## 2.4 Fire Disturbance

Fire is the dominant natural disturbance throughout most forested areas in Alberta. Thus, forest and land managers over the past decade have attempted to incorporate knowledge on both fire regimes and the impact of fires on ecosystems into sustainable forest management activities. As re-establishing a natural fire regime is not desirable in all locations, harvesting and prescribed burning are the primary management tools used to emulate the landscape patterns produced by a natural disturbance regime. Application of these tools on the landscape requires information on historical fire regimes, altered fire regimes resulting from fire suppression, as well as the potential threat of fire to human values.

## 2.4.1 Fire Regime

The pattern of fire activity, or fire regime, of a given area can be characterized by the following attributes: frequency, cycle, and return interval, size, season, type, intensity, and severity (see Glossary for definitions). Components of a fire regime analysis vary from one study to the next and may also include measures of burn probability and landscape patterns resulting from spatial variation in fire behaviour, vegetation types, etc. Variation is an intrinsic component of any ecosystem process, including disturbance patterns. To account for this variation, managers and scientists alike are recognizing that fire regimes and associated descriptors should be estimated as a range of natural variability rather than a single static target (Tymstra et al. 2005).

Since factors used to delineate natural subregions (e.g., topography, climate) also influence spatial and temporal parameters of fires, natural subregion boundaries are often used when describing fire regimes. A detailed fire regime analysis has not been completed at the natural subregion level for the majority of the R11 FMU. Rogeau (1999) studied historical fire regimes between 1470 and 1998 for the area west of the Cline River as well as White Goat and Siffleur Wilderness Areas, while Tymstra et al. (2005) analyzed natural subregion fire regimes primarily between 1961 and 2002 at the provincial level. This latter study period coincided with fire suppression activities and thus the fire regimes identified within Tymstra et al. (2005) should be considered as altered from the natural condition. The following discussion will summarize relevant fire regime components for R11, drawing heavily on these studies. Note that the Alpine Natural Subregion experiences very few fires due to the terrain and lack of fuel and thus is not included in this fire regime analysis.

### 2.4.1.1 Fire Frequency

A total of 461 fires have occurred in the R11 FMU since 1967, burning 12,252 ha of land (Table 7). Approximately 40% of the total number of fires occurred during the last decade (1997-2006), while the lowest number of fires occurred over the previous ten years between 1987 and 1996. Of the total area burned, approximately 86% can also be attributed to the last ten years. When examined on a per unit area basis, the Montane Natural Subregion experiences the highest fire occurrence of any Natural Subregion found within R11 (i.e., an annual average of 82 fires per million hectares, Table 8).

Decade	# of Fires	% of Fires	Area Burned (ha)	% of Total
				Area Burned
1967-1977	80	17.35	374	3.05
1977-1986	134	29.07	286	2.33
1987-1996	62	13.45	1021	8.33
1997-2006	185	40.13	10571	86.28
Total	461	100	12,252	100

Table 7. Fire frequency within the R11 FMU between 1967 and 2006.

Table 8. Basic wildfire statistics for natural subregions found within the R11 FMU as adapted from Tymstra et al. (2005). Note that these statistics are based on the fire regime after the onset of fire suppression activities and are for natural subregions at the provincial level.

Descriptor	Subalpine	Montane	Upper	Lower
			Foothills	Foothills
Avg wildfires/year	23	26	77	176
Avg area burned/year	382 ha	68 ha	4,378 ha	13,516 ha
Avg Class E	0	0	1	2
wildfires/year				
% by cause	41.9% human	84.1% human	36.5% human	53.2% human
	56.7%	13.0%	62.3%	44.3%
	lightning	lightning	lightning	lightning
	1.3% unknown	3.0% unknown	1.2% unknown	2.5% unknown
Peak fire season	May to	March to	May to August	April to
	September	October		August
Avg wildfires/10 <sup>6</sup>	13.5	82.0	28.2	27.5
ha/year				
Avg wildfire size	16 ha	3 ha	57 ha	77 ha
Annual area burn rate	0.02%	0.02%	0.16%	0.21%
Current fire cycle	4,542 years	4,736 years	627 years	475 years
Historical fire cycle*	100-300+	100-199 years	N/A	N/A
	years (varies	(varies with		
	with	topography)		
	topography)			
Current fire regime	Infrequent	Frequent small	Mostly	Frequent med-
	small wildfires	human-caused	lightning-	sized
	owing to fuel	wildfires, often	caused	wildfires;
	and landscape	in spring;	frequent med-	lightning-
	discontinuity;	wildfires small	sized and	caused fires
	very	in size owing	infrequent	dominate in
	infrequent	to low fire	large wildfires	summer but
	large, high-	load and	with majority	spread is
	intensity	effective	of area burned	restricted by

wildfires; lightning accounts for most area burned	suppression in pine fuel types; rare large, high- intensity	in summer, especially June	fuel discontinuities and relatively moist summer conditions
	wildfires are		
	wind-driven		
	tall events		

\* taken from Rogeau (1999) based on fire history stand origins dating between 1470 and 1998

## 2.4.1.2 Fire Size

Most fires occurring within the R11 FMU are small in size: 95% are less than 4 ha (Table 9, Figure 5). On average those occurring within the Montane and Subalpine Natural Subregions are smaller than those occurring within the Upper and Lower Foothills Natural Subregions (Table 8). Yet, infrequent large fires burn vastly more area. Class E fires greater than 200 ha in size account for only 1.1% of the total number of fires since 1967 but are responsible for 93.4% of the total area burned (Table 10, Figure 5). This trend is mirrored at the provincial level where 2% of fires were greater than 200 ha in size but they accounted for 98% of the total area burned between 1961 and 2002 (Tymstra et al. 2005).

Decade	Class A (0.01-0.1 ha)	Class B (0.11-4.0 ha)	Class C (4.1-40.0 ha)	Class D (40.1-200.0 ha)	Class E (200.1+ ha)
1967-1977	59	16	2	3	0
1977-1986	99	32	2	0	1
1987-1996	12	44	4	0	2
1997-2006	142	34	5	2	2
Total	312	126	13	5	5

Table 9. Fire frequency by size class within the R11 FMU between 1967 and 2006.

Table 10. Hectares burned by size class within the R11 FMU between 1967 and 2006.

Decade	Class A*	Class B	Class C	Class D	Class E
	( <b>0.01-0.1 ha</b> )	( <b>0.11-4.0 ha</b> )	(4.1-40.0 ha)	(40.1-200.0 ha)	(200.1+ ha)
1967-1977		26.0	12.0	336.0	0.0
1977-1986		17.0	19.0	0.0	250.2
1987-1996	0.1	16.6	79.5	0.0	924.9
1997-2006	1.8	15.7	41.4	236.0	10,276.0
Total	1.9	75.3	151.9	572.0	11,451.1

\* between 1967 and 1986, the area burned for Class A fires was not recorded for fires <0.1 ha



Figure 5. Percentage of the total number of fires and area burned (ha) for each fire size class within the R11 FMU between 1967 and 2006.

Extreme climatic conditions (i.e., extended periods of drought followed by hot and dry weather that render most forest types susceptible to fire) are usually responsible for producing large fires and years with increased numbers of fires. For example, the Dogrib Creek fire in September 2001 occurred after a relatively dry summer and burned most of its 10,000 ha on a single afternoon where wind gusts reached 75 km/hr. This individual fire is the primary driver behind total area burned in R11, but other notable Class E fires in recent years include the 2001 Two O'Clock Creek fire, the 1998 Thompson Creek/North Saskatchewan River fire, and the 1994 Lost Guide Creek and Red Rock fires (Map 15). A 2700 ha fire also occurred in 1974 along the Siffleur and Escarpment Rivers in the Siffleur Wilderness Area. Though rare, these large fires are very important in determining landscape patterns (Andison 2003a).



Map 15. Historic wildfires greater than 200 ha in size within the R11 FMU.

## 2.4.1.3 Fire Cause

Humans represent an important and often dominant ignition source for fires in the R11 area (Figure 6, Map 16). Rogeau (1999) found that 17% of fires since 1961 in the upper North Saskatchewan River valley and adjacent Wilderness Areas were lightning-caused while 82% were human-caused, primarily by recreational users. She suggested that pre-European settlement, human-caused fires, whether accidental or intentional, were important in evolution and maintenance of stand age patterns in North Saskatchewan River valley. Tymstra et al. (2005) reported similar findings for the Montane Natural Subregion, though lightning-caused wildfires were more prevalent in the Subalpine and Upper Foothills Natural Subregion (Table 8). Overall, the majority of the R11 FMU falls under a lightning shadow with a higher density of lightning strikes in Subalpine and Upper Foothills habitats along the eastern boundary of the FMU (Map 17).



Figure 6. General cause of wildfires within the R11 FMU between 1961 and 2001.



Map 16. Wildfire occurrence within the R11 FMU between 1993 and 2004.



Map 17. Lightning strike density within and adjacent to the R11 FMU from 2001 to 2005.

## 2.4.1.4 Fire Season

The peak fire season within R11 runs from May to August: July and August are the most fire-prone months, owing in part to the late-lingering snow in the mountains (Rogeau 1999). Spring fires in all natural subregions tend to be human-caused and burn less area than lightning-caused fires that occur between June and August (Tymstra et al. 2005). The exception is the Montane Natural Subregion where human-caused fires are most prevalent throughout the fire season and could, in fact, occur during any month of the year.

## 2.4.1.5 Topographic Influences

In no other region of Alberta does topography have a stronger influence on fire regime than in the mountains. Fuel and landscape discontinuities coupled with moisture regimes serve to limit the spread of many wildfires. Rogeau (1999) found that stand age patterns in montane and subalpine ecosystems can largely be explained by elevation, aspect, valley orientation to prevailing winds, and proximity to Continental Divide. Specifically, mean stand ages are increasingly older at higher elevations, in small valleys perpendicular to the main valleys, on north and northwest facing slopes, and generally closer to the Continental Divide (likely related to patterns of precipitation and lightning ignition). This further supports the analysis of fire regimes based on natural subregion boundaries rather than an analysis based solely on the Forest Management Unit boundary.

## 2.4.2 Wildfire Threat Assessment

A wildfire threat assessment provides a spatial analysis of key factors contributing to or driving the wildfire threat on a given landscape. Managers can use the results to assess the potential impact of fires on various resources contained within the landbase and explore options to reduce the probability of large, intense wildfires (e.g., through FireSmart planning). When used iteratively, a wildfire threat assessment can illustrate how various management scenarios will influence threat factors both spatially and temporally. The four main components in such an assessment – Fire Behaviour Potential, Fire Occurrence Risk, Values At Risk, and Suppression Capability – are assessed and mapped individually and then combined to provide an overall threat rating. As discussed below, the wildfire threat assessment for the R11 FMU identifies specific areas of high threat that appears to be driven by fire behaviour potential and values at risk.



Map 18. Fire behaviour potential ratings within R11 during the spring.



Map 19. Fire behaviour potential ratings within R11 during the summer.



Map 20. Fire behaviour potential ratings within R11 during the fall.

## 2.4.2.1 Fire Behaviour Potential

Fire behaviour potential is the manner in which fuel ignites, flame develops, and fire spreads and exhibits other related phenomena. Fuels, topography, fire weather and climate, barriers to fire spread, and fire growth potential contribute to the fire behaviour potential of a given location. Although the R11 FMU contains areas of high fire behaviour potential during all seasons of the year, the highest ratings occur during the summer (Map 18 to Map 20). Significant areas in the Blackstone/Wapiabi FLUZ, around Nordegg, between the North Ram and Ram Rivers, and south of the Clearwater and Red Deer Rivers retain high fire behaviour potential ratings throughout the spring, summer, and fall, while Kootenay Plains and adjacent river valleys have seasonally high ratings in the summer. Spruce fuel types are the main driver for the high ratings, although weather also drives the seasonal variations. Fire behaviour potential is generally lower in spring because snow cover lingers longer than in areas further east of R11. Similarly, early snows can decrease the fall fire behaviour potential.

## 2.4.2.2 Fire Occurrence Risk

Fire occurrence risk is the relative probability or chance of fire starting as determined by the presence of causative agents (i.e., potential number of ignitions). An assessment of fire probability incorporates factors such as weather and fuel moisture, soil types and moisture, green-up stages, climate projections, and potential ignition sources. Human-caused fires are generally more common within the FMU, with a concentration along high-use travel and recreation corridors (i.e., North Saskatchewan River and Highway 11, Ram, Clearwater, and Red Deer Rivers; Map 16), while lightning-caused fires become more common in the Upper and Lower Foothills Natural Subregions east of the FMU as the density of lightning strikes increases (Map 17). The fire occurrence risk in R11 is highest in the spring and summer seasons, and the highest risks occur along the North Saskatchewan River valley (Map 21 to Map 23). The combined effect of weather, moisture regimes, and ignitions by recreational users drive this pattern.

## 2.4.2.3 Values At Risk

Values at risk are largely man-made improvements and developments that have measurable or intrinsic worth, and which could potentially be impacted by fire. Human life and communities receive the highest priority with regards to provincial fire suppression efforts, followed by the values encompassed by watersheds/soils, natural resources, and infrastructure. The western portion of R11, the area along Highway 11 and around both Nordegg and the Big Horn Reserve, and portions of the south-eastern boundary have the highest rankings for values at risk (Map 24). The Clearwater, Cline, and Siffleur River watersheds receive high rankings as a result of watersheds and sensitive soils. Most of the remaining high rankings are attributable to infrastructure development including residential development, commercial accommodations, industrial sites, and campgrounds.



Map 21. Fire occurrence risk ratings in R11 during the spring.



Map 22. Fire occurrence risk ratings in R11 during the summer.



Map 23. Fire occurrence risk ratings in R11 during the fall.



Map 24. Values at risk ratings within R11.

## 2.4.2.4 Suppression Capability

Suppression capability includes the factors and limitations that are related to the ability to contain a wildfire upon detection in order to protect values at risk. Landscape elements that can influence suppression capability include steepness of terrain/slope, water availability, existing barriers to fire spread such as deciduous stands and linear disturbances, and ecological factors such as riparian habitats and insect- or disease-affected stands. Human limitations are also capable of affecting suppression elements. Examples of these constraints include but are not limited to detection capability, initial attack response times and success, available access, and proximity to fire bases. Suppression capability throughout much of R11, aside from areas adjacent to the eastern section of Highway 11, ranks as relatively poor (Map 25). This is due in large part to human limitations given the relative remoteness of the area.

## 2.4.2.5 Overall Wildfire Threat

The highest wildfire threat rankings in R11 occur during the summer, although pockets of high threat are also present during the spring and fall seasons (Map 26 to Map 28). The upper North Saskatchewan River valley from the western end of Abraham Lake to the Banff National Park boundary has a high overall wildfire threat rating as does much of the Cline and Siffleur Rivers drainage basins and areas immediately south of the Clearwater and Red Deer Rivers. The area around Nordegg experiences high threat during the summer and fall season, but it is somewhat lower in the spring. Fire behaviour potential and values at risk heavily influence these observed patterns.



Map 25. Suppression capability within R11.



Map 26. Overall wildfire threat rating in R11 during the spring.



Map 27. Overall wildfire threat rating in R11 during the summer.



Map 28. Overall wildfire threat rating in R11 during the fall.

# 2.5 Forest Health

## 2.5.1 Insects and Diseases

All forests have endemic insects and diseases that limit tree growth, cause abnormal growth, weaken, and even kill trees. These forest disturbance factors can play an important role in forest renewal by removing less vigorous trees and creating openings in the canopy. Thus, while a given forest health agent may cause considerable damage at a local level or over a long time period, concern is generally only raised when populations reach epidemic levels. Some non-native forest health agents occurring in an area outside of their natural distribution can be particularly troublesome as they have few natural controls in the new area. Major insect pests of mature forests in Alberta include defoliators (e.g., spruce budworm, forest tent caterpillar) and bark beetles (e.g., mountain pine beetle); the most important diseases are root

and trunk rot (Table 11). Forest health programs run annually by ASRD focus on detection, survey and monitoring, risk and impact assessment, and implementation of management programs in forest stands. Annual aerial surveys are typically conducted from late June to early September to assess location, area disturbed, severity, possible causal agent, and host tree species for insect and disease disturbances. Any significant disturbances are mapped, and if deemed necessary, management actions are initiated.



**Dwarf mistletoe** 

Agent	Target Species	Target Species Age	Damage Caused	Historical Occurrence	Management Implications
Spruce Beetle	All spruce	80+	Mortality of entire tree in one year	Low	Although somewhat similar to mountain pine beetle, this insect prefers stressed/dying trees to healthy trees. Healthy trees can be attacked and killed once populations build.
Spruce Budworm	All fir Tamarack All spruce	All ages	Growth loss, top kill, and mortality caused by defoliation	Low	Historically, these insects are not much of a problem. The species normally found in the R11 FMU takes two years to develop; therefore, the trees always have one year to recover from defoliation. If the population of budworm increases significantly, some spruce stands may lose volume.
Aspen	Aspen,	All ages	Growth loss,	High	These insects are common in

Table 11. Native forest health agents in the R11 FMU.

Defoliaters: - forest tent caterpillar - Bruce spanworm - Large aspen tortrix	Birch, other deciduous trees		top kill, and mortality caused by defoliation		the R11 FMU, defoliating deciduous trees to varying degrees in June. The trees normally recover and reflush leaves later in the summer. Some mortality of trees can occur if populations persist in one area over several years.
Weevils	All pine All spruce Tamarack All fir	All ages attacked, damage occurs on trees <10 years	Mortality in young trees by girdling, growth loss in older trees	High	These insects can kill several seedlings and young trees. The weevils prefer wet ground and heavy duff and are often associated with Armillaria root disease. There are few management options available.
Armillaria Root Disease	All deciduous and conifer	All ages	Growth loss and mortality caused by tree girdling and root rot. Infected trees susceptible to wind throw.	High	This fungus can kill over 500 species of tree and woody plants and is found throughout the R11 FMU. It spreads by root-to-root contact and rhizomorphs, and can severely impact the productivity of a site, reduce/kill entire plantations, and cause significant blowdown in mature stands. Management options are experimental; however, removing the stumps from a site may be the only economical option.
Dwarf Mistletoe	All pine	All ages	Growth loss, top kill, and mortality.	Moderate	This parasitic plant infects pine trees and is found in several locations in the R11 FMU. The parasite spreads from mature overstorey trees to young trees. Management options include harvesting entire infested stands, planting spruce buffers in cutblocks that are surrounded by mistletoe-infected stands, and culling young infected pine.
Tomentosis root disease	All conifer	Mature trees	Growth loss and mortality caused by root and butt rot Infected trees susceptible to wind throw.	Moderate	This fungus is most prevalent in the west side of the R11 FMU. It causes butt rot that can reduce the value of timber and predispose trees to wind throw.

The mountain pine beetle is a native insect pest in temperate, lodgepole pine forests of western North America: the eastern edge of the beetle distribution lies along the southern Rockies near the Alberta-British Columbia border. Accordingly, lodgepole pine forests in

Alberta have evolved largely in the absence of mountain pine beetles. However, altered fire regimes which have left more mature and old-growth forests on the landscape, coupled with a changing climate which has increased over-winter survival of larvae, have given rise to mountain pine beetle infestations in areas considered outside their historical distribution (e.g., Willmore Wilderness Park). British Columbia is dealing with a major mountain pine beetle outbreak, and the beetle continues to spread eastward into Alberta. The North Saskatchewan River valley represents the last major east/west corridor through the mountains where the beetles have not been detected in significant numbers (i.e., the only confirmed beetle observations within the R11 FMU come from pheromone-baited traps). The Forestry Division of ASRD has undertaken an aggressive control program to cut and burn individual infested trees; however, mature pine stands along the eastern slopes in R11 remain vulnerable to mountain pine beetle attack. Areas adjacent to Banff National Park and Kootenay Plains, along the lower half of the Cline River valley, along the Clearwater River valley south of Peppers Lake, along the Red Deer River valley between Banff National Park and Ya Ha Tinda, and along the southeastern boundary of the FMU near Limestone Creek currently have the highest risk (Map 29).

## 2.5.2 Non-native, Invasive Plants

Non-native, invasive plants species, often referred to as weeds, are species that have been introduced into an area beyond their natural range of occurrence where they have few natural enemies and where uncontrolled spreading can create severe damage by altering the forest habitat and displacing native species. Several non-native, invasive plants have been identified within or immediately adjacent to R11 including oxeye daisy, scentless chamomile, tall buttercup, wild caraway, and white cockle (Map 30). Weed sites are typically treated by either hand-picking or herbicide application.



Tall buttercup

## 2.5.3 Wind and Other Disturbances

Additional forest disturbance within R11 can also result from other environmental factors including avalanches, flooding, drought, and wind and ice storms. Forest damage caused by these factors can be relatively localized, as in the case of avalanches, or more widespread, as in the case of riparian habitat loss caused by the 2005 Father's Day flooding throughout much of the Bighorn Backcountry. Chinook conditions are less frequent in the R11 FMU than areas further south in the province; however, strong, unpredictable winds do still occur. The incidence of damage associated with wind events is affected by biotic conditions such as stand composition, canopy structure, stand age, and stand vigor, as well as by abiotic conditions including wind severity and direction, exposure, landscape position, topography, and soil properties. For example, wind events under saturated soil conditions will result in more blowdown of shallow-rooted species such as white spruce, black spruce, and birch.



Map 29. Mountain pine beetle hazard in R11. A Stand Susceptibility Index of 0 indicates the lowest hazard while an index of 14 indicates the highest hazard.



Map 30. Known weed sites in the R11 FMU as of 2006.

# 2.6 Land and Resource Use

## 2.6.1 Infrastructure

Compared to many other regions in Alberta, the R11 FMU is relatively pristine wilderness with a small human footprint. Nonetheless, human use of the landscape has led to infrastructure development. Aside from the establishment of the Nordegg townsite in the early 1900s and the current growth in the nearby residential subdivision, the development of the David Thompson Highway (Hwy 11) between 1958 and 1975 as well as the Forestry Trunk Road (Hwy 734) represent the most visible human infrastructure in R11. Construction of the Bighorn Dam in 1972 also impacted a significant area when over 32,000 ha of valley habitat was flooded creating Lake Abraham. Facilities, access roads, and wellsites associated with limited resource extraction activities, primarily in the eastern half of the FMU (see description below), further contribute to the footprint. Overall, less than 1% of the R11 landbase is covered by human infrastructure including residences, transportation corridors, wellsites, industrial facilities, seismic lines, access roads, railways, airstrips, and powerlines (Table 12, Map 31).

Land Use	Area (ha)	% of R11 Landbase
Non-vegetated Rights-of-Way	1332	0.26
Gravel Pits/Surface Mines	80	0.02
Plant Sites/Sewage Lagoons	20	0.004
Rural Residential	57	0.01
Hamlets, Villages, Towns	57	0.01
Indian Reserve	2233	0.43

Table 12. Amount of the R11 FMU covered by human land uses.

# 2.6.2 Resource Extraction

Resource extraction activities within R11 are largely limited by *A Policy for Resource Management of the Eastern Slopes, Revised 1984* (Government of Alberta 1984) and the *Nordegg-Red Deer River Subregional Integrated Resource Plan* (Alberta Energy/Forestry Lands and Wildlife 1988). Critical Wildlife Zone 2 and Multiple Use Zone 5 (Map 4) cover the eastern boundary of the FMU, and permit resource exploration and development either under certain circumstances or special conditions (Zone 2) or under normal guidelines and regulations (Zone 5). Accordingly, the limited development of oil and gas reserves in R11 has been concentrated in this area (Map 32) and some trails in the FMU are old roads from related activities dating back to the mid-1950s. Despite the sales of geophysical resources throughout much of R11, the nature of the geological formations and logistical issues associated with accessing hydrocarbon reserves in the foothills and mountains further constrain the economic feasibility of oil and gas development. Recently, there have been some coalbed methane test wells drilled nearby, but these have not expanded into R11 as yet.



Map 31. Human footprint within the R11 FMU.

![](_page_29_Figure_1.jpeg)

Map 32. Oil and gas development within and adjacent to the R11 FMU.

Historical commercial timber harvesting in R11 has existed for many decades, though largescale timber harvest has not occurred. In the early 1900s, commercial harvest in R11 provided wood to local sawmills, and supported the railway and mining construction. Most harvesting was done through permits to many small loggers. With the advent of the timber quota system in 1966, timber harvesting and reforestation became more regulated. Some of the larger operators in the R11 unit included Murray Bros., Edwards Logging, Revelstoke Building Materials Ltd., A.A. Fisher Lumber Ltd., ITT Industries of Canada Ltd., Kelti

Holdings Ltd., and Atlantic Pressure Treating Ltd. Scattered evidence of historical harvesting is found as sawdust piles, old stumps, and mill remnants, and historical photos show slopes near Nordegg relatively barren of tree cover. Timber licenses and permits have been issued periodically since 1966, with some small-scale harvesting occurring predominantly along the eastern side of the FMU for

![](_page_30_Picture_3.jpeg)

varied purposes (e.g., habitat improvement in the Bighorn Creek valley in late 1980s; a few cutblocks north of the Ya Ha Tinda ranch, and FireSmart activities near Nordegg). There are currently no timber commitments in R11. In addition to the limits in place under the *Eastern Slopes Policy*, slopes (Map 11), sensitive soils, relative distance to mills, and accessibility issues render much of the area inoperable for timber harvest.

The abundance of coal reserves in the R11 FMU and adjacent areas was established in surveys from around 1900; however, coal-mining activity has been limited to the development and operation of the Brazeau Colleries in Nordegg between 1910 and 1955. One further resource that has been harvested throughout the FMU is furbearers. Currently there are 28 registered fur management areas contained partially or wholly within the boundaries of the R11 FMU (Map 33). Good forage production and thus considerable grazing opportunities exist to the southeast of the FMU: portions of six grazing allotments overlap the FMU boundary in this area (Map 34).

![](_page_31_Figure_1.jpeg)

Map 33. Registered Fur Management Areas within and adjacent to the R11 FMU.

![](_page_32_Figure_1.jpeg)

Map 34. Grazing allotments within and adjacent to the R11 FMU.

## 2.6.3 Recreation and Tourism

Recreation, both personal and commercial, has been the most pervasive and intensive human use of the R11 FMU over the last century. The popularity of off-highway vehicle (OHV) and snow machine use has increased dramatically during the past 15 years. The

![](_page_33_Picture_3.jpeg)

Kiska/Willson FLUZ is particularly popular with OHV users, while the random sledding areas known as the Sugarbowl (on Littlehorn Creek), Onion Lake, Ranger Creek, and Scalp Creek and the trails accessing these areas receive considerable use from snowmobiling enthusiasts (Map 35). Forms of non-motorized recreation commonly pursued in the Bighorn Backcountry including equestrian trail riding, hiking and backpacking, skiing, dog sledding, mountain biking, rock and ice climbing, and caving (i.e., Wapiabi Cave). In addition to

many Protected Areas, ASRD-administered Forest Recreation Areas often contain established campsites and staging areas (i.e., Hummingbird, Crescent Falls, Cutoff Creek, Eagle Creek, Panther, and Pinto Lake Forest Recreation Areas; Map 5), though random camping is popular along the major travel corridors. Hunting and fishing also occur throughout the FMU and are regulated by ASRD. Several commercial recreation ventures capitalize on the potential and resources contained within the Bighorn Backcountry. In fact, as early as 1907, the Brewster family raised and overwintered horses for their outfitting company at Ya Ha Tinda, while at least two guides established ranches and operated from

the Kootenay Plains area between 1902 and 1910. Guides, outfitters, and trail riding companies continue to accommodate clients throughout the FMU, often using primitive backcountry camps. Hospitality services can be found along Highway 11 and the Red Deer River. Other assorted operations, including a helicopter sightseeing company and adventure or leadership camps, are also based within the R11 area. To protect the area's wilderness environment, ASRD in consultation with the Bighorn Advisory Group recently developed the *Bighorn Backcountry Access Management* 

![](_page_33_Picture_7.jpeg)

*Plan* to provide explicit guidelines as to what recreational access and activities are permitted in each area at given times of the year. For example, motorized recreation is currently not permitted in either the Blackstone/Wapiabi or Panther Corners FLUZs, and only on designated trails within the Job/Cline and Upper Clearwater/Ram FLUZs (Map 8).

![](_page_34_Figure_1.jpeg)

Map 35. Trails, random sledding areas, and other recreational facilities in the R11 FMU.

## 2.6.4 Heritage and Culture

Archaeological evidence estimates native occupation within the R11 area up to 10,000 years ago (see summary in Morgantini 1995). Although only limited archaeological investigations have been conducted outside of the Ya Ha Tinda area, locations that may have particular significance or contain buried artifacts include mountain passes and alpine areas, terraces along streams and rivers, rock outcrops suitable for stone tool manufacture, and exposed grassy viewpoints. The earliest recorded history from explorers searching for fur trading routes described significant power struggles between Kootenay Indians from the interior of British Columbia and their well-armed Blackfoot counterparts from the prairies, namely the Peigan, attempting to block the Kootenay's access to fur traders and thus firearms. As the

![](_page_35_Picture_3.jpeg)

Stoney sundance camp

Kootenays retreated west of the Rocky Mountains, Stoney Indians filled the land along the foothills and eastern slopes. The Stoneys relied on the abundant big game for sustenance and frequently travelled along well-used trails between the Morley area and Kootenay Plains. Another major trail headed north from near Nordegg toward the Blackstone River and then onto the Athabasca River: a number of Stoney hunting camps have been found along this trail, including one near the Upper Shunda Creek Recreation Area. The North Saskatchewan River valley and Howse Pass represented a traditional eastwest travel route through the mountains for the

Stoneys and their rivals, the Kootenay Indians. After the signing of Treaty 7 in 1877 relegated the Stoney Indians to reserves in the Morley area, the Wesley Band returned to the Kootenay Plains in 1894 for several decades before receiving their current land in 1947 on the Big Horn Reserve (I.R. 144A). Almost two dozen Stoney gravesites had to be relocated from the river valley to near Two O'Clock Creek when the North Saskatchewan was flooded during the Bighorn Dam construction in 1972. Between 1968 and 1972, Kootenay Plains also proved attractive for a small group of Cree, orginally from Hobema, who wanted to follow more closely their self-supporting, ancestral lifestyle. The Smallboy group eventually moved to a camp north of the R11 boundary when big game became scarce on the Plains. Today, First Nations peoples continue to use several ceremonial sites in the North Saskatchewan River valley.

European explorers, fur traders, and surveyors also used the North Saskatchewan route through R11 in the last 200 years. Trade blockades imposed by the Peigan ultimately resulted in the abandonment of the North Saskatchewan/Howse Pass route through the mountains and subsequent development of the Athabasca and Bow Valley routes for trade and travel. Accordingly, settlement by non-natives was largely absent from the R11 area and focused primarily on Nordegg when the Brazeau Colleries were developed in the early 1900's. The Nordegg Historical Society maintains an extensive record of historical information related to the settlement of town, the mine operation, and the local area. Other human habitations within the Bighorn Backcountry included Forest Service cabins established for use by patrolling forest rangers and trapper cabins occupied on a seasonal basis. Existing residential infrastructure within R11 remains closely tied to the Nordegg area or associated with hospitality services and adventure camps, as well as intermittent development and use of backcountry cabins and camps.

## 2.6.5 Visual Resources

![](_page_36_Picture_3.jpeg)

Spectacular scenery in R11

Phrases such as 'stunning natural beauty' and 'awe-inspiring scenery' often dominate the comments of first-time visitors to the Bighorn Backcountry, despite the fact that many visitors only see the Highway 11 corridor. Accordingly, spectacular viewscapes are a valued component of the R11 landbase, and must be considered when planning treatment activities within the FMU. Map 36 depicts the probability of viewing a given area from Highway 11.

![](_page_37_Figure_1.jpeg)

Map 36. Visibility rankings of landscape near Highway 11.

# 2.6.6 Fish and Wildlife

From alpine ridge tops and mature conifer stands to montane grasslands and valley bottom wetlands, the habitat diversity found within the Bighorn Backcountry supports a wide spectrum of biotic resources. Perhaps the most obvious component of this biodiversity, and certainly a desired component for both economic and aesthetic reasons, are the large mammals. The R11 FMU once supported great herds of ungulates including bison, mule deer, elk, moose, woodland caribou, bighorn sheep, and mountain goats, though the R11 populations of bison and caribou have since been extirpated and white-tailed deer are now present. In fact, Kootenay Plains were once described as a virtual Serengetti. Large carnivores currently present in the FMU include wolf, cougar, coyote, red fox, lynx, black and grizzly bear, and wolverine. A diverse array of waterfowl, grouse, raptor, owl, and songbird species also use the spectrum of available habitats. Native sportfish species found within R11 include bull trout, lake trout, mountain whitefish, and westslope cutthroat trout (although cutthroat populations in R11 are introduced); introduced species include rainbow trout, brown trout, brook trout, and golden trout. Finally, a total of 304 rare vascular plants have been identified within the five natural subregions that overlap the R11 FMU (Appendix II), though a comprehensive vascular plant survey is lacking.

Table 13 summarizes the most recent provincial status ranking of R11 species that are assessed as At Risk, May Be At Risk, or Sensitive. Those species identified as At Risk or May Be At Risk receive further assessment through a Detailed Status Report and appraisal by the Scientific Subcommittee of the Endangered Species Conservation Committee. If warranted, a species can then be designated as Threatened or Endangered under the provincial Wildlife Act or flagged as a Species of Special Concern because of characteristics that make them particularly sensitive to human activities or natural events. Accordingly, this FMP will take particular note of those species identified below as At Risk or May Be At Risk, as well as Sensitive species further assessed to be a Species of Special Concern.

Status Ranking*	Common Name	Scientific Name	Background
At Risk	Woodland Caribou	Rangifer tarandus caribou	Most populations declining, with some at immediate risk of extirpation. Primary threat is increased predation by wolves in response to human activity. Maintenance of old-growth forest habitat is critical. Designated as Threatened under the Wildlife Act. Provincial Recovery Plan has been prepared (Alberta Woodland Caribou Recovery Team 2005)
May Be At Risk	Grizzly Bear	Ursus arctos	Population estimates are currently underway. Currently sustaining its population under a very restrictive sport hunting regime. Greatest threat is loss and degradation of wilderness habitats through resource extraction and recreational development. A 3-year moratorium on hunting began in 2006.

Table 13. Current status ranking of high priority mammal, bird, reptile, amphibian, fish, and butterfly species thought to occur within the R11 FMU (adapted from ASRD 2006a). Plant species are listed in Appendix II.

	Wolverine	Gulo gulo	An uncertain provincial estimate of less than 1000 has been proposed. Trends in distribution and population unknown, but populations may be declining. Human disturbance and associated habitat fragmentation may negatively affect this secretive animal.
	Cutthroat Trout	Oncorhynchus clarki	Native stocks of O. clarkii lewisi over its historical range in Alberta declining as a result of habitat loss, angling pressure, and introgression with non-native cutthroat trout and rainbow trout. Stock considered Threatened by COSEWIC. Introduced populations in Alberta are Secure.
Sensitive	Canada Lynx	Lynx canadensis	Cyclic species. Estimated less than 8 000 individuals at the bottom of the cycle. Population has decreased in recent years, and some concern exists over habitat loss and fragmentation. Harvest is now set by quota.
	Fisher	Martes pennanti	Species considered uncommon to rare. Population status is unknown, and trends in population and distribution uncertain. Current forestry practices may reduce availability of preferred habitat. Fisher harvest has declined since 1985.
	Barn Swallow	Hirundo rustica	A common species that is declining in Alberta and all surrounding jurisdictions.
	Barred Owl	Strix varia	Likely fewer than 2000 breeding birds in the province. This interior forest species requires larger blocks of mature dense woodland. Forest fragmentation detrimental. Forest management plans need to ensure breeding habitat retained. A Species of Special Concern in Alberta
	Brown Creeper	Certhia americana	A mature forest-dependent species vulnerable to forest fragmentation and certain forest management practices.
	Clark's Nutcracker	Nucifraga columbiana	Species has a restricted distribution within the province's mountain parks. Its dependency on declining species such as limber pine and whitebark pine may cause population declines. It may also be susceptible to the West Nile Virus.
	Common Yellowthroat	Geothlypis trichas	A common, widespread species with a declining population in Alberta and surrounding jurisdictions. Threats to habitat identified.
	Harlequin Duck	Histrionicus histrionicus	Provincial population estimated at 2000- 4000 individuals. Habitat integrity may be threatened by logging, mining, grazing and recreational activities. Site-specific mitigation of disturbances may be necessary. A Species of Special Concern in Alberta.
	Least Flycatcher	Empidonax minimus	Species has been declining in Alberta and surrounding jurisdictions. May be threatened by habitat changes on wintering range.
	Northern Pygmy- owl	Glaucidium gnoma	Local populations in boreal forest, foothills and Rocky Mountains. Forest management plans

		need to ensure breeding habitat maintained.
Osprey	Pandion haliaetus	This species is uncommon, but widespread, and faces limited threats to population and habitat, including threats to nesting sites. Continued monitoring and protection of specific nest sites desirable.
Pileated Woodpecker	Dryocopus pileatus	Requires mature to old-growth trees for nesting. Essential to incorporate maintenance of breeding habitat into management plans on both public and private lands. Some threats to populations identified.
Western Tanager	Piranga ludoviciana	Prefers old coniferous and mixedwood forest; obligate neotropical migrant. Species may be vulnerable to habitat loss or deterioration by various forecast land uses, mainly timber harvest.
Wandering Garter Snake	Thamnophis elegans	Common but localized. Least abundant garter snake. Maintenance of stable populations depends on habitat protection and public education. Threatened by oil and gas development and destruction of den sites.
Columbia Spotted Frog	Rana luteiventris	Population status unknown. Extremely limited distribution; possible population decline since the 1970s requires investigation. Threatened by introduced fish, and naturally low maturation and reproduction rates may impede recovery.
Long-toed Salamander	Ambystoma macrodactylum	Few patchy, disjunct populations in mountain riparian areas. Distribution may be declining. Vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development. Considered a Species of Special Concern in Alberta.
Western Toad	Bufo boreas	Population declining elsewhere and possibly within Alberta. Concentrated mainly in northern and western Alberta. Population requires long- term monitoring. Pollution and pesticides are threats in other parts of range, while drought poses a local threat.
Bull Trout	Salvelinus confluentus	Over-harvesting and habitat loss led to a decline in population. Protection from angling may result in recovery, but that may be countered by habitat degradation and competition from introduced species. Considered a Species of Special Concern in Alberta.
Lake Trout	Salvelinus namaycush	Species somewhat limited by the small number of deep, cold lakes in Alberta. Main threat is over-harvest and habitat loss, however angling is now regulated.
Gillette's Checkerspot	Euphydryas gillettii	Restricted range and small, isolated populations. While most of its mountainous habitat is protected in parks and recreation areas, fire suppression may adversely affect this butterfly by reducing the amount of early succession forest.
Mountain	Boloria napaea	Population size unknown. There are 10 records

Fritillary	in west-central Alberta. Has a small distribution
	in the northern Rocky Mountains, where habitat
	may be affected by forestry, oil and gas
	operations. Some habitat is protected within
	Provincial Parks.

\*Definitions of status rankings are as follows: **At Risk** - Any species known to be at risk after formal detailed status assessment and designation as Endangered or Threatened in Alberta; **May Be At Risk** - Any species that may be at risk of extinction or extirpation, and is therefore a candidate for detailed risk assessment; **Sensitive** - Any species that is not at risk of extinction or extirpation but may require special attention to prevent it from becoming at risk.

# 2.6.7 Environmentally Significant Areas

Environmentally Significant Areas (ESA) identify relatively large areas of native habitat within the landscape matrix, but outside Protected Areas, that contribute to the maintenance of biodiversity. Their significance is mainly based on representativeness, diversity, naturalness, and ecological integrity. Specific reasons for designation may include provision of critical ecological services (e.g., travel corridors, winter habitat, floodwater storage, habitat for rare or endangered species), diversity of plant or animal communities, representative of particular ecosystems or landscapes, presence of significant landforms or hydrological features, history of scientific research, and high social or aesthetic value (Timoney 1998). The number of ESAs in an area can provide an indicator of historic landscape integrity and biodiversity: there are 11 nationally and provincially significant ESAs within the R11 planning area (Map 37). These areas were identified through studies done in the late 1980s and early 1990s, based on the available information and the levels of site disturbance at the time (Sweetgrass Consultants 1997). As more information is gathered on the elements of biodiversity in the province, new sites that would qualify as ESAs may now be known, and sites identified as ESAs at the time of the original studies may no longer qualify if they have been impacted by developments. A more recent report by Timoney (1998) identified 17 additional nationally, provincially, and regionally significant ESAs within the Rocky Mountain Natural Region, though these sites are not included on Map 37. See Appendix III and

www.tprc.alberta.ca/parks/heritageinfocentre/environsigareas/default.aspx for further details on all ESAs found within the R11 FMU.

Nine Special Features have also been identified within the R11 area (Alberta Environmental Protection 1998). These features are typically smaller in aerial extent than the broad landscape-level ESAs, and may be landforms, vegetation communities, or plant or animal species that are limited in distribution, small in number, or unique examples of Alberta's natural biodiversity. The R11 features include Clearwater River West, Ya Ha Tinda, Kootenay Plains Ecological Reserve Extension, White Goat Lakes, Colliseum-Shunda Mountain, Ram River Falls/Canyon, Bighorn Mountain/South Ram, Landslide Lake, and Wapiabi Cave. See Appendix III and

www.tprc.alberta.ca/parks/heritageinfocentre/docs/special\_features\_in\_alberta\_report.pdf for further details on Special Features found within the R11 FMU.

![](_page_42_Figure_1.jpeg)

Map 37. Provincially and nationally Environmentally Significant Areas (ESA) within and adjacent to the R11 FMU. ESAs were identified from Sweetgrass Consultants (1997); note that ESAs identified in Timoney (1998) are not included here.

# 3 Values, Objectives, Indicators, and Targets for the Desired Future Forest

Stewardship of our forested landscapes, the natural resources they contain, and the multiple benefits they provide for current and future generations is the primary objective of sustainable forest management. Forest management planning to balance multiple values is, however, a complex and challenging endeavour. Anchored in the SFM criteria (CSA 2003, CCFM 2002) and the general values provided by the *Alberta Forest Management Planning Standard Version 4.1* (ASRD 2006), the R11 Planning Team undertook a public Charrette process to acquire the specific values and objectives stakeholders wished to have encompassed in the R11 landscape of the future. Participants in the initial stakeholder meetings and the Charrette planning session brought forward core ecological, economic, and social values of importance (see summary in Appendix I), which were developed into the 47 unique objectives highlighted below.

# 3.1 Ecological Values and Objectives

Sustainable forest ecosystems display ecological integrity. An ecosystem has integrity when its dominant ecological characteristics (e.g., elements of composition, structure, function, and ecological processes) occur within their natural ranges of variation (NRV) and can withstand or recover from most perturbations imposed by natural environmental dynamics or human disturbances (Parrish et al. 2003). Since our knowledge of a given ecosystem and its component communities, species, structure, function, disturbance regimes, etc. is almost certainly incomplete, the ability to manage ecosystem integrity to produce desired conditions is an imperfect science.

Describing desired management outcomes within the context of natural spatial and temporal variation provides a range of acceptable results. Furthermore, the maintenance of ecosystem characteristics within the NRV existing in the absence of human influence provides a coarse-filter management strategy that is likely to conserve biological diversity in most associated species, communities, environments, and ecological processes, even in the absence of complete information (Landres et al. 1999). Conservation of biodiversity is critical as disturbance-induced changes in ecosystems precipitate changes in species distributions and populations, and only with adequate genetic diversity can species maintain their ability to adapt and evolve. Particular species of concern, such as species-at-risk or species with high economic or cultural value, whose needs are not met by this coarse-filter approach may require additional management activities to ensure their conservation (i.e., fine-filter management).

Within the R11 landscape, maintenance of ecological integrity translates into the maintenance of biodiversity at the ecosystem, species (i.e., plant, fish, wildlife), and genetic levels; maintenance of forest health and productivity despite native and non-native insects and diseases; conservation of valuable soil and water resources critical to both terrestrial and aquatic environments; and integration of fire disturbance where feasible. Overall, 29 (62%)

of the 47 R11 Forest Management Plan objectives address ecological integrity through the conservation of biodiversity and maintenance of natural patterns and processes.

### **Biodiversity - Ecosystem Diversity**

1.1 Conserve ecosystem diversity by emulating natural disturbance patterns and the range of variation therein (i.e., coarse filter approach).

1.2 Conserve ecosystem diversity by maintaining uncommon plant communities.

1.3 Conserve ecosystem diversity by maintaining unique habitats provided by burns and blowdown.

### **Biodiversity – Plant Species Diversity**

1.4 Conserve plant species diversity by maintaining viable populations of native species (i.e., fine filter approach).

### **Biodiversity – Fish Species Diversity**

- 1.5 Maintain important habitat for populations of fish species.
- 1.6 Minimize impact of harvest activities on known bull trout and cutthroat trout streams.
- 1.7 Maintain the integrity of key instream habitats.

### **Biodiversity – Wildlife Species Diversity**

- 1.8 Ensure treatment activities do not unduly benefit either predator or prey populations.
- 1.9 Maintain and restore high quality ungulate summer and winter range and associated movement habitat.
- 1.10 Maintain important habitat for grizzly bear.
- 1.11 Maintain important habitat for wolverine.
- 1.12 Maintain habitat for important furbearer populations, specifically pine marten and red squirrel.
- 1.13 Maintain important habitat for Harlequin duck.
- 1.14 Maintain important habitat for Clark's nutcracker.
- 1.15 Maintain habitat capable of sustaining future woodland caribou range expansion into the R11 area.
- 1.16 Maintain habitat capable of supporting long-toed salamander populations.

### **Biodiversity – Sensitive Sites**

1.17 Maintain integrity of sensitive sites.

### **Biodiversity – Genetic Diversity**

1.18 Conserve genetic diversity by maintaining genetic variation of tree species.

### **Ecosystem Integrity and Productivity**

- 2.1 Maintain natural disturbance patterns at the landscape level.
- 2.2 Allow natural reforestation processes in disturbed areas.
- 2.3 Track loss of forest landbase to other uses.
- 2.4 Maintain soil productivity by preventing soil compaction.

### **Forest Health**

- 3.1 Recognize role of all native forest health agents and climate change.
- 3.2 Prevent introduction of non-native, invasive plant species.
- 3.3 Reduce impact of mountain pine beetle.

### Watershed Integrity

- 4.1 Maintain flow quantity.
- 4.2 Maintain flow quality.

4.3 Support Watershed Alliances.

### Science-based Decision Making

5.1 Ensure stakeholders and managers are informed by science so they can understand trade-offs and make defensible decisions; employ scientific thresholds and checkpoints; make ecosystem-based decisions; and adhere to planning standards.

## 3.2 Economic Values and Objectives

Contrary to many forested landscapes in Alberta, tourism and recreation within the R11 FMU generate greater economic returns than timber harvest. Additional economic benefits result from grazing opportunities and furbearer harvest. Resources from which these values are derived must be managed sustainably to ensure future generations can realize similar benefits and opportunities for diversification. Economic values may be further influenced by several social values discussed below (e.g., aesthetic qualities, availability of access, use of forest for non-timber products).

### **Domestic Grazing**

6.1 Maintain trails open to manage livestock and consider cow locations during seasonal burn plans.

### **Economic Opportunities**

7.1 Maintain or increase the economic potential of the R11 area without damaging the overall appeal for users.

### 3.3 Social Values and Objectives

Healthy, productive forests contribute multiple benefits beyond those realized in an ecological or economic context. Aesthetically pleasing landscapes often represent a place of physical, mental, or spiritual rejuvenation for those choosing to recreate or live therein. First Nations peoples have used many traditional sites found within the forest for centuries. Economic benefits derived from the forest can help create sustainable and stable local communities. Accordingly, forest management decisions must reflect social values, must adapt as these values change and evolve over time, and must be informed by the best available scientific knowledge on ecosystem processes and human interactions with forest ecosystems. Local residents and users must remain engaged in forest management through an effective participation process as well as ongoing communication from forest managers explaining the rationale and benefits arising from management activities.

### Wildfire Threat

- 8.1 Integrate fire management objectives with overall landscape management objectives.
- 8.2 Reduce the threat of large, high intensity, catastrophic wildfire.
- 8.3 Protect values at risk within and adjacent to the R11 area.

### **Inherent Value**

- 9.1 Maintain cultural values and treaty rights.
- 9.2 Allow continued use of forest for non-timber products such as mushrooms, medicinal plants, furniture products, berries, etc.

	9.3 Maintain aesthetic qualities of the landscape where possible.
	9.4 Minimize changes to air quality as a result of prescribed burn treatments.
Recreati	onal Opportunities
	10.1 Maintain recreational infrastructure and recognize volunteer efforts to maintain or replace infrastructure.
	10.2 Maintain tourism appeal (i.e., for snowmobiles, off-highway vehicles, hiking, camping, hunting, fishing, berry picking) and opportunities to enhance personal health and wellness.
Access	
	11.1 Adhere to a "no new permanent access" policy in the R11 area while maintaining existing access.
Commu	nity Integrity
	12.1 Protect community appeal for local residents by encouraging economic potential, providing quality recreational opportunities, and protecting private infrastructure and property.
Informa	tion and Education
	13.1 Communicate the rationale behind and benefits resulting from burn and harvest treatments in R11.
Multi-A	gency Cooperation
	14.1 Employ a multi-jurisdictional approach to managing fire and pests at both the planning and operational levels.
	14.2 Ensure protection of timber adjacent to the R11 area is achieved through complementary fire and pest management plans.
	14.3 Share data, information, and resources among stakeholder agencies.
Public S	afety

15.1 Ensure public safety along existing trails through burned and harvested areas.

## 3.4 Indicators and Targets

For each objective summarized above, one or more specific indicators and targets were described. Whereas the values and objectives represented the characteristics or qualities stakeholders wished to have maintained in a given condition, the indicators and targets provide a parameter and specific condition for the parameter against which to measure performance and effectiveness in attaining the desired future forest. The suite of values, objectives, indicators, and targets are detailed in Table 14. This table also includes additional information on the means of identifying and achieving each target, the selected monitoring process, acceptable variance from the target, and response should this variance be exceeded. The agency responsible for implementation of the selected activities is identified.

As Table 14 is based on Annex 4 of the Alberta Planning Standard but deviates somewhat in its organization, the corresponding Annex 4 objective has been identified in the last column where applicable. Of particular note are four Alberta Planning Standard objectives that have not been fully addressed in this R11 Forest Management Plan:

• Objective 1.1.1.1 – deals with the range of cover types and seral stages and the indicator with the area of forest in each seral stage by cover class. Objectives in this R11 FMP only address seral stages; future analyses will need to incorporate cover types as well.

- Objective 1.1.1.2 deals with landscape fragmentation and the indicators with patch sizes and area of old interior forest. A patch size analysis has not been completed at the landscape level for R11. The Planning Team has instead undertaken an analysis of natural disturbance event sizes and the amount of residual forest found in islands and matrix within the boundaries of the event (following Andison 2003a, 2004).
- Objectives 5.1.1 and 5.2.2 deal with sustainable timber supplies. Long-term, even-flow of timber is not an objective of this R11 FMP. Harvesting will be one of multiple tools used to bring the forest age and condition back within the historical natural range of variation.

## 3.5 Forest Management Direction

The values, objectives, indicators, and targets described above and in Table 14, when examined in concert, delineate the desired future condition of the R11 FMU and provide the general direction forest managers will require when making management decisions. The resulting direction described in this FMP is novel in that (1) public involvement occurred a priori to formal plan development; (2) a long-term, even-flow supply of timber was not desired given the lack of timber commitments in the FMU; and (3) prescribed fire will be used as the primary management tool in many areas of the FMU. Management tools available to forest managers in R11 include prescribed burning and mechanical clearing techniques. The most common mechanical treatment to be utilized under this plan involves the emulation of natural disturbance patterns via harvesting (see Glossary). Other mechanical techniques may include thinning, pruning, mulching, and/or mowing to control vegetation. These latter techniques will be limited in extent on the landscape and may be used in preparation for prescribed burning. Accordingly, the remainder of the FMP will generally refer only to prescribed burning or harvesting, recognizing that harvesting is one of a suite of possible mechanical techniques.

The importance of prescribed fire in this R11 FMP and in achieving its objectives cannot be underemphasized as stakeholder participants in the Charrette planning session clearly validated prescribed fire as the management tool of choice not only in the Prime Protection

![](_page_47_Picture_6.jpeg)

Zone but throughout much of the FMU (Map 48). Use of prescribed fire in neighbouring Banff National Park has allowed fire managers and conservation biologists to develop one of western North America's leading fire restoration programs (Arno and Fiedler 2005), and the R11 planning process has drawn on this expertise. Banff's prescribed fire program has required considerable scientific information on historical fire regimes; a significant commitment of time, personnel, logistical, and financial resources from agency staff during both the planning and implementation phases; an education campaign to increase public awareness of natural disturbances and their management implications; and a multijurisdictional approach with consultation and involvement of adjacent land management agencies. A successful prescribed fire program within R11 will require a

**Regenerating burn** 

similar long-term commitment of resources from the multiple agencies involved in its implementation.

The following section of this plan provides supporting information and additional management direction for each objective and indicator. Each detailed indicator sheet begins with a reiteration of the value, objective, indicator, and target. Relevant background information for the indicator and current status within the FMU (if known) are summarized, followed by a forecast of how proposed management activities may affect the indicator. Ideally, these forecasts should be quantitative in nature; however, only qualitative forecasts are included for most indicators as analyses of proposed forest management activity impacts on each indicator are yet to be prepared. Details of monitoring methods and procedures are also included. The sheets conclude with the action or response to be pursued if the target is not met or, in some cases, is exceeded.

# Table 14. Summary of VOITs.

Value Category As Created By Charrette	Value	Objective.	Indicator.	Target	Means to Identify Target	Legal / Policy Requirements	Means of Achieving Objective and Target	Monitoring and Reporting	Acceptable Variance	Response	Responsible Agency	Corresponding Objective # from Annex 4, Planning Standard
I. Ecological	1. Biodiversity - Ecosystem Diversity	1.1 Conserve ecosystem diversity by emulating natural disturbance patterns and the range of variation therein (i.e., coarse filter approach).	1.1.1 Treatment size and residual pattern.	Treatment size and pattern within the natural range of variation: multiple treatments over a series of years may be clustered to emulate larger natural burns.	AVI, GIS analysis, FMF Natural Disturbance Program and Hwy40 North Demonstration Project results.	None	Spatial harvest sequence and prescribed burns.	GIS analysis to determine average treatment event size and total residual structure area (i.e., island and matrix remnants) within treatment events; Stewardship Report.	None	Assess treatment event sizes for subsequent FMPs; Incorporate additional residual structure into treatments.	FD	1.1.1.2a (patch sizes); 1.1.2.1a (residual structure)
			1.1.2 Stand age distribution by area.	Area of young and old forest within the natural range of variation for each natural subregion.	AVI; GIS analysis; Predicted NRV in stand age classes based on negative exponential function applied to observed fire cycle length for each natural subregion.	Planning Standard	Spatial harvest sequence and prescribed burns.	Inventory updates; GIS analysis; Stewardship Report.	None	Adjust treatment levels in subsequent FMPs	FD	1.1.1.1
		1.2 Conserve ecosystem diversity by maintaining or restoring uncommon plant communities.	1.2.1 Uncommon plant communities, specifically whitebark pine, limber pine, Douglas- fir, and lowland grassland communities.	All total known area of each community type inside Protected Areas and 80% of the total known area of each community type outside Protected Areas will be maintained, including via burning if the community is identified as fire dependant.	GIS analysis, AVI, ecosite phases, ANHIC ecological community classification and Tracking List; predict and identify occurrence of uncommon plant community.	Planning Standard, ANHIC Draft Plant Community Sampling Guidelines, ANHIC Preliminary Ecological Community Tracking List; potential COSEWIC species	Inventory rare communities; ANHIC to train FD staff; Compare prescribed burns with selected control areas that have no active vegetation management (i.e., provincial Protected Areas, areas identified in Special Features report)	Maintain GIS data layer with identified communities; PSP's established in 25% of communities planned for burn or harvest and resurveyed every 10 years; Stewardship Report.	10% of the community area, though fire- dependent communities may temporarily experience greater reductions	Assess any reduction >10% for causal factors; Adjust burn or harvest plans.	ATPRC, FD	1.1.1.4
		1.3 Conserve ecosystem diversity by maintaining unique habitats provided by burns and blowdown.	1.3.1 Area of unsalvaged burned forest and blowdown.	90% of burned and blowdown areas remaining unsalvaged.	GIS analysis, limited harvesting required for safety measures	Planning Standard	Use prescribed burn plans to determine if dead trees will be a hazard along roads, trails, etc.	Compare area burned or blown down to area salvaged; Stewardship Report.	Area salvaged may vary by individual burn, but not over landscape.	Adjust strategies in subsequent FMPs	FD	1.1.1.5
	1. Biodiversity - Plant Species Diversity	1.4 Conserve plant species diversity by maintaining viable populations of native species (i.e., fine filter approach).	1.4.1 Location of individual whitebark and limber pine.	80% of identified populations and individual trees maintained (fire dependent).	ASRD inventory database, ground assessment of planned treatment areas, GIS analysis, AVI, ecosite phases.	Potential COSEWIC species	Compare prescribed burns with selected areas that have no active vegetation management (i.e., provincial Protected Areas, areas identified in special features report)	Establish permanent sampling plots and resurvey every 10 years, monitoring to include status of white pine blister rust infestations; Stewardship Report.	Dependent on the distribution of individuals or populations.	Initiate planting program if natural regeneration after burning is unsuccessful; Adjust burn and harvest plans.	FD - Forest Health	1.2.1.1
			1.4.2 Location of mountain bladder fern populations.	All identified populations maintained.	Ground assessment of planned treatment areas	None	Compare planned treatment boundaries to identified population locations; Avoid areas with identified populations if possible.	Resurvey identified locations regularly; Stewardship Report.	Dependent on the distribution of individuals.	Assess downtrends for causal factors.	ATPRC, FD	1.2.1.1

		1.4.3 Location of wood anemone populations.	All identified populations maintained.	Ground assessment of planned treatment areas	None	Compare planned treatment boundaries to identified population locations; Avoid areas with identified populations if possible.	Resurvey identified locations regularly; Stewardship Report.	Dependent on the distribution of individuals.	Assess downtrends for causal factors.	ATPRC, FD	1.2.1.1
		1.4.4 Location of Lapland rose-bay populations.	All identified populations maintained.	ANHIC database; Ground assessment of planned treatment areas	None	Compare planned treatment boundaries to identified population locations; Avoid areas with identified populations if possible.	Resurvey identified locations regularly; Stewardship Report.	Dependent on the distribution of individuals.	Assess downtrends for causal factors.	ATPRC, FD	1.2.1.1
1. Biodiversity - Fish Species Diversity	1.5 Maintain important habitat for populations of fish species.	1.5.1 Area of disturbed riparian habitat.	Complete protection of all riparian habitats.	GIS analysis	Fisheries Act	Spatial harvest sequence and prescribed burns.	GIS analysis to determine the amount of disturbed riparian habitat; Stewardship Report.	Prescribed burn planning can attempt to retain buffers, however, conditions may result in fires burning into buffers; Fish populations will also fluctuate naturally.	Adjust burn or harvest plans.	FWD	1.1.1.6; 3.2.2.1
	1.6 Minimize impact of treatment activities on known bull trout and cutthroat trout streams.	1.6.1 Maintenance of stream buffers.	Sundre Forest Products OGR for stream buffers met or exceeded on all known bull trout and cutthroat trout streams.	GPS boundaries, GIS analysis, OGR, fish inventory data.	OGR	Retain intact buffers in burn and harvest plans; Identify areas with potential for siltation.	Field inspection and audits; Inspection reporting; Stewardship Report.	Prescribed burn planning can attempt to retain buffers, however, conditions may result in fires burning into buffers.	Take immediate remedial action to correct, where possible.	FD	1.1.1.6; 3.2.2.1
		1.6.2 Number of stream crossings.	No permanent crossings wherever possible.	GIS analysis.	OGR; Water Act; Code of Practice for Watercourse Crossings	Coordinate access with other users and adjacent timber operators; Remove temporary crossings upon completion of operations.	Field inspections; GIS analysis; Inspection reporting; Stewardship Report.		Take immediate remedial action to correct.	FD	1.1.2.3
		1.6.3 Timing of instream work.	No instream work from September 1 to April 30 (bull trout streams) or May 16 to August 15 (cutthroat trout streams).	Code of Practice for Watercourse Crossings; Permit conditions.	Water Act; Code of Practice for Watercourse Crossings	Conduct harvest operations in winter, but instream work (if necessary) must be completed in accordance with restricted activity periods.	Field inspection and audits; Inspection reporting; Stewardship Report.	None	Contraventions of the Water Act could result in fines.	FWD	1.1.2.3
	1.7 Maintain the integrity of key instream habitats.	1.7.1 Spawning, rearing, and overwintering habitat condition.	No significant increase in sediment load in spawning, rearing, or overwintering areas.	Fish inventory data.	Fisheries Act	Minimize sedimentation events by following OGR buffers on known fish- bearing streams, avoiding instream work, minimizing the number of watercourse crossings, and avoiding bared soil surfaces.	Field inspections; Stewardship Report.	None	Few remedial options for impacted habitat; charges possible under Fisheries Act	FWD	1.1.2.2; 1.1.2.3

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1. Biodiversity - Wildlife Species Diversity	1.8 Ensure treatment activities do not unduly benefit either predator or prey populations.	1.8.1 Predator-prey ratio.	Targets to be determined after completion of ongoing research.	Aerial ungulate surveys; Harvest reports for predator species.	Wildlife Act	Track latest research findings on predator- prey ratios as they relate to elk, wolves, caribou, etc.; Implement latest research findings and undertake adaptive management programs.	Aerial ungulate surveys and reports; Harvest reports for predator species; Stewardship Report.	To be determined.	To be determined.	FWD	n/a
	1.9 Maintain and restore high quality ungulate summer and winter range and associated movement habitat.	1.9.1 Stand age distribution broken down by habitat capability for elk, deer, and moose.	Current stand age distribution within the natural range of variation in areas identified as capable of supporting elk, deer, moose, and bighorn sheep.	Canada Land Inventory Land Capability for Ungulates, GIS analysis	Wildlife Act	Use prescribed burning and harvesting to create younger seral stages within the landscape.	GIS analysis; Stewardship Report.	None	Adjust burn or harvest plans.	FWD, FD	n/a
		1.9.2 Location and extent of high quality ungulate winter range, and associated movement habitat.	Not yet completed; target needs to be set using the Elk Habitat Effectiveness Planning tool.	Models, local knowledge.	Wildlife Act	Assess proposed prescribed burn and harvest plans for habitat impacts.	Models; RSF mapping; Stewardship Report.	To be determined.	Adjust burn or harvest plans.	FWD	1.2.1.1
		1.9.3 Location and extent of high quality ungulate summer range, and associated movement habitat.	Not yet completed; target needs to be set using the Elk Habitat Effectiveness Planning tool.	Models, local knowledge.	Wildlife Act	Assess proposed prescribed burn and harvest plans for habitat impacts.	Models; RSF mapping; Stewardship Report.	To be determined.	Adjust burn or harvest plans.	FWD	1.2.1.1
	1.10 Maintain important habitat for grizzly bear.	1.10.1 Location and extent of high quality grizzly bear habitat and associated movement habitat.	Targets to be determined after the Grizzly Bear Recovery Plan is approved.	FMF Grizzly Bear Planning Tools, Recovery Plan.	Provincial Recovery Plan	Assess proposed prescribed burn and harvest plans for habitat impacts.	FMF Grizzly Bear Planning Tools; Stewardship Report.	To be determined.	To be determined.	FWD	1.2.1.1
	1.11 Maintain important habitat for wolverine.	1.11.1 Location and extent of high quality wolverine habitat.	Current stand age distribution within the natural range of variation. See Indicator 1.1.2.	AVI, GIS analysis.	Wildlife Act	Use prescribed burning and harvesting to maintain a mosaic of habitat types across the landscape until habitat requirements are better understood; Support other research and monitoring efforts that will fill data deficiencies.	GIS analysis; Stewardship Report.	None	Adjust strategies in subsequent FMPs	FWD	1.2.1.1
	1.12 Maintain habitat for important furbearer populations, specifically pine marten and red squirrel.	1.12.1 Average number of individuals harvested each year on traplines active for a given species.	No decrease in average number of individuals trapped per year over 5 years.	Furbearer harvest data	Trapping Regulations	Use prescribed burning and harvesting to create young forest that will develop into the mature and old-growth forests of the future; Recognize inevitable impacts on some traplines.	Annual furbearer harvest data; Stewardship Report.	Populations may vary naturally with food supply.	Investigate options available through the Alberta Trappers' Compensation Program	FWD	1.2.1.1
		1.12.2 Stand age distribution, specifically mature and old-growth.	Current stand age distribution within the natural range of variation. See Indicator 1.1.2.								1.2.1.1

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		1.13 Maintain important habitat for Harlequin duck. 1.14 Maintain	1.13.1 Quality of nesting, breeding and foraging habitat for Harlequin duck.	No net increase to motorized access (both on- and off-highway vehicles) on streams with historic duck observations.	BSOD, GIS analysis	Migratory Birds Convention Act	Maintain stream quality through measures identified in Objective 4.2; Use bridges as the preferred crossing method on important streams.	GIS analysis of amount of access on historic Harlequin duck streams; Stewardship Report.		Institute trail closures.	FWD	1.2.1.1
		important habitat for Clark's nutcracker.	extent of high quality Clark's nutcracker habitat, including whitebark and limber pine stands.	populations and individual whitebark and limber pine trees maintained. See Indicator 1.4.1.								
		1.15 Maintain habitat capable of sustaining future woodland caribou range expansion into the R11 area.	1.15.1 Area of mature and old- growth forest.	Area of mature and old- growth forest within the natural range of variation; Target could be further refined once west-central habitat planning targets are developed.	AVI, GIS analysis.	Wildlife Act, Provincial Recovery Plan, SARA	Consult with west- central range planning team; Cluster prescribed burn and harvest treatments to emulate large natural disturbances instead of many small dispersed disturbances; Coordinate prescribed burns with Parks Canada.	GIS analysis, Parks Canada caribou surveys; Stewardship Report.	None	Adjust strategies in subsequent FMPs	FWD	1.2.1.1
		1.16 Maintain habitat capable of supporting long-toed salamander populations.	1.16.1 Location of potential breeding ponds and lakes.	Information on whether long-toed salamanders exist and breed in the identified ponds and lakes.	GIS analysis, HSI models, field surveys.		Conduct field surveys of suitable habitat to determine if populations exist in R11.	Stewardship Report		Adapt burn and harvest plans if they will impact a pond or lake where the species has been identified.	FWD	1.2.1.1
	1. Biodiversity - Sensitive Sites	1.17 Maintain integrity of sensitive sites.	1.17.1 Identified sensitive sites (e.g., nationally and provincially significant ESAs, selected Special Features, mineral licks, major game trails, rocky outcrops, den sites, fish spawning, rearing, and over-wintering areas).	Complete protection of sites sensitive to burning or harvesting (sites not sensitive to such treatments will not require the same degree of protection).	ANHIC, BSOD, ESA reports, GIS inventory, local knowledge, models.	Planning Standard, OGR	Spatial harvest sequence and prescribed burn plans; Compare planned treatment boundaries with GPS locations of sensitive sites.	Post-treatment comparison of burn or harvest boundaries with GPS locations of sensitive sites; Stewardship Report.	None	Continue to build inventory.	ATPRC, FWD, ACA for building inventory and mapping; FD for implementation	1.1.2.2
	1. Biodiversity - Genetic Diversity	1.18 Conserve genetic diversity by maintaining genetic variation of tree species.	1.18.1 Inventory of whitebark and limber pine stands and stored seed.	80% of identified populations and individual trees maintained (see Indicator 1.4.1) as well as a viable stored seed inventory.	ASRD - Genetics and Tree Improvement Section	Planning Standard	Conduct inventory of whitebark and limber pine stands; Assess stored seed inventory.	Inventory reassessed every 10 years; Stewardship Report.	None	Prepare a seed collection plan if seed inventory is too low.	FD	1.3.1.1; 1.3.1.2
	2. Ecosystem Integrity and Productivity	2.1 Maintain natural disturbance patterns at the landscape level.	2.1.1 Area disturbed per decade by natural subregion.	Periodic disturbance rate of 50% of the median reported fire cycle for each natural subregion	Tymstra et al. 2005		Spatial harvest sequence and prescribed burns.	GIS analysis to compare area disturbed per decade within each natural subregion to reported fire cycles; Stewardship Report.	None	Adjust burn or harvest plans; Adjust targets.		1.1.1.1

		2.1.2 Disturbance via natural processes where appropriate.	Identification of natural fire zones for different HFIs.	Escaped Fire Analysis Strategy		Establish fire doors and fuel breaks; Conduct fire suppression activities as indicated in each Escaped Fire Analysis Strategy.	Fire reports; Stewardship Report.	N		FD	n/a
		2.1.3 Fire intensity.	Distribution of HFI ranks across the landscape.	Spatial Fire Management System and associated models, HFI ranks		Create a range of HFI ranks across the landscape through harvest and prescribed burn treatment activities.	HFI ranks calculated for entire landscape; Maps and charts showing HFI ranks prepared at 5, 10, 20, and 50 years or more frequently; Stewardship Report.	None	Adjust burn or harvest plans.	FD	n/a
	2.2 Allow natural reforestation processes in disturbed areas.	2.2.1 Area burned or harvested and left for natural regeneration.	90% of burned or harvested areas will be left for natural regeneration.		Requires waiver from the Timber Management Regulations.	Use artificial reforestation only in select areas.	GIS analysis; Stewardship Report.	Social values may demand artificial reforestation in select areas.	Investigate causal factors.	FD	2.1.1.1 (though not using artificial reforestation)
	2.3 Track loss of forest landbase to other uses.	2.3.1 Amount of change in forest landbase, including oil and gas, seismic, mining, roads, commercial, urban, acreages.	Minimal loss of forest landbase.	Forest inventory and landuse data, County permits.	Planning Standard	Update forest cover and landuse inventories regularly; Encourage use of existing footprint where possible.	Inventory and landuse systems; Stewardship Report.	Report actual.	n/a	FD	2.1.2.1
	2.4 Maintain soil productivity by preventing soil compaction.	2.4.1 Compliance with Sundre Forest Products OGR.	Complete compliance with Sundre Forest Products OGR, with 90% of harvesting conducted under winter conditions.	Permit conditions.	OGR, Forest Soils Conservation Guidelines.	Ensure effective planning and supervision of operations.	Field inspections and audits; Inspection reporting.	None	Take immediate remedial action to correct.	FD	3.1.1.1
3. Forest Health	3.1 Recognize role of all native forest health agents and climate change.	3.1.1 Current inventory and distribution of native forest health agents.	Accurate reporting and mapping of native forest health agents.	Forest health surveys, inventory updates.	Planning Standard.	Update information on native forest health agents and GIS data coverages regularly.	Annual surveys, summaries, and maps; Stewardship Report.	Report actual.	Investigate causal factors behind increases in activity.	FD	2.1.2.2
		3.1.2 Current inventory and distribution of non- native forest health agents.	No increase in incidence of non-native forest health agents.	Forest health surveys.	Planning Standard.	Detect occurrences and develop a management plan for non-native species that ensures continued healthy presence of all native species.	Annual surveys, summaries, and maps; Stewardship Report.	Report actual.	Develop management plans for any occurrences.	FD	2.1.2.2
	3.2 Prevent introduction of non-native, invasive plant species.	3.2.1 Current inventory and distribution of non- native, invasive plant species (i.e., noxious and restricted weeds).	No increase in incidence of non- native, invasive plant species (i.e., noxious and restricted weeds).	Field inventories, public or industry reports.	Directive 2001- 06, Weed Control Act.	Use native seed for any required reclamation work; Public education; Participate in co- operative programs.	Field inventories; Forest Health program; GIS data layers; Inspections; Stewardship Report.	Report actual.	Improve weed program; Develop more aggressive management plan.	FD	2.1.3.1
	3.3 Reduce impact of mountain pine beetle.	3.3.1 Stand Susceptibility Index.	75% reduction in the area of highly susceptible stands currently projected in 20 years.	Mountain Pine Beetle Hazard Rating System (risk assessment to include impacts on adjacent timber supply).		Spatial harvest sequence and prescribed burns.	Susceptibility rating map compared to recent burn and harvest boundaries; Stewardship Report.		Adjust burn and harvest plans to better target high risk stands.	FD	n/a
		3.3.2 Stand age distribution.	Current stand age distribution within the natural range of variation. See Indicator 1.1.2.								1.1.1.1

	4. Watershed Integrity	4.1 Maintain flow quantity.	4.1.1 Annual flow.	No increase in annual flow projections greater than 15% on third order streams.	GIS analysis, ECA- Alberta model.			Stewardship Report	To be determined.		FD	3.2.1.1
		4.2 Maintain flow quality.	4.2.1 Roads and watercourse crossings.	All roads and watercourse crossings meet or exceed Sundre Forest Products OGR standards.	Permit conditions, OGR.	OGR; Code of Practice for Watercourse Crossings	Request additional watershed quality monitoring from AENV; Construct lower class roads under winter conditions whenever possible.	Field inspections and audits; Inspection reporting.	None	Take immediate remedial action to correct.	FD	1.1.2.3; 3.2.1.1
			4.2.2 Maintenance of stream buffers.	Sundre Forest Products OGR for stream buffers met or exceeded in harvest areas.	Permit conditions, OGR.	OGR	Ensure effective planning and supervision of operations and adherence to relevant OGR.	Field inspections and audits; Inspection reporting.	None	Take immediate remedial action to correct, where possible.	FD	3.2.2.1
			4.2.3 Bared soil surfaces.	No bared soil surfaces created by harvest operations.	Permit conditions, OGR.	OGR	Conduct harvesting operations under winter conditions; Maintain duff layer.	Field inspections and audits; Inspection reporting.	None	Take immediate remedial action to correct.	FD	3.1.1.1; 3.2.2.1
			4.2.4 Area of unsalvaged blowdown.	No salvage of merchantable blowdown in riparian areas.	Sound science, ecological considerations.	Planning Standard	Avoid entry into stream buffers for timber removal.	Stream buffer widths identified from air photos or GPS boundaries; Stewardship Report.	Localized variance may be required if blowdown contributes to excessive fuel hazard or safety concerns.	Take immediate remedial action to correct, where possible.	FD	3.2.2.1
		4.3 Support Watershed Alliances.	4.3.1 Communications with Watershed Alliances.	Referral of plan to Red Deer River and North Saskatchewan Watershed Alliances.	Charette	None	Encourage participation of Watershed Alliance representatives in planning process; Ensure approved R11 FMP is made available to Watershed Alliances.	Documentation of correspondence with Watershed Alliances; Stewardship Report.	None	n/a	FD	n/a
	5.Science-based Decision Making	5.1 Ensure stakeholders and managers are informed by science so they can understand trade-offs and make defensible decisions; employ scientific thresholds and checkpoints; make ecosystem-based decisions; and adhere to planning standards.	5.1.1 Implementation of current research findings in R11.	Continual monitoring and implementation of research findings relevant to R11; Current communications system in place to monitor research initiatives.	Regular review of relevant research initiatives.	None	Promote research on important topics (e.g., fire, salt licks); Adaptively manage R11 based on the research and monitoring program; Discuss recently completed and ongoing research at regular stakeholder meetings.	Stewardship Report	None	Implement immediately small- scale changes resulting from research findings; Consider large-scale management implications for subsequent FMP.		6.2.1.1
II. Economic	6. Domestic Grazing	6.1 Maintain trails open to manage livestock and consider cow locations during seasonal burn plans.	6.1.1 Location of cow trails and season of use.	No increased use of riparian areas as a result of prescribed burn or harvest treatments; Consultation with affected disposition holders prior to treatments.		Directive 2006-1 Integration of Grazing and Timber Activities	Consult with disposition holders prior to treatment activities.	Documentation of consultations; Stewardship Report.			FD	5.2.2.1

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	7. Economic Opportunities	7.1 Maintain or increase the economic potential of the R11 area without damaging the overall appeal for users.	7.1.1 Number of tourism-related operators in the R11 area.	Number of tourism- related operators in the R11 area is maintained or increased.	Currently no means to identify or track tourism-related operators.	None	Currently no means to identify or track tourism-related operators.	None				5.2.2.1
			7.1.2 Client impact, financial impact for operators, and economic impact on local economy.	Positive client feedback.	Visitor surveys.	None	Monitor visitor trends from other agencies; Investigate targets that both reflect the indicator and are measurable.	Visitor surveys.				5.2.2.1
III. Social	8. Wildfire Threat	8.1 Integrate fire management objectives with overall landscape management objectives (i.e., balance the level of risk of wildfire with the responsibility of other parties, such as developers and adjacent forest companies, to participate in their own risk reduction).	8.1.1 Vegetation management zone map.	Appropriate vegetation management zoning map developed.			Vegetation Management Zone map has been completed.				FD	5.2.1.1
			8.1.2 Number of FireSmart initiatives.	FireSmart Programs in place for all communities and infrastructure in the R11 area; FireSmart Landscape in place for the R11 area.		Planning Standard	Prepare FireSmart plans where not currently completed; Continue existing initiatives for vegetation control	Stewardship Report			FD	5.2.1.1
		8.2 Reduce the threat of large, high intensity, catastrophic wildfire.	8.2.1 Fire behaviour potential.	5% reduction of high and extreme fire behaviour classes over a 20-year period.	Alberta Wildfire Threat Assessment Rating Model	Planning Standard	Spatial harvest sequence, prescribed burns, and managed natural fires.	Maps and tables of fire behaviour classes at 0, 10, 20, and 50 years, reanalyzed every 10 years; Stewardship Report.	Issue specific	Adjust harvest or prescribed burn timing and sequence.	FD	5.2.1.1
			8.2.2 Number of human-caused wildfires.	Number of human- caused wildfires at or below levels indicated in Forestry Division Standard Operating Procedures performance measures (i.e., <27 human- caused fires per year).	Annual analysis of human-caused wildfires in the R11 area.	Prevention Business plan.	Support public education, engineering, and enforcement.	Comparison of numbers of human- caused wildfires to Standard Operating Procedures performance measures; Annual summary; Stewardship Report.		Adjust strategies in subsequent FMPs	FD	5.2.1.1
			8.2.3 Area burned outside containment areas.	No hectares burned outside of containment areas.	Prometheus Wildfire Growth Model.		Identify containment zones; Spatial harvest sequence, prescribed burns, and managed natural fires.	Periodic wildfire growth modelling and mapping after harvest, prescribed burn, or natural wildfire; Stewardship Report.		Adjust harvest or prescribed burn timing and sequence.	FD	5.2.1.1
		8.3 Protect values at risk within and adjacent to the R11 area.	8.3.1 Presuppression Plans developed for communities, Development Nodes, and high-use areas.	Completion of Nordegg Presuppression Plan by 2007 fire season; Completion of Development Node Presuppression Plans as development occurs.		Planning Standard	Prepare FireSmart Community Zone Plans and Presuppression Plans.	Stewardship Report	None	n/a	FD	5.2.1.1

		8.3.2 Disposition referral process.	Referral process implemented by fall 2007.		Process under development.	Implement the referral process; Place consultative notations on Community Zones.		None		FD	5.2.1.1
9. Inherent Value	9.1 Maintain cultural values and treaty rights.	9.1.1 Integrity of traditional sites, burial grounds, ceremonial locations, etc.	Complete protection of all traditional sites, burial grounds, ceremonial locations, etc.	Historic Resources inventory, public consultation.	First Nations Consultation Policy, Historical Resources Act.	Compare location of identified traditional use sites to planned treatment boundaries and adapt plan for consultation if required.	Documentation of consultations; Review of management activities and level of protection achieved; Stewardship Report.	Not all cultural features are impacted by burn or harvest, in which case site- specific level of protection will be evaluated in operational plans.	Determine alternative protection methods for future treatments.		6.1.1.1
		9.1.2 Number and diversity of cultural stakeholders involved in R11 planning.	Representatives from local First Nations participating in stakeholder meetings.	Stakeholder list derived from the Bighorn Backcountry Access Management Plan process, targetted invitations.	First Nations Consultation Policy	Invite and encourage cultural stakeholders to participate in all R11 planning and consultation exercises.	Documentation of consultations; Stewardship Report.	Participation of representatives depends on individual or band interest level.	Attempt to engage additional cultural stakeholders if sufficient representation is not achieved.	FD	6.1.1.1
	9.2 Allow continued use of forest for non- timber products such as mushrooms, medicinal plants, berries, etc.	9.2.1 Known incidences of non- timber product use.	Continued and enhanced use of non- timber products in the R11 FMU.	Charrette, local knowledge, advertisements	Planning Standard	Ensure site-specific protection, where necessary, through prescribed burn or harvest plans.	Stakeholder feedback; Stewardship Report.	None	Adjust burn or harvest plans.	FD	5.2.2.1
	9.3 Maintain aesthetic qualities of the landscape where possible.	9.3.1 Visual impact and buffer width.	No increase in proportion of negative comments about aesthetic appeal of changed viewscape; Target for visual buffers yet to be determined.		None	Present a computer simulation of visual impact from key viewpoints to public prior to implementation of treatments; Establish visual buffers in select areas; Foster appreciation for the aesthetic benefits arising from the changed viewscape.	Visitor survey; Stewardship Report.		Address visual impacts in future burn or harvest plans.	FD	n/a
	9.4 Minimize changes to air quality as a result of prescribed burn treatments.	9.4.1 Number of smoke-filled days in high use areas.	Less than five consecutive smoke- filled days per year in high use areas as a result of prescribed burn treatments.	Parks Canada experience on consecutive smoke days tolerated by public.		Attempt to initiate prescribed burns only when conditions are optimal for smoke dispersion.	Visibility distance from nearest fire tower; Number of complaints received; Stewardship Report.	Weather conditions may influence smoke dispersion on multi-day burns.	Adjust size and number of subsequent burn units.	FD	n/a
10. Recreational Opportunities	10.1 Maintain infrastructure and recognize volunteer efforts to maintain or replace infrastructure.	10.1.1 Location of staging areas, washrooms, bridges, campgrounds, trails, roads.	No impact to infrastructure from treatments.	GPS locations of all infrastructure.	None	Maintain an inventory of staging areas, washrooms, etc.; Provide department assistance with repair / replacement of damaged infrastructure.	Work with Bighorn Backcountry Monitoring Group; Stewardship Report.	Conditions may result in some damage during prescribed burns.	Volunteer groups will be consulted regarding options for replacement or upgrading of infrastructure damaged by treatments.	FD	5.2.2.1
	10.2 Maintain tourism appeal (i.e., for snowmobiles, off- highway vehicles, hiking, camping, hunting, fishing, berry picking) and opportunities to enhance personal health and wellness.	10.2.1 Annual number of visitors and visitor feedback on quality of experience including aesthetics, general enjoyment, and opportunities to promote personal wellness.	Visitor trends follow trends in other jurisdictions (e.g., Banff); No decline in proportion of positive visitor feedback.	Visitor trends from other agencies.	None	Monitor visitor trends from other agencies; Investigate other possible indicators that better reflect the objective.	Tourist information booth counts; Banff National Park gate traffic counts; Visitor surveys; Stewardship Report.		Investigate causal factors behind downtrends		5.2.2.1

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11. Access	11.1 Adhere to a "no new permanent access" policy in the R11 area while maintaining existing access.	11.1.1 Kilometers of permanent trails or roads open to public by use type.	4190 km of permanent access open to public for the following use types: foot access, equestrian, mountain biking, snowmobiles, off-highway vehicles, on-highway vehicles.	Amount of existing access within the Bighorn Backcountry.	Bighorn Backcountry Access Management Plan	Maintain and improve existing trails and roads in the R11 area; Reclaim any new temporary access; Work with the Bighorn Backountry Monitoring Group to promote the Adopt-a-Trail program.	Recreational Trail Monitoring program; GIS data layer and analysis; Stewardship Report.		Close trails suffering from abuse and lack of maintenance; Address any failures to reclaim new access.	FD	1.1.1.3; 5.2.2.1
12. Community Integrity	12.1 Protect community appeal for local residents by encouraging economic potential, providing quality recreational opportunities, and protecting private infrastructure and property.	12.1.1 Economic growth.	Tax base of Clearwater County for R11 area is maintained or increased.		None	Complete and implement Clearwater County Development Node plans.	No data currently available - default to Indicator 10.2.1 as a measure of economic health.			FD	5.2.2.1
		12.1.2 Local user feedback on quality of recreational experiences including aesthetics and general enjoyment.	No decline in the proportion of positive user feedback.		None	See Indicators 9.3.1, 10.1.1, and 11.1.1	User surveys; Stewardship Report.		Investigate causal factors behind downtrends	FD	5.2.2.1
		12.1.3 Integrity of personal property in or near treatment areas.	Complete protection of private property during treatment activities.		None	Maintain GIS data coverage of trapper cabin locations; Encourage trappers to FireSmart around their cabins; Consult with affected communities or individuals; Implement community protection plans.				FD	5.2.2.1
13. Information and Education	13.1 Communicate the rationale behind and benefits resulting from burn and harvest treatments in R11.	13.1.1 Activities demonstrating communication and education (e.g., presentations, signage, websites, literature, field tours).	Ongoing and timely multi-pronged communication and public education program.		Planning Standard	Develop and implement communications strategy that may include any or all of the following: Creation of static display; One sign per burn adjacent to main routes highlighting the potential increase in wildlife encounters; School education programs; Information on NRV, fire ecology, and harvest ecology on R11 website; Website links to partner sites / Bighorn Backcountry FLUZ sites, etc.; R11 information pamphlet available at area accommodations and campgrounds.	Documentation of all communication activities; Feedback from participants in programs and presentations; Stewardship Report.	None		FD	6.2.1.1

14. Multi- Agency Cooperation	14.1 Employ a multi- jurisdictional approach to managing fire and pests at both the planning and operational levels.	14.1.1 Harmonized plan objectives compatible across agency boundaries.	Timely and meaningful consultation with stakeholder agencies; Refer to targets identified in management plans for embedded or adjacent protected areas.	Protected Areas management plans; National Parks management plans.	Planning Standard, National Parks Act, Wilderness Areas, Ecological Reserves, and Natural Areas Act, Provincial Park Act, Historical Resources Act, individual parks management plans, IRP.	Participate in North Saskatchewan Watershed Alliance Integrated Watershed Management Plan, adjacent area plans, and emergency response plans (e.g., coordinating prescribed burn plans near the National Park boundaries with Parks Canada).	Regular R11 stakeholder meetings to monitor implementation of the R11 Forest Management Plan; Documentation of consultation processes; Stewardship Report.		FD	1.4.1.1
		14.1.2 Joint operations among agencies when implementing fire and pest management treatments.	Participation in joint treatments with other agencies.			Arrange meetings with other agencies to coordinate operational plans.	Stewardship Report		FD	n/a
	14.2 Ensure protection of timber adjacent to the R11 FMU is achieved through complementary fire and pest management plans.	14.2.1 Number of adjacent forest companies with a fire and pest management plan.	All adjacent FMA holders with a fire and pest management plan that is compatible and integrated with the R11 FMP.		Planning Standard	Continue regular meetings with adjacent National Parks, ACD, and FMA holders regarding mountain pine beetle; Provide input during the FMP review process for adjacent FMAs.	Stewardship Report			n/a
	14.3 Share data, information, and resources among stakeholder agencies.	14.3.1 Awareness among stakeholder agencies of other available agencies, resources, or services and initiatives in the R11 area.	Current and accessible list of all available agencies, resources or services and initiatives in the R11 area; Regular communication among agencies to discuss new initiatives and opportunities to maximize utility of data and resources (e.g., regular stakeholder meetings).			Develop a process that ensures all stakeholder agencies are informed and kept up to date; Maintain a current website of agency initiatives in the R11 area; Update GIS data coverages regularly.	Documentation of communications with and data requests from stakeholder agencies; Stewardship Report.	None		n/a
15. Public Safety	15.1 Ensure public safety along existing trails through burned and harvested areas.	15.2.1 Identification and mitigation of risk trees in burned and harvested areas.	Mitigation of all risk trees along existing trails running through burned and harvested areas.	GIS analysis.	None	Current fuel management project plans address hazards along existing trails; Compare harvest and burn boundaries with location of high use trails; Develop a plan to deal with all risk trees	Stewardship Report	Investigate and mitigate the risk if complaints are received regarding specific trees or trails	FD .	n/a