
	Contribution	Medium	Medium	Medium
	Irreversibility	Low	Medium	Medium
	Threat Rank	Low	Medium	Low
10	Motorized recreational activities			
	Contribution	-	Medium	
	Irreversibility	-	Medium	
	Threat Rank	-	Medium	-