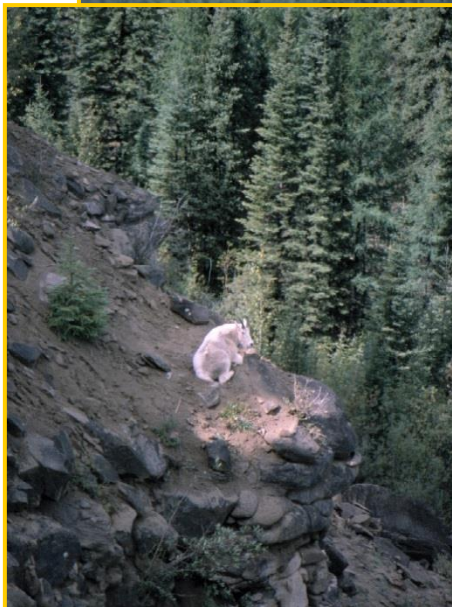




Hinton Wood Products

A division of West Fraser Mills Ltd.

Pinto Creek Mountain Goats Habitat Conservation Strategy



Version 6
October 28, 2014

Table of Contents

Preface	iv
Summary	1
Introduction	2
Conservation Status	5
Pinto Creek Goat Herd Population Status	5
FMA Goat Observations	8
Limiting Factors	9
Starvation and Adverse Weather	10
Predation	11
Accident	11
Parasites and Diseases	11
Small Isolated Population	11
Emigration	11
Habitat Alteration	12
Mountain Pine Beetle	12
Forest Fire	14
Timber Harvest	14
Linear Corridors	14
Human Activity	14
Habitat Conservation Strategy	15
Roles and Responsibilities	15
Goals	16
Forest Management Plan – Long-Term Mountain Goat Habitat Supply	16
Landbase Designation	16
Pinto Creek Canyon Natural Area	16
Pinto Creek Goat Special Management Area	19
SMA Management Strategy	19
Access Management	23
Final Harvest Plan	23
Harvest Planning and Operating Ground Rules	24
Goat Population Indicators	24
Population Size	24
Population Composition	24
Distribution and Behaviour	25
Monitoring	25
Research and Continual Improvement	26
DNA Analysis	26
Predator Interactions	26
Goat Behaviour Monitoring	27
Habitat Use and Movements	27
References	27
Appendix 1. Risk assessment matrix for the Pinto Creek goat population	32
Risk evaluation table	34
Appendix 2 HWP Commitment History and Status for Pinto Creek Mountain Goats	35
Appendix 3 Conservation History for Pinto Creek Mountain Goats	38
Reserve Area	38
Protective Notation	38
Special Management Area	38
Monitoring and Research	38
Appendix 4 Mountain goat sightings on the Hinton Wood Products Forest Management Area	39
Appendix 5 Document history	40

List of Figures

Figure 1 – *Cliffs and cliff complexes used by the Pinto Creek mountain goat herd along Pinto, Wroe, and Hightower Creeks (from Harrison 1999).* 3

Figure 2 – *Pinto Creek Canyon Natural Area orthophoto showing trails used by goats moving between cliff complexes* 4

Figure 3 – *Cliffs and interconnected trails along Pinto Creek* 5

Figure 4 – *Pinto Creek mountain goat herd minimum population estimates 1997–2009 using composite ground surveys and DNA analysis (Nelson 1998, Schindler 2009).* 8

Figure 5 – *Mountain goat observations on or near the Hinton Wood Products Forest Management Area, 1988-2009. The Pinto Creek Canyon Natural Area is shaded red and other observations are indicated with a red dot* 9

Figure 6 – *Mountain pine beetle stand susceptibility index for the Pinto Creek Canyon Natural Area and vicinity, Hinton Wood Products Forest Management Area.* 13

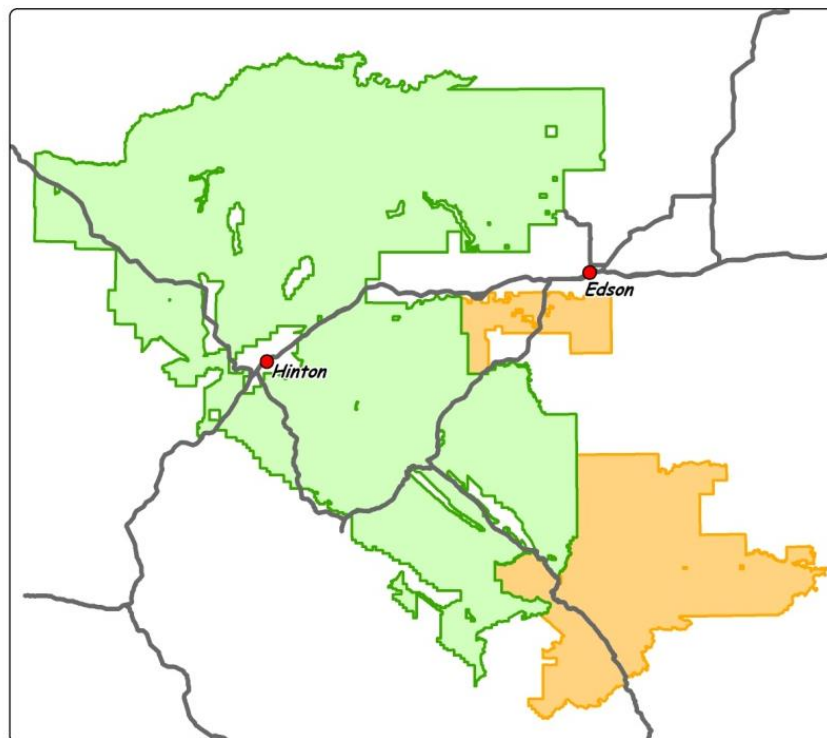
Figure 7 – *Pinto Creek Goat Special Management Area showing contributing landbase from the upcoming FMP MPB Amendment and proposed cutblocks and roads within the SMA.* 18

Figure 8 – *Berland 11 SMA harvest commenced in fall 2009 and was completed in spring 2012* 22

PREFACE

Hinton Wood Products and Edson Forest Products are Divisions of West Fraser Mills Ltd. Hinton Wood Products manages Forest Management Agreement 8800025 and Edson Forest Products manages Forest Management Agreement 9700032. The Forest Management Areas (FMA) associated with the Agreements border each other in west central Alberta. Each has a separate Forest Management Plan. A single Woodlands Department (hereafter, West Fraser) representing Hinton Wood Products and Edson Forest Products manages both FMA.

West Fraser is certified to the Sustainable Forestry Initiative¹ Standard, which requires signatories to have biodiversity conservation programs, especially for species at risk designated by relevant governments. The West Fraser Species at Risk (SAR) Guide (West Fraser 2014) describes species and ecological communities that are mandatory content to meet SFI requirements, plus additional species and communities that West Fraser includes as voluntary good practice. The SAR Guide is a document that provides identification and basic forest management direction for each species or community. The SAR Guide references a more detailed Species Conservation Strategy, which contains additional information about West Fraser habitat management to direct forest management and conservation.



Hinton Wood Products (green) and Edson Forest Products (yellow) Forest Management Areas.

West Fraser has one target related to Species Conservation Strategies:

1. Target #1 – Complete species conservation strategies for all species at risk (SARA and Alberta designations) within 6 months of designation, update strategies at least every 2 years and report on results of strategies annually.

Species conservation strategies are developed by West Fraser and reviewed, endorsed, and approved as a cooperative program between West Fraser and Alberta Environment and Sustainable Resource Development.

¹ <http://www.sfiprogram.org/>

SUMMARY

The Pinto Creek mountain goat herd is the only known canyon-dwelling mountain goat herd in Alberta. The herd warrants special attention because of the unique character of the herd, small population size, and isolation from other mountain goat populations. Minimum population size recorded over the period 1962–2009 was 8–39 goats. Since 1994 the minimum population size has remained in the higher end of the historic range (22–39 goats).

Hinton Wood Products (HWP) and Alberta Sustainable Resource Development (Alberta) agreed to a Habitat Conservation Strategy (HCS, this document) for the Pinto Creek mountain goat herd (Version 1 of this document dated May 26, 1999) that was incorporated into the HWP 1999 Forest Management Plan (FMP). The HCS is regularly updated and revised to reflect new information and status. This is the 6th revision of the HCS. This version will be incorporated into the next FMP.

The 1,233 ha Pinto Creek Canyon Natural Area (PCCNA) was designated by Order in Council in December 2000. The PCCNA was nominated by HWP under the Alberta Special Places program. This deletion from the Forest Management Area (FMA) protects the entire known area used by the Pinto Creek goats. Alberta Tourism, Parks, Recreation and Culture are responsible for management of the PCCNA.

Although recorded goat use of the area adjacent to the PCCNA is very low, HWP designated a 1-km wide 3,106 ha Special Management Area (SMA) surrounding the PCCNA to address possible goat conservation issues that were mainly related to sensory disturbance. The SMA is still part of the FMA, and this strategy now applies only to the SMA. The harvest plans for compartments Berland 7, 11, and 18 were designed to minimize disturbance and human access into the SMA and the PCCNA.

A 3-stage adaptive management approach to minimizing conservation risk was developed. The first stage was to harvest in the compartments surrounding the PCCNA, but not within the SMA. The second stage was to harvest approximately 10% of the SMA, and the third stage was to harvest the remainder of the SMA. Continual monitoring of the goat population was used to assess potential negative impacts on the goats. The first and second stages were completed. The goat minimum population size remained near historic high levels over the period. Due to other priorities the third stage will not be implemented in the first 10 years of the 2014 SHS.

Most of the forest in the PCCNA and SMA is dominated by mature lodgepole pine stands which are very susceptible to attack by Mountain Pine Beetle (MPB). The Pinto Creek area contains the single highest “hotspot” of susceptible pine on the FMA and there is high risk of significant pine mortality if an MPB attack occurs. The area is also in a landscape corridor that HWP designated as a high priority for harvest to reduce MPB-susceptible stands and slow the expected spread of MPB into the FMA from existing populations north of the FMA. Potential impacts of MPB on the Pinto Creek goats are unknown, but deadfall could seriously hamper goat movements and possibly alter predator-prey relationships. On a larger scale MPB infestation is expected to have major impacts on many forest values in the Alberta Eastern Slopes.

In keeping with the adaptive management approach and considering the probable low risk to goats and the known high risk from MPB HWP completed harvesting the most MPB-susceptible pine stands in the SMA. Additional SMA harvest will be deferred while high priority MPB-susceptible pine stands elsewhere on the FMA are harvested. Future stage 3 SMA harvest will occur after higher-priority pine stands elsewhere have been harvested, or sooner if MPB attack, forest fire, or other significant occurrences warrant a change in management direction. The deferral will be periodically reviewed as part of the HWP MPB strategy and future harvest or reforestation will be considered as part of that process.

HWP will stop monitoring the Pinto Creek goat population after 2014 and will not restart monitoring until further harvest is proposed in the area. HWP will continue to work with Alberta to ensure goat conservation.

INTRODUCTION

The mountain goat (*Oreamnos americanus*) lives in North America mountain habitats from the Pacific coastal mountains in the west to the Rocky Mountains in the east and from Alaska in the north to Colorado in the south. Mountain goats normally occupy steep terrain in Alpine and Subalpine habitats and rarely venture far from cliffs or very steep slopes and rocky outcrops. Their superb climbing abilities mean no large predator can follow them onto this escape terrain.



Mountain goats also use escape terrain and habitat formed by canyon cliffs and cutbanks. The population of about 300 goats that lives in the Grand Canyon of the Stikine River in British Columbia is the best known example of canyon-dwelling goats (Foster and Rabs 1985). The Pinto Creek mountain goat herd is the only known canyon-dwelling mountain goat herd in Alberta.

The Pinto Creek canyon is about 40 km north of Hinton. It includes a series of 31 discontinuous cliffs and cutbanks along 17 km of valley along Pinto Creek and the lower reaches of Wroe and Hightower Creeks (Figure 1). The

goats travel on well-worn trails between the cliffs (Figure 2).

The Pinto Creek canyon was part of the Hinton Wood Products Forest Management Area (FMA) since FMA inception in 1954 until December 2000, when the Pinto Creek Canyon Natural Area (PCCNA) was designated as a protected area by an Alberta Order in Council and removed from the FMA. The Pinto Creek mountain goat herd warrants special attention because of the unique character of the herd, small population size, and isolation from other mountain goat populations. Minimum population size recorded over the period 1962–2009 ranged from 8–39 goats.

Hinton Wood Products and Alberta Sustainable Resource Development (Alberta) cooperated to plan and implement a series of cooperative conservation measures to protect the Pinto Creek goats beginning in 1991 and continuing today. Most programs were funded by HWP. See Appendix 3 for a detailed summary of historical conservation measures.

This habitat conservation strategy is based on data collected from 1994–2012 (Neiderleitner 1994; Harrison and Hooge 1995; Harrison 1996, 1997, 1999; Nelson 1998, 1999; Applied Ecosystem Management 1999, 2000, 2001, 2002; Fiera Biological Consulting 2003, 2004, 2005, 2006, 2007, 2008, HWP 2009, 2010, 2011, 2012, 2013, 2014) and field surveys and reconnaissance conducted by HWP biologist Gordon Stenhouse from 1995 to 1998. These data represent the most up to date and complete data set on habitat use, movements, and population demographics for the Pinto Creek goats.

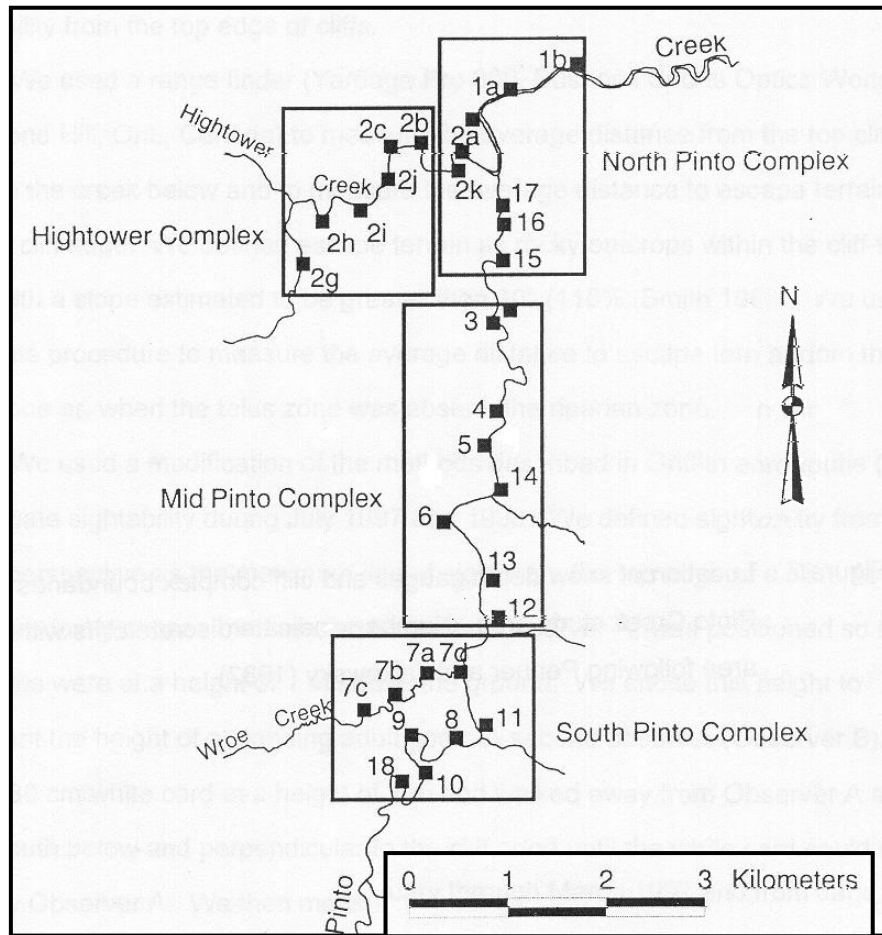


Figure 1 – Cliffs and cliff complexes used by the Pinto Creek mountain goat herd along Pinto, Wroe, and Hightower Creeks (from Harrison 1999).



Pinto Creek Canyon

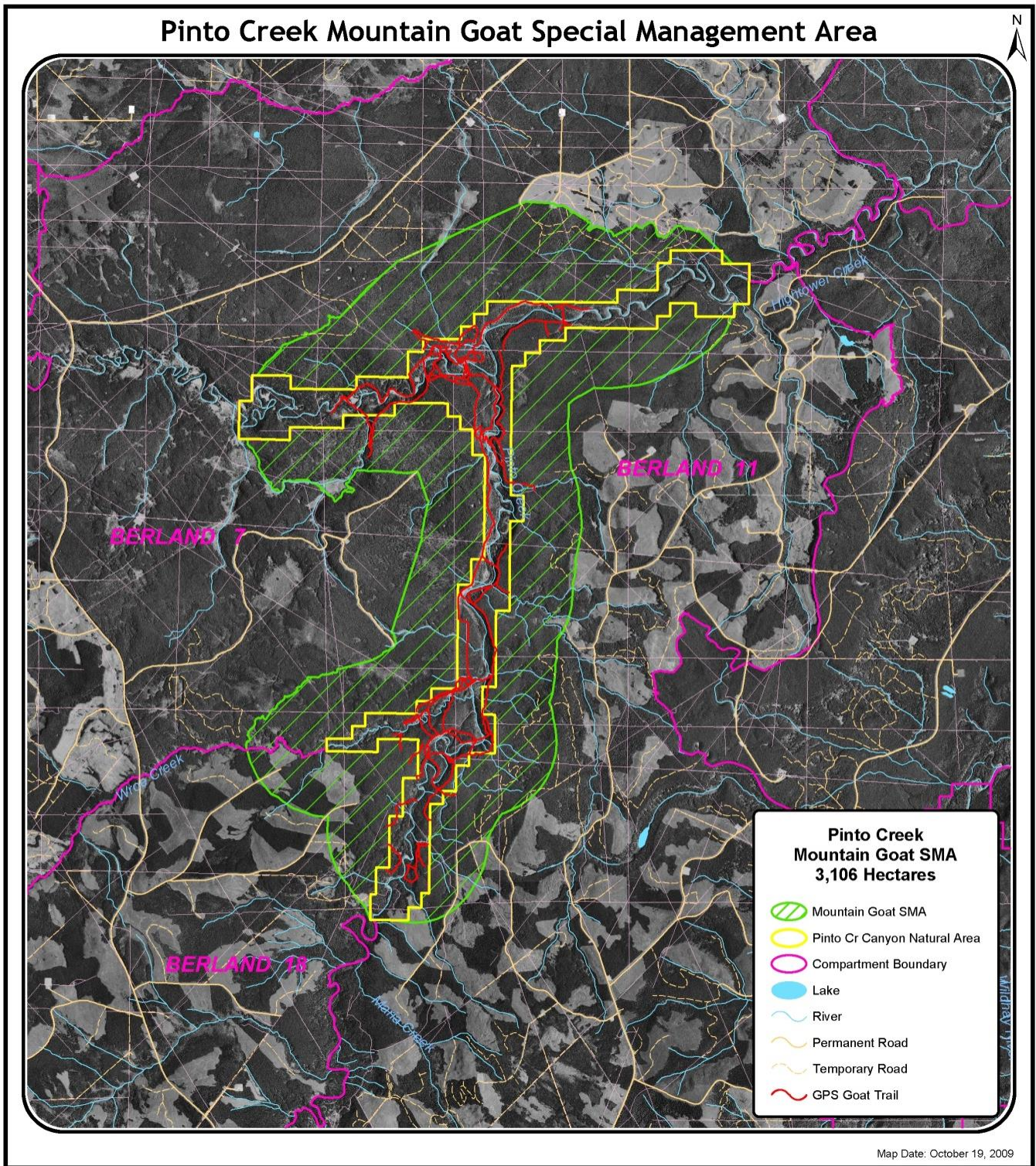


Figure 2 – Pinto Creek Canyon Natural Area ortho photo showing trails used by goats moving between cliff complexes

CONSERVATION STATUS

The total North America range of the mountain goat supported approximately 75,000-110,000 animals in 2002 (Cote and Festa-Bianchet 2003) and 80,000-119,000 in 2008 (Festa-Bianchet 2008). British Columbia has approximately half the total goat population. Mountain goat status is Least Concern² according to the IUCN (2009). The species has not been evaluated by the Committee on the Status of Endangered Wildlife in Canada. Mountain goat status in Alberta is Secure³ (Alberta 2005). Hunting in Alberta was closed in 1988 due to declining populations and reopened in 2001 through a few permits allocated annually by lottery. Based on surveys from 1997-2000 the Alberta population estimate was 1,650 goats (Alberta 2003). More recently, Festa-Bianchet (2008) increased the Alberta estimate to 2,750 goats.

The Pinto Creek mountain goat herd is the only known canyon dwelling goat herd in Alberta and is separated from more traditional mountain goat terrain and populations by approximately 45 km of forest. The Pinto Creek mountain goat herd warrants special attention because of the unique character of the herd, small population size, and isolation from other goat populations.

PINTO CREEK GOAT HERD POPULATION STATUS

Mountain goats have long been reported in forested habitats of the eastern foothills of Alberta. The earliest local record is from a forest ranger who observed a goat in the winter of 1931 very close to the Pinto Creek area (Kerr 1965). Goats were reported along Oldman Creek in 1942, Wildhay River in 1957, and Athabasca River near Hinton in 1959 (Stelfox and Kerr 1962). In 1969, a trapper⁴ saw five goats travelling west across Highway 40 north of Fred Creek, which is approximately 7 km south of the crossing of Pinto Creek and Highway 40. Since 1990, regular observations of mountain goats on the FMA have been recorded (Figure 5). These records include Canyon Creek, the Athabasca River (near Highway 40, Obed, Emerson Creek, and Oldman Creek), Gregg Lake, lower Oldman Creek, Barbara Creek, Wildhay River, and Berland River⁵.

Mountain goats apparently have continuously occupied the Pinto Creek area at a minimum population size of 8–49 animals (Table 1) since the earliest known records in 1942 (Stelfox and Kerr 1962, Harrison and Hooge 1995). Very little was known about the Pinto Creek herd until studies were conducted to assess the oil and gas exploration and development in the Pinto Creek area (Penner and Jalkotzy 1982, Smith 1982, Penner 1982, Penner 1986, and Penner 1988). The known range of the Pinto Creek goats consists of approximately 17 km of discontinuous canyon habitat along Pinto Creek and the area surrounding its junction with Hightower and Wroe Creeks. Goat use is primarily focused on a series of cliffs and interconnected trail systems along these three creeks (Figure 1 and Figure 3).



Figure 3 – Cliffs and interconnected trails along Pinto Creek

² A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

³ Secure: A species that is not “At Risk,” “May Be at Risk” or “Sensitive.”

⁴ Joe Geinger, personal communication

⁵ Hinton Wood Products wildlife observation database

Table 1 – Population Size and Structure of the Pinto Creek Goat Herd, 1962–2014

Method	Date	0+	1+	2+	Ad F	Ad M	Uncl	Kids/100 F	Total	Source
Ground	Jun-62	1	2	-	3	1	5 (Ad)	33	12	Stelfox and Kerr 1962
Ground	Jul-62	2	3	3	5	4	-	40	17	Kerr 1965
Air	Jan-76	1	1	-	-	-	7 (Ad)	-	9	Bibaud and Hall 1976
Air	Jan-77	2	1	-	-	-	6 (Ad)	-	9	Bibaud 1977
Ground	Dec-81	3	1	2	3	2	-	100	11	Penner and Jalkotzy 1982
Ground	Apr-81	1	1	1	3	2	-	33	8	Smith 1982
Air	Jun-84	2	1	2	3	2	-	66	10	Smith 1984
Ground	Nov-84	1	1	2	3	2	-	100	10	Penner 1986
Air	Aug-85	3	1	1	3	-	1	75	9	Taggart 1985
Air	Jun-86	3	2	-	4	-	-	75	9	Taggart et al. 1986
Ground	Mar-87	3	3	2	4	2	-	33	14	Penner 1988
Ground	Aug-94	5	3	-	9	3	2 (Ad)	56	22	Niederleitner 1994
Air	Aug-96	-	-	-	-	-	-	-	11	Harrison 1999
Ground	Aug-96	7	3	3	8	4	2 (Ad)	86	27	Hooge and Harrison 1996
Ground	Aug-96	7	3	2	8	4	1	88	27	Harrison 1999
Ground	Jan-97	6	-	-	6	-	6	100	18	Harrison 1999
Ground	Aug-97	4	5	2	6	1	5	67	23	Harrison 1999
DNA ¹	1997	-	-	-	-	-	-	-	31	Nelson 1998
Ground	Jul-98	5	1	2	6	2	1	83	17	Harrison 1999
DNA	1998	-	-	-	-	-	-	-	35	Nelson 1998
DNA	1999	-	-	-	-	-	-	-	38	Nelson 1999
Composite ²	1999	7	4	6	11	4	-	64	32	AEM 1999
Composite	2000	7	3	3	11	4	6 (Sa)	64	28	AEM 2000
Composite	2001	11	1	3	12	3	-	92	30	AEM 2001
Ground	2002	-	-	-	-	-	-	-	30	Brian and Cheryl Franz ³
Composite	2002	9	10	3	10	4	-	90	36	AEM 2002
Composite	2003	3	8	3	11	3	-	27	28	Fiera Consulting 2003
Composite	2004	2	6	5	12	2	3	17	26	Fiera Consulting 2004
Composite	2005	6	3	1	12	2	-	38	24	Fiera Consulting 2005
Composite	2006	7	7	-	16	3	-	44	33	Fiera Consulting 2006
Composite	2007	6	9	-	16	6	4	38	37	Fiera Consulting 2007
Composite	2008	6	8	-	16	4	-	38	34	Fiera Consulting 2008
Composite	2009	9	6	-	16	5	6	56	42	HWP 2009
Composite	2010	11	6	-	23	9	-	48	49	HWP 2010
Composite	2011	4	5	-	11	8	-	36	28	HWP 2011
Composite	2012	3	4	-	12	7	8 (Ad)	25	34	HWP 2012
Composite	2013	3	3	-	8	1	9 (Ad)	38	24	HWP 2013
Composite	2014	3	1	-	7	-	-	43	11	HWP 2014 (in progress)

¹ Estimated total number of individuals based on DNA analysis of hair samples collected on multiple summer ground surveys.

² Estimated minimum herd composition based on multiple ground surveys in summer.

³ 30 goats observed in a single large group on cliff 1a on January 6, 2002 by Brian and Cheryl Franz (AEM 2001).

Table 2 – Adjusted¹ Minimum Population Structure of the Pinto Creek Goat Herd, 1999–2014

Year	0+	1+	2+	Unclassified Subadult	Adult Female	Adult Male	Unclassified Adult	Unclassified	Unadjusted Total	Adjusted Total
1999	7	4	6		11	4	-		32	32
2000	7	3	3	4	11	4	1		28	33
2001	11	1	3		12	3	-		30	30
2002	9	10	3		10	4	1		36	37
2003	6	8	3		11	3			28	31
2004	3	6	5		12	2	3		26	28
2005	7	3	1		12	2	-		24	25
2006	9	7	-		16	3	-		33	35
2007	8	9	-		16	6	-		37	39
2008	6	8	-		16	4	1		34	35
2009	7	6	-		13	5	5		36	36
2010	11	6	-		23	9	-		49	49
2011	4	5	-		11	8	-		27	28
2012	3	4	-		12	7	-		33	34
2013	3	3	-		8	1	9		24	24
2014	3	1	-		7	0	-		11	11 ²

¹ Numbers in blue were adjusted based on minimum composite population surveys between years. For example, the 2003 observed total of 3 kids was adjusted to 6 because 6 yearlings were observed in 2004, indicating that there must have been at least 6 kids in 2003.

² This estimate is based on 1 survey with more to come.

Minimum population estimates as determined by ground and aerial surveys may not fully represent the population structure of the Pinto Creek mountain goat herd (Harrison 1999; Nelson 1998, 1999; Applied Ecosystem Management 1999, 2000, 2001, 2002, Fiera Biological Consulting 2003, 2004, 2005, 2006, 2007, 2008). Surveys suggested a minimum population of 23 in 1997, 17 in 1998, and 32 in 1999, while DNA analysis suggested 31 individuals in 1997, 35 individuals in 1998, and 38 in 1999 (Table 1). A second period of DNA analysis population estimates occurred from 2005-2008 (Schindler 2009, Table 2).

There are several potential explanations for differences between the two survey methods. Survey estimates in 1997 and 1998 were based on single surveys, which can underestimate the total number of goats in the population. The composite survey and DNA results match up fairly well in 1999, which was the first year composite minimum population estimates were used, and again from 2005-2008. The DNA analysis method may overestimate population size if it does not accurately distinguish individual goats, and underestimate population size if all goats present are not represented in hair samples. There may be sighting bias in ground surveys that results in an underestimate of total goats present. Goats may move back and forth between the Pinto Creek area and other habitats, so that some goats are often or always elsewhere during ground surveys and the total population that uses the Pinto Creek area annually cannot be determined using ground surveys. Additional research would be needed to investigate these possibilities (see Research section).

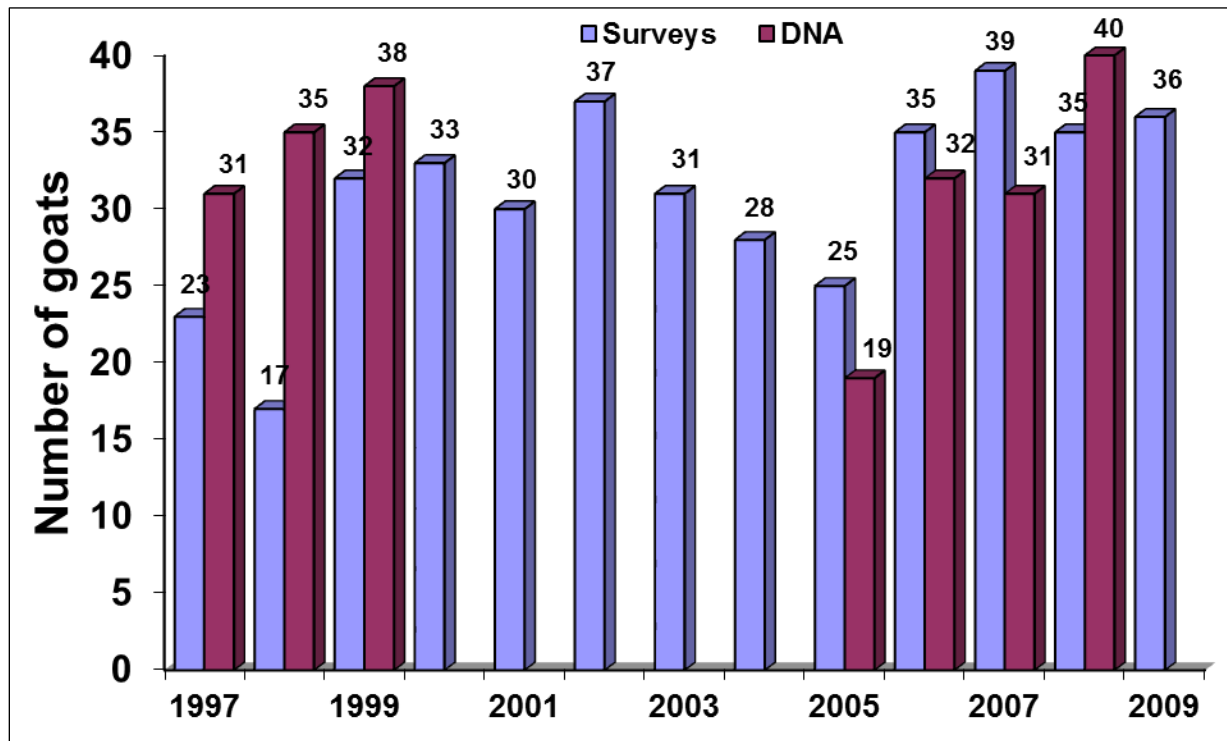


Figure 4 – Pinto Creek mountain goat herd minimum population estimates 1997–2009 using composite ground surveys and DNA analysis (Nelson 1998, Schindler 2009).

Since 1999, the Pinto Creek goat population has been above the upper range of historic recorded minimum population size. The 2007 minimum population of 39 is the all-time high for the herd using the minimum population estimate method, and the 2008 population of 40 is the all-time high using the DNA method. Forty-two goats were observed on June 24, 2009, but this may have included some duplicate observations so 36 goats was used as the minimum 2009 total.

FMA GOAT OBSERVATIONS

Mountain goat observations occur regularly in other areas of the FMA, mostly in association with cliffs/bluffs along rivers and streams (see summary in Appendix 4). Observations (Figure 5) include goat sightings and goat sign (hair, droppings, and tracks). Sightings were usually single goats, but up to four goats have been observed at a single time. Most single goat sightings were probably young male goats, which often disperse over long distances and appear in unusual locations. These animals may have come from occupied alpine goat range west of the FMA, or they may have been Pinto Creek goats that dispersed or wandered from the Pinto Creek area.

Individuals or groups of goats may move in and out of the Pinto Creek area over short or extended periods of time. Some ground surveys during both snow-free and snow-present conditions of the Pinto Creek area resulted in few or no goat or goat track observations (Harrison 1999, Fiera 2006). This suggests that some goats were missing or that goats were absent from the area surveyed, although it is possible goats were present but missed by the surveyors. Annual ground surveys from 1996-2006 (Fiera 2006) detected 2-4 adult males (average 3.4). Consistent detection of few adult males "...suggests that males are not residents within the population, that males are highly mobile and access non-traditional cliff habitats that are not monitored, or that there are few adult males recruited into the population due to mortality and/or emigration" (Fiera 2006).

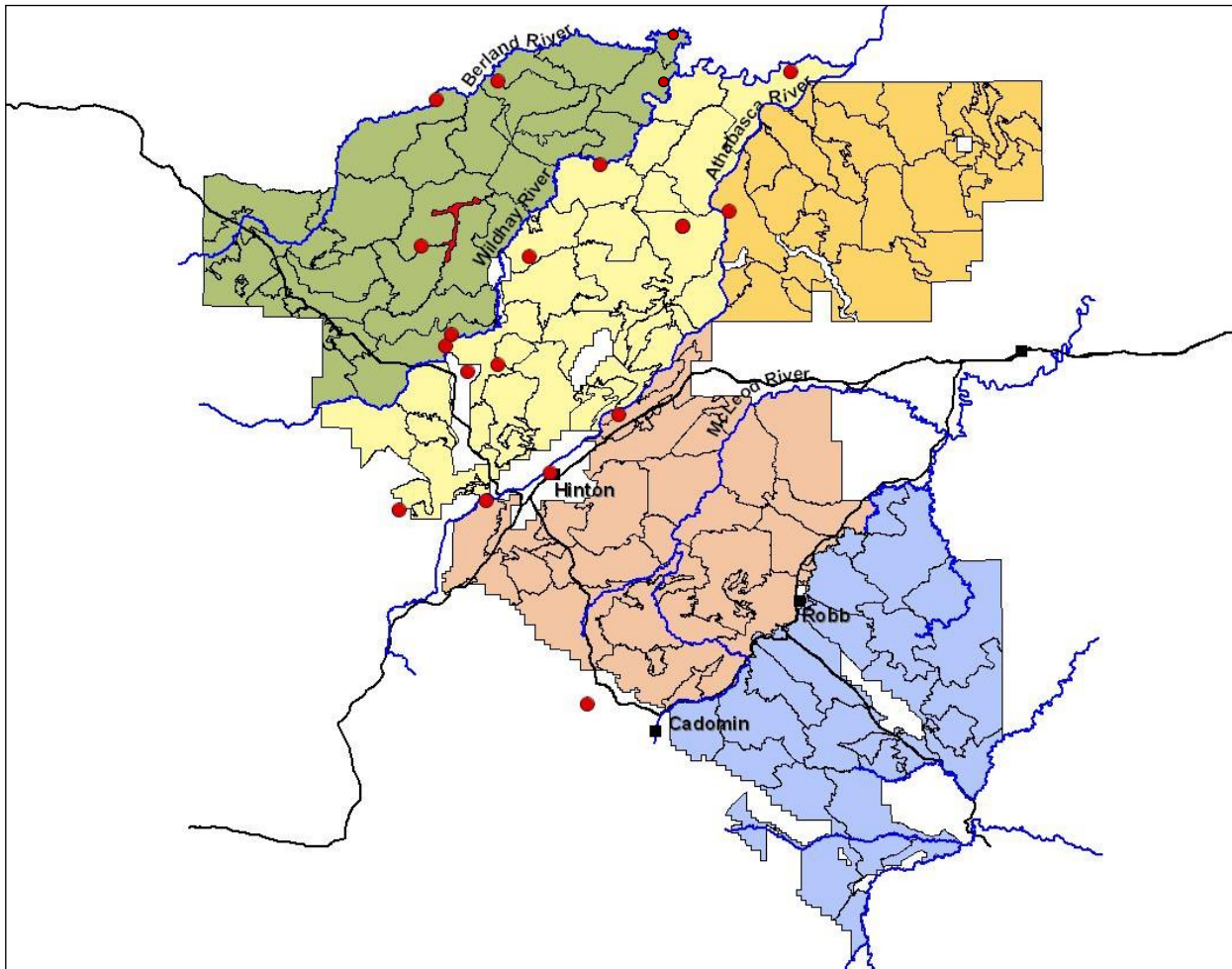


Figure 5 – Mountain goat observations on or near the Hinton Wood Products Forest Management Area, 1988-2009. The Pinto Creek Canyon Natural Area is shaded red and other observations are indicated with a red dot

Radio-telemetry studies of non-alpine mountain goat use in British Columbia documented considerable goat movement through forested areas between isolated bluff-canyon complexes (Turney 2004, 2005). Mountain goats also regularly travel considerable distances through forested habitats to access mineral licks (Holroyd 1967, Hebert and Cowan 1971, Hopkins et al. 1992). There is one small mineral lick in the PCCNA and it is also possible that goats may travel to unknown licks located outside the PCCNA.

LIMITING FACTORS

Natural mountain goat mortality factors include starvation, predation, accidental death, adverse weather, and death caused by parasites and diseases (Alberta Sustainable Resource Development 2003, Cote and Festa-Bianchet 2003). There are no recorded incidents of human-caused mortality from hunting and illegal killing so this is not considered to be a limiting factor for the Pinto Creek goat herd.

Known mortalities from 1994-2014 are shown in Table 3. Limiting factors are discussed below.

Table 3 – Observed mountain goat mortalities on the Hinton Wood Products Forest Management Area, 1994 – 2009

Year	Location	Description	Reference
1994	Bottom cliff 14	Goat skull found on a Pinto Creek gravel bar – no other documentation.	Niederleitner 1994
1994	Valley bottom near cliff 12	Kid or yearling probably killed by wolves in Jul-Aug 2004.	Niederleitner 1994
1994	Trail between cliffs 3 and 4	Adult probably killed by wolves in summer – no other documentation.	Niederleitner 1994
1995		No surveys in 2005	
1996	Near cliff 13	No documentation	Harrison 1999
1997	Near cliff 18	Adult goat skull probably >2 years old found Jul 31 1997.	Harrison 1999
1997	Bottom cliff 2k	3 year old male died in Jun 3–Jul 24 1997 window. Goat hair in bear and wolf scat found within 10 m of remains.	Harrison 1999
1997	Bottom cliff 2k	Unclassified adult died in Aug 24–Sep 14 1997 window. Goat hair in bear and wolf scat found within 10 m of remains.	Harrison 1999
1998	Cliff 13	Observer saw female kid fall to death off 7 m cliff while attempting to avoid a naturally rolling boulder.	Harrison 1999
1999		No documented mortalities	AAM 1999
2000		No documented mortalities	AEM 2000
2001		No documented mortalities	AEM 2001
2002		No documented mortalities	AEM 2002
2003		No documented mortalities	Fiera 2003
2004		No documented mortalities	Fiera 2004
2005	Near cliff 3	May 5, 2005 unclassified animal found across from trapper camp. No other documentation.	Fiera 2005
2005	Trail between cliffs 2a and 2b	Oct 6, 2005 unclassified animal found. Likely killed by wolves – tracks and scat found close by.	Fiera 2005
2006		No documented mortalities	Fiera 2006
2007	Cliff 7c	Fresh adult female remains found in early May. Likely killed by wolves – tracks and scat found close by.	Fiera 2007
2008		No documented mortalities	Fiera 2008
2009		No documented mortalities	HWP
2010		No documented mortalities	
2011		Remains of a subadult (leg bones) unknown sex, likely killed by a cougar. Scat latrine close by.	HWP
2012		Adult male 7.5 years old, likely killed by a cougar – flesh stripped from skeleton and much scat found close by. Animal had older missing/abscessed teeth on upper right side of jaw.	HWP
2013		No documented mortalities	HWP
2014	Cliff 12	Adult male 7.5 years old, likely killed by a cougar within last month. Skull and lower jaw collected.	Karen Graham
	South of cliff 13	Unknown adult, lower leg attached to scrap of hide. Likely killed by a cougar about 1 month previous.	Karen Graham

Starvation and Adverse Weather

Starvation could occur from shortage of high-quality food plants or from environmental conditions that limit goat access to food plants. Neither of these factors appears to be significant for the Pinto Creek goats. Food plants are apparently abundant and observed browsing effects are light to moderate. Winter snow conditions in the area do not appear to limit goat access to food. Pinto Creek goats generally seem to be in good condition and there are no recorded mortalities attributed to starvation or adverse weather.

Predation

Predation is likely the most important limiting factor for the Pinto Creek goat herd. Wolf, bear, or cougar predation was implicated in 10 of 14 mortalities recorded from 1994-2014 (Table 3), and may have been responsible for 13 of the 14 mortalities. Ground surveys consistently recorded evidence of wolf, grizzly bear, black bear, and cougar presence in the area. Other FMA predators that could be potential goat predators, especially of kids, are golden eagle, bald eagle, wolverine, coyote, and lynx.

Cougar predation appears to be the primary cause of predator mortality in the area. According to Cote and Festa-Bianchet (2003), "Most mountain goat populations are too small to serve as prey base for a population of predators, and a single cougar, bear, or wolf pack that specialized on preying on mountain goats could have a very strong impact on a local herd. Consequently, the effects of predation on mountain goat population dynamics may be density independent."

Accident

Mountain goats live in steep hazardous terrain where gravity increases chances of accidental death. In typical mountain habitat mountain goats are continually at risk of injury caused by falls off cliffs and being struck by objects (e.g. rocks, avalanches) falling from above. Falling rock and avalanche risk is lower in the Pinto Creek area but is still present. One recorded goat mortality resulted from a falling rock (Table 3).



Parasites and Diseases

There is no information on parasites and diseases in relation to the Pinto Creek goats. No known mortalities are associated with these factors.

Small Isolated Population

The Pinto Creek mountain goat herd is limited by small population size and isolation from other mountain goat populations. Small populations are more vulnerable to unusual events (e.g. disease, forest fire, severe winter, concentrated predation) that could cause extirpation. Isolation for long periods can result in inbreeding which can lead to reduced population fitness.

It isn't known if the Pinto Creek goats are genetically distinct from the closest goat population about 45 km west of Pinto Creek. There is no evidence of inbreeding depression and annual reproduction has occurred since annual monitoring began in 1994. Immigration by male goats dispersing from other populations into the Pinto Creek goat population may be sufficient to prevent inbreeding effects.

Emigration

Emigration may affect the Pinto Creek goat population. Adult males in particular may temporarily or permanently emigrate from the area (see above). There is also evidence to suggest that some yearling goats may emigrate. The proportion of yearlings present in April-May the following year to kids present in the previous year averaged 86.5 % from 1996-2009 (Table 1). The proportion of yearlings present in the fall to yearlings present in the spring of the same year averaged 22.9 %. This suggests that an unknown proportion of yearlings may emigrate between spring and fall. The alternative explanation that yearling survival in the second summer is lower than kid survival in the first year seems unlikely, considering that kid and adult

numbers are relatively stable over the same summer period. Emigration may occur early in the spring, before or soon after annual ground surveys begin: 10 yearlings were observed on May 27, 2002 but no more than 3 yearlings were observed in the next 11 surveys ending on October 31, 2002 (AEM 2002); 7 yearlings were observed on April 26, 2006 but no more than 3 were observed in the next 10 surveys ending on September 19, 2006 (Fiera 2006).

Habitat Alteration

There has been no significant habitat alteration to either the PCCNA or the SMA since extensive forest fires that occurred in the 1880s. Both areas are now mostly covered by mature or old conifer-dominated forests. The main species is lodgepole pine, with lesser amounts of white spruce and black spruce along riparian areas and in wetlands. There is a large area of very old (>200 years) pine on the west side of the SMA south of Hightower Creek.

If no stand-replacing disturbance occurs succession will continue to operate in mature/old stands. Pathways are complex but in general pine stands with no understory will probably open up and transition to other species at variable rates depending on seed sources. Pine stands that already have a non-pine understory will probably transition to the understory species (white spruce, black spruce, subalpine fir). White spruce, black spruce, and subalpine fir stands will likely transition to uneven-aged combinations of the same species.

Mountain Pine Beetle

Alberta mountain pine beetle populations increased significantly in 2006 and again in 2009. The ongoing mountain pine beetle outbreak is expected to kill >80 % of mature lodgepole pine in British Columbia and may do the same in Alberta. High pine mortality levels would significantly alter habitat in both the PCCNA and SMA.

In the event of mountain pine beetle attack about 82.5 % of the PCCNA and 92.5 % of the SMA forest stands are at high risk (mountain pine beetle Stand Suitability Index ≥ 30) for pine mortality (Figure 6).



Adult female and kid – Pinto Creek

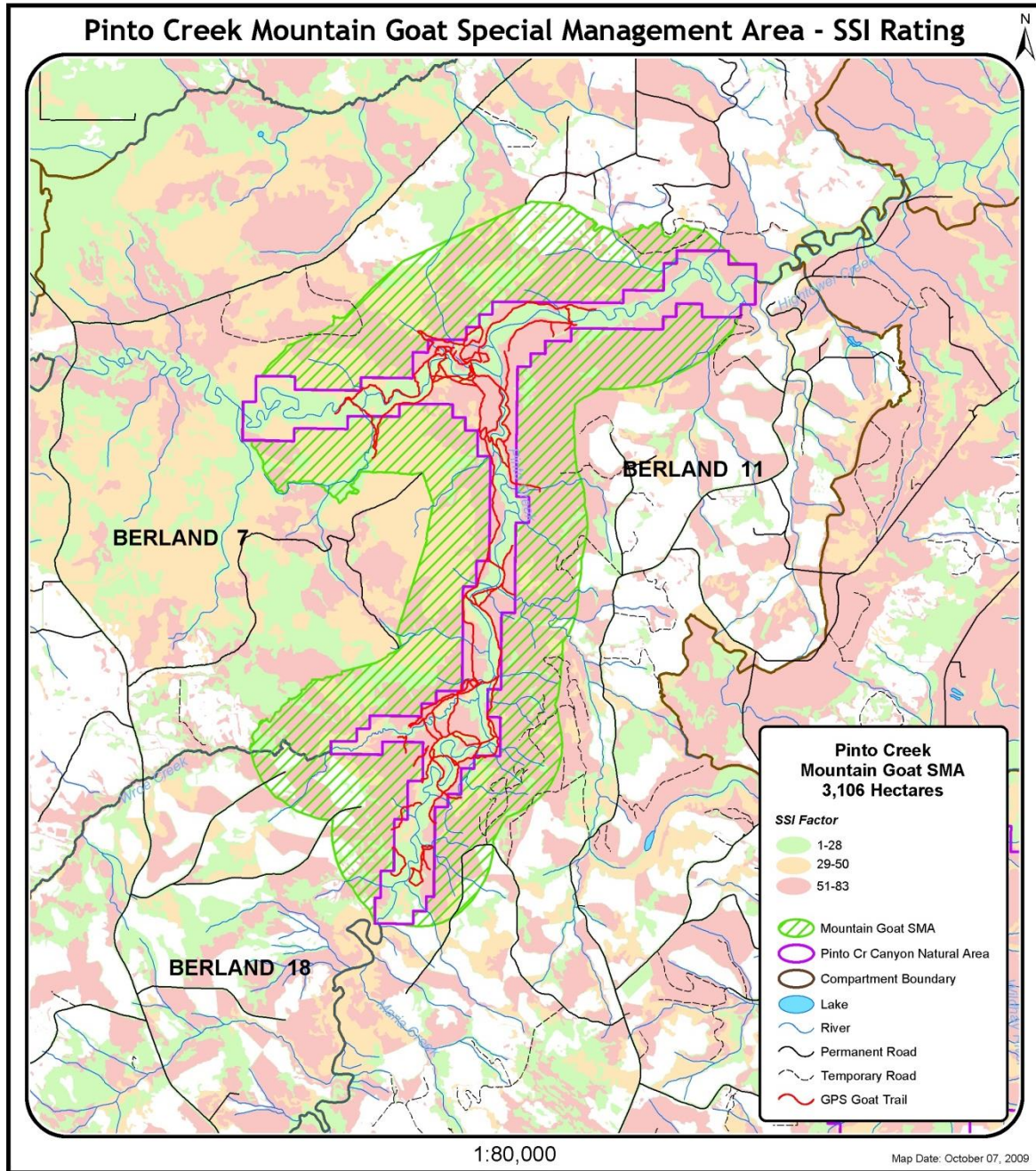


Figure 6 – Mountain pine beetle stand susceptibility index for the Pinto Creek Canyon Natural Area and vicinity, Hinton Wood Products Forest Management Area.

Mountain goat food plant diversity and biomass would likely increase following mountain pine beetle and/or forest fire disturbance. Once dead trees start to fall in significant numbers fallen trees could impede goat movements through forest adjacent to cliff and steep slope habitats and along established trails linking cliff complexes. Fallen trees might also physically prevent goats from using habitat or increase their vulnerability to predators.

Forest Fire

The mature/old forest covering the PCCNA and SMA is vulnerable to forest fire disturbance. There are large areas of continuous fuels. The last fire episodes in the 1880s burned across the canyon and Pinto Creek. Forest fires typically do not stop at riparian areas in FMA landscapes (Anderson and McCleary 2002).

Forests killed by mountain pine beetles have increased fuel loads that make them more vulnerable to forest fires for a few years after mortality and again after about 10-20 years when beetle-killed trees fall and increase ground-level fuels.

Timber Harvest

There was no historic timber harvest activity in the PCCNA. The only timber harvest within the current SMA was in the south in compartments Berland 11 and 18 from 1994–1995. At that time the SMA did not extend as far south as it does today and the harvested blocks were not within the SMA.

Linear Corridors

There are no wellsites, pipelines, or other facilities within either the PCCNA or SMA. Currently there are 1.4 km of reclaimed road and 0.2 km of deactivated road within the SMA. Future plans call for an additional 22.2 km of temporary roads within the SMA in Berland 7. The temporary road network in the Berland 11 portion of the SMA has not yet been designed. A network of conventional 8 m seismic lines constructed in the late 1970s (Figure 2) includes 28.7 km within the PCCNA and 80.0 km within the SMA. There has been some low-level seismic exploration in the SMA in recent years. For the most part this involved reuse of historic lines and/or hand cut lines.

Goats travel between Pinto Creek cliff complexes along a trail network through forest habitat.
Trail camera photo G. Harrison.



Human Activity

The PCCNA and SMA are relatively remote and human activity in the area is low. A cabin owned and used infrequently by Registered Fur Management Area 1992 holder Al Walker (deceased) located on the east side of Pinto Creek near cliff 3 in the PCCNA is the only building in the area. Recreational use is very low and does not occur every year. Recorded recreational use includes summer paddling down Pinto Creek from the Polecat

Road to below the junction of Hightower creek, and winter snowmobile travel along the frozen Pinto Creek. Paddling is only possible during periodic flood events and snowmobiling is only possible after extended periods of cold weather freeze Pinto Creek enough to allow safe travel.

The main human activity in the area is the annual twice-monthly May-October ground surveys conducted by Hinton Wood Products. Surveyors walk the entire area to locate, classify, and count goats, taking care to minimize disturbance. In general the goats do not react adversely to surveyors.

Industrial activity in the SMA and surrounding areas has been increasing since Hinton Wood Products started developing the area in 1991 with the initiation of the Berland 11 Compartment Operating Plan. Over the ensuing 16 years the Pinto Creek goat herd has either increased or remained stable, therefore industrial activity has had no measurable impacts on the Pinto Creek goats.



A male mountain goat bedded at a wellsite near cliffs along the Athabasca River downstream of Oldman Creek in October 2005. This goat used the buildings as escape terrain, climbing on them when threatened. Single goats, usually adult males, are regularly transient along major river corridors on the FMA.

HABITAT CONSERVATION STRATEGY

Roles and Responsibilities

Hinton Wood Products has no responsibility for management of the Pinto Creek goats or the Pinto Creek Canyon Natural Area. Commitments made in this document relate specifically and only to Hinton Wood Products management of the SMA and potential associated impacts on goat conservation. Other factors that may affect conservation of the population including genetic diversity, natural disturbance, habitat within the PCCNA, and effects of other human activity and predators are beyond the responsibility of HWP. As part of the

HWP stewardship commitment HWP will consider and may partner with Alberta and others in their conservation programs related to other factors.

HWP and Alberta are jointly responsible for developing, implementing, monitoring, and improving this HCS. Periodic revisions will be endorsed and the most current version of the HCS will be approved as part of FMP revisions. Alberta is responsible to seek the participation and/or consent of Alberta Tourism, Parks, and Recreation, the land manager for the PCCNA.

HWP and Alberta will work together to implement the monitoring program and related investigations that may be commenced if conservation objectives are not being met.

In cooperation with Alberta, HWP initiated and coordinated research and monitoring programs for the Pinto Creek mountain goat herd starting in 1994. The University of Northern British Columbia was a participant from 1996–1998. Contractors used were Seastar Biotech (Victoria, B.C., 1998–2000), Applied Ecosystem Management (Hinton, Alberta, 1999–2002, and Fiera Biological Consulting (Edmonton, Alberta, 2003–2008).

Goals

The HWP goal is to contribute to long-term prosperity of the Pinto Creek goat population by managing the SMA to meet HWP timber objectives without detriment to the goats. The mountain goat HCS describes HWP activities that will contribute to long-term conservation of the Pinto Creek mountain goat herd. The primary focus of the strategy is to put in place an adaptive management strategy that will use monitoring to assess the success of conservation measures and collect more information toward conservation of the Pinto Creek mountain goat herd. The HCS will be reviewed and revised as new information is acquired.

Forest Management Plan – Long-Term Mountain Goat Habitat Supply

HWP and Alberta reached agreement in 1998 on a conservation strategy for the Pinto Creek mountain goat herd to be included in the 1999 Forest Management Plan. The strategy was described in Version 1 of this document and is referenced in the 1999 Forest Management Plan, which was approved in December 2000. HWP made 5 commitments in the 1999 FMP. The commitments, status, and future activities are described in Appendix 2. This document updates the habitat conservation strategy and the approved revision will be incorporated into the 2014 Forest Management Plan.

Landbase Designation

Pinto Creek Canyon Natural Area

Cliff complexes and trails within the Pinto Creek Canyon Natural Area were used during all seasons (Harrison 1999; AEM 1999, 2000, 2001, 2002; Fiera Biological Consulting 2003, 2004, 2005, 2006, 2007, 2008; HWP 2009, 2010, 2011, 2012, 2013). Goats do use some cliffs more than others but use patterns have changed back and forth over time both seasonally and between years. Cliffs that receive less use at any given time connect preferred sites and may be important for seasonal isolation requirements of goats (e.g. parturition, breeding; Harrison 1999). The trail network (approximately 21 km) connecting the cliff system is also a critical resource that supports goat movements.

Based on goat observations and sign (hair, feces and tracks) HWP established a Reserve Area in 1988 which was excluded from the contributing landbase in the 1991 FMP. The Reserve Area was expanded to 371.8 ha in 1994 based on new information (Neiderleitner 1994). HWP expanded the Reserve Area again in 1998 to 780 ha to incorporate known goat use areas outside the existing reserve (Harrison 1999). Amendments included widening the existing reserve in some locations, and extensions north and south along Pinto Creek and west along Wroe and Hightower Creeks. In 1998 HWP also nominated the 780 ha Reserve Area as a protected area under the Alberta Special Places program. After modification the Pinto Creek Canyon Natural Area (PCCNA) covering 1,233 ha was designated by an Alberta Order in Council in December 2000. The PCCNA is linked to other protected areas through the Hinton Wood Products watercourse corridor SMA strategy.

The PCCNA designation is the third and final refinement of the original boundary of the RA, which was originally established in 1988 and expanded in 1994, 1998, and 2000.

The revised 1998 goat RA was included in the 1999 Forest Management Plan landbase allocation as not available for timber management. The subsequent PCCNA, which includes all of the 1998 RA plus some additional area, is an FMA landbase deletion. The Ministry responsible for preparing a Management Plan for the PCCNA, Alberta Tourism, Parks, and Recreation, has not commenced a Management Plan and as of this writing does not have a planned commencement date.



Two adult females at top of slope break – Pinto Creek

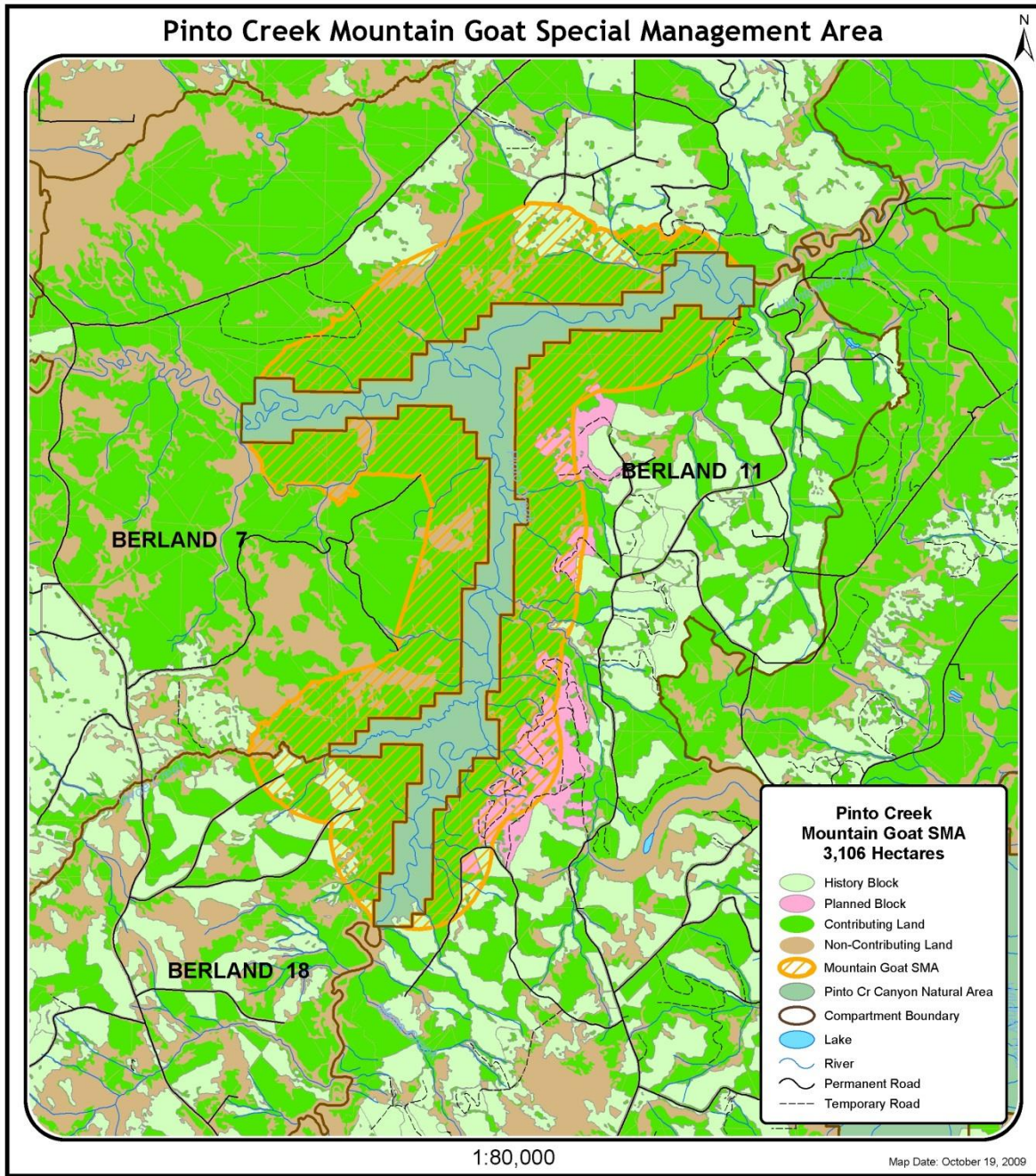


Figure 7 – Pinto Creek Goat Special Management Area showing contributing landbase from the upcoming FMP MPB Amendment and proposed cutblocks and roads within the SMA.

Pinto Creek Goat Special Management Area

A 1-km Special Management Area (SMA) was established in 1994 to encircle the 1994 goat Reserve Area. In 1998, HWP made changes to the SMA to reflect additions to the 1994 Reserve Area based on new information about goat use. The SMA now extends outward approximately 1 km from the 1998 Reserve Area and encompasses 3,106 ha (Figure 6). The SMA boundary was adjusted on the inside when the PCCNA was designated, but the outer boundaries remained the same. The boundaries of the SMA in Berland 7 were flagged in the field and located with a GPS.

Pinto Creek goats periodically utilized some areas outside of the 1998 Reserve Area from 1996–1998, primarily along Pinto Creek to the south and Hightower Creek to the west (Harrison 1999). These areas have since been protected as part of the PCCNA or assigned to special management under the Hinton Wood Products Riparian SMA program. The only locations within the study area where goats used forested uplands (bedding and feeding) during all seasons (Harrison 1999) were steep areas immediately north of Cliffs 1A and 1B, which were identified previously as a goat use area (Penner and Jalkotzy 1982, Smith 1982). North of these cliffs, the boundary of the SMA and the identified feeding/bedding sites was located 1 km from these sites.

With the above noted exceptions, existing data indicates that goat use of the SMA is very low (Harrison 1999; AEM 1999, 2000, 2001, 2002, Fiera Biological Consulting 2003, 2004, 2005, 2006, 2007, 2008, HWP 2009, 2010, 2011, 2012, 2013).

Landbase Designation Summary and Commitments

The PCCNA and surrounding SMA designations represent a conservative approach to address goat conservation and timber management issues in the area. The PCCNA is an FMA landbase deletion. The 1998 SMA designation will be maintained and all SMA stands are eligible to be part of the contributing landbase for the next FMP (shown in Figure 7).

HWP and Alberta will consider additions to the SMA and/or nomination for additions to the PCCNA if future information suggests that landbase designations should be revised to improve goat conservation.

HWP will participate in the PCCNA Management Plan process when it gets underway.

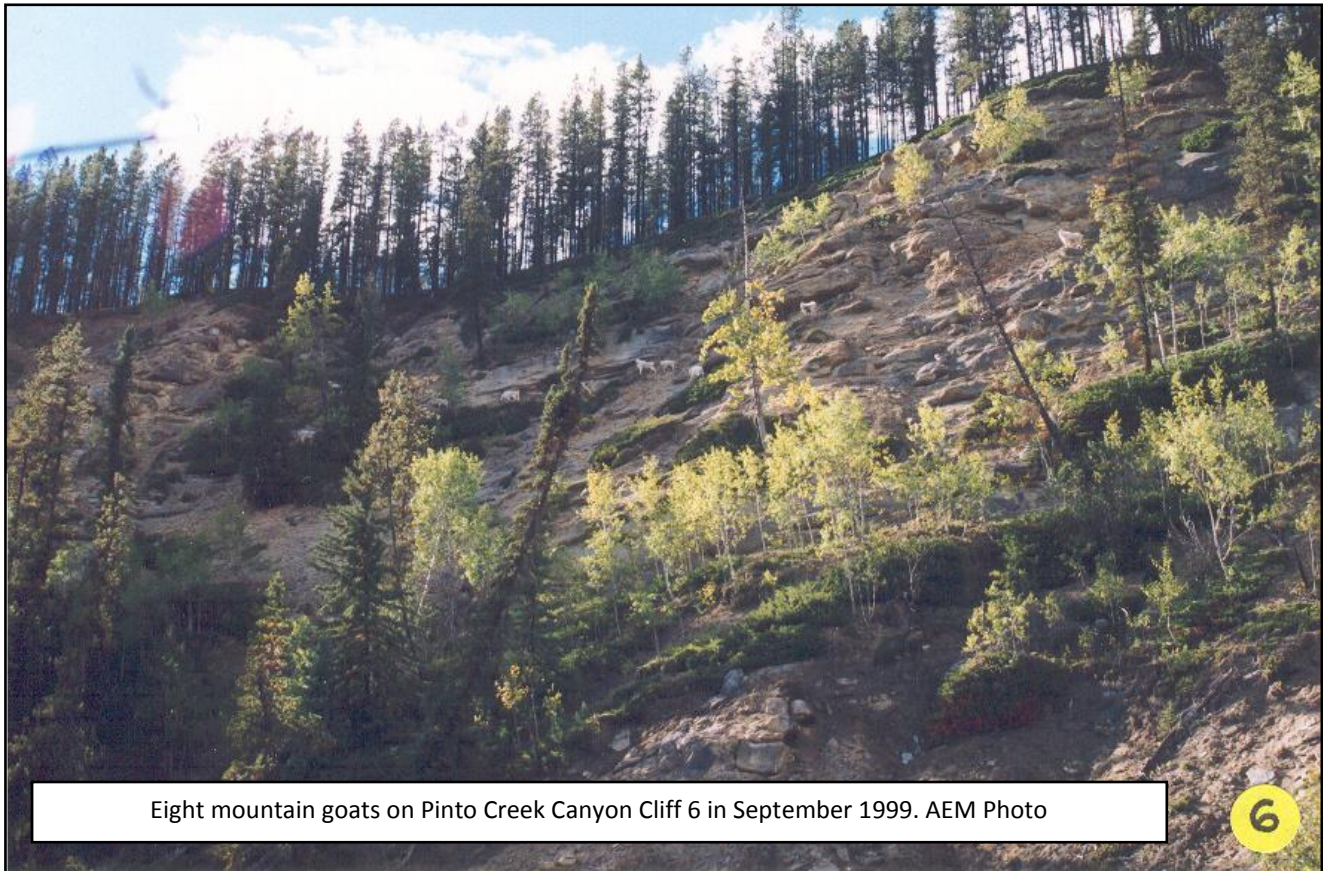
SMA Management Strategy

Research sponsored by Hinton Wood Products since 1994 has increased understanding of Pinto Creek goat habitat use and movements. Goat use of forested habitats in the SMA away from the known trail systems protected by the PCCNA is very low (excepting the steep area north of Cliffs 1a and 1b) but Harrison (1999) hypothesized that SMA goat use may be important. This hypothesis was explored through annual surveys since the completion of the Harrison (1999) study. These surveys did not identify any reason to suggest that the very low goat use of the SMA is an important aspect of goat conservation.

SMA Harvest Risk Assessment

Although goats rarely use the SMA, there are other potential impacts of SMA timber harvest on the Pinto Creek goats that cannot be determined in advance. Possible conservation issues include:

1. Human activity within the SMA causing sensory (mainly aural) disturbance to goats within the PCCNA and any goats that may be using the SMA.
2. Human activity within the PCCNA causing a potential adverse reaction by goats.
3. Habitat alteration within the SMA, parts of which are used occasionally by goats.
4. Disruption and/or displacement of goat movements and habitat use within the PCCNA and SMA.
5. Potential increased predation rates on goats within the PCCNA.



The conservation risks of the identified issues are discussed individually in this HCS and a risk assessment matrix is included in Appendix 1.

Mountain goats use regenerating clearcuts adjacent to canyon habitats in British Columbia and goats in those areas continued to use areas adjacent to logging activity over many years afterwards (Blume and Turney 1999, Turney et al. 2000, Turney et al. 2001). Proceeding with a cautious harvesting program coupled with close monitoring of goat response and ongoing review of the harvesting program is ranked as a low potential risk (Appendix 1). There may be limited opportunities in some locations (e.g. north of cliffs 1A and 1B) to use SMA harvesting to improve habitat conditions and create a long-term benefit for the Pinto Creek goats. At present HWP does not intend to explore these opportunities.

Mountain Pine Beetle Risk Assessment

The risk of MPB attack and extensive pine mortality in both the PCCNA and SMA has increased (see Limiting Factors and Appendix 1). Potential impacts of MPB-caused pine mortality on goats in the PCCNA are unknown and likely include both positive and negative aspects. Significant pine mortality caused by MPB or other factors (e.g. forest fire) could lead to subsequent pine deadfall along goat trails and in forest adjacent to cliff systems that could severely disrupt goat movements and potentially increase their vulnerability to predation by preventing rapid access to escape terrain (Appendix 1). This has not occurred in northeast British Columbia where MPB-caused pine mortality has occurred (Mari Wood, personal communication to Steve Bradbury, 2009). However there has been insufficient time since pine mortality for significant deadfall to occur.

MPB-caused pine mortality may also increase forest fire risk if the first few years following mortality and again 10-20 years later when fallen trees increase fuel loads near the ground.

MPB-caused pine mortality, forest fire, and harvesting would all increase the availability of food for ungulates in the area, including mountain goats. Increased food could benefit goats directly but also increase populations of other ungulate species, which in turn could increase predation risk for goats.

HWP expects that MPB control activity conducted by Alberta within the PCCNA will likely be limited to Level 1 treatments (single tree fall and burn) and will only occur when Level 1 treatments are judged to be effective by Alberta. Any decision to implement Level 1 treatments will be made by Alberta. If it occurs, Level 1 activity should have little impact on the goats (Appendix 1).

The impact of MPB mortality to pine in the SMA is probably comparable to harvest impacts, with the only difference being that pine mortality from MPB would likely occur over a larger area and shorter time period than harvesting would.



SMA Harvest Design and Schedule

Before the increased risk related to MPB, Hinton Wood Products proposed to harvest 10% of the SMA in the 1998-2008 period followed by a monitoring period to assess goat response. Assuming no negative goat response, remaining areas of the SMA would then be scheduled for harvest. The proposed harvest was to start near the end of the first pass harvest in surrounding areas, specifically in compartment Berland 7. One SMA block totalling 79.1 ha (2.5%) of the SMA was harvested in the winter of 2007-2008. Before and after goat behaviour response was monitored (Fiera 2008a) and goats continued to use the closest cliffs before, during, and after the harvest operations. Post-harvest population monitoring in 2008 and 2009 (Fiera 2008b, HWP 2009) documented continued healthy population numbers.

As directed by Alberta, starting in 2006 Hinton Wood Products shifted harvest to the most MPB-susceptible pine stands in a corridor that includes the Pinto Creek area (Hinton Wood Products 2007). This change altered the criteria that Hinton Wood Products uses to select stands for harvest and affects both the design and schedule for SMA harvest. Priority stands are $\geq 80\%$ pine, ≥ 18 m height, < 140 years age, 500-1,600 stems/ha, and $< 25\%$ coniferous understory.

The new design included 4 Berland 11 blocks that were harvested in 2009 and 2011 (Figure 8). All remaining stands in the SMA do not meet current HWP criteria for MPB threat reduction and were not scheduled for harvest in the Spatial Harvest Sequence of the 2014 FMP. This decision will be reviewed regularly and may change pending further development of the MPB outbreak on the FMA.

Notwithstanding the potential negative impacts of MPB attack in the SMA and PCCNA on the goats, there are compelling reasons to accelerate susceptible pine harvest in the SMA and surrounding area that relate to the

risk of MPB establishing and spreading in the FMA. The Pinto Creek area is the single largest susceptible pine “hotspot” on the FMA so as directed by the Mountain Pine Beetle Action Plan (Alberta 2007), HWP started accelerating harvest of susceptible pine in the area in 2007 (HWP 2007). Accelerated susceptible pine harvest in the SMA and surrounding compartments may reduce risk of pine mortality within the PCCNA by removing susceptible pine in the surrounding area to disrupt MPB movements and fragment MPB food supply, and by acting to slow or disrupt MPB spread into the FMA from infestations north of the FMA. SMA harvest will assist with implementation of the HWP healthy pine strategy to reduce susceptible stands.

HWP will continue an adaptive management approach to timber management within the SMA to minimize any risks to goat conservation, with the added consideration of addressing changes related to MPB considerations. The main changes related to MPB risk are to change the harvest design to target the most susceptible pine stands, and to complete harvest of the most susceptible stands in the SMA in 2009-2010. This is generally consistent with the previous strategy. The revised strategy contains the following main elements:

1. SMA harvest of Berland 7 block 5-7-0492 is complete. Goat response was monitored (Fiera 2008a) with favourable results.
2. SMA harvest of Berland 11 blocks 5-11-0543, 5-11-0933, 5-11-2143, and 5-11-2855 was completed in the 2010-2011 operating year. Total SMA harvest was 274.3 ha (8.8% of the SMA).
3. All remaining stands in the SMA do not meet current HWP criteria for MPB threat reduction and will not be scheduled for harvest in the Spatial Harvest Sequence of the 2014 FMP.
4. The scheduling decision will be reviewed regularly and may change pending further development of the MPB outbreak on the FMA or other unanticipated events (e.g. forest fire).
5. The new harvest design and schedule will be incorporated into the next FMP.
6. Goat response monitoring continued through 2014 and will then be suspended until future operations are proposed for the area.

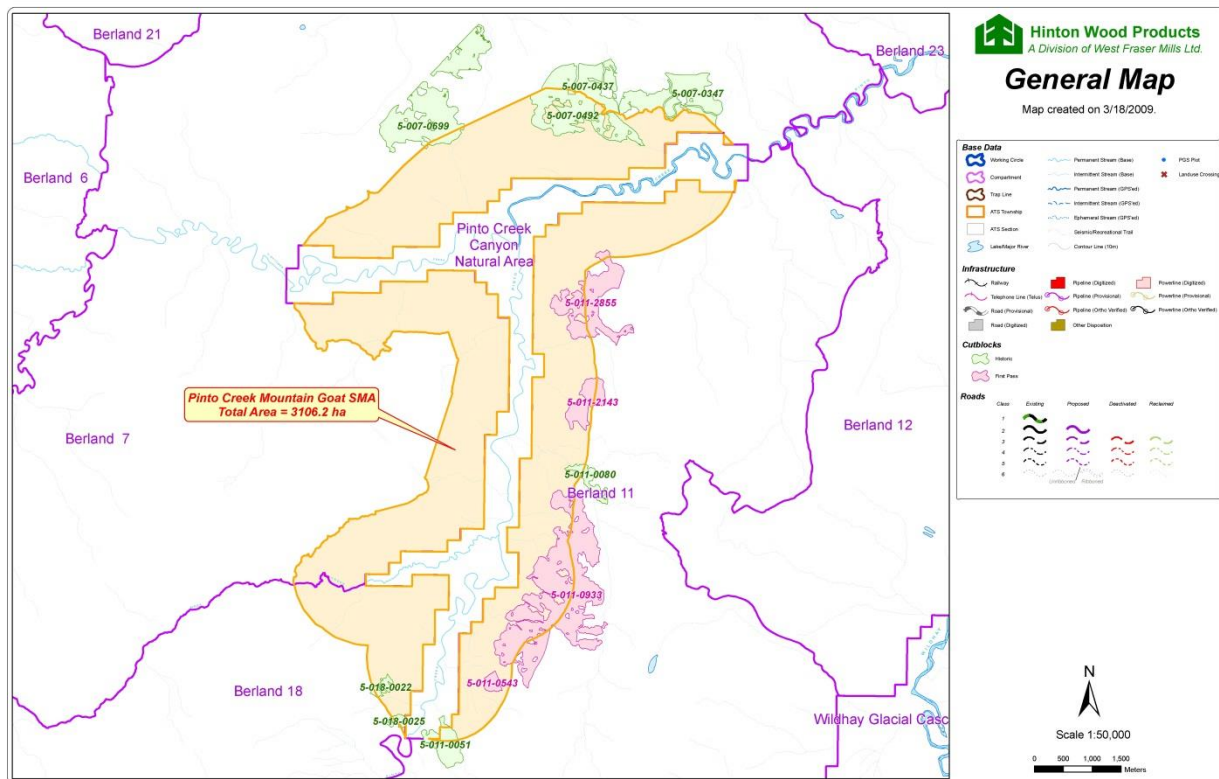


Figure 8 – Berland 11 SMA harvest commenced in fall 2009 and was completed in spring 2012

Access Management

The PCCNA and SMA are currently accessed by a network of older conventional seismic lines. Some of the seismic lines are accessible to 4-wheel drive vehicle or OHV during dry or frozen conditions, and others have naturally reforested and motorized use is not possible. A network of permanent Class 2 to 4 all-weather roads were developed in the three compartments that border the SMA. Additional temporary roads will be needed for SMA harvest and silviculture activities.

Motorized use of the PCCNA is currently prohibited by legislation. Other existing human use of the area is not restricted and has not been quantified, but field surveys show that human use occurs at very low and infrequent levels. Increasing access in the area and increased awareness of the Pinto Creek goats could lead to increases in human activity, which in turn could have a negative impact on the goats. This has not occurred to date. In Version 1 of this document, HWP proposed to develop an access management strategy for surrounding compartments, the SMA, and the 1998 RA with six main elements. The updated access management strategy is described below:

1. Development of new road access in the SMA will be limited by using combinations of existing trails, temporary roads, forwarding, and other measures.
2. Access routes within the SMA will be deactivated and physically blocked when they are not being actively used for operations.
3. HWP and Alberta will implement a joint program to monitor the effectiveness of the SMA access management strategy.
4. Depending on the success of elements 1–3, HWP may request a Forest Land Use Zone (FLUZ) that covers the SMA and restricts human access for the purposes of goat conservation.
5. HWP will participate in Alberta Tourism, Parks, and Recreation management planning for the PCCNA.

At present there is no indication of public viewing demand. If public viewing demand develops to the point that public viewing could have negative impact on the goats HWP supports the concept of potential development of one or more trails and observation points to allow public goat viewing in a manner that does not disturb goats. HWP would support and comply with an aircraft “No Fly Zone” over the PCCNA to eliminate aircraft disturbance of goats. HWP already follows this practice for HWP aerial work. HWP would also be interested in partnering with Alberta to use special timber harvest to improve goat habitat within the PCCNA.

Final Harvest Plan

HWP will not develop a separate FHP for the SMA. Instead, special management will be incorporated into the FHP for the 3 compartments that surround the PCCNA, Berland 7, 11, and 18. These will describe harvest strategies designed to conserve the Pinto Creek goats while allowing timber management within the SMA. Both harvesting and goat response will be closely monitored and regularly reviewed. The approach will be to conduct harvesting in stages, followed by a period of monitoring. Additional harvesting will be dependent on evaluation of monitoring results.

1. Initial operations were completed in Berland 7, 11, and 18 adjacent to the SMA. Goat response was monitored and evaluated. There were no detectable impacts on the goats. SMA harvest commenced in winter 2007-2008 and was completed in winter 2011-2012. Goats showed elevated levels of awareness but otherwise continued normal behaviour.
2. There will be no SMA operations from May 1–July 31 to reduce disturbance to goats during the kidding period and minimize stress to newborn kids during the first 3 months of life.
3. Operations will be focused spatially and temporally within the SMA in any operating period to reduce overall disturbance.
4. Goat response will be monitored only when SMA operations are active through continuation of the annual composite ground surveys.
5. The HCS will be adjusted as appropriate.

Experimental timber harvesting for goat habitat enhancement (e.g. small patches, partial cut systems) may be considered in selected areas adjacent to or within the PCCNA. This would occur only after responses to harvesting in other areas of the SMA are known and provided a Management Plan supporting this approach was developed and approved by Alberta for any activity within the PCCNA.

Harvest Planning and Operating Ground Rules

The 2002 Harvest Planning and Operating Ground Rules included a commitment to follow this HCS within the Pinto Creek mountain goat SMA identified on the wildlife zone map. The 2009 OGR revision does not mention this HCS. HWP does not anticipate activities that require other changes to the Harvest Planning and Operating Ground Rules, which will be applied with site-specific judgment.

Goat Population Indicators

This section describes indicators for the status of the Pinto Creek goat population that will be used to evaluate the success of HCS implementation. Each indicator has an intent statement, a description of the indicator, a target, and if appropriate one or more tripwires. If a tripwire is reached HWP and Alberta will jointly review the situation to see if adjustments to the HCS are warranted.

Population Size

Intent

- Maintain long-term viability and prosperity of the Pinto Creek mountain goat herd. This includes maintaining at least the minimum number of goats within the recent range of historic population variability (≥ 20 goats).

Indicator

- Minimum annual composite population size from repeated summer/fall ground surveys.

Target

- Minimum annual composite population size of ≥ 20 goats, including at least 8 adult females and 2 adult males.
- Tripwire 1: Minimum annual composite population size of ≤ 25 goats.
- Tripwire 2: Minimum annual composite population size decline of $\geq 25\%$ in one year.

Strategies

- Annual composite ground surveys 2 years before, during, and 2 years following periods of harvest activity in the SMA.
- Periodic ground surveys during other periods.
- Tripwires 1 and 2: If the population declines to ≤ 25 goats and/or if the population declines $\geq 25\%$ in one year HWP will cease operations or postpone scheduled operations in the SMA while HWP and Alberta review the population status and determine or investigate possible cause(s) of the decline. SMA operations will be recommenced by agreement.

Population Composition

Intent

- Adults of both sexes to indicate reproductive capacity.
- Annual production of kids to indicate successful reproduction.
- Presence of age 1+ subadults to indicate successful recruitment.

Indicators

- Sex and age class composition of minimum annual composite population from repeated summer/fall ground surveys.

Targets

- At least 8 adult females and 2 adult males present each year.
- At least 2 kids observed each year.
- At least 1 subadult present each year.
- There are no tripwires for these targets.

Strategies

- Continue ground surveys (see above).

Distribution and Behaviour

Intent

- Continuing annual use of cliffs and trails in the known goat habitat within the PCCNA.
- Minimal and non-consequential short-term behaviour response to SMA operations.

Indicators

- Annual and seasonal distribution of goat sightings, tracks, hair, droppings, and other use evidence, defined as % of traditional cliffs used at least once annually.
- Distribution of goats in response to SMA operations, defined as use of the closest cliffs to SMA operations.

Targets

- Annual use of $\geq 80\%$ of traditional cliffs in the known goat habitat within the PCCNA.
- Use of the closest previously-used cliffs to SMA operations within 6 months of completion of operations.
- There are no tripwires for these targets.

Strategies

- Determine annual and seasonal goat distribution in conjunction with ground surveys.
- Increase intensity of observations immediately before and during start-up of SMA operations to detect distribution changes that may be related to operations.

Additional indicators and objectives may be developed in future versions of this HCS as part of the continual improvement process.

As described elsewhere in this document, all indicators are currently at or above targets and no tripwires have been triggered.

MONITORING

HWP supports an ongoing monitoring program to assess success of the goat conservation strategy as it relates to HWP forest management activities. The best way to monitor this population is through inventory techniques designed to document goat population size, sex ratios, and trail use. The monitoring program must be both achievable (logistically realistic) and cost effective, since long term monitoring is essential to track responses to management actions. Potential impacts of harvesting operations within the SMA will be assessed through a periodic long term monitoring program as described in part in the following section.

Since 1999, minimum count population estimates for the Pinto Creek goat population have ranged from 25–49 animals (Table 2). The lowest previous estimates were 8-10 goats from 1976-1986. The population data are minimum count numbers only, and should not be considered as actual population numbers suggestive of trends. Many of the numbers presented in Table 1 prior to 1999 were from aerial surveys. Mountain goats are easily disturbed by aircraft (Stockwell et al. 1991, Cote 1996) which could affect visibility in the heavily forested habitats of the PCCNA. None of the historic aerial survey reports identified or cited any visibility correction factors to address this problem and thus numbers from these surveys also represent minimum counts. Simultaneous aerial and ground-based surveys were conducted in the summer of 1996 as an experiment (Harrison 1999). Goats exposed to low-flying aircraft responded by retreating into forested habitat where they

were not visible to either air or ground survey teams (Harrison 1999). Ground survey results from 1996 showed a population of 27 animals while the aerial surveys observed 12 animals (Harrison 1996).

Aging and sexing mountain goats under ideal conditions is difficult, even for trained observers, and obtaining these types of data from the air is even more difficult. Ground based survey methods also have biases. Goats are not marked for individual identification, so animals may be erroneously counted more than once. Visibility issues are also present and survey crews may not see goats bedded or travelling through forested habitat. Although the ground based survey method has biases these are mitigated by repeated surveys and ground surveys are currently considered the most appropriate and cost-effective method to continue monitoring the population demographics of the herd.

Monitoring program results will be reported in annual reports prepared each year that monitoring is done, and summarized in future versions of this document. Revisions to the HCS are tracked in the Stewardship Report.

RESEARCH AND CONTINUAL IMPROVEMENT

Successful integration of timber management and goat conservation depends on monitoring SMA management and associated goat conservation indicators and objectives and using the monitoring results to adjust this HCS. HWP and Alberta will annually review monitoring results and agree to changes to SMA operations, monitoring, and research. Additional research may be of interest or warranted to understand the reasons for observed changes in the monitoring indicators.

DNA Analysis

Work to date on DNA analysis has been inconclusive (Harrison 1999, Nelson 1998, 1999; Nelson and Cooper 2000, Schindler 2009). As tissue or blood samples were not available, work focused on developing techniques to allow extraction of DNA from hair follicles collected from hair snagged on bushes and underbrush at cliffs and along trail systems. One to several hairs from each hair clump were isolated and used as a single sample for the analysis. As it was impossible to know if a clump of hair was from a single goat, this technique could lead to creation of “artificial” individual genotypes, which are actually combinations of genetic material from 2 or more goats. Additional work to see if results are reproducible would be needed to improve reliability of the technique.

The genetic analysis completed by Nelson (1998) used a maximum of 4 microsatellite loci with 2 or 3 alleles at each locus (Nelson 1998). High-resolution results require ≥ 6 microsatellites and larger numbers of alleles (Parker et al. 1998). Initial efforts to increase the number of microsatellites/alleles to improve resolution were unsuccessful (Nelson 1999). Schindler (2009) used 9 microsatellite markers but still got variable error performance, which could have been due to a variety of factors.

In general, DNA analysis estimates of the number of goats present roughly corresponded to results obtained from the minimum composition method (Table 2). It may be possible to improve the DNA analysis method but at present there don't seem to be compelling reasons to investigate further. Collection of hair samples still requires field visits, and it appears that surveys produce a robust estimate without the cost of additional DNA analysis. Hair sample collection was suspended for 2009 surveys. HWP will consider resumption of DNA analysis if advancements in analysis technology warrant additional investigation.

Predator Interactions

Alberta expressed a concern that habitat alterations outside the PCCNA could alter predator-goat interactions and potentially increase predation on goats. Population monitoring will detect changes in the goat population but would not likely determine causes, including any declines that might be related to increased predation. Direct measurement of predation rates would require telemetry marking of a substantial portion of the goat population and frequent monitoring to determine cause of death for goats that die. The risks of goat mortality associated with capture and handling and the cost of this type of research outweigh possible benefits of information and the likely low risk of potential predation increases. Information on changes to predator

occurrence and use might correlate with observed changes in the goat population and provide some inference related to Alberta concern. Some information on predator species presence and a crude index of predator use of the PCCNA are available from remote camera data (Harrison 1999). HWP supplied the camera data to Alberta, who may investigate if the data are suitable for possible comparison with future camera data to detect changes in predator presence, composition, and use. Ad hoc observations of predator occurrence and goat interactions will also be recorded during ground surveys.

Most of the first pass harvesting in the compartments surrounding the PCCNA and SMA was completed by 2007. Based on subjective observations, deer populations in these areas appear to have increased substantially, but there have been no corresponding effects on goat population parameters, other than a possible increase in goat numbers. Information from the ground surveys (Table 1) indicates the population level peaked at 49 goats in 2010 and remained high through 2012. Since then there has been a decline in minimum population size and concurrent increase in dead goats found. All of the dead goats found in recent years were attributed to cougar predation. It would appear that one or more cougars have been active in the area and may be responsible for the decline in minimum population size in 2013 and 2014. However the decline may in part be related to the reduced number of surveys.

Goat Behaviour Monitoring

Disturbance from SMA activities could alter goat behaviour patterns and potentially increase habitat avoidance and stress that in turn leads to increased mortality rates and/or decreased productivity. Goats are highly sensitive to certain types of human disturbance (Cote 1996) but they readily tolerate or habituate to other human activity (Penner 1986). For example, Pinto Creek goats are quite tolerant of field surveyors on foot.

Fiera Biological Consultants (2008a) conducted behavioural monitoring in conjunction with harvest of SMA block 5-7-0492 in winter 2007-2008. This block was located approximately 500 m from cliff 1b at the north end of the PCCNA. Goats continued to use the cliff before, during, and after the SMA operations. Compared to goats not subjected to aural disturbance, goats using cliff 1b spent more time standing or bedded on escape terrain and exhibiting concerned or inquisitive response to stimuli (Fiera 2008a). Goats on cliff 1b demonstrated unconcerned or no response approximately 80% of the time they were observed (Fiera 2008a). In conclusion, goats appeared to hear the harvest noise but didn't significantly change their behaviour. They occupied the closest cliffs to the harvest activity throughout the harvest period and continued to use the cliffs after harvest ended.

Habitat Use and Movements

Pinto Creek goat habitat use and movements have been determined so far using direct observation, remote cameras and sign (tracks, hair, pellets, etc). This method probably does not fully identify all areas used by the goats. The number of goats observed during ground surveys is highly variable, and there have been surveys when no goats or fresh sign were observed. Goats 'missing' on any particular survey may have been in the area but not observed, or they may have been in some unknown location. It is possible that goats from the Pinto Creek population may come and go from the area, and goat observations from other locations on the FMA (Figure 5) could be Pinto Creek animals. Additional insight to this issue would require telemetry marking of a portion of the goat population. The risks of goat mortality associated with capture and handling and the cost of this type of research currently outweigh possible benefits of more information about habitat use and movements.

REFERENCES

Alberta. 2003. Management plan for mountain goats in Alberta. Wildlife Management Planning Series Number 7. Alberta Sustainable Resource Development, Edmonton, Alberta, Canada. Online at: <http://www.srd.gov.ab.ca/fw/hunting/pdf/managementplans/MgmtPlanMountainGoat.pdf>

Alberta. 2005. The general status of Alberta wild species 2005. Alberta Sustainable Resource Development, Edmonton, Alberta, Canada. URL downloaded on February 2, 2007: <http://www.srd.gov.ab.ca/fw/wildspecies/index.htm>

- Alberta. 2007. Mountain pine beetle action plan. Alberta Sustainable Resource Development, Edmonton, Alberta, Canada. URL downloaded on July 14, 2009: http://www.mpb.alberta.ca/Files/MPB_action_plan.pdf
- Alberta Natural Resources Service. 1996. The status of Alberta wildlife. Alberta Department of Environmental Protection, Edmonton, Alberta, Canada.
- Andison, D.W. and K. McCleary. 2002. Disturbance in riparian zones in foothills and mountain landscapes of Alberta. Alberta foothills disturbance ecology report 3, Foothills Model Forest, Hinton, Alberta, Canada.
- Applied Ecosystem Management Ltd. 1999. 1999 Pinto Creek mountain goat monitoring program. Applied Ecosystem Management Ltd., Hinton, Alberta, Canada.
- Applied Ecosystem Management Ltd. 2000. 2000 Pinto Creek mountain goat monitoring program. Applied Ecosystem Management Ltd., Hinton, Alberta, Canada.
- Applied Ecosystem Management Ltd. 2001. 2001 Pinto Creek mountain goat monitoring program. Applied Ecosystem Management Ltd., Hinton, Alberta, Canada.
- Applied Ecosystem Management Ltd. 2002. 2002 Pinto Creek mountain goat monitoring program. Applied Ecosystem Management Ltd., Hinton, Alberta, Canada.
- Bibaud, A. 1977. Pinto Creek Reservation. Unpublished report, Alberta Fish and Wildlife Division, Edmonton, Alberta, Canada.
- Bibaud, A. and W.K. Hall. 1976. Pinto Creek goat survey. Unpublished report, Project Number W-4-76, Alberta Fish and Wildlife Division Edmonton, Alberta, Canada.
- Blume, R., and L. Turney. 1999. Habitat use of mountain goats near Nadina Mountain. Ardea Biological Consulting, Terrace, British Columbia, Canada.
- Côté, S. D. 1996. Mountain goat responses to helicopter disturbance. *Wildlife Society Bulletin* 24:681-685.
- Côté S. D. and M. Festa-Bianchet. 2003. Mountain goat. Pages 1061–1075 *in* Feldhamer, G. A., B. C. Thompson, and J. A. Chapman (editors). *Wild mammals of North America: biology, management, and conservation*. John Hopkins University Press, Baltimore, Maryland, USA.
- Fiera Biological Consulting. 2003. 2003 Pinto Creek mountain goat monitoring program. Fiera Biological Consulting, Rocky Mountain House, Alberta, Canada.
- Fiera Biological Consulting. 2004. 2004 Pinto Creek mountain goat monitoring program. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Fiera Biological Consulting. 2005. 2005 Pinto Creek mountain goat monitoring program. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Fiera Biological Consulting. 2006. Pinto Creek mountain goat monitoring program 2006. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Fiera Biological Consulting. 2007. Pinto Creek mountain goat monitoring program 2007. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Fiera Biological Consulting. 2008a. Pinto Creek mountain goat behavioural monitoring: response to harvest. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Fiera Biological Consulting. 2008b. Pinto Creek mountain goat 2008 monitoring program. Fiera Biological Consulting, Edmonton, Alberta, Canada.
- Foster, B.R., and E.Y. Rabs. 1985. A study of canyon-dwelling mountain goats in relation to proposed hydroelectric development in northwestern British Columbia, Canada. *Biological Conservation* 33:209-228.

- Harrison, D.G. 1996. A review and synthesis of the literature pertaining to the Pinto Creek mountain goat herd. Unpublished report, Weldwood of Canada Ltd., Hinton, Alberta, Canada.
- Harrison, D. G. 1997. Distribution, movements, habitat use and genetic variability of Pinto Creek mountain goats (*Oreamnos americanus*). Thesis proposal, University of Northern British Columbia, Prince George, British Columbia, Canada.
- Harrison, D. G. 1999. Distribution and movements of canyon-dwelling mountain goats along Pinto Creek, Alberta. Thesis, University of Northern British Columbia, Prince George, British Columbia, Canada.
- Hebert, D. M., and I. M. Cowan. 1971. Natural salt licks as a part of the ecology of the mountain goat. *Canadian Journal of Zoology* 49:605-610.
- Hinton Wood Products. 2007. 2007 Development Plan. Hinton Wood Products, Hinton, Alberta, Canada.
- Hinton Wood Products. 2009. Pinto Creek mountain goat 2009 monitoring program. Hinton Wood Products, Hinton, Alberta, Canada.
- Hinton Wood Products. 2010. Pinto Creek mountain goat 2010 monitoring program. Hinton Wood Products, Hinton, Alberta, Canada.
- Hinton Wood Products. 2011. Pinto Creek mountain goat 2011 monitoring program. Hinton Wood Products, Hinton, Alberta, Canada.
- Hinton Wood Products. 2012. Pinto Creek mountain goat 2012 monitoring program. Hinton Wood Products, Hinton, Alberta, Canada.
- Hinton Wood Products. 2013. Pinto Creek mountain goat 2013 monitoring program. Hinton Wood Products, Hinton, Alberta, Canada.
- Hooge, J.M. and D.G. Harrison 1996. Review of the 1996 summer field season: Pinto Creek mountain goat project. Unpublished report, Weldwood of Canada Ltd., Hinton, Alberta, Canada.
- IUCN 2009. 2009 IUCN Red List of Threatened Species. Version 2009.1 URL Downloaded on 11 June 2009: www.iucnredlist.org
- Kerr, G.R. 1965. The ecology of mountain goats in west central Alberta. Thesis, University of Alberta, Edmonton, Alberta, Canada.
- Mahon, T. and L. Turney. 2002. Canyon-dwelling mountain goats along Foxy Creek: status, habitat use patterns and management recommendations. Unpublished report prepared for Small Business Forest Enterprise Program, Lakes Forest District, WildFor Consultants Ltd., Telkwa, British Columbia, Canada, and Ardea Biological Consulting, Smithers, British Columbia, Canada.
- Nelson, R. J. 1998. Pinto Creek mountain goat research project 1998 year end DNA analysis report. Seastar Biotech Ltd., Victoria, British Columbia, Canada.
- Nelson, R. J. 1999. Pinto Creek mountain goat research project 1999 year end DNA analysis report. Seastar Biotech Ltd., Victoria, British Columbia, Canada.
- Nelson, R. J. and G. Cooper. 2000. Pinto Creek mountain goat research project. 1999 Sample Year Report and Analysis of 1997, 1998 and 1999 Samples Combined. Seastar Biotech Ltd., Victoria, British Columbia, Canada.
- Niederleitner, J.F. 1994. Pinto Creek mountain goat study. Report prepared for Weldwood of Canada, Hinton Division, Hinton, Alberta, Canada.
- Parker, P. G., A. A. Snow, M. D. Schug, G. C. Booton, and P. A. Fuerst. 1998. What molecules can tell us about populations: choosing and using a molecular marker. *Ecology* 79:361–382.
- Penner, D. F. 1986. Habituation of mountain goats to auditory stimuli prior to a seismic program at Pinto Creek, Alberta. Report prepared for Fish and Wildlife Division, Alberta Energy and Natural Resources, Edmonton, Alberta, Canada.

- Penner, D. F. 1988. Monitoring of mountain goats at Pinto Creek, Alberta, in relation to an Amoco drilling program: winter 1986-87. Report prepared for AMCO Petroleum Co. Ltd., Calgary, Alberta, Canada.
- Penner, D. F. and P. Jalkotzy. 1982. Ecological studies of the Pinto Creek mountain goat population: interim report on Phase 1 research. Report prepared for Gulf Canada Resources Inc., Calgary, Alberta, Canada.
- Schindler, H. M. 2009. Microsatellite DNA analysis of hairs from a canyon-dwelling mountain goat population in Alberta. Report (draft) prepared for Hinton Wood Products, Hinton, Alberta, Canada.
- Smith, K. G. 1982. Winter studies of forest-dwelling mountain goats of Pinto Creek, Alberta. Proceedings of Biennial Symposium of the North American Wild Sheep and Goat Council. 3:374–390.
- Smith, K. G. 1984. Report on Pinto Creek mountain goat herd. Alberta Fish and Wildlife Division files, Edmonton, Alberta, Canada.
- Stelfox, J. G. and G. R. Kerr. 1962. The status of Rocky Mountain goats in the forested regions of the Wildhay River and Pinto Creek areas in Zone 14, east of the 6th meridian; and their prospects for future survival. Alberta Fish and Wildlife Division, Edmonton, Alberta, Canada.
- Stockwell, C., G. C. Bateman and J. Berger. 1991. Conflicts in National Parks: a case study of helicopters and bighorn sheep time budgets at the Grand Canyon. *Biological Conservation* 56: 317–328.
- Taggart, J. 1985. Report on Pinto Creek Mountain goat herd. Unpublished Report, Alberta Fish and Wildlife Division, Edmonton, Alberta, Canada.
- Taggart, J., R. Quinlan, and K. Smith. 1986. Report on Pinto Creek mountain goat herd. Unpublished Report, Alberta Fish and Wildlife Division, Edmonton, Alberta, Canada.
- Turney, L., R. Blume and T. Mahon. 1999. Habitat use by mountain goats near Nadina Mountain – Final Report. Unpublished report prepared for Ministry of Environment, Lands and Parks and Houston Forest Products Ltd. Smithers, British Columbia, Canada.
- Turney, L., R. Blume, and T. Mahon. 2000. Mountain goat populations and movement patterns near Nadina Mountain. Ardea Biological Consulting, Terrace, British Columbia, Canada.
- Turney, L., T. Mahon, R. Blume and J. Farkvam. 2001. Mountain goat populations, movement patterns and habitat use in forested habitats near Nadina Mountain and Foxy Creek British Columbia – 2000 summary report. Unpublished report prepared for Ministry of Environment, Lands and Parks, Canadian Forest Products Ltd. and Houston Forest Products Ltd. Ardea Biological Consulting, Smithers, British Columbia, Canada.
- Turney, L., R. Blume, J. Farkvam and T. Mahon. 2002. Mountain goat movement patterns and forested habitat use near Nadina Mountain, British Columbia - 2001 summary report. Unpublished report prepared for Houston Forest Products Ltd, Canadian Forest Products Ltd., Ministry of Water, Land and Air Protection and Ministry of Sustainable Resource Management, Smithers, British Columbia, Canada.
- Turney, L., R. Blume, A.M. Roberts and J. Murray. 2003. Non-alpine habitat use and movements by mountain goats in north-central British Columbia: Annual operational report 2002-2003. Unpublished report prepared for Forest Research Program, Forest Innovation Investment, Smithers, British Columbia, Canada.
- Turney, L and A.M. Roberts. 2004. Non-alpine habitat use and movements of mountain goats in northcentral British Columbia. Summary of 2003-2004 activities. Unpublished report prepared for Morice and Lakes Innovative Forest Practices Agreement. Smithers, British Columbia, Canada.
- Turney, L. 2003. Habitat use by mountain goats near Nadina Mountain site investigations of GPS collar locations. FIA Project 5034008, Morice and Lakes Innovative Forest Practices Agreement, Terrace, British Columbia, Canada. URL downloaded on February 8, 2007 <http://www.for.gov.bc.ca/hfd/library/FIA/2003/FIA-03-04-0136.pdf>
- Turney, L. 2004. Non-alpine habitat use and movements of mountain goats in north-central British Columbia. Summary of 2003-2004 activities. Morice and Lakes Innovative Forest Practices Agreement, Terrace, British Columbia, Canada.

Turney, L. 2005. Non-alpine habitat use and movements of mountain goats in north-central British Columbia. Summary of 2004-2005 activities. Morice and Lakes Innovative Forest Practices Agreement, Terrace, British Columbia, Canada.

Appendix 1 – Risk assessment matrix for the Pinto Creek goat population

Activity	Aspect	Impact	Probability	Severity	Risk	Strategy
SMA operations	Aural disturbance leading to disruption and/or displacement of goat movements and habitat use within the SMA	Increased goat mortality related to stress and/or predation	Improbable – known goat use of SMA is very low	Negligible – goat mortality unlikely	D	Report any goat use of SMA encountered during operations
SMA operations	Aural disturbance leading to disruption and/or displacement of goat movements and habitat use within the PCCNA	Increased goat mortality related to stress and/or predation	Remote – noise level will be low and distant and goats did not exhibit significant stress response. Operations will be periodic for short periods.	Negligible – goat mortality unlikely	D	Goat response was monitored during SMA operations with no significant impact
SMA operations	Aural disturbance leading to disruption and/or displacement of goat movements and habitat use within the PCCNA	Decreased birth rate related to stress	Improbable – noise level will be low and distant and goats quickly habituated. Operations will be periodic for short periods and outside kidding period.	Negligible – goat mortality unlikely	D	Monitor goat birth rate as part of regular population surveys. No impact observed.
Other human disturbance within the SMA (non-HWP)	Aural disturbance leading to disruption and/or displacement of goat movements and habitat use within the SMA	Increased goat mortality related to stress and/or predation	Improbable – known goat use of SMA is very low	Negligible – goat mortality unlikely	D	Alberta approval and oversight of any proposed activity
Ground surveys within the PCCNA	Disturbance and/or harassment of goats (people on foot)	Increased goat mortality and/or reduced birth rate	Probable – 3 observers conduct 2 one-day surveys/month during summer/fall	Negligible – goat mortality or decreased birth rates unlikely and not observed to date	C	Address issue in PCCNA Management Plan (Alberta Tourism, Parks, and Recreation)
Other human disturbance within the PCCNA (non-HWP)	Disturbance and/or harassment of goats (people on foot or OHV)	Increased goat mortality and/or reduced birth rate	Occasional – mainly snowmobiles in winter, trapper cabin and related activity	Negligible – goat mortality or decreased birth rates unlikely and not observed to date	D	Address issue in PCCNA Management Plan (Alberta Tourism, Parks, and Recreation)
Increased access in SMA	Increased disturbance of goats (non-Company)	Increased goat mortality and/or reduced birth rate	Occasional – any new human activity likely to be people seeking goat viewing opportunities	Negligible – goat mortality or decreased birth rates unlikely	D	SMA access management and PCCNA Management Plan (Alberta Tourism, Parks, and

Activity	Aspect	Impact	Probability	Severity	Risk	Strategy
						Recreation)
Harvest-related habitat alteration within the SMA	Temporary displacement of goat use	Increased goat mortality and/or reduced birth rate	Improbable – known goat use of SMA is very low	Negligible – goat mortality unlikely	D	Report any goat use of SMA encountered during operations
Harvest related habitat alteration in surrounding areas	Increased predator activity in PCCNA	Increased predation on goats	Remote – no evidence that predator populations would increase	Minor – goat ability to avoid predators will not change	C	Monitor goat population
MPB related habitat alteration within the SMA	Temporary displacement of goat use	Increased goat mortality and/or reduced birth rate	Improbable – known goat use of SMA is very low	Negligible – goat mortality unlikely	D	Report any goat use of SMA encountered during surveys
MPB related habitat alteration in surrounding areas	Increased predator activity in PCCNA	Increased predation on goats	Remote – no evidence that predator populations would increase	Minor – goat ability to avoid predators will not change	C	Monitor goat population
No habitat disturbance within the PCCNA	Declining habitat quality within the PCCNA	Increased goat mortality and/or reduced birth rate related to poor nutrition	Improbable – habitat appears adequate over the short term, may be a problem during severe winters or in future	Negligible	D	Address issue in PCCNA Management Plan (Alberta Tourism, Parks, and Recreation)
Level 1 (single tree) fall and burn of MPB infested trees within the PCCNA	Temporary displacement of goat use	Increased goat mortality and/or reduced birth rate	Improbable – goat encounters with fall and burn crews would likely be uncommon	Negligible – goat mortality unlikely	D	Report any goat sightings and adjust fall and burn crew activity to avoid current use areas
MPB related mortality of pine within the PCCNA	Deadfall blocking trails and foraging areas	Physical blockage of goat movements leading to habitat displacement	Frequent – MPB attack is considered likely within next decade. Goats would encounter deadfall continually after dead trees begin to fall	Minor – many goat trails are in dense pine stands and deadfall could be severe. Goats are likely to find alternate routes to access preferred habitat.	A	Impact could be mitigated by clearing deadfall from trails and foraging/resting areas
MPB related mortality of pine within the PCCNA	Deadfall blocking trails and foraging areas	Disrupt goat access to escape terrain leading to increased predation	Probable – Goats would likely encounter predators on a weekly to monthly basis.	Minor – deadfall would presumably also hinder predator movements	B	Impact could be mitigated by clearing deadfall from trails and foraging/resting areas
Low elevation aerial over flights	Severe panic reaction by goats	Physical accident leading to death	Remote – over flights rare and goat accidents are improbable	Negligible – goat mortality unlikely	D	HWP over flight policy, Alberta oversight of

Activity	Aspect	Impact	Probability	Severity	Risk	Strategy
						proposed activity by others

Activity – an activity that may result in a negative effect on goat conservation.

Aspect – the presumed result of the activity.

Impact – the negative goat conservation effect.

Probability – the frequency that the impact may occur. Nil: Activity not currently undertaken; Improbable: Likely to never happen; Remote: Less than once a year; Occasional: Monthly to yearly; Probable: Weekly to monthly; Frequent: Daily to weekly.

Severity – the level of severity that the impact could cause. Each of 5 severity aspects is rated on a scale of 1 – 3, with 1 = low, 2 = medium, and 3 = high. Aspects are: size of the impact, duration of the impact, cost of changing the impact, likelihood of recovery after the impact occurs, and length of time for recovery to occur. Each aspect is scored, and the total Severity score is Negligible 0 – 6; Minor 7 – 9; Major 10 – 12, and Catastrophic 13 – 15.

Risk – a combination of Probability and Severity according to the Risk table:

Risk evaluation table

Probability of impact	Severity of impact			
	Catastrophic	Major	Minor	Negligible
Frequent	A	A	A	C
Probable	A	A	B	C
Occasional	A	A	B	D
Remote	A	B	C	D
Improbable	B	C	C	D

Appendix 2 – HWP Commitment History and Status for Pinto Creek Mountain Goats

Appendix 2 describes commitments and their status from previous versions of the HVS.

1999 FMP Commitments

HWP made 5 commitments in Version 1 of this document, which were incorporated the 1999 FMP. The commitments, status, and future activities are described below.

Commitment 1 *“The canyon cliff system and adjacent areas used by the Pinto Creek mountain goat herd was identified as a Reserve Area (protected).”*

Status – Complete. The Pinto Creek Canyon Natural Area was designated as a protected area and removed from the FMA in December 2000.

Future Activity. Monitor goat use and population status and propose adjustments to the PCCNA if warranted.

Commitment 2 *“A 1-km Special Management Area was identified surrounding the Reserve Area and the SMA harvest schedule was extended to mitigate harvest impacts on the Pinto Creek goats.”*

Status – Complete. The Special Management Area has not changed since 1999. The SMA harvest schedule was extended. A maximum of 10% SMA harvest in the SMA was proposed in the 1998-2008 period. The first SMA harvest was completed in winter 2007-2008.

Future Activity. Monitor goat use and population status and propose adjustments to the SMA boundary if warranted. Adjust the SMA harvest schedule to respond to MPB threat and occurrence.

Commitment 3 *“HWP will design harvesting within the SMA during the first decade of FMP implementation as a deliberate experiment and monitor goat/habitat response in cooperation with Alberta.”*

Status – Complete. Goat monitoring has occurred every year and is ongoing. The first SMA harvest was completed in winter 2007-2008.

Future Activity. Monitor goat use and population status, and MPB threat/occurrence, and propose adjustments to the SMA harvest schedule if warranted.

Commitment 4 *“Experimental harvesting will be designed and closely monitored to minimize risks to the Pinto Creek mountain goat herd, in recognition of the unique status of the herd.”*

Status – Complete. Goat monitoring has occurred every year and is ongoing. The first SMA harvest was completed in winter 2007-2008. Remaining SMA harvest for MPB susceptibility reduction was commenced in 2009-2010 and completed in 2011-2012.

Future Activity. Monitor goat use and population status during and after future SMA harvest.

Commitment 5 *“Monitoring information will be used to revise the HCS on a continual basis.”*

Status – Complete. Goat monitoring has occurred every year and is ongoing. The first SMA harvest was completed in winter 2007-2008. This document is the 5th revision of the original HCS.

Future Activity. Update and revise this document at least every 2 years.

SMA Management Strategy

Commitment 1 *“Harvesting within the first decade of the new FMP will be limited to a maximum of 10% of the merchantable volume in the SMA.”*

Status – Complete. SMA harvesting commenced in 2007-2008 and was completed in 2011-2012. The total SMA harvest was 8.8% of the SMA area. Due to a change in the FMA utilization standard the proportion of the merchantable volume is unknown but likely is not significantly different from the proportion of area.

Future Activity. HWP is not proposing to harvest additional area of the SMA in the first decade of the 2014 FMP SHS.

Commitment 2 *“The remaining 90% of volume within the SMA was scheduled in the 1999 FMP in thirds for decades 2, 3, and 4.”*

Status – Incomplete, commitment changed. Decade 2 of the 1999 FMP commenced on June 15, 2008.

Future Activity. This commitment has been cancelled. HWP is not proposing to harvest additional area of the SMA in the first decade of the 2014 FMP SHS. HWP will monitor the MPB situation to see if further SMA harvesting is warranted.

Commitment 3 *“Special goat conservation measures will be prepared for the SMA as part of the COP for Berland 7, 11, and 18.”*

Status – Complete. The Berland 7 and Berland 11 FHP contained special goat conservation measures.

Future Activity. Future harvest plans in the SMA are on hold while HWP harvests susceptible pine elsewhere on the FMA.

Commitment 4 *“Goat response will be monitored and evaluated and adjustments will be made to the FMP harvest schedule and/or AOP and/or COP (FHP) as appropriate.”*

Status – Complete. Goat behaviour response to SMA harvesting in 2007-2008 was monitored. Goat population response was monitored from 2008-2014.

Future Activity. Adjustments to the SMA harvest design and schedule may be proposed to address MPB threat.

Commitment 5 *“Initial operations will proceed on the periphery of the SMA in Berland 7, and goat response will be monitored and evaluated before additional harvesting occurs.”*

Status – Complete. First pass harvesting in surrounding compartments was completed in 2007.

Future Activity. None.

Commitment 6 *“There will be no SMA operations from May 1–July 31 to reduce disturbance to goats during the kidding period and minimize stress to newborn kids during the first 3 months of life.”*

Status – Complete. SMA harvesting occurred in winter and late summer only.

Future Activity. This commitment remains in effect.

Commitment 7 *“Operations will be focused spatially and temporally within the SMA in any operating period to reduce overall disturbance.”*

Status – Complete. SMA harvesting occurred in winter and late summer only and was clustered into several large blocks.

Future Activity. This commitment remains in effect.

Commitment 8 *“Goat response will be monitored and the HCS will be adjusted as appropriate.”*

Status – Complete. Goat response to 2007-2008 SMA harvesting was monitored. Annual population surveys were continue for 2 years following completion of SMA harvesting.

Future Activity. This commitment remains in effect. However HWP will only monitor in years where future SMA harvest is proposed.

Commitment 9 *“Harvesting within the SMA will be deferred until first-pass cuts have been substantially completed in surrounding compartments (Berland 7, 11, and 18).”*

Status – Complete. First pass cuts were completed in surrounding compartments in 2007.

Future Activity. None.

Access Management Strategy

Commitment 1 *“Development of new road access in the SMA will be limited by using combinations of existing trails, temporary roads, lower-class permanent roads, forwarding, and other measures.”*

Status – Complete. Temporary roads were used to harvest block 5-7-0492. These roads have been reclaimed.

Future Activity. This commitment remains in effect.

Commitment 2 *“Access routes within the SMA will be physically blocked when they are not being actively used for operations.”*

Status – Complete There are 1.7 km of reclaimed/deactivated roads in the SMA from previous harvest in Berland 11 and 18. Roads accessing block 5-7-0492 were reclaimed. The 5-7-305 road was deactivated.

Future Activity. This commitment remains in effect.

Commitment 3 *“HWP and Alberta will implement a joint program to monitor the effectiveness of the SMA access management strategy.”*

Status – Incomplete There are currently no active roads in the SMA.

Future Activity. This commitment remains in effect.

Commitment 4 *“Depending on the success of elements 1–3, HWP may request a Forest Land Use Zone (FLUZ) that covers the SMA and restricts human access for the purposes of goat conservation.”*

Status – Incomplete There are currently no active roads in the SMA, and at this time there doesn’t seem to be any need to consider a FLUZ.

Future Activity. This commitment remains in effect.

Commitment 5 *“HWP will participate in Alberta Tourism, Parks, and Recreation management planning for the PCCNA. HWP supports development of one or more trails and observation points to allow public goat viewing in a manner that does not disturb goats. HWP supports an aircraft “No Fly Zone” over the PCCNA to eliminate aircraft disturbance of goats. HWP would also be interested in the possibility of using special timber harvest to improve goat habitat within the PCCNA.”*

Status – Incomplete The Alberta TPR management planning process has not started.

Future Activity. This commitment remains in effect.

Appendix 3 – Conservation History for Pinto Creek Mountain Goats

Reserve Area

- 1976** A Reserve Area of approximately 600 ha was removed from the contributing landbase for the 1976 Forest Management Plan. The Reserve Area was shown on a 1:250,000 scale map but there was no file documentation.
- 1988** The FMA was expanded in size. The Pinto Creek Reserve Area was discussed as part of the expansion negotiations but the discussions were not documented. Apparently there were no changes to the 1976 Reserve Area.
- 1991** The 1976 Reserve Area encompassing the canyon area was removed from the contributing landbase that supported the Annual Allowable Cut in the 1991 Forest Management Plan.
- 1994** The Reserve Area was revised to 371.8 ha.
- 1998** The Reserve Area was revised to 780 ha as part of the 1999 Forest Management Plan.
- 2000** The Reserve Area became the Pinto Creek Canyon Natural Area and 1,214 ha were removed from the FMA.
- 2001** NAA-01003 Pinto Creek Canyon Natural Area was established on June 11.

Protective Notation

- 1977** Alberta placed Protective Notation 77539400 634.021 ha on the area on March 14 – the PNT ensured that Alberta Fish and Wildlife would be consulted if any developments were proposed.
- 1984** PNT 77539400 was amended to include 3,367 ha.
- 1991** PNT 77539400 was updated.
- 1996** September 16 Alberta placed CNT 960084 on Special Places 2000 candidate site 120 Pinto Creek Goat Cliffs.
- 1997** PNT 77539400 was renewed.
- 2001** CNT 960084 was cancelled on January 31 after the Pinto Creek Canyon Natural Area was created in December 2000.
- 2007** PNT 77539400 expired on March 31.

Special Management Area

- 1991** HWP initiated a Compartment Operating Plan for Compartment Berland 11 east of the Reserve Area.
- 1994** A Special Management Area (SMA) approximately 1 km wide was established around the Reserve Area. Forest operations in the SMA were deferred until after first pass cuts were completed in Berland 11.
- 2000** The SMA boundary on the west and north side of Pinto Creek in Compartment Berland 7 was flagged in the field and surveyed with GPS.

Monitoring and Research

- 1994** HWP initiated field reconnaissance work (Neiderleitner 1994).
- 1995** An MSc research program was initiated (Harrison 1999).
- 1996** Annual population estimates using the minimum total count method were initiated.
- 1997** A hair collection program for DNA analysis was initiated (Nelson 1998, 1999).
- 1998** The Harrison MSc research field program was completed (Harrison 1999).
- 1999** HWP initiated the annual ground survey program, which has continued every year since.
- 2008** Goat behaviour monitoring was completed for SMA harvest in block 5-7-0492 (Fiera 2008a).
- 2009** Schindler (2009) completed DNA analysis of 2005-2008 hair samples.
- 2010** Annual population monitoring continued.
- 2011** Annual population monitoring continued.
- 2012** Annual population monitoring continued.
- 2013** Annual population monitoring continued.
- 2014** Annual population monitoring continued.

Appendix 4 – Mountain goat sightings on the Hinton Wood Products Forest Management Area

Date	Observer	Description
1969	Joe Gienger	5 goats headed west crossing Highway 40 north of Fred Creek.
	Joe Passamare	Single goat observed on cliff downstream right bank at Barbara Creek Polecat Road Bridge.
	Peter Krog Rick Bonar	Adult M observed along Canyon Creek cliff complex below Emerson Creek Road.
		Adult observed on shore of Gregg Lake.
1992	Tom Mulvihill	Goat hair and dropping along Oldman Creek below Willow Road.
	Peter Andrews	2 adults observed on cliffs NE of Gregg Lake in Athabasca 15.
	Chris Spytz	Adult observed on cliff beside Highway 40 at S end of Athabasca Bridge.
	Rick Bonar	Goat hair, tracks, droppings observed along cliffs/bluffs of un-named creek south of 5-9-300 road in Berland 9.
199?	Gordon Stenhouse	2 goats along Wildhay River 20 km south of Pinto Creek Canyon.
	Chris Spytz	Wildhay River (Chris has details)
	Chris Spytz	Berland River (Chris has details)
Fall-winter 2005	Roger Hayward Rick Bonar Oil/gas workers	Adult M observed on S side Athabasca River downstream from and opposite Oldman Creek. Observed several times at Peyto wellsite, bedded on wellsite or on buildings. One report of a billy observed on buildings and fresh wolf tracks in snow all around.
2006	Brian Kirstein	2 goats observed on a pipeline ROW in Berland 26 (Chris has details)
2007	Jim LeLacheur	Two unclassified (“Appeared to be younger animals – both about the same size”) goats foraging beside Hightower Road in Berland 7. Mature forest bordering the road ROW.
2008	Oil/gas workers	A single goat was observed by several people in October near the mouth of Beaver Creek and the Berland River in Berland 27.
2008	Mark Schoenberger	A single adult goat observed on November 23 at km 76 on the Willow Road, junction Z road – went east toward Wildhay River about 1 km away.
2008-2014		No reported FMA sightings.

Appendix 5 – Document history

Version 1a	June 1998	April 28, 1998 Draft approved by HWP and Alberta
Version 1b	September 28, 1998	Revised Draft
Version 1	May 26, 1999	Approved as part of the 1999 Forest Management Plan
Version 2a	January 17, 2001	Revised for review
Version 2	December 6, 2002	Revised to address Alberta May 30, 2001 letter
Version 3	March 9, 2004	Revised for review
Version 4	September 20, 2007	Revised for review
Version 5a	July 14, 2009	Revised for review
Version 5	October 21, 2009	Revised and approved.
Version 6	October 28, 2014	Revised for approval as part of 2014 FMP.