

# Recreational Access Management Planning: Understanding Perceptions Regarding Public Forest Lands in SW Alberta

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## Abstract

Management of recreational access on public forest lands is a complex issue of growing global importance. The provision of public recreation opportunities is part of the suite of ecological goods and services that must be considered by many forest managers. Effective access management is predicated on understanding the attitudes and perceptions of recreation users in order to predict and influence visitor behaviour and gauge the acceptance of new management strategies. Potential access management strategies vary given the nature of recreation activities and include: restricting the amount, type, and spatial distribution of use, visitor education, temporal restrictions and enhancing site durability. In this research we examined the views of recreation users on public lands in southwestern Alberta, Canada through implementation of an online survey (n = 945) with a focus on access management options. The results indicate a strong belief that the quality of the recreation experience is declining and that increased management and enforcement are required. More detailed analysis indicates that demographic and user-type variables strongly influence ideas about appropriate management. Forest managers need to engage with, understand, and respond to a wide variety of recreation user needs and preferences.

## Keywords

Forest Recreation Management, Access Management, Off-Highway Vehicles, Non-Motorized Recreation, Social Science of Natural Resource Management

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## 1. Introduction

The [Society of American Foresters \(2008\)](#) defines “forest management” as:

*the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest—note forest management includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.*

In this paper we focus on some elements of forest management required for the provision of recreational opportunities through access management. In many parts of the world, the use of forests primarily for the production of timber resources is being supplanted by other societal needs such as recreation ([Kaae, 2010](#)). Managing forest recreation is both about addressing the ecological impacts that affect forest health and managing for the provision of quality recreation experiences. These two components, however, are inextricably linked since the condition of the forest often affects the quality of the experience ([Hammit & Cole, 2015](#)).

Public multiple-use forest lands in southwestern Alberta, Canada are highly valued by local residents, visitors, communities and industry. In a recent land-use planning survey, respondents’ top three management concerns were: 1) inadequate consideration of cumulative effects; 2) loss of biodiversity and wildlife habitat; and 3) not enough places for recreation activity ([Alberta Environment and Sustainable Resource Development, 2007](#)). Moreover, the majority of respondents indicated a desire for more regulations and enforcement to protect the landscape and the quality of recreation experiences ([Alberta Environment and Sustainable Resource Development, 2007](#)). A recent regional land-use plan for the area indicates that “providing access to nature is essential for the physical and emotional health of children and adults, increasing recreational opportunities throughout the region by enhancing outdoor recreation infrastructure and amenities will increase quality of life and active living” ([Alberta Environment and Sustainable Resource Development, 2014: p. 90](#)). Outside designated protected areas, forestry is the dominant industrial activity on these public lands; there is also an abundance of petroleum development.

Recreation in the region includes a wide spectrum of activities including hunting, fishing, camping (designated campgrounds and random access camping), hiking, biking and off-highway vehicle (OHV) use. The latter is widespread and concentrated within a network of linear features (e.g., roads, haul-trails, seismic lines and pipelines) initially created for industry access and now used as OHV trails ([Fiera Biological Consulting Ltd., 2013](#)). These linear features create challenges for forest managers through erosion, degradation of watersheds and damage to cultural resource sites ([Cordell, 2004](#)). Roads and trails are ubiquitous in the region with 77% of the headwaters area rated at high or moderate risk owing to the density of all linear features ([Fiera Biological Consulting Ltd., 2013](#)).

Negative effects from unpaved roads in forested environments span social, economic and environmental systems ([Hunt & Dyck, 2011](#)). [Trombulak & Frissell \(2000\)](#) identified seven primary concerns for terrestrial and aquatic habitats owing to linear disturbances: increased mortality from road construction, increased mortality from collisions with vehicles, modifications of animal behaviour, alteration of the physical environment, alteration of the chemical environment, spread of exotic species, and increased alteration and use of habitats by humans. Additionally, people using linear corridors as trails to access remote areas have the potential to adversely affect the environment through destruction or alteration of vegetation, change in aesthetics, soil erosion and compaction, sedimentation of watercourses, disturbance of environmentally sensitive areas, and contribution to cumulative effects ([Farrand et al., 2003](#)). The potential environmental effects of recreational development include cumulative effects ([Joslin & Youmans, 1999](#)). Cumulative environmental effects related to access have three main causes: 1) loss of ecosystem structure and function; 2) activities associated with easier access (e.g., presence of increased numbers of humans and machines, illegal hunting and presence of more toxic substances and other wastes) and 3) cumulative exacerbation of the effects of existing activities and developments in both additive and interactive ways ([Epp, 2003a, 2003b](#)). Finally, unmanaged roads and trails create the potential for negative user interaction and conflict. Unmanaged outdoor recreation is one of the “four threats” to forest health identified by [Bosworth \(2003\)](#). Recreation access management is a critical tool for forest managers to address the potential effects of linear disturbances.

Consistent with other similar forested regions, recreational use of public lands in southwestern Alberta has increased dramatically owing to a booming resource extraction economy, a burgeoning population and the

growing popularity of outdoor recreation. The population of the nearby Calgary Region grew by 36 percent between 2001 and 2011 from 1.05 million residents to 1.4 million (Urban Futures, 2012). The area needed for recreational activities is increasing rapidly and is expected to surpass the energy sector footprint before 2057 (Silvatech Consulting Ltd., 2008). Increasing human use of these public lands has resulted in a call for comprehensive recreation access management planning in the study area (Figure 1). Access management encompasses a wide range of management and planning tools—from addressing human behaviour patterns and attitudes towards public lands to implementing land use measures or installing road engineering deterrents (Matthews & Quinn, 2003). Potential management strategies for forested lands vary given the nature of recreation activities and include: restricting the amount, type, and spatial distribution of use; visitor education; temporal restrictions and enhancing site durability (Knight & Gutzwiller, 1995; Hammitt & Cole, 2015).

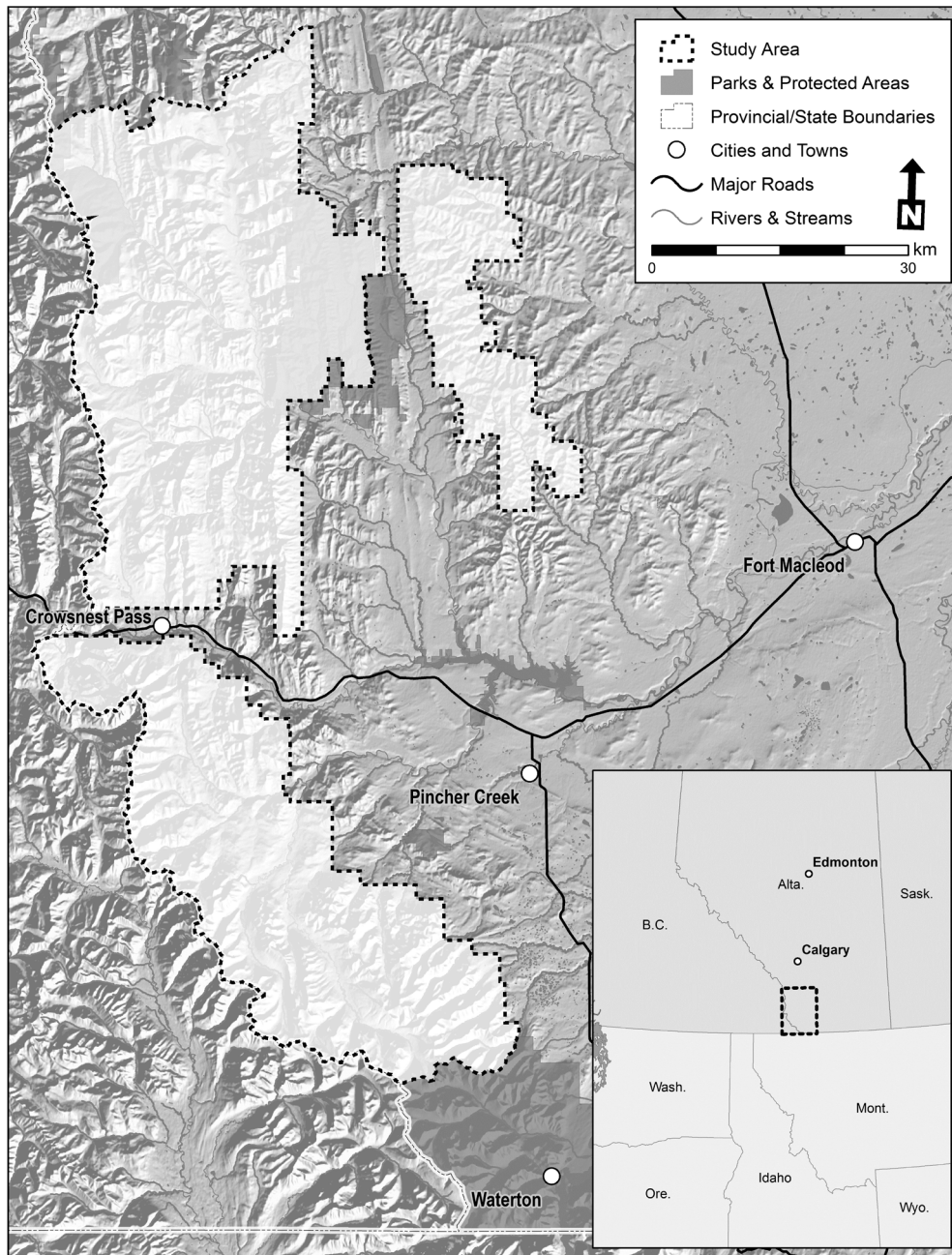


Figure 1. Map of study area.

The call for recreation access management planning is confounded by the lack of a clear government mandate to manage recreation on public lands in Alberta outside of parks and protected areas (Driedzic, 2014). The public forest lands referenced in this study are not designated as parks and protected areas. The Government of Alberta's historical management paradigm for public lands in southwestern Alberta is best described as multiple-use. "Increasingly, quantitative and subjective assessments by the scientific community and the public have shown that the laissez-faire nature of the government's multiple-use formula is no longer serving society well" (ALCES Landscape and Land Use Ltd., 2012: p. iii). The Government of Alberta has sought to address the challenges of multiple-use management and resulting cumulative effects on public and private land in the province by creating the Alberta Land Stewardship Act (ALSA) which mandates the creation of regional plans across the province. The Government of Alberta released the South Saskatchewan Regional Plan (SSRP) in 2014. The SSRP, which covers our study area, sets the stage for land-use and resource management decisions for the next 50 years (Alberta Environment and Sustainable Resource Development, 2014). The SSRP identifies strategic directions for the region over the next 10 years and stipulates a need for recreation management planning to occur in the region within the next two years, including the creation of multiple recreation management plans. Our research contributes valuable information to this process and similar processes occurring on public forest lands.

Managing recreation on forested public lands is about managing people, and managing people is about developing collaborative mechanisms to understand values, beliefs, attitudes and behaviours. Prior to engaging in new planning and management, it is crucial to understand the current social context. Knowing the attitudes and perceptions of recreation users can assist resource managers in predicting and influencing behaviour and gauging the acceptance of new management strategies.

Burgin and Hardiman (2012) call for a strategic and holistic approach to planning and managing outdoor recreation incorporating collaboration across stakeholders. The potential influence of public sentiment on implementing public policy necessitates that agencies understand and address public sentiment as they create policy directives and design programs to realize those directives (Martin, 1999). An understanding of attitudes toward numerous management options will increase the likelihood of implementing a decision with public support (Bath & Enck, 2003). It is within the context of finding and focusing on areas of agreement, developing joint understanding through shared perspectives, and dialogue among the unlike that this research is couched.

The purpose of this research was to examine the views of recreation users on public forest lands in southwestern Alberta with regard to what is currently happening on the landscape and the potential for recreation access management. For the purposes of this study, access management was defined as determining what types of recreation activities happen on a landscape, and where and when those activities take place.

## 2. Experimental Design

### 2.1. Design and Sample

The study was conducted through an online survey in the fall of 2008. Content of the survey instrument was guided by the outcome of three focus groups (24 participants in total) comprised of a cross-section of recreationists from the study area (Haddock, 2010). Given that there was not a complete list of recreation users in the study area focus group participants could not be randomly selected. Instead, focus group participants were recruited in-person at two public events and via email messages to seven public interest groups in the region. The survey was pre-tested and revised for accuracy and clarity. Participants were recruited through direct contact with regional recreation and management organizations and via information communicated through local news media and online discussion boards. A total of 945 individuals responded to the survey. An overall survey response rate was impossible to calculate because a complete list of recreation users for this region does not exist. The final sample is purposive rather than entirely random as this type of online survey makes it infeasible to draw a sample where every member of the population has a known chance of being selected from a population of online users (Duda & Nobile, 2010). However, the survey was reliable given the robust sample size. Six hundred respondents were required for a statistically significant sample with a 95% confidence level and a confidence interval of four (Creative Research Systems, 2010).

### 2.2. Questionnaire

The survey instrument contained questions about participant demographics, their perceptions of access man-

agement issues on public lands in southwestern Alberta, and public consultation for access management planning. Only the questions relevant to perceptions of access management are described in this paper. Participants were asked to: 1) rate the change in the quality of their recreation experience over time and 2) rank their level of agreement with a series of statements about access management in the study area. These Likert scale statements were derived from themes that arose during the three focus groups.

### 2.3. Analyses

Analyses were conducted using SPSS Statistics 17.0 at a confidence level of  $p < 0.05$  or 95% (Rea & Parker, 1997). The socio-demographic variables chosen for exploration included: age, membership in an organized recreation user group, type of recreation user (motorized vs. non-motorized), gender, tenure recreating in the study area (i.e., the number of years a respondent has recreated in the study area), and place of residence. If a respondent's postal code indicated an address within Calgary or Edmonton (cities of over a million people), the respondent was assigned as a large city resident. Respondents with all other postal codes including smaller cities, towns and rural areas were classified as rural residents.

Factor analysis was used to reduce access management statements into smaller sets of related factors. An exploratory factor analysis was performed using principal components analysis (PCA) with Varimax rotation and Kaiser Normalization to detect the presence of meaningful patterns among the original variables and to extract the main factors. PCA reveals underlying patterns of correlations among observed variables and its goal is to reduce variables to a number of components that express as much of the total variance in the data as possible (Tabachnick & Fidell, 2001). In the interpretation of the factors, access management statements having factor loadings of 0.6 or higher were considered in determining the latent construct represented by each factor (Hair Jr. et al., 1998).

Responses to fourteen survey questions (statements with a 7-point Likert scale: 1) strongly disagree; 2) disagree; 3) somewhat disagree; 4) neither agree nor disagree; 5) somewhat agree; 6) agree; and 7) strongly agree) were used as variables in the factor analysis. Three factors were suggested by Kaiser's Normalization criterion. Varimax rotation converged in five iterations and resulted in two rotated components, which were interpreted to be: beliefs and management (Table 1). The two factors were accepted because they were a good fit with the research's aim to: examine views of recreation users of public lands in southwestern Alberta with regard to the current situation on the landscape (beliefs factor), and potential recreation access management on public lands (management factor). Cronbach's Alpha was acceptable for the beliefs and management factors.

Factor one (beliefs) was characterized by prominent loadings of statements related to respondents' beliefs about what was currently happening on the study area landscape and general beliefs about access management. For example, the statements "Overall, recreation users demonstrate responsible use of public lands" and "There is enough enforcement to encourage responsible use of public lands" were included under the beliefs factor. The beliefs factor statements center on the present or present conditions. With the exception of one statement which is focused on industrial activities ("The current level of impacts from industrial activities, such as logging and oil and gas development, is acceptable"), all of these statements imply strong pro-recreation beliefs and speak to maintaining the status quo on public lands, with a focus on education instead of additional regulation to manage recreation.

Factor two (management) was characterized by prominent loadings of statements related to respondents' views about specific access management actions. These statements centered on infrastructure and determining what recreation activities occur when, and where, on public lands in southwestern Alberta. For example, the statements "There is a need for staging areas, and bathroom and garbage facilities on public lands in southwestern Alberta" and "There is a need for a formal access management plan for public lands in southwestern Alberta" are included under the management factor. The management factor statements center on the future or desired future conditions and speak to desire for change from the status quo to higher levels of recreation management and provision of recreation infrastructure.

The factors were used to carry out multiple analysis of variance (MANOVA) tests on the access management statements. MANOVA was used to compare groups formed by categorical independent variables against the two dependent variables or components created through the exploratory factor analysis. The categorical independent variables included: age, membership to organized recreation use group (membership), motorized recreation use (motorized), place of residence (residence), gender, and tenure. Given the lack of a random sample, we checked for normality and equality of variance before running MANOVAs. When normal distributions were not present,

**Table 1.** Principal component analysis of access management statements-rotated components.

Statement	Factor loadings	Eigen-value	Percent of Variance	Cronbach's Alpha
<b>Beliefs</b>		3.96	28.28	0.87
Random camping is an important part of the overall quality of my experience on public lands.	0.43			
It is important to keep public lands open for all types of recreation uses.	0.65			
Overall, recreation users demonstrate responsible use of public lands.	0.74			
Education is the best way to encourage responsible use of public lands.	0.66			
There are enough rules, regulations and fines to guide responsible use of public lands.	0.77			
There is enough enforcement to encourage responsible use of public lands.	0.70			
The current level of impacts from recreation on public lands in southwestern Alberta is acceptable.	0.74			
The current level of impacts from industrial activities, such as logging and oil and gas development, is acceptable.	0.60			
<b>Management</b>		2.96	21.11	0.69
There is a need for staging areas, and bathroom and garbage facilities on public lands in southwestern Alberta.	0.31			
There is a need to determine what recreation activities are allowed to occur, and where they are allowed to occur, on public lands in southwestern Alberta.	0.83			
There is a need to separate recreation activities that may be incompatible on public lands in southwestern Alberta.	0.83			
There is a need for a formal access management plan for public lands in southwestern Alberta.	0.75			
<b>Total Variance Explained</b>			49.39	

we removed outliers for skewness and kurtosis to achieve a normal distribution. When MANOVA resulted in significant differences, Tukey Honestly Significant Differences (HSD) multiple comparisons were used to test for all pair-wise differences involving categorical variables with more than two groupings.

### 3. Results and Discussion

#### 3.1. Descriptive Results

The demographic characteristics of the sample are displayed in **Table 2**. The gender distribution was heavily skewed toward male respondents who made up 80% of the sample. Forty-five percent of the respondents had recreated in the study area for more than twenty-one years. Motorized users made up 59% of the sample. Almost half of the respondents (48%) were members of organized recreation use groups and 41% of respondents lived in large cities. The overall attitudes and perceptions are presented in **Table 3** by valid percent per statement. Of note, over 83% of respondents indicated that they strongly agreed that “It is important to maintain recreation opportunities for future generations.” Forty percent of respondents indicated they strongly agreed that “There is a need to determine what recreation activities are allowed to occur, and where they are allowed to occur, on public lands in SW Alberta.”

The access management statement results indicate areas of agreement, or common ground, shared between the many types of users who responded to this survey. An understanding of visitors' perceptions, how they view impacts, and what effect, if any, visitors' perceptions have on overall experience can influence management decisions related to visitor experience (D'Antonio et al., 2012). Several trends were evident for the access management statements. In considering the management implications of these findings, statements where a high level of agreement or disagreement is shared by a majority of respondents could represent views or beliefs that stakeholders shared in common. These views or beliefs may be used as a foundation upon which to build public consultation efforts by providing a starting point for access management planning. For instance, over half of

**Table 2.** Demographic characteristics of the sample.

Variable	Percent
Age	18 - 29: 14%
	30 - 39: 22%
	40 - 49: 23%
	50 - 59: 24%
	60 and over: 17%
Recreation tenure	<1 year: 2%
	1 - 2 years: 6%
	3 - 5 years: 12%
	6 - 10 years: 15%
	11 - 20 years: 20%
	Over 21 years: 45%
Type of user (motorized)	59%
Member of organized recreation use group	48%
Residence (other)	59%
Gender (men)	80%

**Table 3.** Access management statement results.

Access Management Statement	Valid Percent						
	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly Agree
Random camping is an important part of the overall quality of my experience on public lands.	13.30	8.90	5.70	6.60	9.80	16.70	38.90
It is important to keep public lands open for all types of recreation uses.	15.10	12.30	9.50	1.30	12.40	13.10	36.30
It is important to maintain recreation opportunities for future generations.	0.50	0.10	0.30	0.80	1.90	12.80	83.60
Recreation use on public lands in SW Alberta is increasing.	2.30	2.30	1.80	3.10	8.00	28.10	54.40
Overall, recreation users demonstrate responsible use of public lands.	9.90	16.60	16.90	5.40	23.50	20.90	6.80
Education is the best way to encourage responsible use of public lands.	3.50	6.60	5.70	3.80	20.30	24.50	35.70
There are enough rules, regulations and fines to guide responsible use of public lands.	17.60	14.60	14.10	4.90	13.90	17.60	17.20
There is enough enforcement to encourage responsible use of public lands.	37.10	21.30	14.30	5.10	9.60	7.70	5.10
There is a need for staging areas, and bathroom and garbage facilities on public lands in SW Alberta.	2.00	4.70	4.20	4.70	17.10	35.60	31.70
There is a need to determine what recreation activities are allowed to occur, and where they are allowed to occur, on public lands in SW Alberta.	4.30	3.50	4.00	4.00	14.60	28.50	41.00
There is a need to separate recreation uses that may be incompatible on public lands in SW Alberta.	4.50	6.80	6.20	7.30	13.80	24.90	36.50
There is a need for a formal access management plan for public lands in SW Alberta.	3.60	4.60	5.00	8.60	14.00	26.00	38.10
The current level of impacts from recreation on public lands in SW Alberta is acceptable.	23.20	15.40	16.60	9.40	14.60	14.10	6.60
The current level of impacts from industrial activities on public lands in SW Alberta is acceptable.	29.80	18.10	19.10	10.50	9.30	10.60	2.70

respondents indicated that their recreation experience has decreased/declined. This result is consistent with another survey conducted in the southern portion of the study area where two-thirds of respondents agreed they had noticed changes in the past five years that they did not like (Alberta Sustainable Resource Development, 2005).

The majority of respondents agreed on some level that: there is a need for certain types of infrastructure; there is a need to determine what recreation activities are allowed to occur and where they are allowed to occur; there is a need to separate incompatible recreation uses; and there is a need for a formal access management plan. The high levels of agreement with these statements indicate a shared understanding across users that access management planning could address some of their concerns, providing a basis upon which to build public consultation for access management planning by demonstrating shared perceptions among what many believe are disparate stakeholders.

Statements where views were polarized between respondents may indicate more contentious topics. These topics could be addressed later in the access management planning process after a sense of trust and a shared common vision have been established, and when the process has achieved some initial successes. Respondents had polarized views on the statement “It is important to keep public lands open for all types of recreation uses.” Consequently, access management planning efforts should not be framed within the context of some uses being more preferable, or allowable, compared to others. Such an approach could alienate certain user groups and undermine an access management planning process from its early stages. Successful approaches to access management bring all affected stakeholders to the table (US Institute for Environmental Conflict Resolution and the Morris K. Udall Foundation, 2005).

Respondents had polarized views on the statement “Overall recreation users demonstrate responsible use of public lands.” Additionally, respondents had polarized views on the statement: “The current level of impacts from recreation on public lands in southwestern Alberta is acceptable.” These results could indicate that respondents have different views of what constitutes “responsible use” and an “impact from recreation”. These polarized results underscore the need for continued and increased education initiatives about recreating responsibly on public lands. Eighty-one percent of respondents indicated that they agreed on some level that “Education is the best way to encourage responsible use of public lands.” Education objectives are often described as being paramount by stakeholders in trail planning case studies (e.g., Fitzhenry & Chavez, 2005; Waight & Bath, 2014).

Although there were polarized views between respondents on the amount of rules, regulations and fines, a majority of respondents expressed a high level of disagreement that there is sufficient enforcement of existing rules. Given that contemporary access management is characterized by desultory enforcement of legislation (Epp, 2003a, 2003b), access management planning should address the lack of enforcement on public lands as this is an area of concern for a majority of respondents. Many focus group participants stated that “We don’t need more rules, but we need to enforce existing rules.”

### 3.2. Bivariate Comparisons & Factor Analysis

Descriptive statistics for the beliefs factor are presented in **Table 4** and for the management factor in **Table 5**. The results of the overall comparisons and univariate comparisons (beliefs and management) are reported in **Table 6**. Only significant differences at the  $p = 0.05$  level for post hoc comparisons are reported. Factor analysis and MANOVA comparisons demonstrated that significant differences existed between user-type groups on level of agreement with both the beliefs and management factors. The following results highlight how different user-type groups perceive the current situation on public lands (i.e., beliefs factor) and potential access management (i.e., management factor). Research to discern more specific types of rules, regulations, and facilities important to different users groups can be instructive for planners, managers and policy-makers (Kil et al., 2012). Some types of users (e.g., non-motorized recreation users, recreation users with six-20 years tenure, recreation users aged 50 and over) had higher levels of agreement with the management factor, indicating that they may be more amenable to access management planning. These types of users may be more supportive of access management planning from the onset and may be champions for the planning process. Forest managers engaged in access management planning will need to use different strategies to engage types of users (e.g., motorized recreation users, recreation users aged 18 - 29) who are satisfied with the status quo and less supportive of access management.



**Table 4.** Descriptive results for beliefs factor.

Variable	Group	Factor Mean	Standard Deviation	n
Age	18 - 29 years old	4.33	1.43	101
	30 - 39-years old	4.35	1.37	158
	40 - 49 years old	4.06	1.49	172
	50 - 59 years old	3.95	1.37	186
	60 and over years old	3.37	1.38	122
Tenure	<1 year - 5 years	4.45	1.38	150
	6 - 20 years	3.82	1.44	262
	>21 years	4.04	1.42	342
Membership	Members	4.31	1.37	374
	Non-members	3.79	1.45	390
Motorized/Non-motorized	Non-motorized	3.33	1.26	401
	Motorized	4.82	1.22	366
Residence	Large City	4.12	1.32	284
	Other	3.96	1.53	419
Gender	Male	4.06	1.41	537
	Female	3.40	1.39	144

**Table 5.** Descriptive results for management factor.

Variable	Group	Factor Mean	Standard Deviation	n
Age	18 - 29 years old	5.29	1.28	101
	30 - 39-years old	5.29	1.22	158
	40 - 49 years old	5.61	1.07	172
	50 - 59 years old	5.81	1.09	186
	60 and over years old	6.19	0.71	122
Tenure	<1 year - 5 years	5.47	1.09	150
	6 - 20 years	5.80	1.00	262
	>21 years	5.57	1.22	342
Membership	Members	5.45	1.19	374
	Non-members	5.79	1.07	390
Motorized/Non-motorized	Non-motorized	6.11	0.79	401
	Motorized	5.08	1.25	366
Residence	Large City	5.55	1.19	284
	Other	5.64	1.16	419
Gender	Male	5.79	0.87	537
	Female	6.15	0.74	144

**Table 6.** MANOVA overall, univariate and Tukey HSD results.

Variable	Result	Source	F	(df)	p	
Age	Overall (Management and Beliefs)		8.92	8, 1466	≤0.0004	
	Univariate	Beliefs	10.04	4, 734	≤0.0004	
		Management	15.60	4, 734	≤0.0004	
	Tukey HSD-Beliefs	18 - 29 vs. 60 and over				≤0.0004
		30 - 39 vs. 60 and over				≤0.0004
		40 - 49 vs. 60 and over				≤0.0004
		50 - 59 vs. 60 and over				0.0040
		Tukey HSD-Management	18 - 29 vs. 50 - 59			
	Tukey HSD-Management	18 - 29 vs. 60 and over				≤0.0004
		30 - 39 vs. 50 - 59				≤0.0004
		30 - 39 vs. 60 and over				≤0.0004
		40 - 49 vs. 60 and over				≤0.0004
		50 - 59 vs. 60 and over				0.0250
Tenure	Overall (Management and Beliefs)		5.51	4, 1500	≤0.0004	
	Univariate	Beliefs	9.44	2, 751	≤0.0004	
		Management	5.01	2, 751	0.0070	
	Tukey HSD-Beliefs	<1 - 5 yrs. vs. 6 - 20 yrs.				≤0.0004
		<1 - 5 yrs. vs. >21 yrs.				0.0090
	Tukey HSD-Management	<1 - 5 yrs. vs. 6 - 20 yrs.				0.0120
	6 - 20 yrs. vs. >21 yrs.				0.0340	
Membership	Overall (Management and Beliefs)		14.52	2, 761	≤0.0004	
	Univariate	Beliefs	25.45	1, 762	≤0.0004	
		Management	16.55	1, 762	≤0.0004	
Motorized/Non-motorized	Overall (Management and Beliefs)		174.60	2, 764	≤0.0004	
	Univariate	Beliefs	277.73	1, 765	≤0.0004	
		Management	188.22	1, 765	≤0.0004	
Residence	Overall (Management and Beliefs)		1.09	2, 700	0.3360	
	Univariate	Beliefs	2.13	1, 701	0.1450	
		Management	0.90	1, 701	0.3430	
Gender	Overall (Management and Beliefs)		15.83	2, 678	≤0.0004	
	Univariate	Beliefs	24.75	1, 679	≤0.0004	
		Management	20.76	1, 679	≤0.0004	

As the age groups increased in years, there was a trend of reduced levels of agreement with the beliefs factor (i.e., reduced levels of agreement that the status quo is acceptable). There was a trend of increasing levels of agreement with the management factor as age increased (i.e., older respondents had higher levels of agreement about the need for changes to how recreation is managed). There was a significant difference ( $p \leq 0.0004$ ) in the

overall comparison (beliefs and management) between the age groups. The univariate F values for beliefs and management were also significant at  $p \leq 0.0004$  for both factors. Post hoc comparisons for the beliefs factor and for the management factor indicated that the “60 and over years old” age group was significantly different from all other age groups. Additionally, there were significant differences for the management factor between the “50 - 59 years old” group and both the “18 - 29 years old” and the “30 - 39 years old” groups. It is possible that older participants have seen a greater degree of change in the region over time. Younger participants may have initiated their activity in the region after a significant amount of change had already occurred.

There were differences between tenure groups in levels of agreement with the beliefs and management factors. The “6 - 20 years” tenure group expressed the lowest level of agreement with the beliefs factor and the highest level of agreement with the management factor, meaning that this tenure group has a slightly higher desire to change the status quo and engage in access management planning. These results could reflect that respondents in the “six to 20 years” tenure group have spent a sizeable amount of time on the landscape and anticipate spending more time on the landscape, resulting in a higher level of agreement with the management factor through a desire for infrastructure and access management planning. Meanwhile, it is possible that those with the lowest number of years tenure may not have experienced enough change to warrant increased levels of agreement with the management factor, and that those with the most tenure may be spending less time on the landscape, or do not wish to change their ways, or both.

Previous studies found that there is a positive relationship between experience and perceived environmental impacts of outdoor recreation (e.g., [van Riper et al., 2010](#)). The longer users have been visiting a site, the more negatively they evaluate environmental and social conditions, specifically recreation conflict, depreciative behavior and environmental impacts ([White et al., 2008](#)). In contrast, [Waight and Bath \(2014\)](#) found that experienced all-terrain vehicle users become more conditioned to environmental impacts as time passes causing the detrimental effects of their activity to become less evident and less concerning over time.

Respondents who belonged to an organized recreation use group expressed slightly higher levels of agreement with the beliefs factor (i.e., maintenance of the status quo) than respondents who did not belong to an organized recreation use group. Additionally, organized recreation use group members expressed slightly lower levels of agreement with the management factor than those who did not belong to a group, signaling that recreation use group members have less desire for access management planning. There was a significant difference ( $p \leq 0.0004$ ) in the overall comparison (beliefs and management) between the membership groups. The univariate F values for beliefs and management were also both significant at  $p \leq 0.0004$ .

Motorized users expressed a higher level of agreement with the beliefs factor than did non-motorized users, indicating that motorized users are more content with the current level (or lack) of recreation management. The reverse held for the management factor where non-motorized users expressed a higher level of agreement than motorized users demonstrating that motorized users are less in agreement with the need for access management planning. There was a significant difference ( $p \leq 0.0004$ ) in the overall comparison (beliefs and management) between the motorized and non-motorized groups, and the univariate F values for beliefs and management were also significant at  $p \leq 0.0004$ .

Findings from a survey of OHV users in North Carolina suggest that even when riders are satisfied with OHV opportunities they do not want their use restricted, and there appeared to be little support for increasing regulations, user fees or government involvement ([Flood, 2005](#)). [Waight and Bath \(2014\)](#) found that experienced ATV users are least supportive of regulations that limit resource use and would prefer fine increases and compulsory environmental education courses than to face access restrictions, while attitudes toward increased fines and enforcement were somewhat less negative. Similarly, [Kil and others \(2012\)](#) found that OHV riders are more accepting of indirect forms of management, such as education, strategic trail siting and signage, than they would be of overt rules and regulations (i.e., direct approaches to managing their activities). Both OHV and non-OHV user groups preferred pristine recreation settings and moderate levels of rules and regulations ([Kil et al., 2012](#)). In her study of recreation users of the Livingstone River Valley (encompassed by this project’s study area), [St. Arnaud \(2004\)](#) found that many OHV users in the area were concerned about their ongoing ability to use similar areas in a free and unrestricted fashion. The results of her study showed that OHV users were generally less supportive of management in the area, and she hypothesized that OHV users feel defensive about being managed and losing opportunities to recreate in their preferred activity ([St. Arnaud, 2004](#)). A Calgary Herald (largest regional newspaper in the study area) headline “Off-roaders fear being shut out by southern Alberta land-use plan” ([Derowiz, 2014](#)) captures this sentiment.

Non-motorized users experience more conflict than motorized users (Jackson & Wong, 1982). According to Andereck and others (2001), although conflict occurs among recreation user groups, most often researchers have reported asymmetric antipathy, with some groups expressing more negative evaluations than other groups. While studies have generally found trail users are amenable toward meeting others engaged in the same activity, they perceive faster and more mechanized activities negatively. A significant proportion of conflicts in Southern Alberta's Forest Land Use Zones relate to non-motorized users' concerns for wilderness values, noise levels and other aesthetic effects of motorized traffic (Eos Research & Consulting Ltd., 2009). After concerns for aesthetics, some proportion of conflict is due to incompatibility of many motorized and non-motorized recreation uses of public lands in southern Alberta (Eos Research & Consulting Ltd., 2009).

There was a slight difference between the genders in levels of agreement with the beliefs and management factors. Males expressed a slightly higher level of agreement with the beliefs factor than did females, while males expressed a slightly lower level of agreement with the management factor than did females. There was a significant difference ( $p \leq 0.0004$ ) in the overall comparison (beliefs and management) between the gender groups, and the univariate F values for beliefs and management were also significant ( $p \leq 0.0004$  for both factors).

"Large city" respondents (Calgary and Edmonton) expressed a similar level of agreement with the beliefs factor as did respondents from "other communities". Both "large city" and "other community" respondents shared a similar level of agreement on the management factor. The residence variable was the only independent categorical variable that did not result in any significant differences in the results for both the overall and univariate comparisons of the beliefs and management factors. This was an interesting result as many focus group participants perceived there to be major differences between urban and rural recreation users, which aligns with past research (e.g., O'Neill, 2005; Shindler et al., 2011).

"Demographic changes exacerbate conflict both within communities and between local and extra-local groups. These conflicts pose serious questions relative to the ability of groups in the region to work together to solve common problems" (Clark et al., 1999: p. 247). However, results of this study indicate that an urban/rural rift does not exist for the recreation users in the study area. Dwyer and Childs (2004: p. 154) state that because of the changing distribution of people across the landscape, "The differences between what has traditionally been considered urban and rural are tending to blur over time." Nonetheless, physical features, local regulations, and social practices remain sufficiently different in rural and urbanized areas to warrant comparison (O'Neill, 2005). Acknowledging this lack of difference could be used to build trust during the early stages of public consultation between recreation users from different communities and to address the "us versus them" or "city people vs. country folk" mentality that often hinders collaboration.

The coding of respondents into "large city" and "other communities" categories may have resulted in a lack of significant differences as large communities such as Lethbridge or Sherwood Park were included in the "other communities" category. Also, interpretation of these results is dependent on how a person perceives urban and rural communities. A Lethbridge resident may define themselves as being rural owing to the smaller size of that city compared to Calgary, while a rural resident from the Municipal District of Willow Creek may consider a citizen of Pincher Creek (town with less than 4,000 residents) as urban. Such varied perceptions of urban versus rural made it challenging to decide where to draw the arbitrary boundary between urban and rural for the purposes of this study. There are a number of additional limitations to this study. A complete list of recreation users for the region does not exist so we were unable to draw a random sample of this population and determine if the survey sample was representative of the public land user population. The survey was completed online and this presents a problem of selection, since some populations may have limited use of the internet or online surveys. Finally, this research only provides a snapshot of the situation at one point in time. Although cross-sectional visitor research is useful for the provision of current information, it can become much more valuable if repeated so that both standard cross-sectional and trend information can be generated (Kuentzel & Heberlein, 2003).

#### 4. Conclusion

This study indicates recreation users in the study area have a strong belief that the quality of the recreation experience is declining and that increased management and enforcement are required. Analysis indicates significant differences between demographic and user-type variables about both perceptions of what is currently happening

on these forested public lands and desired future conditions, including recreation access management. When using access management planning as a tool to provide quality recreational opportunities while managing for impacts to forest ecosystems, forest managers can bolster the success of their efforts by considering the views and perceptions of diverse types of recreation users. Information about how user-types perceive issues on forested public lands and desired access management can be used to engage recreation users in creating an effective access management plan designed to provide quality recreation experiences while attempting to minimize negative effects to forest ecosystems.

Our results indicate that effective consultation around access management planning for public forest lands in southwestern Alberta should recognize the needs and beliefs of a spectrum of users. Continuation of passive approaches to access management in the region will result in declining quality of the recreation experience and degradation of forest health. The combination of both OHV and non-motorized recreation in the area creates the conditions for user conflict and goal interference. More active access management through the use of designated staging areas, single-purpose trails and zoning could help to insure the effective discharge of agency mandates. There is clearly an appetite on behalf of the users to engage in meaningful dialogue related to access management. In addition, respondents expressed a desire to see more enforcement and a greater visibility of managers. Finally, users expressed a clear preference for more education rather than regulation. This presents an opportunity for forest managers to work proactively with recreation user groups in designing viable solutions.

Recreation trends indicate OHV use will likely increase, meaning that pressures on natural resources and competition for recreational space and activities will endure as a significant concern for public land agencies (USDA Forest Service, 2006), including those charged with managing forested lands. Decisions balancing recreational carrying capacity, resource allocation, and public demand will become increasingly difficult in the future (Schuster, 2007). Marzano and Dandy (2012) call for a holistic approach that combines understanding human behaviour and ecological knowledge that links human behaviour to impacts on forests and wildlife to identify opportunities for management where (and when) “problem” behaviours may emerge or develop. Forest managers need to be cognizant of the heterogeneity in views about access when planning roads and access (Mi-hell & Hunt, 2011).

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