C5 FOREST MANAGEMENT PLAN 2006–2026

# APPENDIX 4A. LANDSCAPE ASSESSMENT

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This landscape assessment document was developed between 2002-2004. Some information such as the net landbase was updated in 2005; therefore, some of the information presented here does not coincide precisely with that provided in Appendix 6. Where discrepancies in similar information are noted Information from Appendix 6A and 6B shall take precedence.

# 1.0 INTRODUCTION, PURPOSE AND APPROACH TO THE LANDSCAPE ASSESSMENT

The landscape assessment is intended to provide a snapshot of baseline conditions in the C5 Forest Management Unit. This baseline information will provide managers with a means of assessing change over time and act as a measuring device to assess the success of the FMP's preferred forest management scenario in meeting the stated values and objectives. The landscape assessment will identify the current characteristic vegetation, land use patterns and landscape conditions within the FMU.

# 2.0 DESCRIPTION OF C5 FOREST MANAGEMENT UNIT

The C5 Forest Management Unit (FMU) is located entirely within the Rocky Mountains Forest Reserve in the southwest corner of the Province of Alberta. Primarily on the eastern side of the continental divide (i.e., the Alberta–British Columbia border), and lying to the north of Waterton Lakes National Park and south of Kananaskis Country, this forest management unit occupies 3,522 $km^2$ (352,200 ha) of the forested area.

## DEMOGRAPHICS

Two cities are located within a "day trip and return" distance of the C5 FMU: Calgary (pop. 951,395) and Lethbridge (pop. 67,374). Other surrounding local and larger towns include the Municipality of Crowsnest Pass (pop. 6,262), Pincher Creek (pop. 3,666), Fort Macleod (pop. 2,990), Cardston (pop. 3,475) and Claresholm (pop. 3,622). The population numbers were acquired from the 2001 census from Statistics Canada. Table 1 provides the workforce statistics for cities and larger towns within easy driving distance of the C5 FMU.

**Table 1. Workforce statistics.**

| City or Town | Total Workforce | Primary Industries — Agriculture and Other Resource-Based Industries | Secondary Industries — Manufacturing and Construction Industries | Tertiary Industries — Service Industries |
|---|---|---|---|---|
| Calgary | 470,219 | 28,652 | 75,697 | 365,870 |
| Lethbridge | 33,967 | 1,080 | 5,217 | 27,670 |
| Crowsnest Pass | 2,687 | 590 | 447 | 1,650 |
| Pincher Creek | 1,860 | 190 | 250 | 1,415 |
| Fort Macleod | 1,467 | 132 | 180 | 1,155 |
| Cardston | 1,277 | 69 | 64 | 1,144 |
| Claresholm | 1,699 | 156 | 192 | 2,047 |
| Total | 513,176 | 30,869 | 82,047 | 400,951 |
| Percent | 100% | 6% | 16% | 78% |

## PHYSICAL DESCRIPTION

The C5 FMU is located within one of the most ecologically diverse regions in the province. Vegetation and landforms characteristic of the aspen parkland, boreal foothills, montane, subalpine and alpine natural subregions can be found within the FMU.

The FMU has been subdivided into a number of landscape management units (LMUs), as shown in Table 2 and illustrated on Map 1. In addition, the area has been divided into compartments and watershed management units for TSA purposes, as illustrated in Maps 2 and 3. For ease of reporting metrics in this forest management plan, the landscape units were grouped into five unique subregions. These five subregions are illustrated in Map 4 and will be referenced as the C5 Subregions throughout this Landscape Assessment. The C5 Subregions are not to be confused with the natural subregions, which are discussed in the following section.

**Table 1. Landscape unit summary.**

| Landscape Management Unit | Total Hectare | Hectares in C5 | Percent in C5 | Percent of C5 |
|---|---|---|---|---|
| Alpine High Rock | 8479.56 | 8388.52 | 98.93% | 2.38% |
| Beaver | 43390.38 | 12496.71 | 28.80% | 3.55% |
| Carbondale | 15337.80 | 15337.72 | 100.00% | 4.36% |
| Castle/West Castle | 39923.80 | 39923.80 | 100.00% | 11.35% |
| Chapel Rock | 26619.32 | 660.52 | 2.48% | 0.19% |
| Crowsnest Pass | 7727.36 | 1210.33 | 15.66% | 0.34% |
| East Ranchlands | 39993.13 | 141.20 | 0.35% | 0.04% |
| Flathead | 7645.94 | 7639.82 | 99.92% | 2.17% |
| Head Water Valleys | 34283.47 | 34208.82 | 99.78% | 9.72% |
| Horseshoe Parkland | 67044.44 | 1464.09 | 2.18% | 0.42% |
| Ironstone | 16379.07 | 13150.24 | 80.29% | 3.74% |
| Livingstone Valley | 7197.68 | 7197.68 | 100.00% | 2.05% |
| Middle Ridges | 73645.04 | 67711.58 | 91.94% | 19.24% |
| North Livingstone | 38016.32 | 37098.30 | 97.59% | 10.54% |
| Porcupine Hills | 81737.92 | 39268.37 | 48.04% | 11.16% |
| Saddle Mountain | 19788.44 | 11915.58 | 60.21% | 3.39% |
| South Fescue | 29164.44 | 85.96 | 0.29% | 0.02% |
| South Front Range | 26630.17 | 26569.51 | 99.77% | 7.55% |
| South Livingstone | 7947.96 | 7763.93 | 97.68% | 2.21% |
| Spread Eagle | 16744.03 | 1867.55 | 11.15% | 0.53% |
| Whaleback | 39607.93 | 17785.32 | 44.90% | 5.05% |
| | 647304.20 | 351885.55 | | 100.00% |

## Ecological Land Classification

Ecological classification provides a synthesis of the climate, physiographic, and vegetation characteristics of an area. Within the C5 FMU, the most detailed level of ecological mapping that has been completed is to the level of the natural subregions (Map 5). This level of classification provides a context in which to interpret the C5 FMU landbase in relation to adjacent regions of the province.

The topography of the planning area is highly varied. Significant terrain changes occur as one moves from east (Foothills Parkland Subregions) to west (Alpine Subregion). On the eastern edge of the FMU, the prairies give way to forest-covered rolling terrain (Montane Subregion). In some areas, the rolling prairie landscape comes to a somewhat abrupt stop at the base of the steep-sided Rocky Mountains (Sub-alpine and Alpine Subregions).

## Foothills Parkland Subregion

The Foothills Parkland Subregion occupies a narrow band along the eastern edge of the foothills from Calgary south to the Porcupine Hills, and from Pincher Creek south to the U.S. border in the Waterton Lakes National Park area. The topography is rougher than that of the Central Parkland Subregion and elevations are higher, ranging to over 1300 m near Paine Lake. Surficial deposits include extensive areas of hummocky and ground moraine as well as more restricted areas of outwash and glaciolacustrine deposits along valleys. Extensive river terraces occur in some areas.

Mean annual precipitation ranges from 650 mm in the far south to 500 mm in the northern part of the subregion. The mean May–September temperature is 12-13°C and the frost-free period averages 90 days. Predominant soils in the forested areas are Black Chernozems with Dark Brown and Black Chernozems in the grasslands. Regosolics occur on active stream floodplains, while Gleysolics occur in wetland sites.

Foothills Parkland generally forms a narrow, transitional band between the grasslands of the Foothills Fescue Subregion and the forests of the Montane Subregion. As in the Central Parkland Subregion, there is a continuum from open grassland with some groves, to forests containing meadows, to closed deciduous forest. Because of rapid topographic and climatic change, the transition in vegetation occurs over distances of 1-5 km. This compression results in significant diversity within small geographic areas. The northern boundary has been placed near Calgary since this is the northern limit of a number of distinctive southwestern species.

The grassland is similar to the Foothills Fescue Subregion, a fescue–oat grass community with a large diversity of forb and grass species. Aspen generally dominates upland forests with balsam poplar on moister sites. A distinctive characteristic of these woods in the southwestern part of the subregion is large amounts of glacier lily which bloom in early-to-mid May. Willow groveland, a distinctive community, occurs extensively in the northern part of the subregion.

## Montane Subregion

The Montane Natural Subregion is characterized by a pattern of open forests and grasslands. Tree species include Douglas fir, lodgepole pine, white spruce, limber pine and aspen. Modal sites have stands of Douglas fir, lodgepole pine, white spruce, aspen or mixtures of all. Limber pine is restricted to dry, exposed ridgetops. Understory vegetation is very diverse in this subregion. Common shrub species include thimbleberry, creeping mahonia, Canada buffalo berry, bearberry and snowberry. Herb species are varied and include species not found elsewhere in Alberta.

This subregion occurs in the passes of the Rocky Mountains including the Crowsnest, Bow and North Saskatchewan valleys in southwestern Alberta. The Porcupine Hills are also included in the subregion as well as the front ranges of the Rocky Mountains in the extreme southwest. Soils are highly variable due to the complex topographic and climatic conditions; Chernozems, Brunisols and Regosols occur under grasslands while Brunisols and Luvisols are common under forests.

The climate of this subregion is generally warmer than the other subregions in the area. Chinooks are characteristic and the area is intermittently snow-free in winter.

## Subalpine Subregion

Lower elevations of the Subalpine Natural Subregion are characterized by closed forests of lodgepole pine, Engelmann spruce and subalpine fir. At higher elevations, the forest canopy is generally more open. Subalpine larch and whitebark pine are found at these higher elevations, particularly in the southern portion of the subregion. Grasslands are common on steep south- and west-facing slopes.

White-flowered rhododendron, false azalea and grouse-berry are characteristic understory shrubs within the subregion. These species rarely occur at lower elevations; therefore, they are good indicators of the subalpine environment. At upper elevations, mountain heathers are a common species.

The topography of the subregion consists of strongly rolling ridges and lower slopes of mountains, often with bedrock close to the surface. The subregion falls mainly within the Rocky Mountains and Rocky Mountain Foothills. Parent materials are commonly moraine and colluvium, usually underlain by bedrock at varying depths. Soils are dominantly Brunisols or Regosols.

Winter precipitation is greater in this subregion than in any other part of Alberta. Often there is more than 200 cm of snowfall. This subregion exhibits considerable mesoclimatic variability from north to south. It also has significant variations in elevation, which results in a broad range of characteristic species on mesic sites. Refinement of the subregion classification into upper and lower and latitudinal subdivisions would enhance the resolution of the ecosite classification, but was not incorporated into the classification because the ecological relationships are not completely understood.

## Alpine Subregion

The Alpine Subregion includes all areas above tree line including vegetated areas, rockland, snowfields and glaciers. Materials are generally residual bedrock and colluvium, often on steep slopes. Extensive areas of unvegetated bedrock occur. Rock glaciers occur from Kananaskis Country north to Jasper National Park; however, none are noted within the C5 FMU.

Climatic data for the Alpine Subregion are spotty, both geographically and in time. However, this is likely the coldest subregion in Alberta, with mean May–September temperatures of about 6°C and essentially no frost-free period. Winter temperatures are colder than in the Subalpine Subregion. Mean annual precipitation ranges from 420-850 mm, and is likely higher in some areas.

Much of the Alpine Subregion has no soil, as the amount of weathered material is too thin to qualify as a soil. Generally, soils are weakly developed Regosolics and Brunisolics. Alpine vegetation typically forms a complex, fine-scale mosaic in which microclimatic variations are

reflected by marked changes in dominant species. Significant environmental factors include aspect, wind exposure, time of snow melts, soil moisture and snow depth.

Deep, late-melting snowbeds are occupied by black alpine sedge communities. Moderate snowbed communities typically contain dwarf shrub–heath tundra, which is dominated by heathers, mountain heathers and grouseberry. Shallow snow areas on ridgetops and other exposed sites typically contain communities dominated by white mountain avens, snow willow, and moss campion or kobresia. Diverse, colourful herb meadows occur in moist sites below melting snowbanks or along streams. Highest elevation communities are composed mainly of lichens on rocks and shallow soil.

Some floristic differences are apparent south of the Crowsnest Pass. Mountain heathers are absent and heathers are more restricted than further north. Bear grass meadows occur in some low elevation Alpine areas, and other vegetation communities are apparently confined to this part of the province.

Canada Land Inventory (CLI) Land Capability for Forestry (Map 6) provides a general description of the soils associated with the forest productivity classes found in the FMU. Forest productivity is moderately to severely limited on about 60% of the gross landbase. Limiting factors to vegetative growth are likely due to poor soil fertility and lack of soil moisture. The remaining 40% of the landbase consists of high alpine areas, rock and rangelands.

The Timber Productivity Rating (TPR) is also an indication of site potential for forest growth. The TPR values are calculated on an individual stand basis using combinations of height, age and primary species. A summary of TPR values for the landscape are provided in Table 2. Map 7 illustrates the distribution of TPR values across the operational and non-operational landbase.

**Table 2. Timber productivity rating summary.**

| Landbase | Timber Productivity Rating | Gross Area (ha) | Percent of Gross Area |
|---|---|---|---|
| Operational | Good | 7,066.4 | 2.0% |
| | Medium | 63,790.0 | 18.1% |
| | Fair | 60,032.4 | 17.1% |
| | Unproductive | 781.8 | 0.2% |
| | Non-forested* | 4.2 | 0.0% |
| Non-operational | Good | 1,466.7 | 0.4% |
| | Medium | 23,550.3 | 6.7% |
| | Fair | 72,286.2 | 20.5% |
| | Unproductive | 76,494.0 | 21.7% |
| | Non-forested** | 46,395.12 | 13.2% |
| Total | | 351,885.6 | 100.0% |

** includes new cutovers*

***includes new cutovers and 20,271.4 ha in recent burns*

## INTEGRATED RESOURCE PLANNING

The C5 FMU is situated within Alberta's eastern slopes; as a result, it is subject to Alberta's *Eastern Slopes Policy* (ESP). This policy was subsequently refined for the FMU through the development and adoption of integrated resource plans (IRPs).

The C5 FMU is overlain by four Integrated Resource Planning areas (Map 8). These are Kananaskis Country, Livingstone–Porcupine Hills, Crowsnest Corridor, and Castle River.

Subregional Integrated Resource Plans have been developed for three of these areas, and a local IRP was developed for the Crowsnest Corridor. These plans were prepared by government agencies with public consultation in recognition of the need for improved management of these lands and resources. These plans apply only to public lands within their respective area, and not to any private or federal land.

IRPs present the Government of Alberta's resource management policy for the public lands and resources within their respective area. They are intended to be a guide to resource managers, industry and the public having responsibilities or interest in the area, rather than a regulatory mechanism. A permanent timber landbase that has been established through the refinement of the Eastern Slopes zones and through more specific land use allocations. These zones are depicted in Map 9.

In summary, all IRP planning areas contain a diverse set of natural resources possessing significance at local, regional, provincial, national and international levels. Direction contained in IRPs emphasize the continued maintenance of high-quality and quantity water, the preservation of environmentally sensitive terrain and critical wildlife ranges, the diversity of wildlife and fisheries populations, high-quality recreation opportunities, and extractable resource uses such as timber, petroleum, natural gas, coal and range feedstock. The diversity of these resources requires resource management to proceed in an orderly and comprehensive manner. The IRPs were prepared as a means to achieve this.

## LANDBASE SUMMARY

The landbase within the C5 FMU is assessed for its timber harvesting potential. This is done by analytically/spatially removing all non-forested and certain types of forested lands (i.e., lands where commercial harvest is not foreseen during the life of the C5 FMP) from the gross landbase. Lands that remain are considered to be the Timber Harvesting Landbase. Table 4 provides a summary of forested and non-forested lands that were removed from the gross landbase. Tables 5 and 6 provide a more detailed summary of landbase reductions by the five C5 Subregions and by landscape management units, respectively. Appendix 6A, Landbase Description, contains the most current update for this information. Map 10 illustrates the distribution of these deletions across the C5 FMU.

Removing the deciduous-dominated stands from the timber harvest landbase (see table below) reduces the net timber harvesting landbase for coniferous production to 117,551 ha.

**Table 3. Timber harvesting landbase summary.**

| Classification | Area (ha) | Area (ha) | Percent of Total Area |
|---|---|---|---|
| Total Landbase | | 351,885.60 | 100.00% |
| Reductions to Gross Landbase | | | |
| Access | 656.9 | | 0.2% |
| Recent Burn | 16,387.4 | | 4.7% |
| Seismic Lines | 1,673.2 | | 0.5% |
| Random Camping Buffers | 832.9 | | 0.2% |
| Private Land | 2,962.8 | | 0.8% |
| Hydrography Buffers | 2,564.1 | | 0.7% |
| Subjective Deletions | 20,245.2 | | 5.8% |
| Pipelines | 389.6 | | 0.1% |
| Protected Areas | 35,205.0 | | 10.0% |
| Recreation Areas | 838.8 | | 0.2% |
| Slopes >45% | 36,419.6 | | 10.3% |
| Unproductive (TPR = U) | 15,706.6 | | 4.5% |
| Wetlands Buffer | 1,425.7 | | 0.4% |
| Non-forested | 20,805.9 | | 5.9% |
| ESP Zone 1 (Prime Protection) | 64,097.3 | | 18.2% |
| Total reductions to gross landbase | 220,210.8 | 220,210.8 | 62.6% |
| Timber harvesting landbase | | 131,674.8 | 37.4% |

**Table 4. Timber harvesting landbase summary by C5 Subregion.**

| Classification/Subregion | Castle | Continental Divide North | Continental Divide South | Livingstone | Porcupine Hills | Total Area (ha) |
|---|---|---|---|---|---|---|
| Total Landbase (in ha) | 54,027.6 | 39,280.7 | 66,332.3 | 152,824.6 | 39,420.5 | 351,885.6 |
| Reductions to Gross Landbase | | | | | | |
| • Access | 94.8 | 94.3 | 91.1 | 272.7 | 104.1 | 656.9 |
| • Recent Burn | 5,844.1 | | 10,305.3 | 238.0 | | 16,387.4 |
| • Seismic Lines | 189.1 | 228.0 | 245.7 | 660.8 | 349.5 | 1,673.2 |
| • Random Camping Buffers | 56.7 | 64.5 | 155.8 | 468.6 | 87.2 | 832.9 |
| • Private Land | | | 1,215.2 | 1,650.7 | 96.8 | 2,962.8 |
| • Hydrography Buffers | 544.5 | 304.5 | 740.1 | 923.8 | 51.1 | 2,564.1 |
| • Subjective Deletions | 1,742.0 | 712.2 | 248.7 | 12,526.7 | 5,015.7 | 20,245.2 |
| • Pipelines | 119.1 | 36.5 | | 206.3 | 27.7 | 389.6 |
| • Protected Areas | | 8,343.0 | 57.1 | 26,804.9 | 0.0 | 35,205.0 |
| • Recreation Areas | 96.7 | 33.7 | 580.1 | 128.3 | | 838.8 |
| • Slopes >45% | 6,361.8 | 2,120.0 | 6,382.0 | 21,138.5 | 417.2 | 36,419.6 |
| • Unproductive (TPR = U) | 1,436.8 | 1,945.2 | 788.8 | 11,309.9 | 225.9 | 15,706.6 |
| • Wetlands Buffer | 190.5 | 8.3 | 209.6 | 1,007.8 | 9.4 | 1,425.7 |
| • Non-forested | 2,311.9 | 641.8 | 1,201.6 | 9,836.6 | 6,814.0 | 20,805.9 |
| • ESP Zone 1 (Prime Protection) | 19,446.6 | 7,065.6 | 24,416.7 | 13,168.5 | | 64,097.3 |
| Total reductions to gross landbase | 38,434.7 | 21,597.5 | 46,637.7 | 100,342.1 | 13,198.7 | 220,210.8 |
| Timber harvesting landbase | 15,592.9 | 17,683.2 | 19,694.6 | 52,482.4 | 26,221.8 | 131,674.8* |

**This includes deciduous leading types which are not part of the 2006 coniferous timber supply analysis. See Table 2-1, Appendix 6B for most current information on the coniferous timber harvesting landbase.*

**Table 5. Timber harvesting landbase summary by LMU.**

| Classification/LMU | Alpine High Rock | Beaver | Carbondale | Castle/West Castle | Chapel Rock | Crowsnest Pass | East Ranchlands | Flathead | Head Water Valleys | Horseshoe Parkland | Ironstone | Livingstone Valley | Middle Ridges | North Livingstone | Porcupine Hills | Saddle Mountain | South Fescue | South Front Range | South Livingstone | Spread Eagle | Whaleback | Total Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Landbase (in ha) | 8,388.5 | 12,496.7 | 15,337.7 | 39,923.8 | 660.5 | 1,210.3 | 141.2 | 7,639.8 | 34,647.2 | 1,464.1 | 13,150.2 | 7,021.2 | 67,449.6 | 37,098.4 | 39,268.4 | 11,915.6 | 86.0 | 26,569.5 | 7,763.9 | 1,867.6 | 17,785.3 | 351,885.6 |
| | | | | | | | | | | | | | | | | | | | | | | |
| Reductions to Gross Landbase | | | | | | | | | | | | | | | | | | | | | | |
| • Access | 0.6 | 51.6 | 15.3 | 68.9 | 0.5 | 9.9 | | 2.5 | 97.3 | 0.4 | 4.6 | 64.1 | 159.5 | 16.9 | 104.1 | 20.4 | | 11.1 | 1.3 | 27.5 | 0.5 | 656.9 |
| • Recent Burn | | 753.1 | 10,098.2 | 199.0 | | | | 8.1 | | | 5,091.0 | | 238.0 | | | | | | | | | 16,387.4 |
| • Seismic Lines | 0.4 | 113.9 | 29.0 | 192.7 | 6.7 | 15.8 | 0.1 | 3.4 | 246.8 | 16.2 | 52.8 | 35.4 | 373.0 | 80.4 | 349.3 | 112.8 | | 13.5 | 12.7 | 9.0 | 9.4 | 1,673.2 |
| • Random Camping Buffers | | 49.2 | 52.2 | 94.8 | | 32.5 | | 0.0 | 73.5 | | 7.5 | 206.6 | 228.8 | 0.3 | 87.2 | | | | | | | 832.9 |
| • Private Land | | | | 263.9 | 213.0 | 51.6 | | 134.9 | 780.4 | | | 66.4 | 599.7 | | 96.8 | | | | 756.1 | | | 2,962.8 |
| • Hydrography Buffers | 5.1 | 302.0 | 94.5 | 617.8 | | 32.0 | | 7.6 | 312.5 | 2.8 | 58.3 | 255.4 | 400.9 | 97.7 | 51.1 | 141.6 | | 114.2 | | 70.1 | 0.4 | 2,564.1 |
| • Subjective Deletions | 26.1 | 544.8 | 13.4 | 142.3 | 29.2 | 20.2 | 14.8 | 15.6 | 801.0 | 14.7 | 716.5 | 568.1 | 6,757.9 | 3,142.1 | 5,000.9 | 1,516.0 | | 481.7 | 331.8 | 0.6 | 107.3 | 20,245.2 |
| • Pipelines | 4.3 | 43.0 | | | | 17.6 | | | 32.2 | 0.4 | 2.2 | 56.8 | 87.4 | 27.2 | 27.2 | 16.9 | 0.5 | 36.6 | | 37.2 | | 389.6 |
| • Protected Areas | 2,457.9 | | | 57.1 | | | | | 5,885.1 | 14.0 | | 21.0 | | 9,911.3 | | | 76.4 | | 114.1 | | 16,668.1 | 35,205.0 |
| • Recreation Areas | | 85.9 | 21.7 | 558.4 | | 14.0 | | | 33.7 | | | 23.6 | 76.1 | | | 14.6 | | 10.8 | | | | 838.8 |
| • Slopes > 45% | 353.8 | 723.3 | 1,462.9 | 4,256.4 | 1.2 | 28.2 | 1.5 | 405.3 | 2,056.3 | 107.2 | 2,608.0 | 147.1 | 14,720.6 | 5,106.1 | 415.7 | 396.7 | | 3,042.0 | 570.5 | 8.1 | 8.6 | 36,419.6 |
| • Unproductive (TPR = U) | 75.0 | 180.7 | 103.7 | 609.9 | | | 7.2 | 53.9 | 1,891.5 | 90.7 | 161.3 | 776.1 | 6,014.6 | 3,677.4 | 218.7 | 693.7 | | 903.8 | 46.1 | 193.2 | 9.4 | 15,706.6 |
| • Wetlands Buffer | 4.8 | 109.5 | 16.3 | 139.5 | | 6.9 | | | 57.3 | 42.3 | 12.3 | 212.1 | 129.0 | 203.0 | 9.4 | 384.1 | | 14.3 | | 54.5 | 30.3 | 1,425.7 |
| • Non-forested | 96.7 | 1,126.1 | 105.1 | 906.7 | 123.5 | 58.4 | 82.5 | 49.6 | 672.5 | 135.1 | 151.9 | 834.9 | 4,841.9 | 2,157.5 | 6,726.8 | 1,194.7 | 3.6 | 808.8 | 354.5 | 234.8 | 140.1 | 20,805.9 |
| • ESP Zone 1 (Prime Protection) | 5,234.8 | 347.2 | 1,301.4 | 16,006.1 | | | | 6,787.3 | 2,152.6 | | 115.3 | 0.2 | 3,158.4 | 5,713.8 | | | | 18,819.0 | 4,216.7 | 188.5 | 55.9 | 64,097.3 |
| Total reductions to gross landbase | 8,259.6 | 4,430.4 | 13,313.8 | 24,113.7 | 374.1 | 287.1 | 106.2 | 7,468.1 | 15,092.7 | 423.8 | 8,981.5 | 3,267.7 | 37,785.7 | 30,133.8 | 13,087.2 | 4,491.6 | 80.6 | 24,255.8 | 6,403.9 | 823.4 | 17,030.0 | 220,210.8 |
| Timber Harvesting Landbase | 129.0 | 8,066.4 | 2,023.9 | 15,810.1 | 286.4 | 923.2 | 35.0 | 171.7 | 19,554.5 | 1,040.3 | 4,168.7 | 3,753.5 | 29,663.9 | 6,964.6 | 26,181.1 | 7,424.0 | 5.4 | 2,313.7 | 1,360.1 | 1,044.2 | 755.3 | 131,674.8 |

## FOREST COVER DISTRIBUTION

The C5 FMU consists of several distinct forest types that vary significantly in both species and age class groupings. The current composition of the forest has been the result of natural disturbances, predominately fire. Human influences have also affected the contiguity of forest stands significantly (e.g., burning by Aboriginal people, human settlement, ranching/farming, industrial activity and recreation). In addition, the region has been impacted by forest harvesting activities that are localized throughout the FMU.

Tables 7 and 8 provide a summary of the dominant forest cover in detail between forested lands and non-forested vegetation types. Figure 1 illustrates the distribution of the dominant forest cover classification in C5 FMU. The resulting mosaic is further described in the following section.

**Table 6. Dominant vegetative cover.**

| Dominant Vegetative Cover | Total Area (ha) | % of C5 |
|---|---|---|
| Aspen | 25,591.71 | 7.27% |
| Douglas Fir | 17,313.45 | 4.92% |
| Grassland Dry | 19,480.06 | 5.54% |
| Grassland Mesic | 21,869.94 | 6.22% |
| Herbaceous Clearcut | 11,609.18 | 3.30% |
| Partial Cut/Regenerating Clearcut | 4,477.63 | 1.27% |
| Lodgepole Pine | 111,110.10 | 31.58% |
| Barren Rock | 23,194.17 | 6.59% |
| Spruce | 59,102.94 | 16.80% |
| Subalpine Fir | 19,339.86 | 5.50% |
| Other | 38,796.56 | 11.02% |
| Total | 351,885.6 | 100.00% |

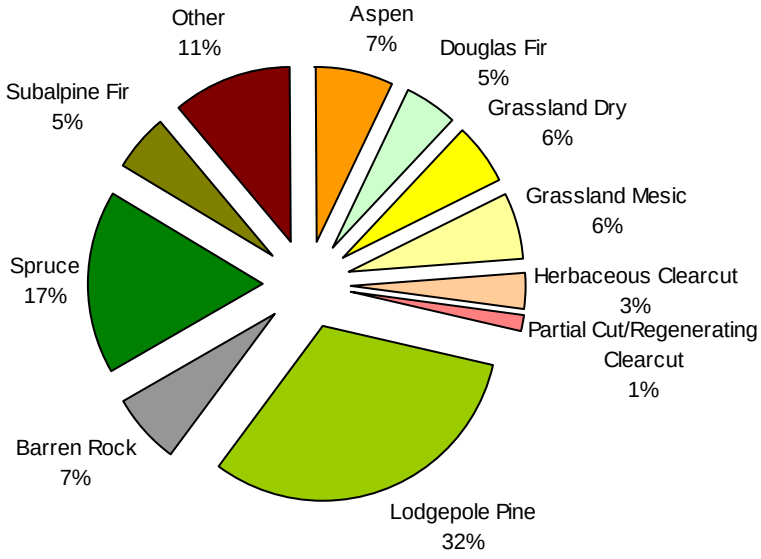


**Figure 1. Dominant forest cover classification in C5 FMU.**

**Table 7. Land features and vegetative cover classifications for the C5 FMU.**

| Land Features and Vegetative Cover | Total Area (ha) | % of C5 |
|---|---|---|
| Annual Crops | 1.4062 | 0.00 |
| Aspen | 25,591.7087 | 7.27 |
| Aspen Mixedwood | 1,711.8197 | 0.49 |
| Balsam Poplar | 872.3160 | 0.25 |
| Balsam Poplar Mixedwood | 604.0120 | 0.17 |
| Cutbank/Sand | 46.8014 | 0.01 |
| Douglas Fir | 17,313.4480 | 4.92 |
| Douglas Fir Mixedwood | 1,314.7582 | 0.37 |
| Farmsteads | 78.1857 | 0.02 |
| Flooded | 47.7633 | 0.01 |
| Forb Meadow | 29.5418 | 0.01 |
| Grassland Dry | 19,480.0628 | 5.54 |
| Grassland Mesic | 21,869.9424 | 6.22 |
| Gravel Pits/Surface Mines | 513.9806 | 0.15 |
| Herbaceous Clearcut | 11,609.1792 | 3.30 |
| Herbaceous Clearing | 3,068.8520 | 0.87 |
| Industrial Reclamation–Vegetated | 440.4753 | 0.13 |
| Lakes/Ponds | 209.2443 | 0.06 |
| Mixed Conifer (Douglas Fir) | 564.9580 | 0.16 |
| Mixed Conifer (Larch) | 2,977.2320 | 0.85 |
| Mixed Conifer (Pine–Lodgepole/Jack) | 127.0781 | 0.04 |
| Mixed Conifer (Spruce) | 1,632.0933 | 0.46 |
| Mixed Conifer (True Fir) | 918.4661 | 0.26 |
| Mixed Conifer (Whitebark/Limber Pine) | 217.8802 | 0.06 |
| Non-Veg ROWs | 1,628.1820 | 0.46 |
| Partial Cut/Regenerating Clearcut | 4,477.6291 | 1.27 |
| Perennial Forage Crops | 387.0682 | 0.11 |
| Permanent Ice/Snow | 46.4923 | 0.01 |
| Pine (Lodgepole/Jack) | 111,110.0993 | 31.58 |
| Pine (Lodgepole/Jack) Mixedwood | 4,570.8995 | 1.30 |
| Plant Sites/Sewage Lagoons | 10.6123 | 0.00 |
| River | 179.4901 | 0.05 |
| Rock Barren | 23,194.1661 | 6.59 |
| Rough Pasture Closed Mesic | 58.3569 | 0.02 |
| Rough Pasture Open Dry | 1,191.5444 | 0.34 |
| Rough Pasture Open Mesic | 21.6079 | 0.01 |
| Rural Residential | 26.0868 | 0.01 |
| Shrub Meadow Closed Dry | 305.1630 | 0.09 |
| Shrub Meadow Closed Mesic | 3,745.9754 | 1.06 |
| Shrub Meadow Open Dry | 2,522.8766 | 0.72 |
| Shrub Meadow Open Mesic | 4,219.0118 | 1.20 |
| Shrub Wetland | 1,059.4879 | 0.30 |
| Spruce | 59,102.9443 | 16.80 |
| Spruce Mixedwood | 2,346.8542 | 0.67 |
| Spruce Wetland | 192.4444 | 0.05 |
| Subalpine Fir | 19,339.8588 | 5.50 |
| Subalpine Fir Mixedwood | 122.5839 | 0.03 |
| Subalpine Larch | 429.1786 | 0.12 |
| Wet Graminoid | 225.0539 | 0.06 |
| Whitebark/Limber Pine | 112.2426 | 0.03 |
| Total | 351,867.1156 | 100.0000 |

The cover group distribution of the landscape area is shown in Map 11. The most notable feature of the map is the large area of contiguous coniferous forest. Forested areas are made up of predominantly pure lodgepole pine as well as the Douglas fir, white/Engelmann spruce types that have successfully avoided fire for extended periods of time. The eastern areas have limited deciduous and mixedwood forest types.

The cover groups were stratified into seven distinct cover types. Tables 9-14 provide summaries in various geographical units for the C5 FMU, while Figures 2 and 3 illustrate the relative distribution of cover types.

**Table 8. Cover type summary for operational and non-operational landbases.**

| Cover Type | Total Area (ha) | Operational (ha) | Percent of Total Area | Non-operational (ha) | Percent of Total Area |
|---|---|---|---|---|---|
| C-Fa/La | 15,151.09857 | 1,190.07313 | 0.3% | 13,961.02544 | 4.0% |
| C-Fd | 21,951.57278 | 11,273.61574 | 3.2% | 10,677.95704 | 3.0% |
| C-Px | 123,602.5581 | 72,683.00852 | 20.7% | 50,919.5496 | 14.5% |
| C-Sx | 61,682.70636 | 27,944.95105 | 7.9% | 33,737.75531 | 9.6% |
| CD | 3,226.00646 | 1,973.13605 | 0.6% | 1,252.87041 | 0.4% |
| DC | 2,665.03193 | 1,700.67108 | 0.5% | 964.36085 | 0.3% |
| D | 20,378.77662 | 14,909.36765 | 4.2% | 5,469.40897 | 1.6% |
| ANF | 6,496.03997 | | 0.0% | 6,496.03997 | 1.8% |
| NNF | 96,731.83944 | | 0.0% | 96,731.83944 | 27.5% |
| Total | 351,885.6303 | 131,674.8232 | 37.4% | 220,210.807 | 62.6% |

| | |
|---|---|
| C-Fa/La | Alpine fir or alpine larch are the leading species according to AVI timber type. |
| C-Fd | Douglas-fir are the leading species according to AVI timber type. |
| C-Px | Lodgepole, whitebark or limber pine are the leading species according to AVI timber type. |
| C-Sx | White spruce or Engelmann spruce are the leading species according to AVI timber type. |
| CD | Conifer-dominated mixedwood (forested areas in which at least 50%, and up to 79%, of the overstory consists of conifer species). Deciduous content is 21-50%. |
| DC | Deciduous-dominated mixedwood (forested areas in which at least 21-49% of the overstory consists of conifer species). Deciduous content is 51-79%. |
| D | Predominantly deciduous (deciduous species comprise 80-100% of the overstoey). |
| ANF | Anthropogenic non-forested. |
| NNF | Naturally non-forested. |

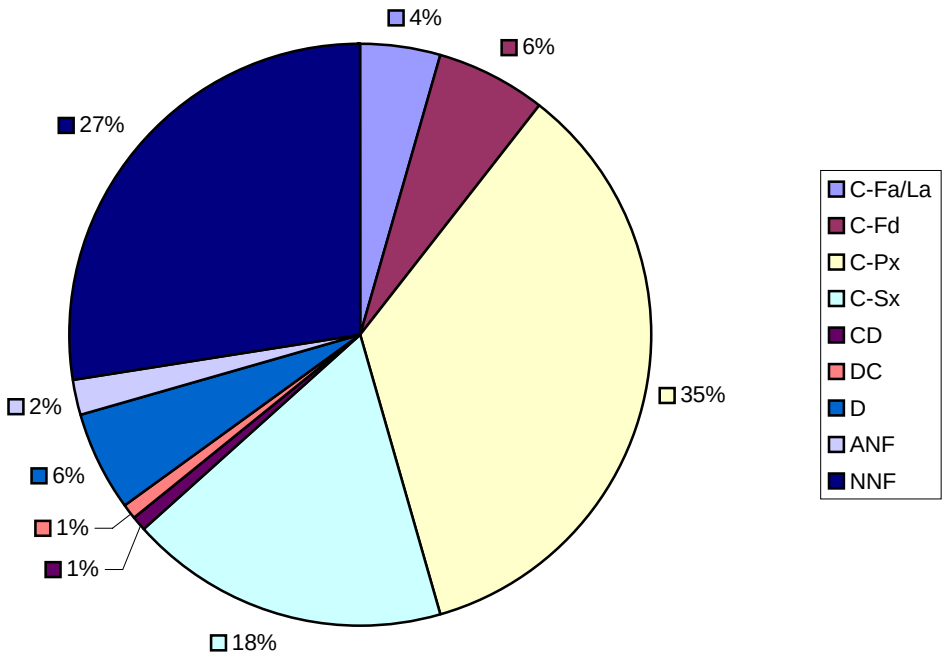


**Figure 2. Cover type summary for gross C5 FMU area.**

**Table 10. Cover type summary by gross landbase as per C5 Subregion.**

| Cover Type/ Subregion | Castle | Percent of Subregion | Continental Divide North | Percent of Subregion | Continental Divide South | Percent of Subregion | Livingstone | Percent of Subregion | Porcupine Hills | Percent of Subregion |
|---|---|---|---|---|---|---|---|---|---|---|
| C-Fa/La | 4,130.2 | 7.6% | 2,683.3 | 6.8% | 7,293.1 | 11.0% | 1,044.6 | 0.7% | 0.0 | 0.0% |
| C-Fd | 1,345.4 | 2.5% | 242.7 | 0.6% | 279.0 | 0.4% | 5,117.3 | 3.3% | 14,967.1 | 38.0% |
| C-Px | 12,885.1 | 23.8% | 15,723.0 | 40.0% | 17,135.6 | 25.8% | 71,155.3 | 46.6% | 6,703.5 | 17.0% |
| C-Sx | 7,224.9 | 13.4% | 12,236.6 | 31.2% | 12,940.5 | 19.5% | 27,185.0 | 17.8% | 2,095.7 | 5.3% |
| CD | 309.8 | 0.6% | 42.0 | 0.1% | 328.8 | 0.5% | 2,232.3 | 1.5% | 313.1 | 0.8% |
| DC | 312.4 | 0.6% | 15.1 | 0.0% | 97.6 | 0.1% | 1,960.1 | 1.3% | 279.8 | 0.7% |
| D | 2,359.5 | 4.4% | 16.2 | 0.0% | 402.3 | 0.6% | 9,896.6 | 6.5% | 7,704.2 | 19.5% |
| ANF | 843.0 | 1.6% | 388.4 | 1.0% | 881.4 | 1.3% | 2,352.3 | 1.5% | 2,031.0 | 5.2% |
| NNF | 24,617.3 | 45.6% | 7,933.4 | 20.2% | 26,973.9 | 40.7% | 31,881.2 | 20.9% | 5,326.0 | 13.5% |
| Total Area (ha) | 54,027.6 | 100.0% | 39,280.7 | 100.0% | 66,332.3 | 100.0% | 152,824.6 | 100.0% | 39,420.5 | 100.0% |

**Table 11. Cover type summary by net forested landbase as per C5 Subregion.**

| Cover Type/ Subregion | Castle | Percent of Subregion | Continental Divide North | Percent of Subregion | Continental Divide South | Percent of Subregion | Livingstone | Percent of Subregion | Porcupine Hills | Percent of Subregion |
|---|---|---|---|---|---|---|---|---|---|---|
| C-Fa/La | 213.3 | 1.4% | 320.4 | 1.8% | 543.1 | 2.8% | 113.3 | 0.2% | 0.0 | 0.0% |
| C-Fd | 557.2 | 3.6% | 121.2 | 0.7% | 127.5 | 0.6% | 716.2 | 1.4% | 9,751.5 | 37.2% |
| C-Px | 9,009.7 | 57.8% | 11,993.5 | 67.8% | 12,354.6 | 62.7% | 32,811.4 | 62.5% | 6,513.8 | 24.8% |
| C-Sx | 3,740.3 | 24.0% | 5,215.7 | 29.5% | 6,057.9 | 30.8% | 10,894.5 | 20.8% | 2,036.6 | 7.8% |
| CD | 210.5 | 1.3% | 26.1 | 0.1% | 235.8 | 1.2% | 1,356.5 | 2.6% | 144.3 | 0.6% |
| DC | 231.0 | 1.5% | 1.9 | 0.0% | 57.1 | 0.3% | 1,162.4 | 2.2% | 248.3 | 0.9% |
| D | 1,630.9 | 10.5% | 4.4 | 0.0% | 318.7 | 1.6% | 5,428.1 | 10.3% | 7,527.2 | 28.7% |
| Total Area (ha) | 15,592.9 | 100.0% | 17,683.2 | 100.0% | 19,694.6 | 100.0% | 52,482.4 | 100.0% | 26,221.8 | 100.0% |

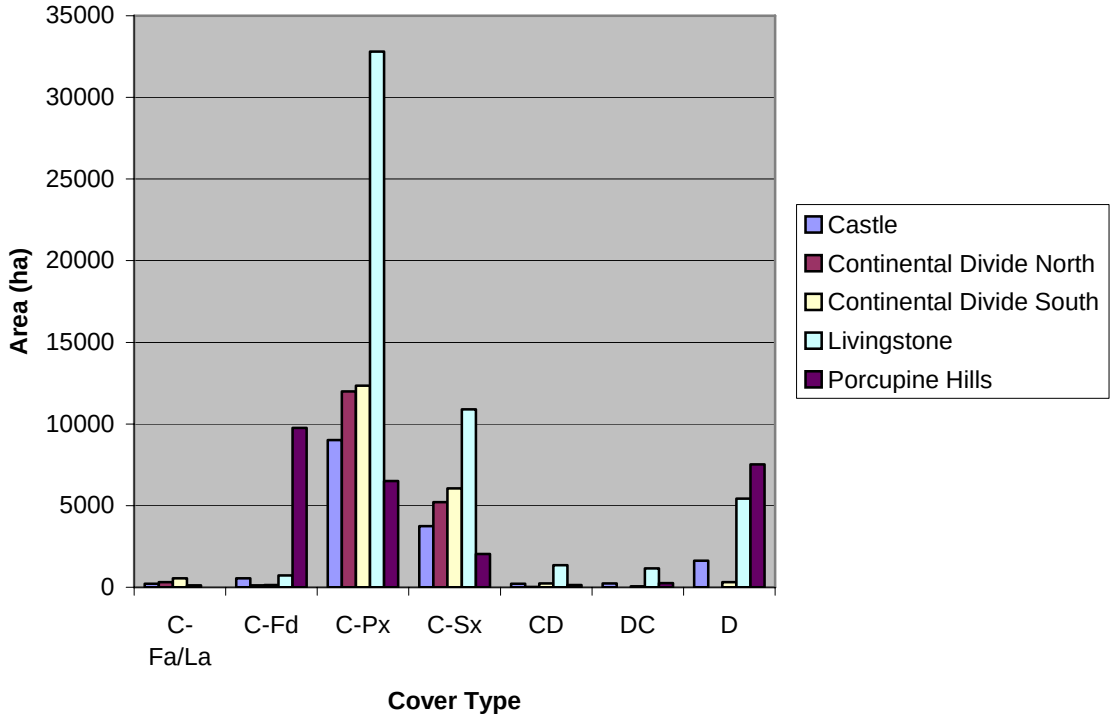


**Figure 3. Cover types by subregion for net forested landbase.**

**Table 12. Cover type summary by gross landbase by LMU.**

| Subregion | Castle | | | | | | Continental Divide North | | | | Continental Divide South | | | | | | Livingstone | | | | | | | | | | | Porcupine Hills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMU | Beaver | Carbondale | Castle/West Castle | Ironstone | South Front Range | Spread Eagle | Alpine High Rock | Crowsnest Pass | Head Water Valleys | Middle Ridges | Beaver | Carbondale | Castle/West Castle | Crowsnest Pass | Flathead | Head Water Valleys | Beaver | Chapel Rock | Crowsnest Pass | Head Water Valleys | Horseshoe Parkland | Livingstone Valley | Middle Ridges | North Livingstone | Saddle Mountain | South Fescue | South Livingstone | Whaleback | East Ranchlands | Porcupine Hills | South Fescue | Whaleback |
| Cover Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C-Fa/La | 30.8 | | | 97.1 | 3990.4 | 11.9 | 938.4 | | 1744.9 | | | 664.8 | 5699.7 | 0.1 | 903.6 | 24.9 | | | | | | 4.0 | 742.7 | 201.2 | | | 74.3 | 22.5 | | | | |
| C-Fd | 644.8 | | | 274.4 | 426.3 | | 79.4 | 3.4 | 160.0 | | | 0.0 | 10.1 | 6.6 | 56.9 | 205.5 | 4.8 | 34.2 | 25.2 | | | 3.9 | 802.8 | 186.3 | | 10.1 | 615.0 | 3435.1 | 37.7 | 14929.4 | | |
| C-Px | 6,039.0 | | | 4,381.2 | 2407.6 | 57.4 | 219.1 | | 15503.8 | 0.0 | 0.0 | 1097.3 | 12760.2 | 28.1 | 938.2 | 2311.9 | 29.7 | 25.7 | 895.8 | 294.9 | 74.3 | 3947.4 | 38686.1 | 16446.0 | 4831.7 | | 2050.0 | 3873.6 | 0.3 | 6703.2 | | |
| C-Sx | 2,017.2 | | | 773.1 | 4330.5 | 104.2 | 498.9 | | 11737.7 | 0.0 | | 1529.4 | 10961.8 | 1.9 | 265.0 | 182.3 | | 48.2 | 6.0 | 139.5 | 233.1 | 1085.2 | 14197.4 | 6543.3 | 1465.5 | 6.6 | 1246.7 | 2213.6 | | 2095.5 | | 0.2 |
| CD | 202.1 | | 0.0 | 62.8 | 44.8 | | 13.7 | | 28.3 | | | 15.4 | 230.0 | 12.1 | 16.5 | 54.9 | | 4.1 | 21.5 | | 37.4 | 168.3 | 487.8 | 480.8 | 595.1 | | 31.4 | 405.9 | | 313.1 | | |
| DC | 164.1 | | | 64.0 | 74.7 | 9.6 | 5.7 | | 9.5 | | | | 74.8 | | 6.8 | 16.0 | | 9.5 | 31.4 | | 13.1 | 145.7 | 255.6 | 365.0 | 590.5 | | 57.4 | 491.8 | | 279.8 | | |
| D | 726.7 | | | 68.6 | 347.4 | 1216.8 | 5.6 | | 10.6 | | | 6.6 | 352.7 | 25.5 | 5.7 | 11.7 | 0.0 | 259.1 | 11.0 | | 917.4 | 213.9 | 802.9 | 1879.7 | 2752.3 | 25.6 | 271.5 | 2763.2 | 19.8 | 7679.0 | 5.4 | |
| ANF | 338.2 | | | 202.8 | 168.2 | 133.8 | 20.3 | | 368.1 | 0.0 | | 201.5 | 386.1 | 24.8 | 36.9 | 232.1 | 0.1 | 88.8 | 75.8 | 0.1 | 48.4 | 223.9 | 1168.7 | 221.5 | 224.1 | 0.7 | 62.6 | 237.6 | 1.0 | 2024.6 | 4.1 | 1.2 |
| NNF | 2,277.5 | 0.0 | | 7,226.4 | 14779.7 | 333.8 | 6607.5 | | 1325.9 | | | 11822.7 | 9448.4 | 11.8 | 5410.2 | 280.8 | 21.9 | 190.9 | 29.2 | 3.9 | 140.4 | 1229.0 | 10305.6 | 10774.6 | 1456.4 | 33.5 | 3355.1 | 4340.7 | 82.3 | 5243.8 | | |
| Total Area | 12440.3 | 0.0 | 0.0 | 13,150.2 | 26569.5 | 1867.6 | 8388.5 | 3.4 | 30888.8 | 0.0 | 0.0 | 15337.7 | 39923.8 | 110.9 | 7639.8 | 3320.0 | 56.4 | 660.5 | 1096.1 | 438.4 | 1464.1 | 7021.2 | 67449.6 | 37098.4 | 11915.6 | 76.4 | 7763.9 | 17783.9 | 141.2 | 39268.4 | 9.6 | 1.4 |

**Table 13. Cover type summary by net landbase by LMU.**

| Subregion | Castle | | | | | | Continental Divide North | | | | Continental Divide South | | | | | | Livingstone | | | | | | | | | | | Porcupine Hills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMU | Beaver | Carbondale | Castle/West Castle | Ironstone | South Front Range | Spread Eagle | Alpine High Rock | Crowsnest Pass | Head Water Valleys | Middle Ridges | Beaver | Carbondale | Castle/ West Castle | Crowsnest Pass | Flathead | Head Water Valleys | Beaver | Chapel Rock | Crowsnest Pass | Head Water Valleys | Horseshoe Parkland | Livingstone Valley | Middle Ridges | North Livingstone | Saddle Mountain | South Fescue | South Livingstone | Whaleback | East Ranchlands | Porcupine Hills | South Fescue | Whaleback |
| Cover Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C-Fa/La | 17.7 | | | 43.8 | 143.9 | 8.0 | 23.4 | | 297.0 | | | 99.8 | 435.9 | | 5.0 | 2.4 | | | | | | | 109.4 | 3.9 | | | | | | | | |
| C-Fd | 343.8 | | | 171.6 | 41.8 | | | | 121.2 | | | | 8.8 | | | 118.7 | | 8.5 | 9.2 | | | | 463.2 | 15.7 | | | 27.6 | 192.0 | 15.2 | 9,736.3 | | |
| C-Px | 5,067.0 | | | 3,229.4 | 658.6 | 54.7 | 56.9 | | 11,936.7 | 0.0 | 0.0 | 950.4 | 9,824.0 | 5.8 | 148.9 | 1,425.4 | | 23.3 | 817.9 | 239.4 | 48.2 | 2,743.1 | 20,959.1 | 3,997.1 | 2,923.9 | | 889.6 | 169.6 | | 6,513.8 | | |
| C-Sx | 1,703.0 | | | 559.7 | 1,382.2 | 95.3 | 48.7 | | 5,167.0 | 0.0 | | 963.4 | 5,006.8 | 1.9 | 12.6 | 73.1 | | 45.4 | 5.1 | 108.5 | 195.0 | 605.6 | 7,050.7 | 1,331.2 | 1,273.6 | | 169.0 | 110.3 | | 2,036.4 | | 0.2 |
| CD | 150.4 | | 0.0 | 37.4 | 22.7 | | | | 26.1 | | | 4.1 | 198.1 | 7.8 | 2.4 | 23.4 | | 2.7 | 21.5 | | 30.0 | 149.2 | 359.7 | 302.9 | 431.9 | | 19.8 | 38.8 | | 144.3 | | |
| DC | 139.1 | | | 63.1 | 24.5 | 4.3 | 0.0 | | 1.9 | | | | 52.9 | | 0.5 | 3.7 | | 9.5 | 23.4 | | 10.2 | 96.4 | 217.3 | 221.3 | 482.1 | | 55.9 | 46.1 | | 248.3 | | |
| D | 645.3 | | | 63.7 | 40.0 | 881.9 | | | 4.4 | | | 6.2 | 283.5 | 20.9 | 2.3 | 5.7 | 0.0 | 196.9 | 9.4 | | 756.8 | 159.2 | 504.4 | 1,092.5 | 2,312.5 | | 198.2 | 198.2 | 19.8 | 7,502.0 | 5.4 | |
| Total Area | 8,066.4 | 0.0 | 0.0 | 4,168.7 | 2,313.7 | 1,044.2 | 129.0 | 0.0 | 17,554.2 | 0.0 | 0.0 | 2,023.9 | 15,810.1 | 36.6 | 171.7 | 1,652.4 | 0.0 | 286.4 | 886.6 | 348.0 | 1,040.3 | 3,753.5 | 29,663.9 | 6,964.6 | 7,424.0 | 0.0 | 1,360.1 | 755.1 | 35.0 | 26,181.1 | 5.4 | 0.2 |

**Table 14. Dominant cover by LMU.**

| Alpine High Rock | | Beaver | | Carbondale | | Castle/West Castle | | Chapel Rock | | Crowsnest Pass | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Grassland | 8.29% | Aspen | 8.53% | Herbaceous Clearcut | 15.29% | Grassland | 7.97% | Aspen | 45.19% | Aspen | 6.09% |
| Mixed Conifer (Larch) | 2.73% | Douglas Fir | 3.57% | Partial Cut/Regenerating Clearcut | 11.64% | Mixed Conifer | 3.44% | Douglas Fir | 2.45% | Herbaceous Clearcut | 7.11% |
| Barren Rock | 69.39% | Grassland | 9.13% | Lodgepole Pine | 16.73% | Lodgepole Pine | 25.88% | Grassland | 26.04% | Partial Cut/Regenerating Clearcut | 4.03% |
| Spruce | 4.57% | Herbaceous Clearcut | 6.41% | Spruce | 36.03% | Rock Barren | 7.37% | Perennial Forage Crops | 10.33% | Herbaceous Clearing | 3.72% |
| Subalpine Fir | 9.39% | Partial Cut/Regenerating Clearcut | 2.17% | Subalpine Fir | 11.10% | Shrub Meadow | 7.37% | Lodgepole Pine | 3.89% | Industrial Reclamation-Vegetated | 3.34% |
| Other | 5.64% | Lodgepole Pine | 43.90% | Other | 9.21% | Spruce | 25.05% | Shrub Meadow | 2.73% | Lakes/Ponds | 2.20% |
| TOTAL | 100.00% | Spruce | 12.06% | TOTAL | 100.00% | Subalpine Fir | 17.20% | Spruce | 3.93% | Lodgepole Pine | 55.19% |
| | | Other | 14.23% | | | Other | 5.73% | Other | 5.45% | Lodgepole Pine Mixedwood | 11.62% |
| | | TOTAL | 100.00% | | | TOTAL | 100.00% | TOTAL | 100.00% | Other | 6.69% |
| | | | | | | | | | | TOTAL | 100.00% |
| | | | | | | | | | | | |
| East Ranchlands | | Flathead | | Head Water Valleys | | Horseshoe Parkland | | Ironstone | | Livingstone Valley | |
| Aspen | 21.08% | Grassland | 15.49% | Grassland | 2.88% | Aspen | 63.60% | Aspen | 1.10% | Aspen | 5.14% |
| Douglas Fir | 13.10% | Lodgepole Pine | 11.17% | Herbaceous Clearcut | 14.60% | Aspen Mixedwood | 10.77% | Douglas Fir | 3.88% | Grassland | 87.24% |
| Grassland | 6.22% | Barren Rock | 40.59% | Partial Cut/Regenerating Clearcut | 1.29% | Grassland | 6.32% | Grassland | 3.21% | Herbaceous Clearcut | 5.12% |
| Mixed Conifer (Douglas Fir) | 2.71% | Shrub Meadow | 12.46% | Lodgepole Pine | 28.72% | Perennial Forage Crops | 2.03% | Herbaceous Clearcut | 1.43% | Lodgepole Pine | 47.89% |
| Shrub Meadow | 52.03% | Spruce | 3.40% | Spruce | 34.75% | Lodgepole Pine | 5.03% | Lodgepole Pine | 69.72% | Lodgepole Pine Mixedwood | 3.13% |
| Whitebark/Limber Pine | 4.11% | Subalpine Fir | 13.68% | Subalpine Fir | 7.71% | Lodgepole Pine Mixedwood | 2.83% | Spruce | 11.95% | Spruce | 15.68% |
| Other | 0.73% | Other | 3.21% | Other | 10.05% | Shrub Meadow | 1.78% | Subalpine Fir | 2.32% | Other | 10.28% |
| TOTAL | 100.00% | TOTAL | 100.00% | TOTAL | 100.00% | Shrub Wetland | 1.48% | Other | 6.38% | TOTAL | 100.00% |
| | | | | | | Spruce | 2.51% | TOTAL | 100.00% | | |
| | | | | | | Other | 3.64% | | | | |
| | | | | | | TOTAL | 100.00% | | | | |
| | | | | | | | | | | | |
| Middle Ridges | | Livingstone Valley | | Middle Ridges | | North Livingstone | | Porcupine Hills | | Saddle Mountain | |
| Aspen | 1.51% | Aspen | 5.14% | Aspen | 1.51% | Aspen | 4.10% | Aspen | 26.75% | Aspen | 25.08% |
| Grassland | 12.73% | Grassland | 12.76% | Grassland | 12.73% | Balsam Poplar | 1.81% | Douglas Fir | 29.39% | Aspen Mixedwood | 3.10% |
| Herbaceous Clearcut | 1.87% | Herbaceous Clearcut | 5.12% | Herbaceous Clearcut | 1.87% | Grassland | 22.57% | Grassland | 9.12% | Balsam Poplar | 1.14% |
| Mixed Conifer | 3.02% | Lodgepole Pine | 47.89% | Mixed Conifer | 3.02% | Lodgepole Pine | 41.25% | Herbaceous Clearcut | 2.73% | Balsam Poplar Mixedwood | 2.89% |
| Lodgepole Pine | 53.38% | Lodgepole Pine Mixedwood | 3.13% | Lodgepole Pine | 53.38% | Lodgepole Pine Mixedwood | 2.56% | Partial Cut/Regenerating | 2.99% | Grassland | 9.14% |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Clearcut | | | |
| Spruce | 19.03% | Spruce | 15.68% | Spruce | 19.03% | Barren Rock | 5.27% | Lodgepole Pine | 11.86% | Lodgepole Pine | 35.40% |
| Other | 8.46% | Other | 10.28% | Other | 8.46% | Spruce | 16.34% | Rough Pasture | 3.23% | Lodgepole Pine Mixedwood | 8.97% |
| TOTAL | 100.00% | TOTAL | 100.00% | TOTAL | 100.00% | Other | 6.09% | Shrub Meadow | 3.90% | Shrub Meadow | 1.13% |
| | | | | | | TOTAL | 100.00% | Spruce | 3.59% | Shrub Wetland | 1.21% |
| | | | | | | | | Other | 6.44% | Spruce | 5.99% |
| | | | | | | | | TOTAL | 100.00% | Spruce Mixedwood | 2.88% |
| | | | | | | | | | | Other | 3.09% |
| | | | | | | | | | | TOTAL | 100.00% |
| | | | | | | | | | | | |
| South Front Range | | South Front Range | | South Livingstone | | South Fescue | | Spread Eagle | | Whaleback | |
| Aspen | 1.55% | Aspen | 1.55% | Aspen | 4.70% | Aspen | 36.43% | Aspen | 69.54% | Aspen | 22.48% |
| Grassland | 23.01% | Grassland | 23.01% | Douglas Fir | 6.76% | Douglas Fir | 7.74% | Grassland | 12.10% | Douglas Fir | 15.36% |
| Lodgepole Pine | 8.36% | Lodgepole Pine | 8.36% | Grassland | 11.32% | Douglas Fir Mixedwood | 3.56% | Herbaceous Clearing | 4.31% | Douglas Fir Mixedwood | 2.44% |
| Barren Rock | 21.70% | Barren Rock | 21.70% | Lodgepole Pine | 26.21% | Grassland | 12.01% | Lodgepole Pine | 2.34% | Grassland | 18.83% |
| Shrub Meadow | 10.71% | Shrub Meadow | 10.71% | Barren Rock | 25.87% | Perennial Forage Crops | 3.73% | Shrub Meadow | 1.40% | Lodgepole Pine | 21.97% |
| Spruce | 12.93% | Spruce | 12.93% | Shrub Meadow | 5.98% | Shrub Meadow | 22.14% | Shrub Wetland | 1.63% | Shrub Meadow | 3.04% |
| Subalpine Fir | 17.29% | Subalpine Fir | 17.29% | Spruce | 14.97% | Shrub Wetland | 3.35% | Other | 8.67% | Shrub Wetland | 2.29% |
| Other | 4.45% | Other | 4.45% | Other | 4.20% | Spruce | 7.65% | TOTAL | 100.00% | Spruce | 6.16% |
| TOTAL | 100.00% | TOTAL | 100.00% | TOTAL | 100.00% | Other | 3.39% | | | Other | 7.43% |
| | | | | | | TOTAL | 100.00% | | | TOTAL | 100.00% |

## FOREST AGE CLASS DISTRIBUTION

Figure 4 illustrates the range of forest age classes of the FMU at 10-year intervals. The most noticeable feature shown is the large quantity of mature forests within the FMU, which are predominantly coniferous forest as shown previously in Map 11. Table 15 shows the relative proportions of age class grouping by Landscape Management Unit. Fire has been the main natural disturbance event in the C5 FMU in the last several centuries, particularly around the turn of the 20th century and during the 1930s in southwestern Alberta. The net result of these fires has been that large tracts of land have undergone natural regeneration and now support mature and overmature timber stands that are largely coniferous in nature.

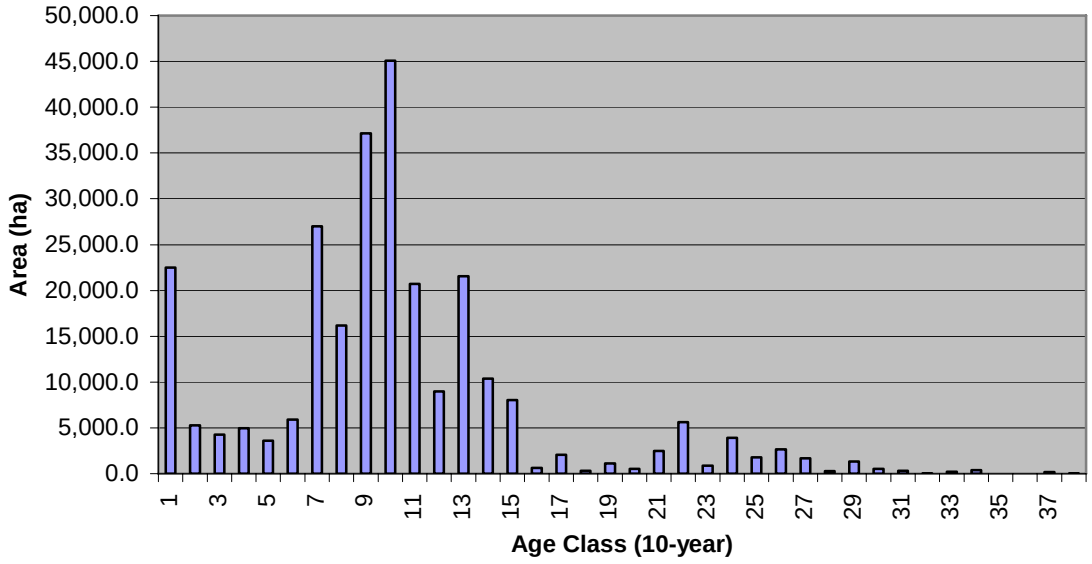


**Figure 4. Ten-year age class distribution for the C5 FMU.**

**Table 15. Ten-year age class distribution by LMU.**

| Ten-Year Age class | Alpine High Rock | Beaver | Carbondale | Castle/West Castle | Chapel Rock | Crowsnest Pass | East Ranchlands | Flathead | Head Water Valleys | Horseshoe Parkland | Ironstone | Livingstone Valley | Middle Ridges | North Livingstone | Porcupine Hills | Saddle Mountain | South Fescue | South Front Range | South Livingstone | Spread Eagle | Whaleback |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 6,623.9 | 1,716.6 | 1,985.6 | 9,438.2 | 273.7 | 108.5 | 83.3 | 5,300.4 | 2,027.9 | 175.1 | 784.9 | 1,377.1 | 10,801.4 | 10,887.9 | 6,965.7 | 1,567.3 | 37.8 | 14,920.9 | 3,398.1 | 429.9 | 4,469.5 |
| 1 | | 986.9 | 10,027.0 | 317.5 | | 58.4 | | 181.0 | 2,587.1 | | 6,597.9 | 232.9 | 921.3 | 24.4 | 543.7 | 18.9 | | | | | |
| 2 | 22.5 | 636.7 | 50.1 | 31.3 | | 71.6 | | 0.7 | 2,916.5 | | 20.9 | 162.7 | 474.5 | | 850.7 | | | 25.6 | | | |
| 3 | 2.6 | 414.6 | 300.2 | 1,131.9 | | 38.8 | | 9.2 | 1,497.1 | | | 54.0 | 67.2 | 354.9 | 336.6 | 4.7 | | 33.7 | 13.1 | | |
| 4 | 19.8 | 53.1 | 133.3 | 752.0 | 5.6 | 37.7 | | 2.7 | 2,216.8 | 3.4 | | 22.5 | 664.6 | | 473.3 | 4.8 | | 40.3 | | 517.2 | |
| 5 | 6.3 | 86.9 | 369.7 | 611.2 | 148.2 | 20.5 | 14.9 | | 366.8 | 3.6 | 32.6 | | 23.3 | 74.3 | 1,285.2 | 37.3 | | 20.5 | 98.9 | 306.4 | 98.1 |
| 6 | 10.6 | 197.1 | 53.3 | 49.9 | 86.4 | 26.0 | 3.2 | 0.2 | 31.3 | 202.8 | 65.7 | 5.6 | 8.4 | 295.9 | 3,180.6 | 663.6 | 0.9 | 143.1 | 106.5 | 270.9 | 519.6 |
| 7 | 12.0 | 1,357.6 | 58.6 | 15,910.8 | 34.4 | 25.5 | | 92.0 | 143.4 | 416.1 | 64.7 | 114.4 | 798.6 | 687.4 | 2,901.6 | 814.3 | 14.0 | 1,352.6 | 205.8 | 53.5 | 1,944.8 |
| 8 | 424.2 | 528.6 | 195.6 | 354.1 | 66.6 | 253.6 | 1.7 | 1,116.2 | 1,181.1 | 50.2 | 1,140.1 | 148.6 | 4,661.2 | 2,318.7 | 1,355.7 | 1,136.2 | 5.4 | 99.6 | 505.7 | 99.9 | 538.0 |
| 9 | 292.3 | 1,825.7 | 27.7 | 60.6 | 15.2 | 235.5 | 12.6 | 73.2 | 1,812.9 | 350.2 | 1,443.4 | 277.6 | 7,791.0 | 6,710.2 | 6,437.0 | 3,668.2 | 11.0 | 3,010.9 | 928.9 | 77.4 | 2,085.5 |
| 10 | 78.2 | 2,714.9 | 183.7 | 1,464.4 | 3.9 | 32.9 | | 28.7 | 2,424.7 | 208.6 | 1,318.0 | 1,920.3 | 18,650.7 | 7,869.8 | 536.3 | 2,830.1 | 0.0 | 663.0 | 1,152.3 | | 2,991.4 |
| 11 | 99.9 | 770.3 | 211.6 | 786.7 | 26.5 | 243.5 | 6.2 | 91.7 | 1,633.8 | 33.7 | 431.1 | 341.1 | 2,517.8 | 433.6 | 6,065.9 | 934.4 | 16.6 | 1,887.4 | 1,253.5 | 53.7 | 2,887.2 |
| 12 | 121.3 | 380.5 | 19.2 | 241.3 | | 57.9 | 7.1 | 25.7 | 2,028.9 | 20.4 | 806.9 | 36.4 | 2,094.5 | 362.5 | 2,158.0 | 223.3 | | 62.0 | 93.1 | | 227.4 |
| 13 | 82.2 | 460.4 | 594.1 | 3,375.7 | | | 12.2 | 71.6 | 1,750.8 | | 104.7 | 218.2 | 3,608.1 | 1,582.0 | 5,400.7 | | 0.2 | 2,621.4 | 8.1 | 58.6 | 1,616.9 |
| 14 | 152.4 | 21.8 | | 758.2 | | | | 483.5 | 2,380.2 | | 73.1 | 818.3 | 3,998.6 | 970.8 | 621.3 | | | | | | 107.0 |
| 15 | 50.6 | 321.0 | 30.1 | 154.8 | | | | | 1,516.9 | | 25.0 | 307.4 | 4,092.7 | 1,415.5 | 77.7 | 0.3 | | | | | 39.5 |
| 16 | 38.0 | 10.0 | 1.0 | 116.4 | | | | 1.6 | 22.7 | | 76.1 | | 101.3 | 65.4 | 34.3 | | | | | | 177.3 |
| 17 | 50.1 | | | 48.5 | | | | | 1,181.9 | | 29.8 | 124.2 | 552.4 | 37.9 | | | | | | | 28.3 |
| 18 | | | 20.9 | | | | | | 40.2 | | 5.8 | | 4.3 | | | | | 224.2 | | | 17.4 |
| 19 | 41.5 | | | | | | | | 422.6 | | 6.6 | 28.8 | 435.1 | 134.2 | | | | | | | 37.4 |
| 20 | 16.9 | 7.7 | | | | | | | 237.0 | | | 62.3 | 197.1 | | | | | | | | |
| 21 | 11.2 | | | | | | | | 877.1 | | 25.4 | 15.6 | 1,181.4 | 342.1 | 29.8 | | | | | | |
| 22 | 22.7 | 6.2 | 1,064.9 | 1,220.2 | | | | 159.8 | 172.6 | | 74.7 | 255.3 | 315.2 | 1,052.7 | | 11.9 | | 1,283.3 | | | |
| 23 | 2.3 | | | | | | | | 120.2 | | | 284.6 | 92.3 | 372.9 | | | | | | | |
| 24 | 48.2 | | | | | | | | 2,136.0 | | | 202.0 | 603.3 | 893.1 | 14.4 | | | | | | |
| 25 | 1.2 | | | 773.6 | | | | | 717.1 | | | | 272.0 | | | | | 2.7 | | | |
| 26 | | | 11.3 | 2,326.5 | | | | 1.6 | 125.3 | | 23.0 | | | | | | | 178.2 | | | |
| 27 | | | | | | | | | 497.9 | | | 10.9 | 1,007.6 | 173.8 | | | | | | | |
| 28 | 50.6 | | | | | | | | 175.2 | | | | 58.5 | | | | | | | | |
| 29 | 25.5 | | | | | | | | 471.2 | | | | 831.8 | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 23.8 | | | | | | | | 426.7 | | | | 23.9 | 38.2 | | | | | | | |
| 31 | 57.0 | | | | | | | | 253.7 | | | | 9.0 | | | | | | | | |
| 32 | 0.8 | | | | | | | | 21.1 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | 0.4 | 201.6 | | | | | | | | |
| 35 | | | | | | | | | 97.1 | | | | 297.8 | | | | | | | | |
| 36 | | | | | | | | | 7.9 | | | | | | | | | | | | |
| 38 | | | | | | | | | 1.7 | | | | | | | | | | | | |
| 40 | | | | | | | | | 125.8 | | | | 40.3 | | | | | | | | |
| 41 | | | | | | | | | | | | | 50.7 | | | | | | | | |
| Total Area (ha) | 8,388.5 | 12,496.7 | 15,337.7 | 39,923.8 | 660.5 | 1,210.3 | 141.2 | 7,639.8 | 34,647.2 | 1,464.1 | 13,150.2 | 7,021.2 | 67,449.6 | 37,098.4 | 39,268.4 | 11,915.6 | 86.0 | 26,569.5 | 7,763.9 | 1,867.6 | 17,785.3 |

## AMOUNT AND DISTRIBUTION OF SERAL STAGES

Seral stages represent distinct changes in forest succession in which an established plant community is gradually supplanted by another community of forest growth. These stages are different for each forest type (e.g., spruce stands vs. pine). The characteristics of each forest type at each seral stage will change. The selected age ranges for each particular seral stage are intended to reflect stand function. The forest within the FMU is quite diverse and contains a broad range of vegetation types, spread across a continuum of seral stages as defined by age.

**The following five seral stage groupings have been adopted for the C5 FMP:**

**Regeneration** — Time required to establish a new forest stand.

**Young stands** — Establish and develop quickly but are generally not merchantable.

**Mature stands** — Change relatively slowly and are merchantable.

**Early Old Forest** — The age range at which processes and structural attributes that characterize old forests have just begun. These processes and structural attributes include breaking up of the dominant stratum, allowing release of suppressed understory trees (canopy gap formation); the presence of tall, large-diameter trees; the presence of large snags; increasing levels of large-diameter downed woody material.

**Late Old Forest** — The age range at which processes characterizing old forests are more advanced and fully expressed throughout the stand. Thus, late-old forest seral stages exhibit more horizontal and vertical structural diversity, resulting in more environmental heterogeneity and species diversity than early-old forests.

Seral stages are operationally defined for each cover group in Table 16.

**Table 16. C5 cover groups/classes and seral stages.**

| Cover Group | Cover Class (Type) | Description | Regeneration | Young | Mature | Early Old Forest | Late Old Forest |
|---|---|---|---|---|---|---|---|
| C | | Forested areas with => 80% conifer species composition in the overstory layer (includes the 4 conifer cover types – which follow – and all other confer species in the C5 FMU. | – | – | – | – | – |
| | C-Fa/La | Forested areas with => 80% conifer species composition in the overstory layer with Alpine Fir or Alpine Larch as the leading species. | 0-40 | 41-100 | 101-160 | 161-200 | >200 |
| | C-Fd | Forested areas with => 80% conifer species composition in the overstory layer with Douglas-fir as the leading species. | 0-30 | 31-90 | 91-200 | 201-250 | >250 |
| | C-Px | Forested areas with => 80% conifer species composition in the overstory layer with Lodgepole, Whitebark or Limber Pine as the leading species. | 0-25 | 26-80 | 81-150 | 151-200 | >200 |
| | C-Sx | Forested areas with => 80% conifer species composition in the overstory layer with either White Spruce or Engelmann Spruce as the leading species. | 0-30 | 31-90 | 91-180 | 181-230 | >230 |
| CD | | Forested areas with 50% up to 79% conifer species composition in the overstory layer. | 0-25 | 26-80 | 81-150 | 151-200 | >200 |
| DC | | Forested areas with 30% up to 40% conifer species composition in the overstory layer. | 0-25 | 26-80 | 81-150 | 151-200 | >200 |
| D | | Forested areas with 20% or less conifer species composition in the overstory layer. | 0-30 | 30-70 | 71-130 | 131-180 | >180 |

The C5 FMU consists of several distinct forest types with significant varied species and age class groupings. The composition of the forest has originated as a result of natural disturbances, predominantly fire. The region has also been impacted by timber harvesting, oil and gas activities, recreation and ranching. The resulting mosaic is further described in the following

tables, charts and maps. Map 12 and Figure 5 illustrates the relative proportions of each seral stage in the landscape.

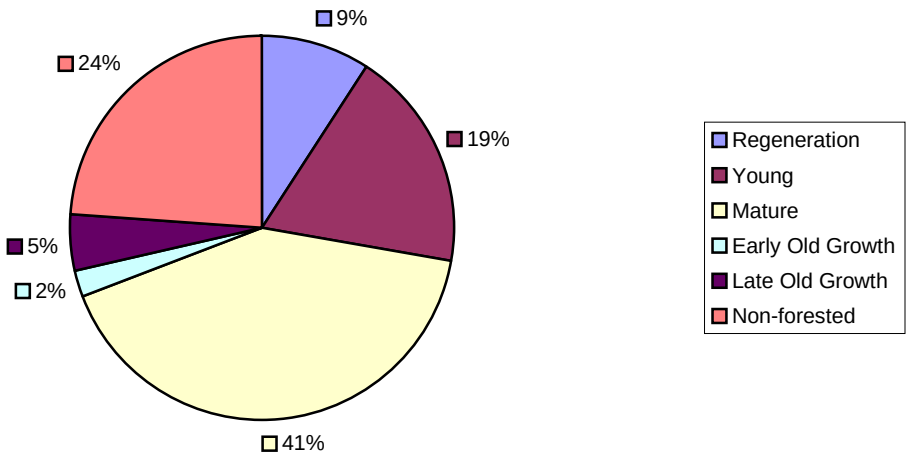


**Figure 5. Seral stage summary for gross FMU area.**

The area of each seral stage for the gross and net landbase are summarized in Tables 17-21 and Figures 6 and 7.

**Table 17. Seral stage summary for operational and non-operational landbases.**

| Seral Stage | Total Area (ha) | Percent of Gross FMU Area | Operational (ha) | Percent of Total Area | Non-operational (ha) | Percent of Total Area |
|---|---|---|---|---|---|---|
| Regeneration | 32,070.7 | 9.1% | 11,816.9 | 3.4% | 20,253.8 | 5.8% |
| Young | 65,539.9 | 18.6% | 41,145.5 | 11.7% | 24,394.4 | 6.9% |
| Mature | 145,941.9 | 41.5% | 70,370.4 | 20.0% | 75,571.5 | 21.5% |
| Early Old Growth | 8,024.6 | 2.3% | 3,074.9 | 0.9% | 4,949.7 | 1.4% |
| Late Old Growth | 16,326.6 | 4.6% | 5,267.2 | 1.5% | 11,059.5 | 3.1% |
| Non-forested | 83,981.9 | 23.9% | | 0.0% | 83,981.9 | 23.9% |
| Total Area | 351,885.6 | 100.0% | 131,674.8 | 37.4% | 220,210.8 | 62.6% |

**Table 18. C5 Subregion Seral Stage for Gross Landbase**

| Seral Stage/ Subregion | Castle | Percent of Subregion | Continental Divide North | Percent of Subregion | Continental Divide South | Percent of Subregion | Livingstone | Percent of Subregion | Porcupine Hills | Percent of Subregion |
|---|---|---|---|---|---|---|---|---|---|---|
| Regeneration | 8,819.1 | 16.3% | 5,759.7 | 14.7% | 13,484.6 | 20.3% | 2,356.3 | 1.5% | 1,651.0 | 4.2% |
| Young | 7,986.8 | 14.8% | 4,485.3 | 11.4% | 21,122.6 | 31.8% | 20,328.8 | 13.3% | 11,616.4 | 29.5% |
| Mature | 17,598.0 | 32.6% | 13,318.0 | 33.9% | 9,850.7 | 14.9% | 86,422.8 | 56.6% | 18,752.4 | 47.6% |
| Early Old Growth | 1,057.4 | 2.0% | 1,995.9 | 5.1% | 1,707.0 | 2.6% | 3,220.5 | 2.1% | 43.8 | 0.1% |
| Late Old Growth | 596.0 | 1.1% | 5,400.0 | 13.7% | 3,844.2 | 5.8% | 6,486.5 | 4.2% | | 0.0% |
| Non-forested | 17,970.3 | 33.3% | 8,321.8 | 21.2% | 16,323.1 | 24.6% | 34,009.7 | 22.3% | 7,357.0 | 18.7% |
| Total Area | 54,027.6 | 100.0% | 39,280.7 | 100.0% | 66,332.3 | 100.0% | 152,824.6 | 100.0% | 39,420.5 | 100.0% |

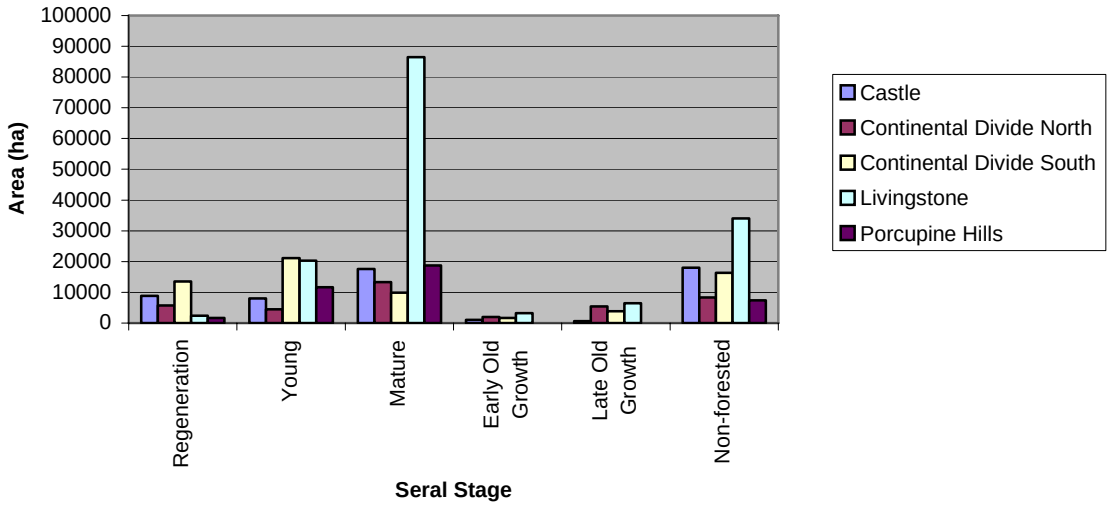


**Figure 6. Subregion seral stage summary for gross landbase.**

**Table 19. C5 Subregion seral stage for net landbase.**

| Seral Stage/ Subregion | Castle | Percent of Subregion | Continental Divide North | Percent of Subregion | Continental Divide South | Percent of Subregion | Livingstone | Percent of Subregion | Porcupine Hills | Percent of Subregion |
|---|---|---|---|---|---|---|---|---|---|---|
| Regeneration | 1,208.3 | 7.7% | 5,440.8 | 30.8% | 1,591.9 | 8.1% | 1,969.8 | 3.8% | 1,606.1 | 6.1% |
| Young | 4,368.0 | 28.0% | 3,190.2 | 18.0% | 12,081.2 | 61.3% | 11,469.1 | 21.9% | 10,036.9 | 38.3% |
| Mature | 9,580.3 | 61.4% | 5,839.8 | 33.0% | 3,972.6 | 20.2% | 36,428.6 | 69.4% | 14,549.2 | 55.5% |
| Early Old Growth | 407.3 | 2.6% | 690.6 | 3.9% | 1,106.4 | 5.6% | 841.0 | 1.6% | 29.6 | 0.1% |
| Late Old Growth | 29.0 | 0.2% | 2,521.8 | 14.3% | 942.5 | 4.8% | 1,773.9 | 3.4% | | 0.0% |
| Totals | 15,592.9 | 100.0% | 17,683.2 | 100.0% | 19,694.6 | 100.0% | 52,482.4 | 100.0% | 26,221.8 | 100.0% |

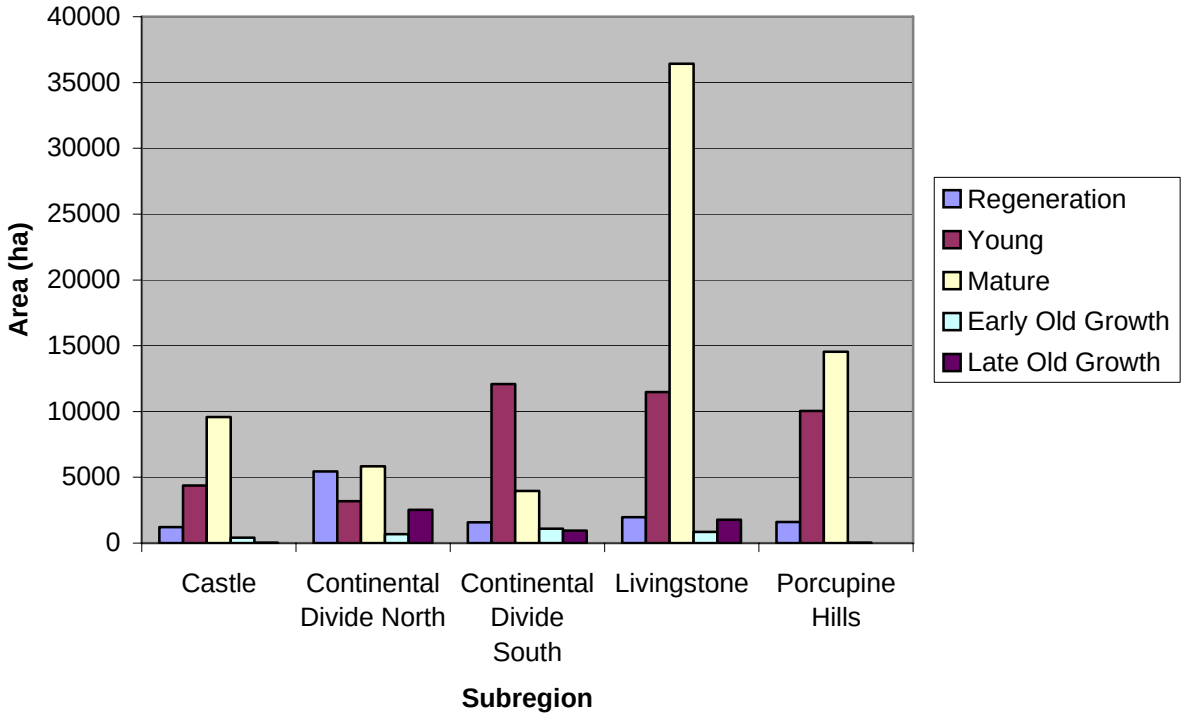


**Figure 7. Subregion seral summary for net landbase.**

**Table 20. LMU seral stage summary by gross landbase.**

| Subregion | Castle | | | | | | Continental Divide North | | | | Continental Divide South | | | | | | Livingstone | | | | | | | | | | | | Porcupine Hills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMU | Beaver | Carbon dale | Castle/ West Castle | Ironstone | South Front Range | Spread Eagle | Alpine High Rock | Crows -nest Pass | Head Water Valleys | Middle Ridges | Beaver | Carbon- dale | Castle/West Castle | Crows nest Pass | Flathead | Head Water Valleys | Beaver | Chapel Rock | Crowsnest Pass | Head Water Valleys | Horseshoe Parkland | Livingstone Valley | Middle Ridges | North Livingstone | Saddle Mountain | South Fescue | South Livingstone | Whaleback | East Ranchlands | Porcupine Hills | South Fescue | Whaleback |
| Seral Stage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Regeneration | 2,047.4 | 0.0 | 0.0 | 6,712.3 | 59.4 | 0.0 | 30.2 | 0.0 | 5,729.5 | 0.0 | 0.0 | 11,368.7 | 1,376.1 | 0.0 | 190.9 | 548.8 | 0.0 | 0.0 | 139.9 | 182.6 | 0.0 | 419.3 | 1,442.1 | 135.7 | 23.7 | 0.0 | 13.1 | 0.0 | 0.0 | 1,651.0 | 0.0 | 0.0 |
| Young | 2,384.9 | 0.0 | 0.0 | 1,373.5 | 3,058.8 | 1,169.7 | 748.8 | 3.4 | 3,733.2 | 0.0 | 0.0 | 1,006.7 | 17,654.1 | 63.8 | 1,262.7 | 1,135.3 | 4.8 | 348.9 | 318.0 | 37.0 | 687.7 | 346.3 | 6,780.3 | 4,073.0 | 2,584.0 | 14.6 | 1,358.3 | 3,775.9 | 30.4 | 11,586.0 | 0.0 | 0.0 |
| Mature | 6,194.8 | 0.0 | 0.0 | 4,187.2 | 6,985.7 | 230.3 | 676.9 | 0.0 | 12,641.0 | 0.0 | 0.0 | 1,063.1 | 6,940.2 | 10.5 | 717.8 | 1,119.1 | 29.7 | 31.9 | 533.1 | 89.7 | 587.6 | 3,880.9 | 42,348.3 | 18,873.7 | 7,615.7 | 27.6 | 2,974.8 | 9,429.7 | 27.6 | 18,719.2 | 5.4 | 0.2 |
| Early Old Growth | 6.2 | 0.0 | 0.0 | 96.9 | 954.4 | 0.0 | 89.8 | 0.0 | 1,906.1 | 0.0 | 0.0 | 871.0 | 780.5 | 0.0 | 51.4 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 571.0 | 1,162.4 | 1,485.4 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 43.8 | 0.0 | 0.0 |
| Late Old Growth | 0.0 | 0.0 | 0.0 | 32.6 | 563.4 | 0.0 | 214.9 | 0.0 | 5,185.0 | 0.0 | 0.0 | 199.6 | 3,535.2 | 0.0 | 109.4 | 0.0 | 0.0 | 0.0 | 0.0 | 125.1 | 0.0 | 350.9 | 4,466.0 | 1,534.3 | 10.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Non-forested | 1,807.0 | 0.0 | 0.0 | 747.9 | 14,947.9 | 467.6 | 6,627.9 | 0.0 | 1,694.0 | 0.0 | 0.0 | 828.6 | 9,637.5 | 36.6 | 5,307.5 | 512.8 | 21.9 | 279.8 | 105.1 | 4.0 | 188.8 | 1,452.9 | 11,250.6 | 10,996.1 | 1,680.5 | 34.2 | 3,417.7 | 4,578.3 | 83.3 | 7,268.4 | 4.1 | 1.2 |
| Total Area (ha) | 12,440.3 | 0.0 | 0.0 | 13,150.2 | 26,569.5 | 1,867.6 | 8,388.5 | 3.4 | 30,888.8 | 0.0 | 0.0 | 15,337.7 | 39,923.8 | 110.9 | 7,639.8 | 3,320.0 | 56.4 | 660.5 | 1,096.1 | 438.4 | 1,464.1 | 7,021.2 | 67,449.6 | 37,098.4 | 11,915.6 | 76.4 | 7,763.9 | 17,783.9 | 141.2 | 39,268.4 | 9.6 | 1.4 |

**Table 21. LMU Seral stage summary by net landbase.**

| Subregion | Castle | | | | | | Continental Divide North | | | | Continental Divide South | | | | | | Livingstone | | | | | | | | | | | | Porcupine Hills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMU | Beaver | Carbon dale | Castle/ West Castle | Ironstone | South Front Range | Spread Eagle | Alpine High Rock | Crows nest Pass | Head Water Valleys | Middle Ridges | Beaver | Carbon dale | Castle/West Castle | Crows nest Pass | Flathead | Head Water Valleys | Beaver | Chapel Rock | Crowsnest Pass | Head Water Valleys | Horseshoe Parkland | Livingstone Valley | Middle Ridges | North Livingstone | Saddle Mountain | South Fescue | South Livingstone | Whaleback | East Ranchlands | Porcupine Hills | South Fescue | Whaleback |
| Seral Stage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Regeneration | 1,123.7 | 0.0 | 0.0 | 30.9 | 53.7 | 0.0 | 17.9 | 0.0 | 5,422.9 | 0.0 | 0.0 | 161.3 | 926.0 | 0.0 | 31.2 | 473.4 | 0.0 | 0.0 | 130.1 | 178.3 | 0.0 | 407.8 | 1,178.2 | 51.7 | 23.7 | 0.0 | 0.0 | 0.0 | 0.0 | 1,606.1 | 0.0 | 0.0 |
| Young | 1,959.2 | 0.0 | 0.0 | 1,104.8 | 399.7 | 904.3 | 52.9 | 0.0 | 3,137.3 | 0.0 | 0.0 | 719.2 | 10,694.5 | 29.3 | 94.7 | 543.5 | 0.0 | 281.9 | 275.3 | 36.5 | 527.9 | 282.2 | 4,791.4 | 2,016.0 | 2,369.6 | 0.0 | 560.4 | 327.9 | 21.2 | 10,015.7 | 0.0 | 0.0 |
| Mature | 4,981.5 | 0.0 | 0.0 | 2,931.0 | 1,528.0 | 139.8 | 15.9 | 0.0 | 5,823.9 | 0.0 | 0.0 | 472.9 | 2,822.4 | 7.2 | 36.4 | 633.6 | 0.0 | 4.5 | 481.2 | 34.7 | 512.4 | 2,601.9 | 21,944.3 | 4,602.1 | 5,020.7 | 0.0 | 799.7 | 427.2 | 13.8 | 14,529.7 | 5.4 | 0.2 |
| Early Old Growth | 2.0 | 0.0 | 0.0 | 77.7 | 327.5 | 0.0 | 0.4 | 0.0 | 690.2 | 0.0 | 0.0 | 611.1 | 486.8 | 0.0 | 6.6 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 347.8 | 278.4 | 214.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 29.6 | 0.0 | 0.0 |
| Late Old Growth | 0.0 | 0.0 | 0.0 | 24.3 | 4.7 | 0.0 | 41.9 | 0.0 | 2,479.9 | 0.0 | 0.0 | 59.3 | 880.4 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 98.4 | 0.0 | 114.0 | 1,471.6 | 80.0 | 9.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Area (ha) | 8,066.4 | 0.0 | 0.0 | 4,168.7 | 2,313.7 | 1,044.2 | 129.0 | 0.0 | 17,554.2 | 0.0 | 0.0 | 2,023.9 | 15,810.1 | 36.6 | 171.7 | 1,652.4 | 0.0 | 286.4 | 886.6 | 348.0 | 1,040.3 | 3,753.5 | 29,663.9 | 6,964.6 | 7,424.0 | 0.0 | 1,360.1 | 755.1 | 35.0 | 26,181.1 | 5.4 | 0.2 |

## Patch Characteristics

Patch characteristics for each cover type are summarized in this section. The distribution of patches across the landscape is shown in Figures 8-13.

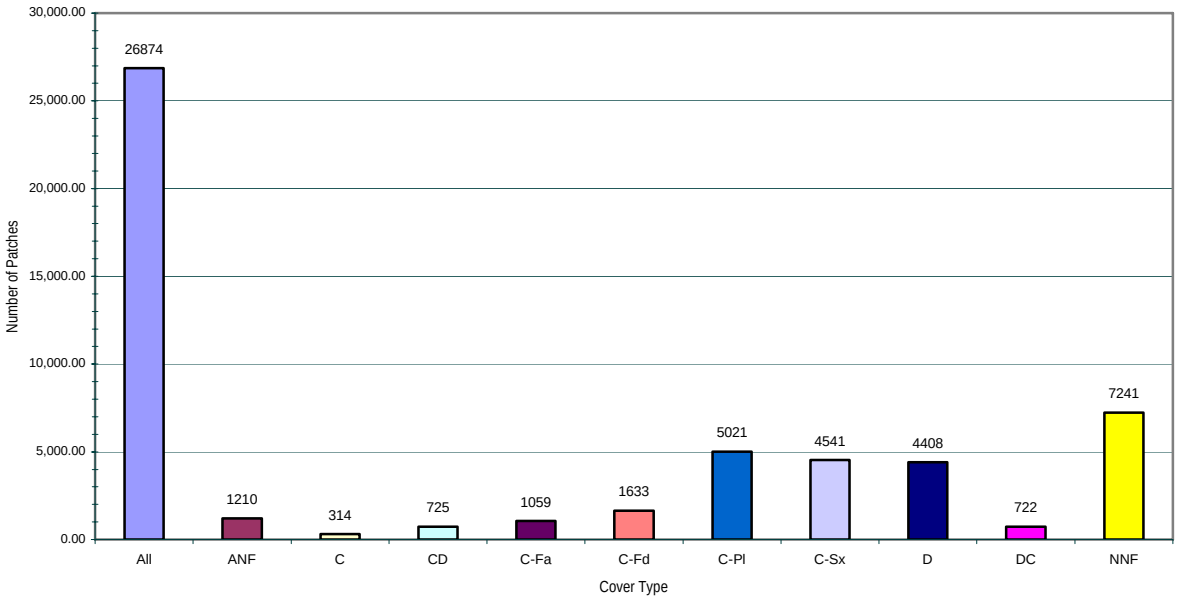


**Figure 8. Cover type: number of patches for the greater C5.**

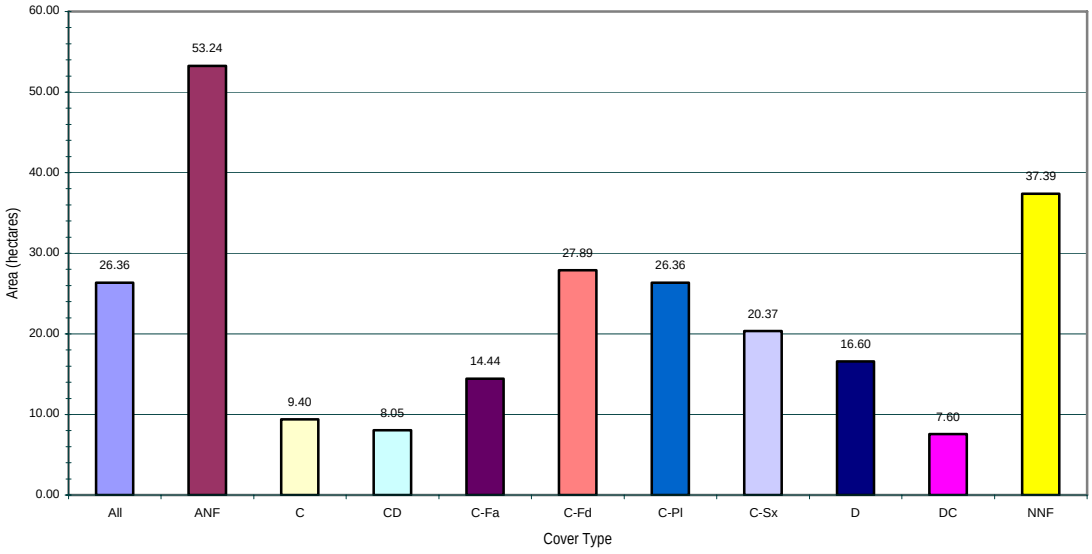


**Figure 9. Mean patch size (hectares) for the greater C5 area.**

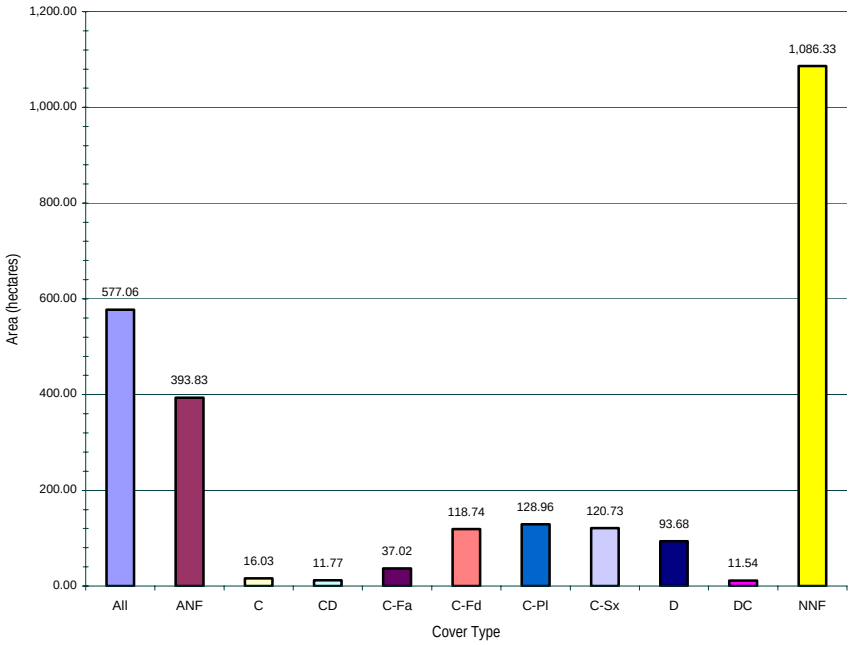


**Figure 10. Cover type: patch size std. dev. (hectares) for the greater C5.**

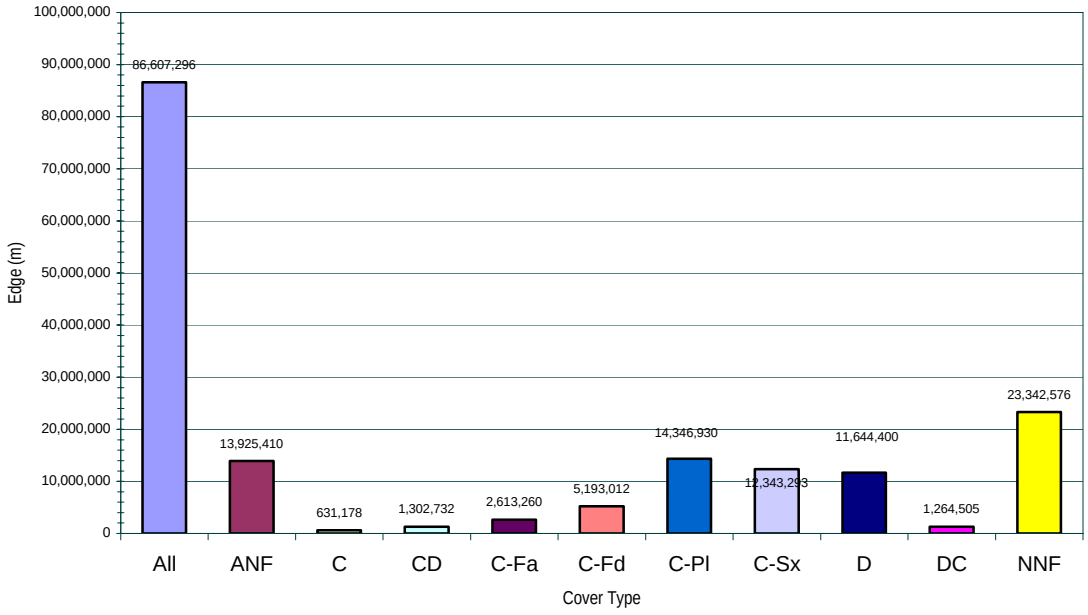


**Figure 11. Cover type total edge (m) for the greater C5 area.**

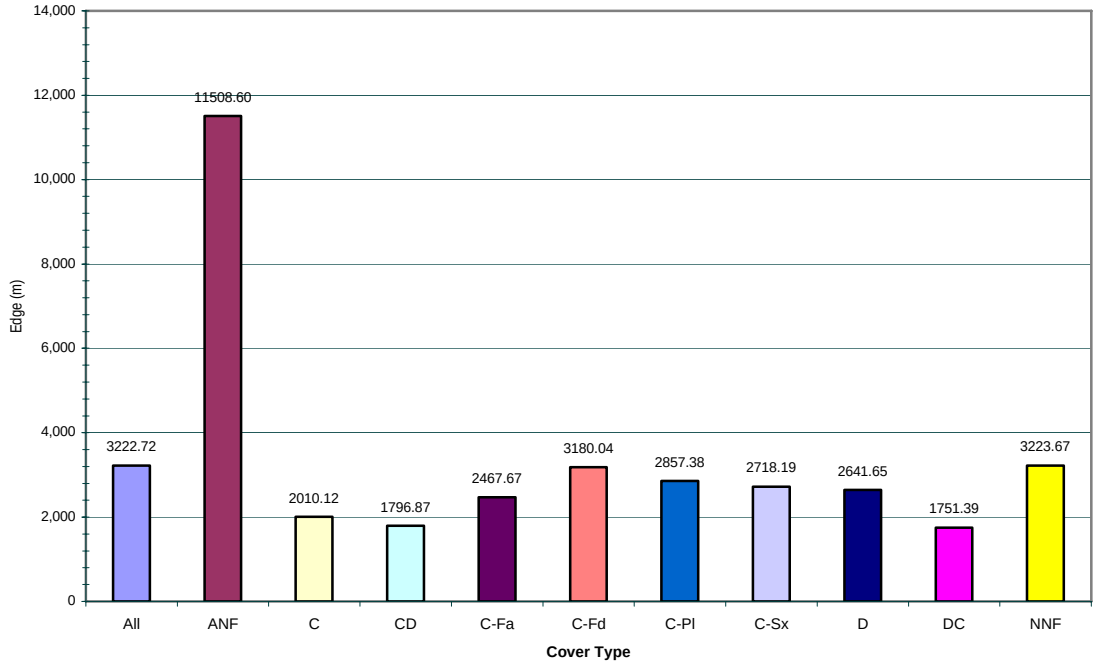


**Figure 12. Cover type: mean patch edge for the greater C5 area.**

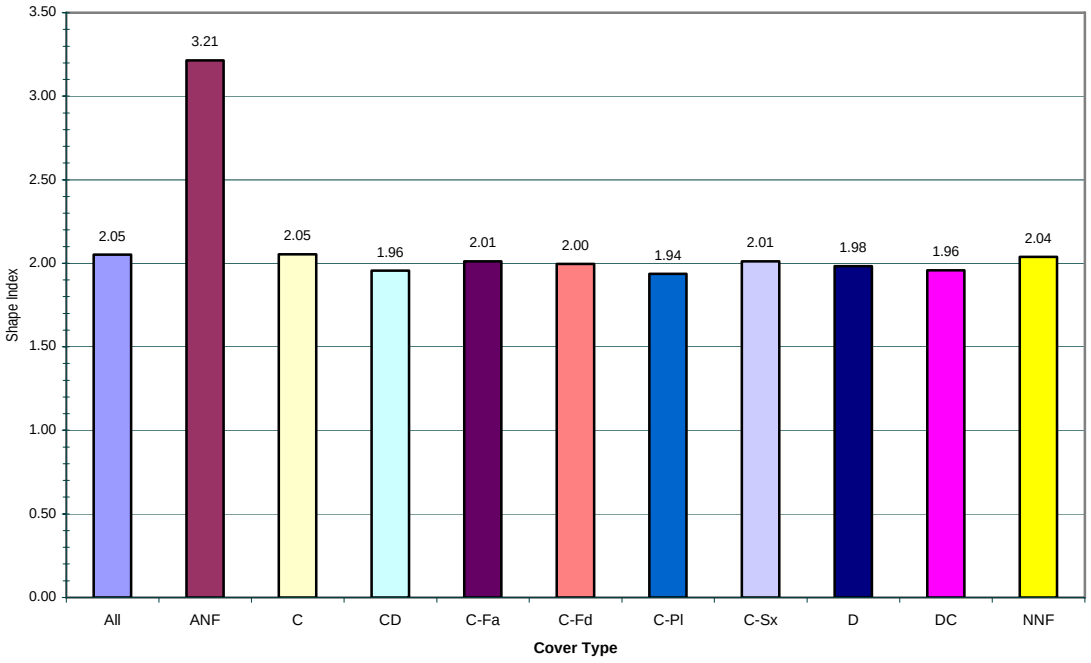


**Figure 13. Cover type: mean shape index for the greater C5 area.**

## Connectivity and Juxtaposition

Patch size and distribution are important characteristics that may influence ecosystem use and function. This is thought to be especially relevant in terms of wildlife values. The edge-to-edge distance between similar patches, and the existence of corridors between patches, may have a significant effect on the value of the landscape for particular species. In addition, the proximity of varied ecotypes to each other may affect the level of use for portions of the landscape. Tables 22-24 and Figures 14-16 summarize the connectivity and juxtaposition of cover type within the landscape.

**Table 22. Cover type patch connectivity.**

| Mean Nearest Neighbour* (m) | | | |
|---|---|---|---|
| Class | Porcupine | Livingstone | Castle |
| ANF | 39.88 | 38.59 | 36.89 |
| C | 449.64 | 539.75 | 648.05 |
| CD | 1,321.81 | 579.93 | 875.01 |
| C-Fa | 0.00 | 311.31 | 137.04 |
| C-Fd | 118.08 | 205.29 | 276.45 |
| C-Pl | 172.34 | 77.28 | 101.41 |
| C-Sx | 281.41 | 115.93 | 124.54 |
| D | 197.86 | 158.95 | 319.59 |
| DC | 1,443.65 | 585.89 | 1,059.11 |
| NNF | 130.26 | 92.88 | 131.54 |

**Nearest neighbour —distance between similar patches*.

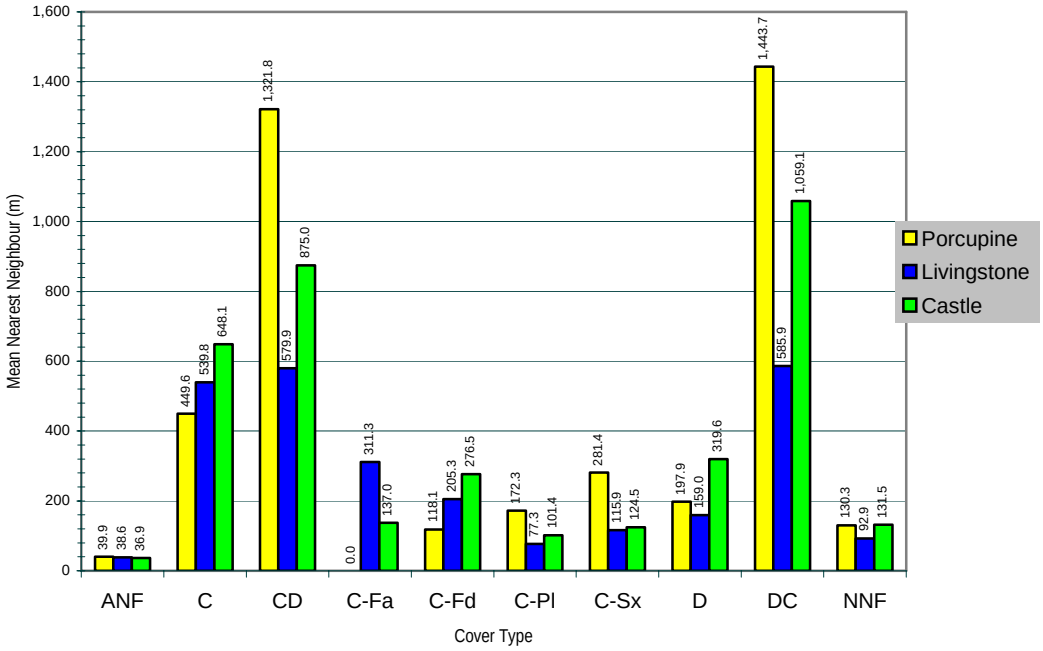


**Figure 14. Mean nearest neighbour.**

**Table 22. Cover type patch connectivity (mean proximity index).**

| Mean Proximity Index | | | |
|---|---|---|---|
| Class | Porcupine | Livingstone | Castle |
| ANF | 19.97 | 557.94 | 36.45 |
| C | 21.93 | 161.68 | 36.29 |
| CD | 65.65 | 63.97 | 36.67 |
| C-Fa | 0.00 | 126.78 | 502.98 |
| C-Fd | 7,152.81 | 307.97 | 182.15 |
| C-Pl | 941.55 | 76,385.48 | 8,474.11 |
| C-Sx | 233.16 | 10,693.46 | 8,447.57 |
| D | 1,087.34 | 1293.13 | 779.12 |
| DC | 21.19 | 66.40 | 31.76 |
| NNF | 395.18 | 6,457.84 | 5,524.39 |

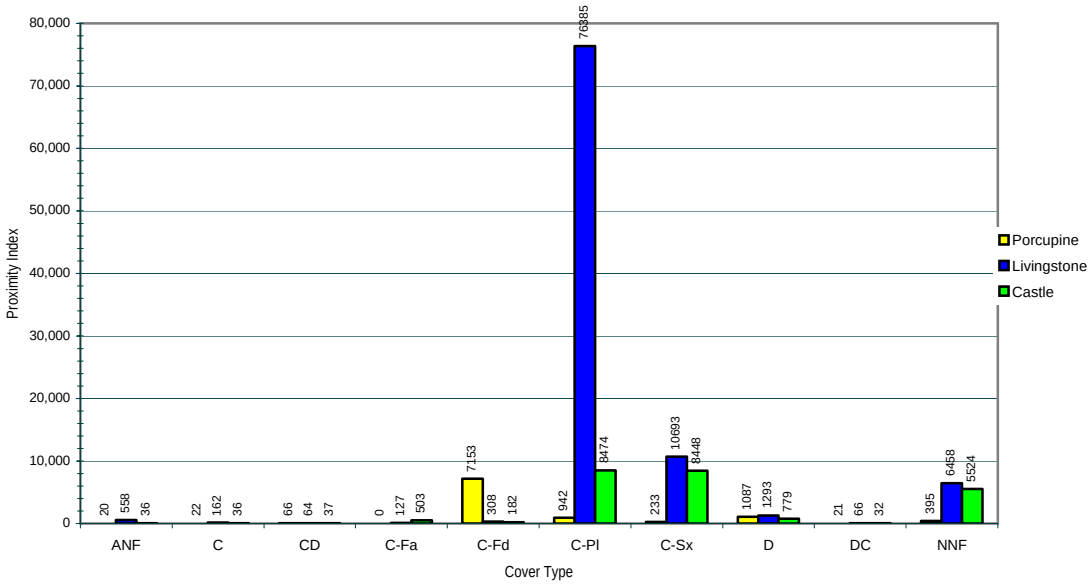


**Figure 15. Cover type: mean proximity index.**

**Table 24. Cover type patch connectivity** (interspersion juxtaposition index).

| Interspersion Juxtaposition Index | | | |
|---|---|---|---|
| Class | Porcupine | Livingstone | Castle |
| ANF | 73.17 | 68.19 | 72.02 |
| C | 54.27 | 62.86 | 78.03 |
| CD | 81.30 | 72.94 | 69.19 |
| C-Fa | 0.00 | 57.16 | 47.64 |
| C-Fd | 75.57 | 73.93 | 69.93 |
| C-Pl | 76.26 | 72.60 | 73.53 |
| C-Sx | 79.31 | 65.73 | 68.94 |
| D | 73.99 | 73.91 | 72.32 |
| DC | 85.92 | 69.81 | 75.33 |
| NNF | 68.66 | 73.06 | 73.69 |

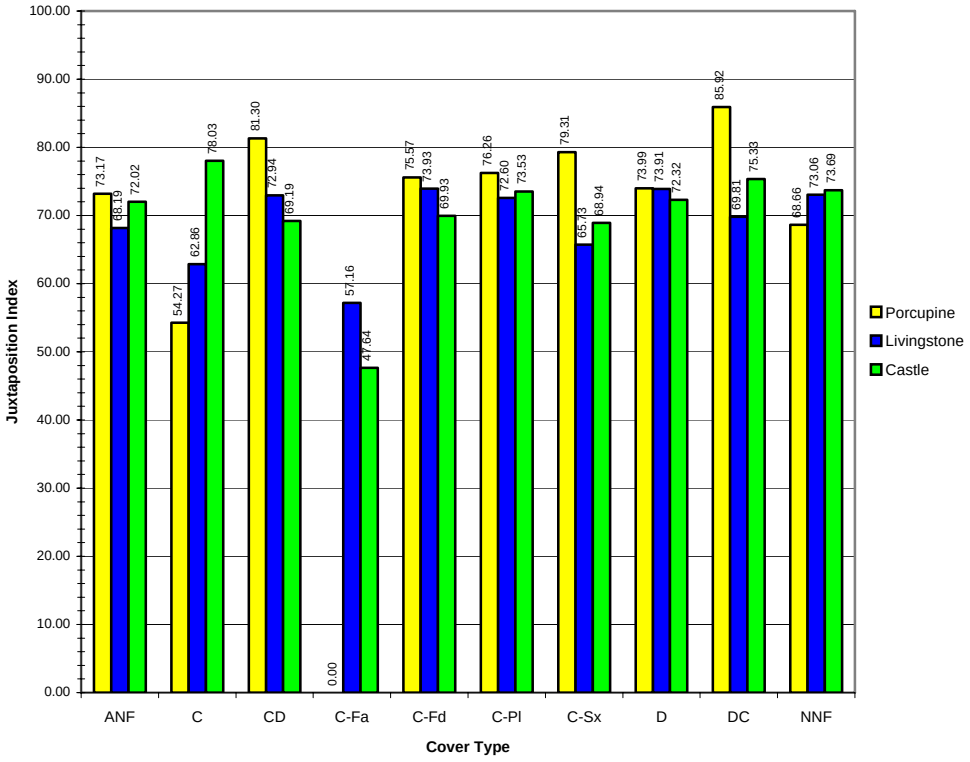


**Figure 16. Cover type: interspersion juxtaposition index.**

## Fragmentation

Forest fragmentation is defined as "the change in the forest landscape from extensive and continuous forest cover to a mosaic of smaller patches separated by open areas or very young stands of forest[1]"(Dunster 1996). Within the C5 FMU, there are two main causes of increased fragmentation of the forest:

1. Oil and gas and other industrial activities — Establishment of road networks, seismic lines, pipelines and transmission lines have had a significant impact on the fragmentation of the forest. These activities tend to create permanent breaks in the forest structure.
2. Timber Harvesting — Established road networks and the historical "cut-and-leave" pattern have contributed to the current landscape pattern.

Forest fragmentation has become more prevalent on the landscape over the past several decades. Fragmentation of the forest has both positive and negative effects on forest users. For example, a fragmented forest may be more accessible, thereby creating more potential for recreational use. However, wildlife species that prefer or need contiguous forest types often suffer.

Forest fragmentation also occurs naturally as a result of disturbances or when interspersed with landscape features such as grasslands and rock. Tables 25-27 and Figures 17-19 summarize fragmentation of cover type within the landscape.

**Table 25. Forest fragmentation** (total class area[ha]).

| Class | Greater C5* | Porcupine | Livingstone | Castle |
|---|---|---|---|---|
| All | 708,315.52 | 39,420.51 | 192,105.26 | 120,359.86 |
| ANF | 64,417.35 | 745.74 | 3,127.83 | 1,851.74 |
| C | 2,952.59 | 87.96 | 1,400.71 | 790.05 |
| CD | 5,836.00 | 336.99 | 2,288.75 | 792.91 |
| C-Fa | 15,296.04 | 0.00 | 3,407.21 | 11,776.87 |
| C-Fd | 45,551.66 | 15,570.52 | 5,371.60 | 2,146.46 |
| C-Pl | 132,356.35 | 4,819.91 | 77,172.28 | 34,051.77 |
| C-Sx | 92,498.52 | 2,140.09 | 44,590.55 | 30,008.49 |
| D | 73,177.95 | 7,749.14 | 9,963.32 | 2,923.87 |
| DC | 5,486.59 | 294.98 | 1,984.01 | 485.68 |
| NNF | 270,742.48 | 7,675.17 | 42,777.66 | 35,531.62 |

**Greater C5 area includes the FMU plus the White Area around it.*

[1] *Dunster, J. and Dunster, K. 1996. Dictionary of Natural Resources Management. UBC Press, 6344 Memorial Rd., Vancouver, B.C.*

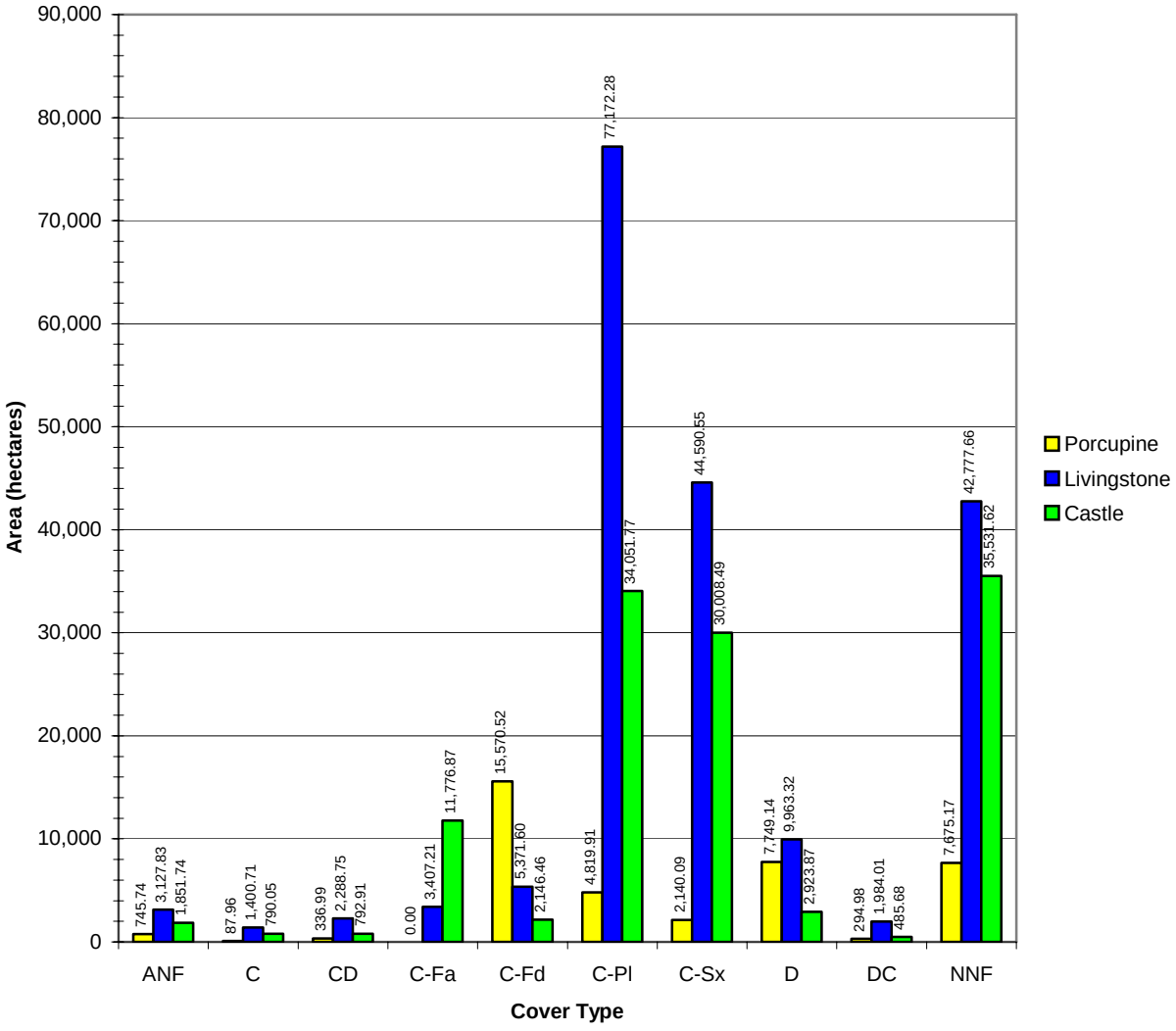


**Figure 17. Cover type: total class area.**

**Table 26. Forest fragmentation** (number of patches).

| Class | Greater C5 | Porcupine | Livingstone | Castle |
|---|---|---|---|---|
| All | 26874 | 2949 | 13050 | 7500 |
| ANF | 1210 | 53 | 149 | 86 |
| C | 314 | 21 | 134 | 117 |
| CD | 725 | 37 | 385 | 175 |
| C-Fa | 1059 | 0 | 399 | 654 |
| C-Fd | 1633 | 725 | 343 | 185 |
| C-Pl | 5021 | 228 | 2973 | 1601 |
| C-Sx | 4541 | 211 | 2339 | 1667 |
| D | 4408 | 705 | 1474 | 508 |
| DC | 722 | 74 | 385 | 113 |
| NNF | 7241 | 895 | 3950 | 1592 |

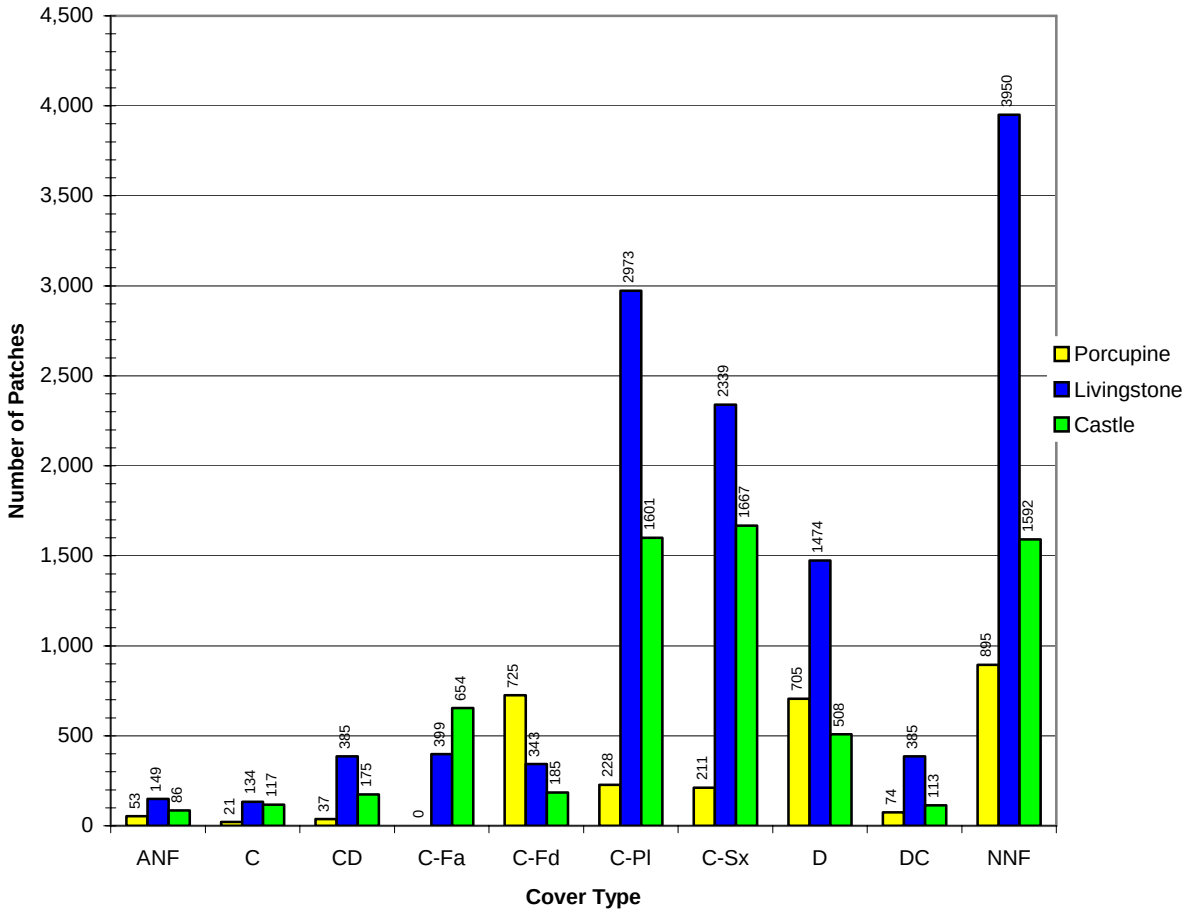


**Figure 3. Cover type: number of patches.**

**Table 27. Forest fragmentation** (mean patch size [ha]).

| Class | Greater C5 | Porcupine | Livingstone | Castle |
|---|---|---|---|---|
| All | 26.36 | 13.37 | 14.72 | 16.05 |
| ANF | 53.24 | 14.07 | 20.99 | 21.53 |
| C | 9.40 | 4.19 | 10.45 | 6.75 |
| CD | 8.05 | 9.11 | 5.94 | 4.53 |
| C-Fa | 14.44 | 0.00 | 8.54 | 18.01 |
| C-Fd | 27.89 | 21.48 | 15.66 | 11.60 |
| C-Pl | 26.36 | 21.14 | 25.96 | 21.27 |
| C-Sx | 20.37 | 10.14 | 19.06 | 18.00 |
| D | 16.60 | 10.99 | 6.76 | 5.76 |
| DC | 7.60 | 3.99 | 5.15 | 4.30 |
| NNF | 37.39 | 8.58 | 10.83 | 22.32 |

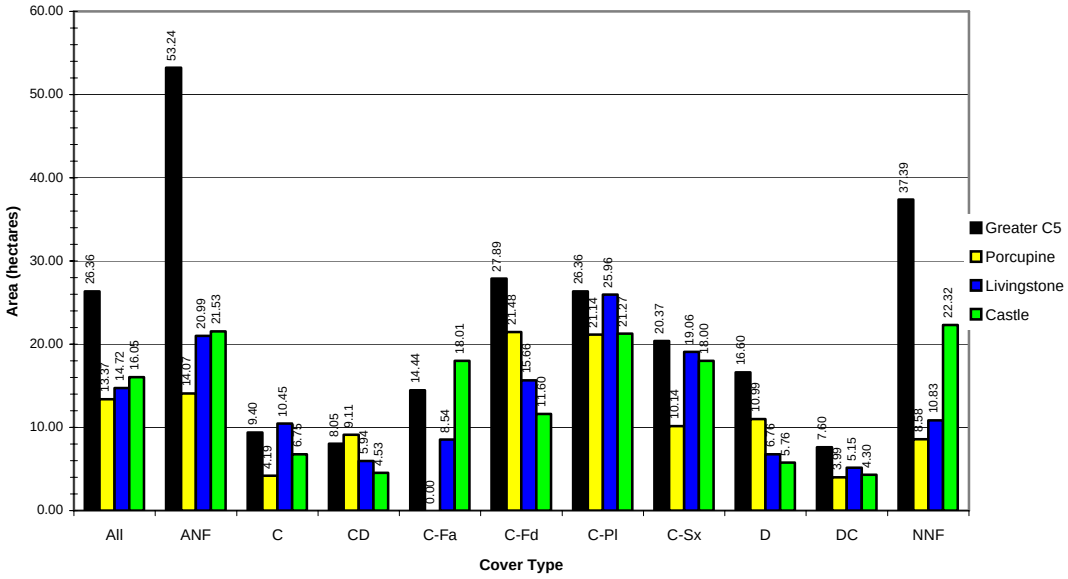


**Figure 19. Cover type: mean patch size.**

# 3.0 WILDFIRE MANAGEMENT

Historically, wildfire has been the predominant ecological process influencing the evolution of Alberta's forests. Under the natural fire regime, forest landscapes were young and dynamic. Periodic fires initiated early successional stages, and influenced the species composition and age

structure of the current forest. With the advent of forest protection and wildfire management, one of the direct impacts has been a greater fuel build-up of older-aged forests with an associated increase in fire hazard.

## FIRE HISTORY 1931–2003

Natural disturbances, such as wildfire, are not homogeneously distributed over mountainous landscapes, and fire cycles and other fire parameters (e.g., fire size, type, frequency, intensity) vary spatially. Fire regime and fire history information are essential elements in describing the role fire plays in forested ecosystems. The fire regime is defined by the fire frequency, cycle, type, size and intensity of fires that occurs in a given area (i.e., natural region or natural subregion).

Evaluating these characteristics provides essential information to support various aspects of forest protection and forest management programs. The fire regime can be obtained by evaluating the natural range of variability of fire size, frequency and return intervals. An annual disturbance rate can be estimated based on historical fire analysis, and forest management strategies can be adapted to emulate natural disturbance.

A Fire Regime Analysis[2] is currently completed and the following preliminary findings are noteworthy. The Fire Regime Analysis indicates the total forested area that has burned in the C5 FMU over a 20-year period (1930-1950) was 50,673 ha. This represents a burn rate of 2,534 ha per year. Based on a forested area of 203,727 ha, this is equivalent to an annual disturbance rate of 1.24%.

## FIRE FREQUENCY

Over a 41-year period it is estimated that a total of 433 fires have occurred in the C5 FMU, burning 2428.71 ha of forested land (Table 28). Fire frequency was highest in the 1970s and lowest during the 1990s. There was no noticeable increase or decrease in fire frequency from 1961-2002. However, with the diminished appearance of fire on the landscape, as well as aggressive suppression and prevention policies, a decline in fire occurrence would be expected. The yearly fire statistics also demonstrate the wide variation in the number of fires each year and area burned. The largest number of fires on record occurred in 2000; however, they accounted for only 0.53% of the total area burned.

[2] *The C5 FMU Fire Regime Analysis is being conducted by Wildland Disturbance Consulting, Banff, Alberta, under contract to the Forest Protection Division.*

**Table 28. Temporal fire distribution in C5 FMU by decade (1961-2002).**

| Period | Count | Area Burned (ha) |
|---|---|---|
| 2000-2002 | 83 | 2090.89 |
| 1990-1999 | 50 | 160.53 |
| 1980-1989 | 109 | 31.86 |
| 1970-1979 | 121 | 123.84 |
| 1961-1969 | 70 | 21.59 |
| Total | 433 | 2428.71 |
| Average: 10 fire; Std Deviation (+/-9) | | |
| Min: 1 fire | | |
| Max: 53 fires | | |

## FIRE SIZE AND TYPE

During the period 1960 to 2002, the largest fire occurred in 2000 and burned 2088 ha, which accounted for over 85% of the total burned area from 1961-2002 (Table 29). Approximately 80% of the total number of fires over that time were small (<0.1 ha). There were no other large fires (>200 ha) aside from the one class E fire in 2000.

**Table 29. Temporal fire distribution in C5 FMU by size class (1961-2002).**

| Size Class (ha) | Count | % Occurrence | Area Burned (ha) | % Total Burned |
|---|---|---|---|---|
| A (0.01 to 0.1) | 342 | 78.98% | 11.04 | 0.45% |
| B (0.11 to 4.0) | 77 | 17.78% | 53.91 | 2.22% |
| C (4.1 to 40.0) | 11 | 2.54% | 178.46 | 7.35% |
| D (40.1 to 200.0) | 2 | 0.46% | 285.3 | 11.75% |
| E (200.1 +) | 1 | 0.23% | 1900 | 78.23% |
| Total | 433 | 100.00% | 2428.71 | 100.00% |

When the provincial fire history data of class E fires (>200 ha) from 1931-2003 are included, the total area burned increases significantly (Table 30). During the 1930s there were several large fires, with the largest occurring in 1936 which burned over 30,000 ha. The majority of the large fires from 1931-2003 have occurred in the southern portion of the FMU (Map 13).

The most recent large fire was the Lost Creek Fire in 2003, which covered a total area of 18,966.2 ha[3] (both burned and partially burned), with 13,167.8 ha lying within the timber harvesting land base. There were 642.0 ha of green islands within the perimeter of the fire, of

[4] The final acreage was determined from aerial photo interpretation, and excludes non-burned areas within the fire boundaries. The area burned as determined by AWIS, covers the entire area within the perimeter of the fire, and was established at 21,163 ha.

which 18,338.7 ha were within the Green Area (Rocky Mountain Forest Reserve) and 627.5 ha in the White Area. Of the burned area:

- 2,111 ha were non-forested,
- 7,334 ha were pine types (average age 85 years),
- 7,996 ha were spruce types (average age 110 years),
- 388 ha were Douglas fir types (average age 95 years),
- 1,029 ha were alpine fir/alpine larch types (average age 100 years) and
- 79 ha were mixedwood types.

**Table 30. Class E fires (>200 ha) in C5 FMU (1931-2002).**

| Year | Size (ha) | Year | Size (ha) |
|---|---|---|---|
| 1931 | 1,256.0 | 1936 | 4,155.8 |
| 1931 | 1,118.9 | 1939 | 314.4 |
| 1934 | 309.9 | 1982 | 349.0 |
| 1934 | 11,702.6 | 2003 | 258.0 |
| 1936 | 31,760.9 | 2003 | 227.5 |
| 1936 | 28,055.6 | 2003 | 18,966.2 |
| Total = 98,474.8 | | | |

The leading cause of fire for C5 is anthropogenic, accounting for 70% of total fire occurrences (Table 31). Lightning-caused fires accounted for only 30% of total fires that have occurred since 1961. The majority of anthropogenic fires are caused by recreational users, who were responsible for over 45% of the total fires.

**Table 31. Classification of fire occurrence by cause in C5 FMU (1961-2002).**

| General Causes | Count | % Occurrence |
|---|---|---|
| Lightning | 130 | 30.02% |
| Anthropogenic | 303 | 69.98% |
| Total | 433 | 100.00% |
| Detailed Causes | | |
| Other Industry | 29 | 6.70% |
| Lightning | 130 | 30.02% |
| Resident | 2 | 0.46% |
| Forest Industry | 29 | 6.70% |
| Railroad | 1 | 0.23% |
| Not Used | 11 | 2.54% |
| Recreation | 200 | 46.19% |
| Incendiary | 3 | 0.69% |
| Misc. Known | 19 | 4.39% |
| Unknown | 9 | 2.08% |
| Total | 433 | 100.00% |

## FIRE SEASON

The majority of wildfires in the planning area occurred during the months of July and August (Table 32). Before the Lost Creek Fire, the greatest amount of area burned occurred in August (1961.94 ha). An assessment of fire distribution on a monthly basis revealed that over 50% of all fires occurred in July and August. Due to lack of large fire sizes during the 1961-2002 period, it is difficult to determine the peak burning season, but July, August and September experienced fire weather conditions that were favorable to large fires. Human-caused fires occurred at all times of the year, while lightning fires occurred from May to September.

**Table 32. Fire occurrence for each month by cause and area burned in C5 FMU (1961-2002).**

| Month | Count | % Total | % Lightning | % Anthropogenic | Area Burned (ha) | % Burned |
|---|---|---|---|---|---|---|
| January | 7 | 1.62% | 0.00% | 2.31% | 1.35 | 0.06% |
| February | 1 | 0.23% | 0.00% | 0.33% | 1.00 | 0.04% |
| March | 1 | 0.23% | 0.00% | 0.33% | 0.10 | 0.00% |
| April | 3 | 0.69% | 0.00% | 0.99% | 0.31 | 0.01% |
| May | 53 | 12.24% | 2.31% | 16.50% | 10.41 | 0.43% |
| June | 37 | 8.55% | 8.46% | 8.58% | 4.98 | 0.21% |
| July | 114 | 26.33% | 40.00% | 20.46% | 199.88 | 8.23% |
| August | 122 | 28.18% | 41.54% | 22.44% | 1961.94 | 80.78% |
| September | 47 | 10.85% | 6.92% | 12.54% | 122.33 | 5.04% |
| October | 21 | 4.85% | 0.00% | 6.93% | 60.58 | 2.49% |
| November | 19 | 4.39% | 0.00% | 6.27% | 36.68 | 1.51% |
| December | 8 | 1.85% | 0.00% | 2.64% | 29.15 | 1.20% |
| Total | 433 | 100.00% | 100.00% | 100.00% | 2428.71 | 100.00% |

## LANDSCAPE HAZARD ASSESSMENT

FireSmart landscapes focus on mitigating the likelihood of large, high-intensity, high-severity fires. Designing FireSmart landscapes involves the use of wildfire threat assessment and fire regime analysis to evaluate the negative ecological, social and economic impacts of wildfire on the landscape. The model incorporates four components:

1. Fire behaviour potential.
2. Fire occurrence risk.
3. Values at risk.
4. Suppression capability.

Assessing each component is key in determining what is driving the wildfire threat and identifying those areas on the landscape most threatened by wildfire. Based on the model, the highest wildfire threat in the C5 FMU occurs during the fall (September and October), as shown in Figures 20-22, and is concentrated in the southern portions of the management unit. This can be attributed primarily to fuels and values at risk.

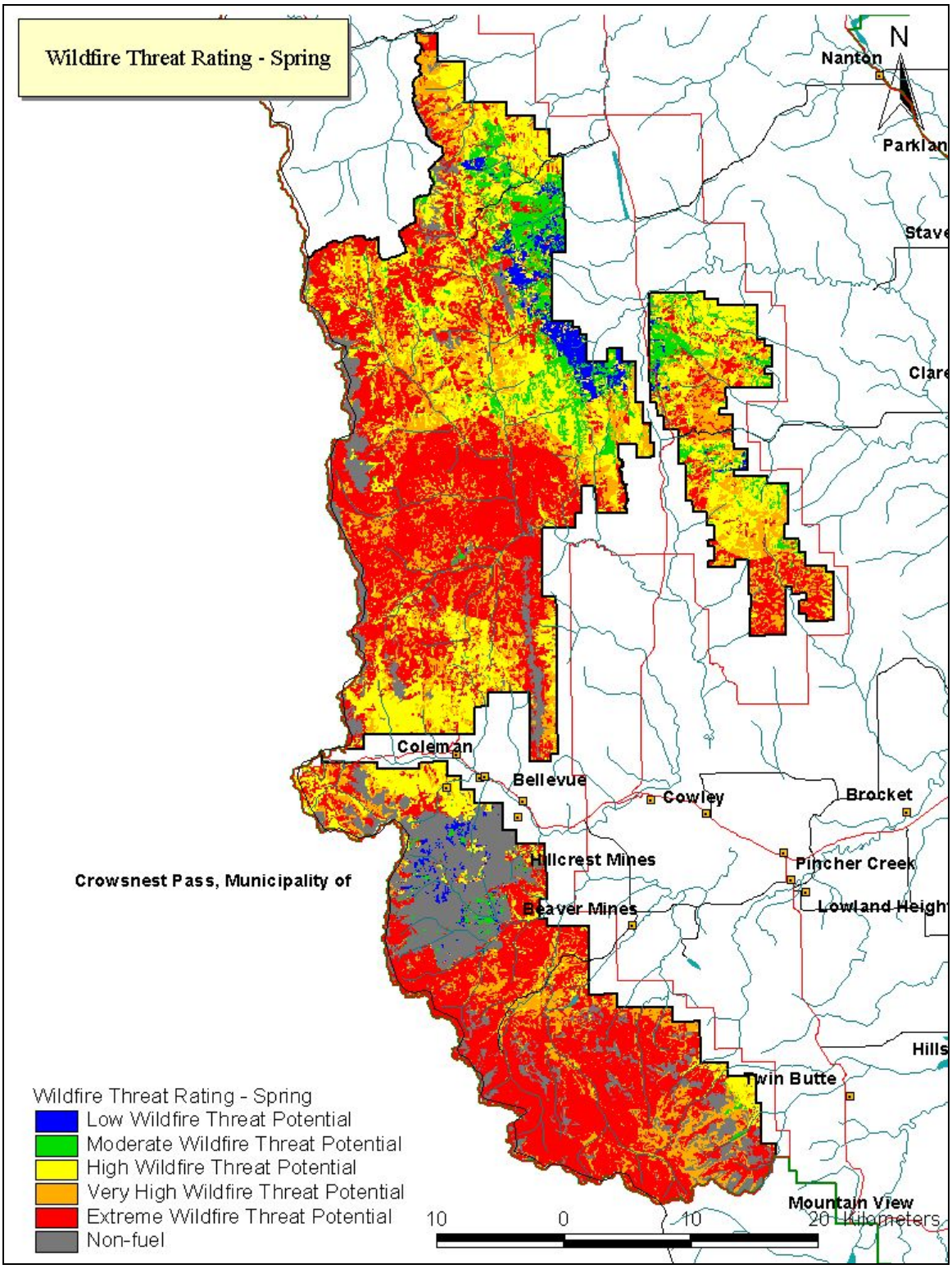


**Figure 20. Spring wildfire threat rating for C5.**

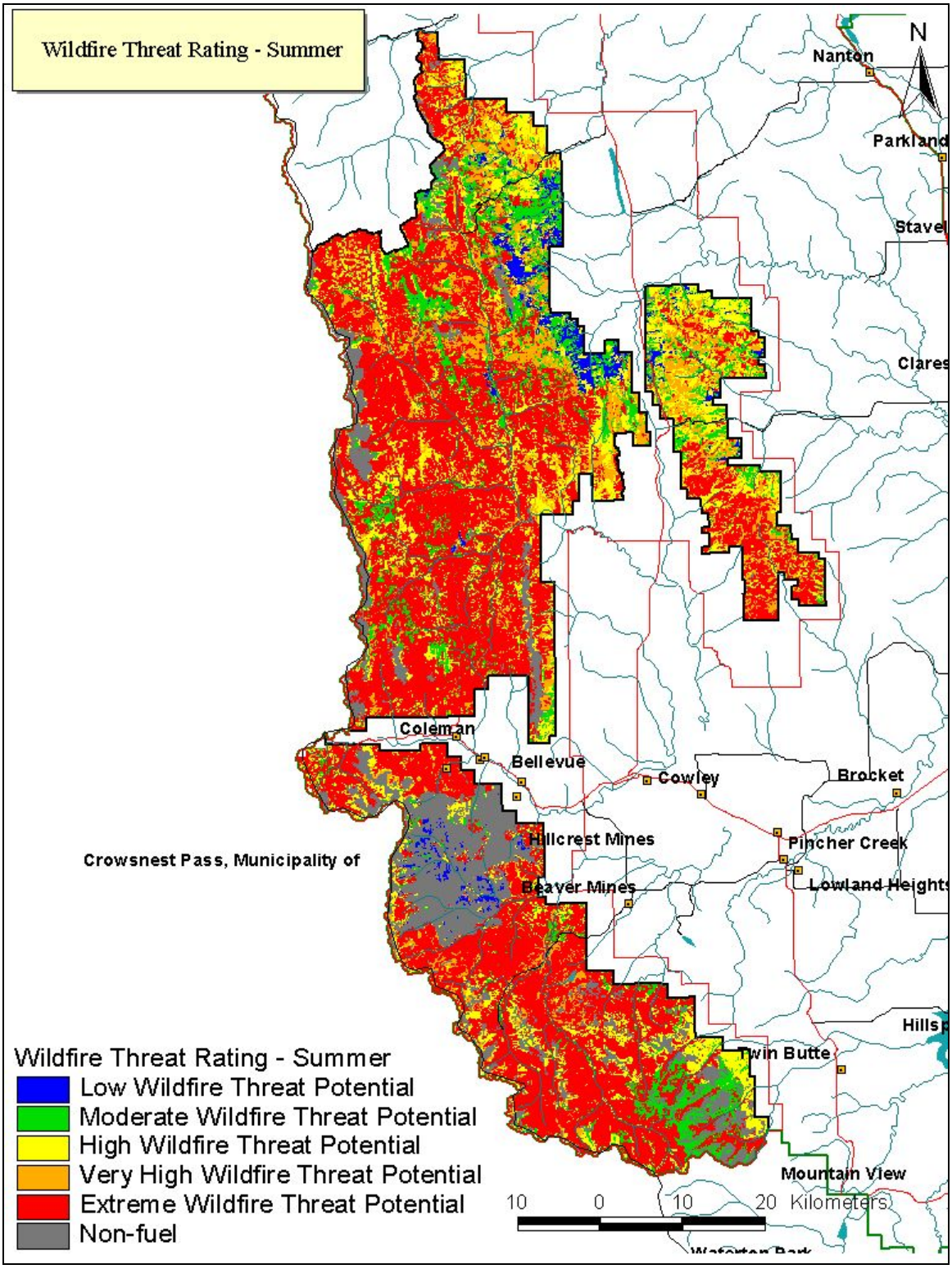


**Figure 21. Summer wildfire threat rating for C5.**

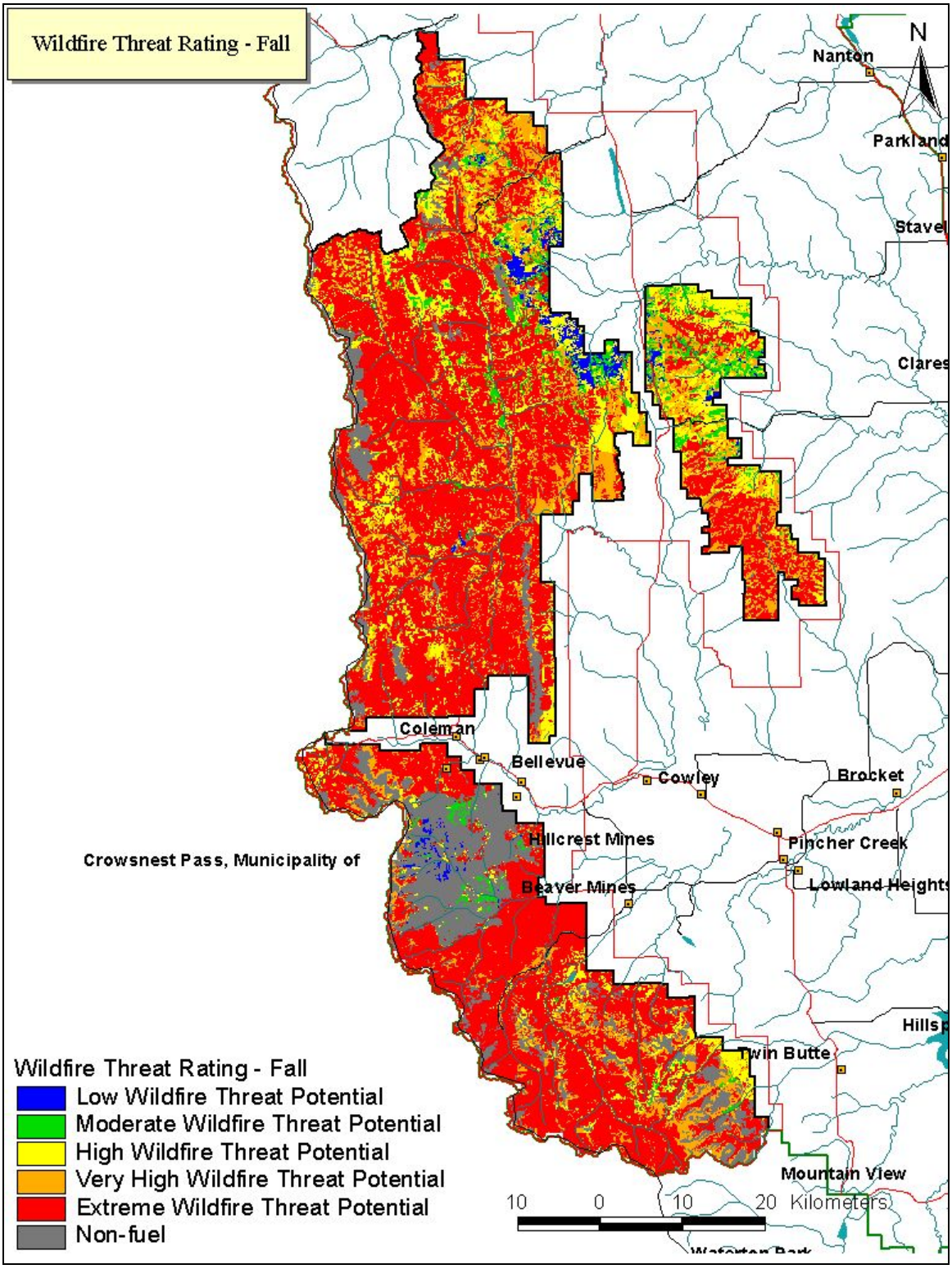


**Figure 22. Fall wildfire threat rating for C5.**

## FIRE BEHAVIOUR POTENTIAL

Fire behaviour is the manner in which fuel ignites, flame develops and fire spreads and exhibits other related phenomena. There is potential for extreme fire behaviour throughout the planning area (Figures 23-25), and it is mainly driven by fuels. The majority of the FMU consists predominantly of continuous C2 (spruce) and C3 (mature pine) fuel types (Map 14).

The funneling effect of topography in valleys and strong southwest winds during periods of high fire hazard, when combined with favourable weather conditions, contributes to high fire spread potential. The highest fire behaviour potential occurs during the fall months.

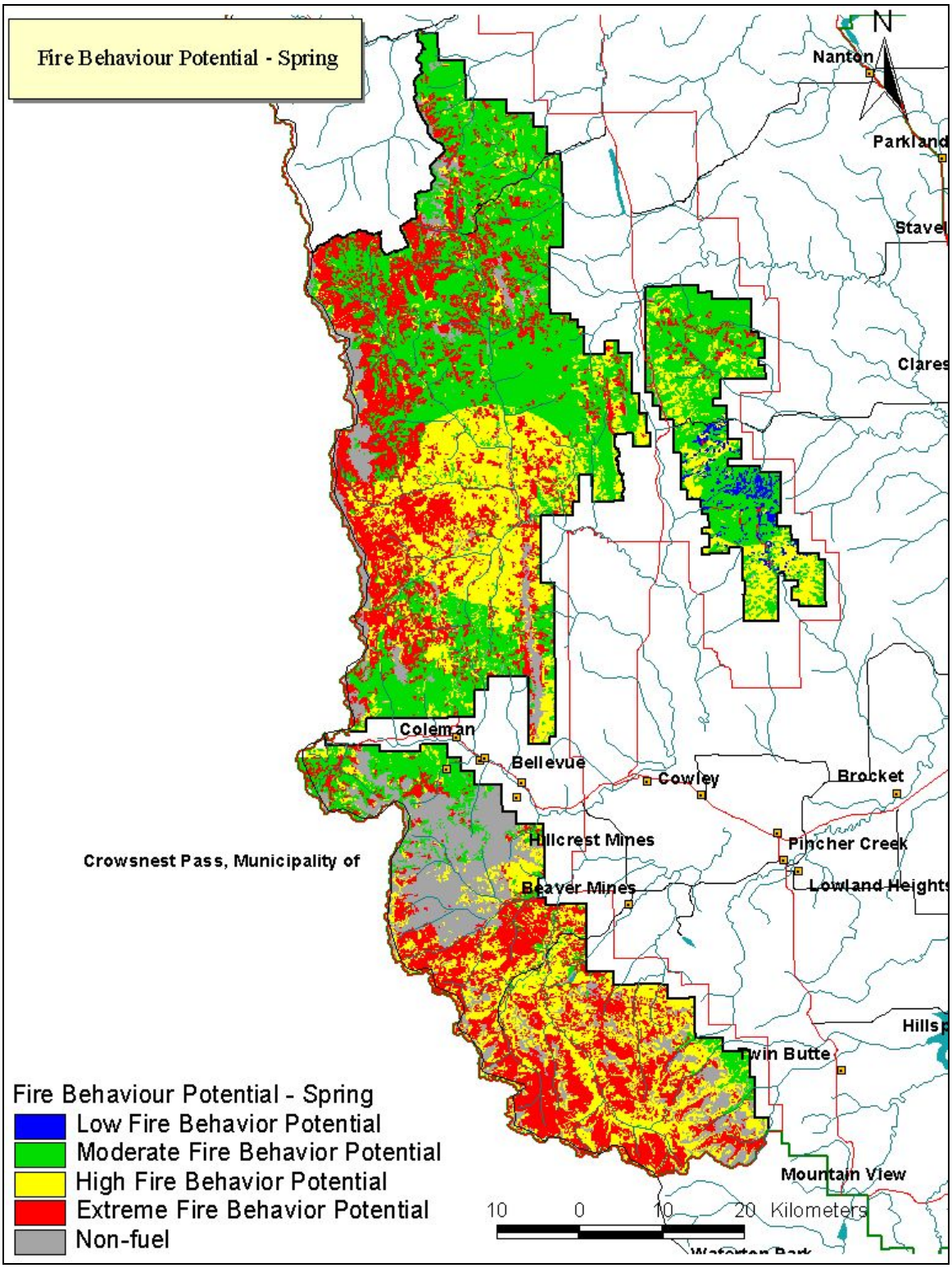


**Figure 23. Spring fire behavior potential for C5.**

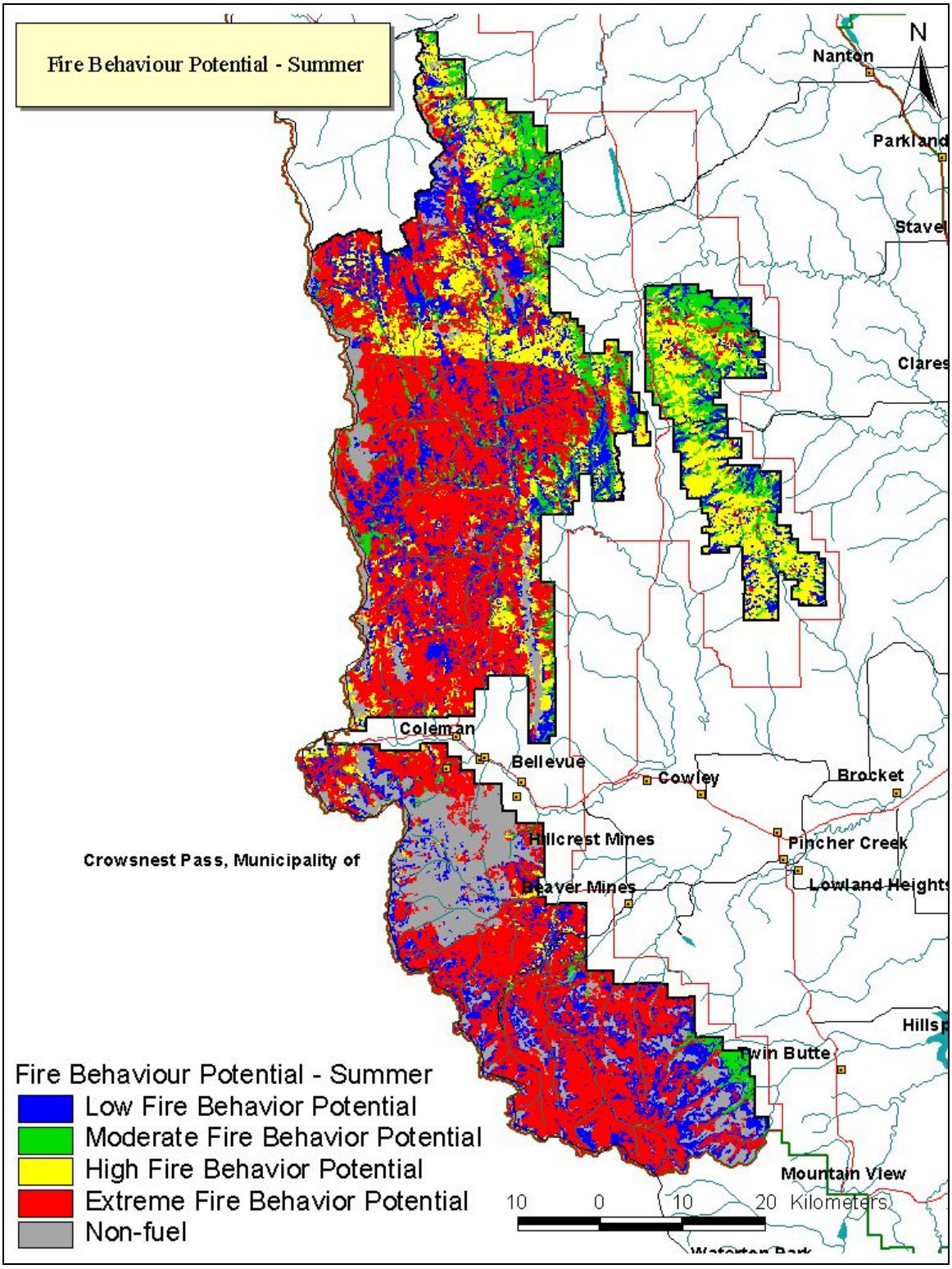


**Figure 24. Summer fire behavior potential for C5.**

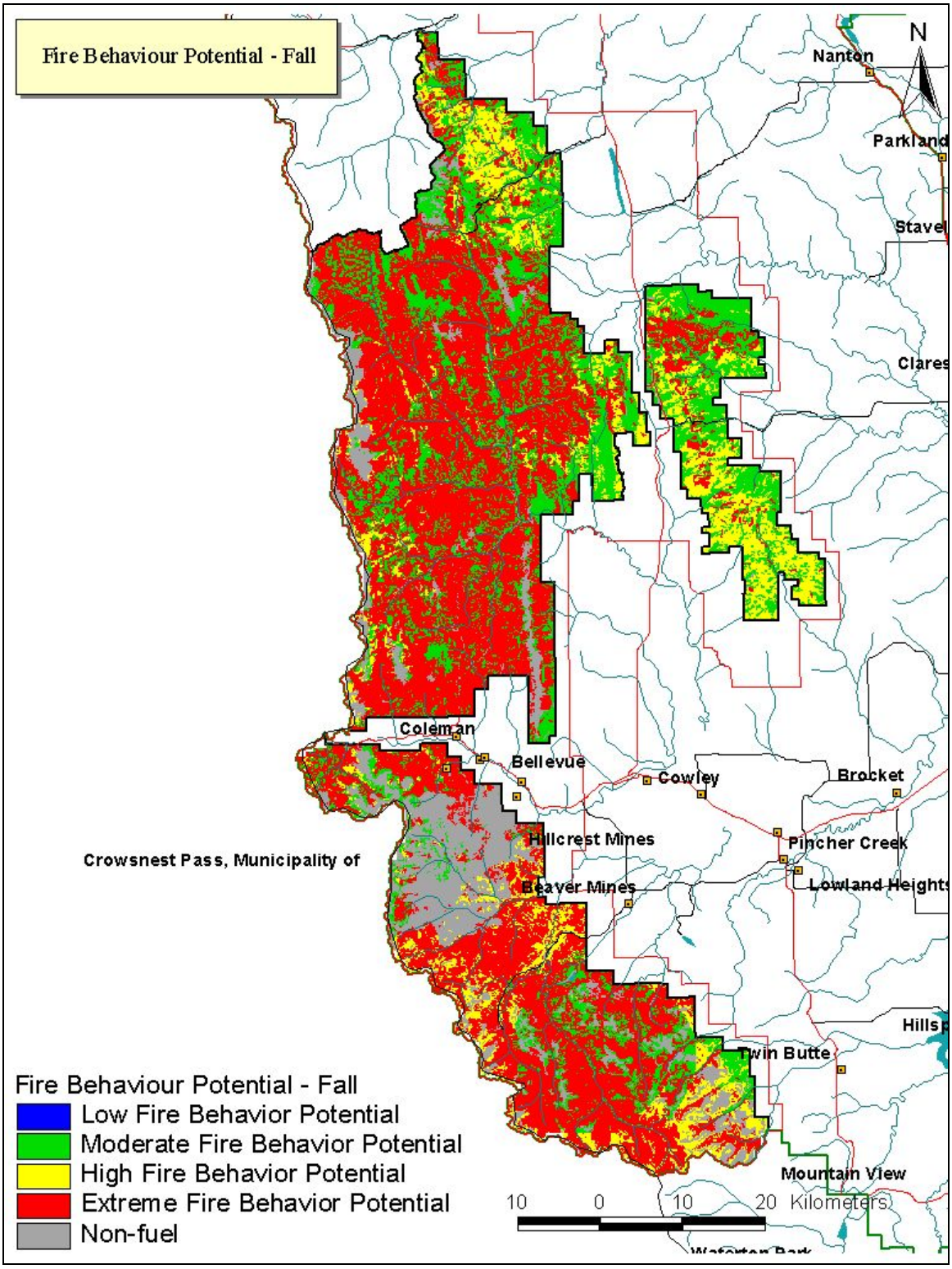


**Figure 25. Fall fire behavior potential for C5.**

## FIRE OCCURRENCE RISK

Fire occurrence risk is the probability or chance of fire starting, as determined by the presence of causative agents. There have been 541 wildfires in the planning area since 1961. The majority of fires have been human related and occurred in valley corridors (Figure 26). There have been several recreation fires in Kananaskis Country where the risk of human-related fires occurs during spring, summer and fall. Risk of lightning-caused fires occurs during the summer and fall.

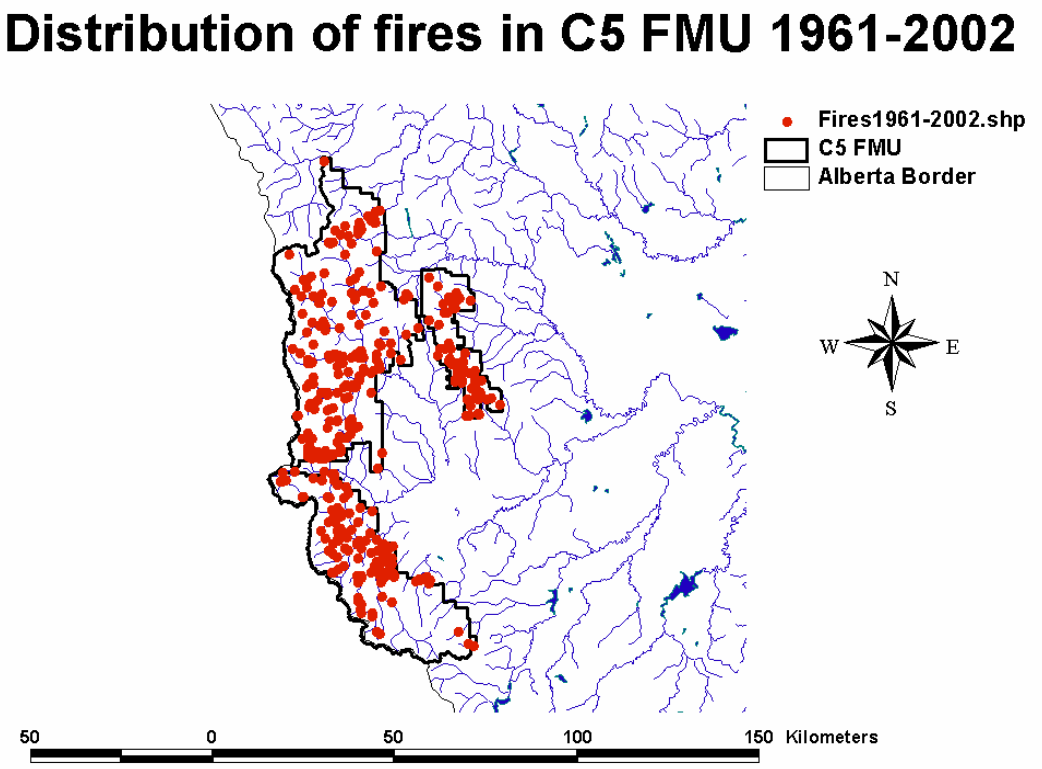


**Figure 26. Distribution of fires in C5 (1961-2002).**

The greatest fire occurrence risk lies in the southern portion of the planning area (Figures 27-29).

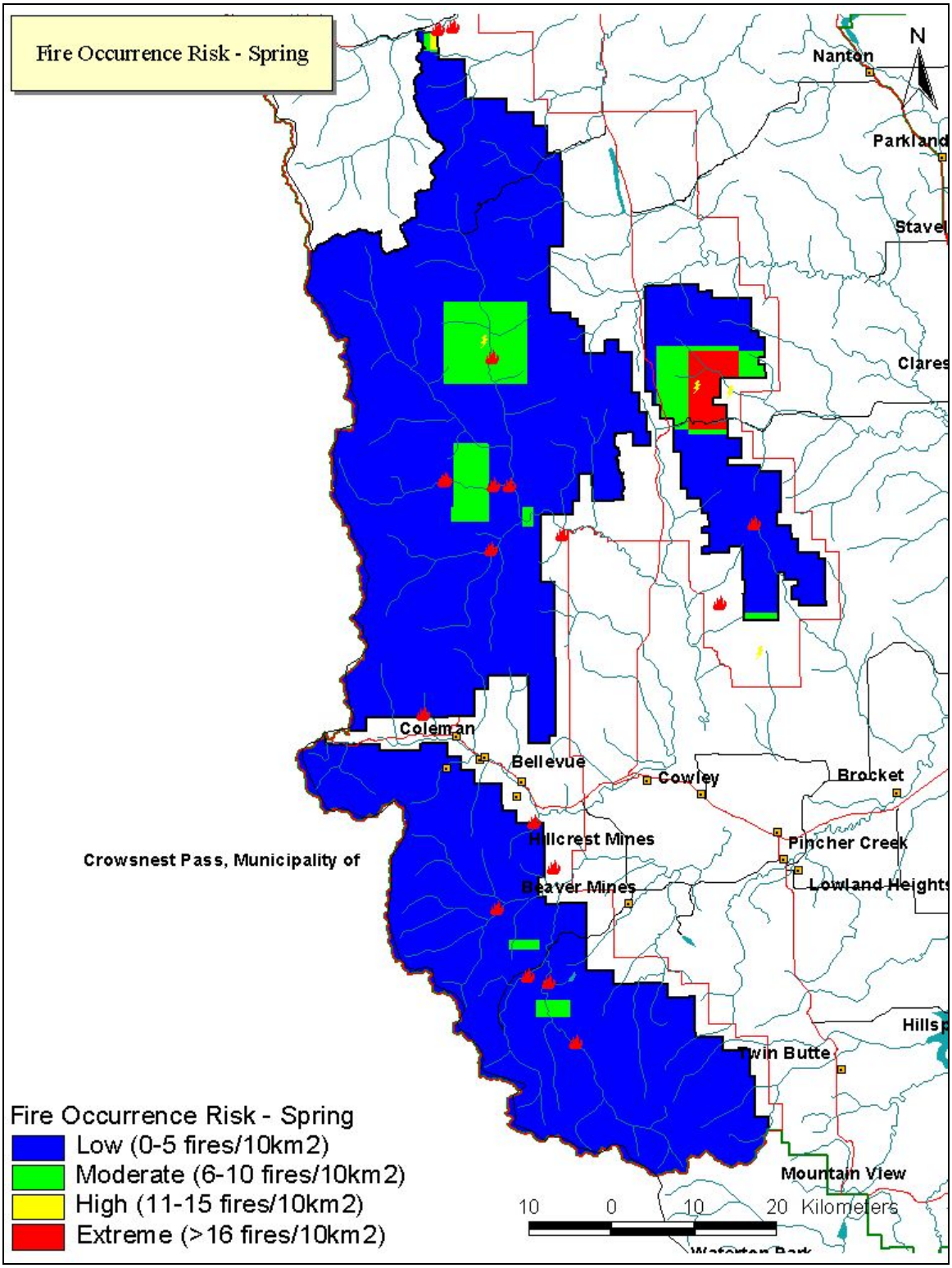


**Figure 27. Spring fire occurrence risk for C5.**

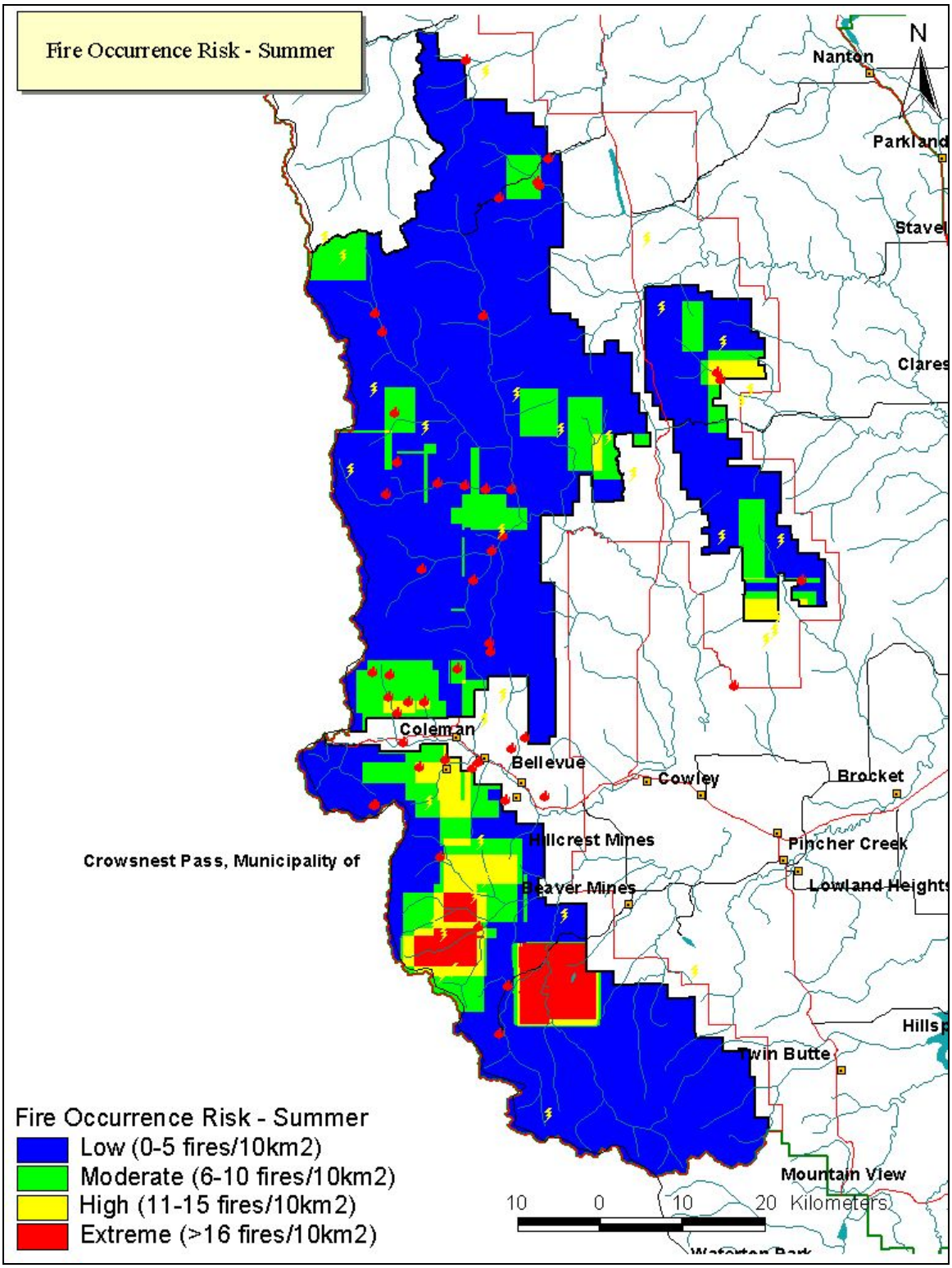


**Figure 28. Summer fire occurrence risk for C5.**

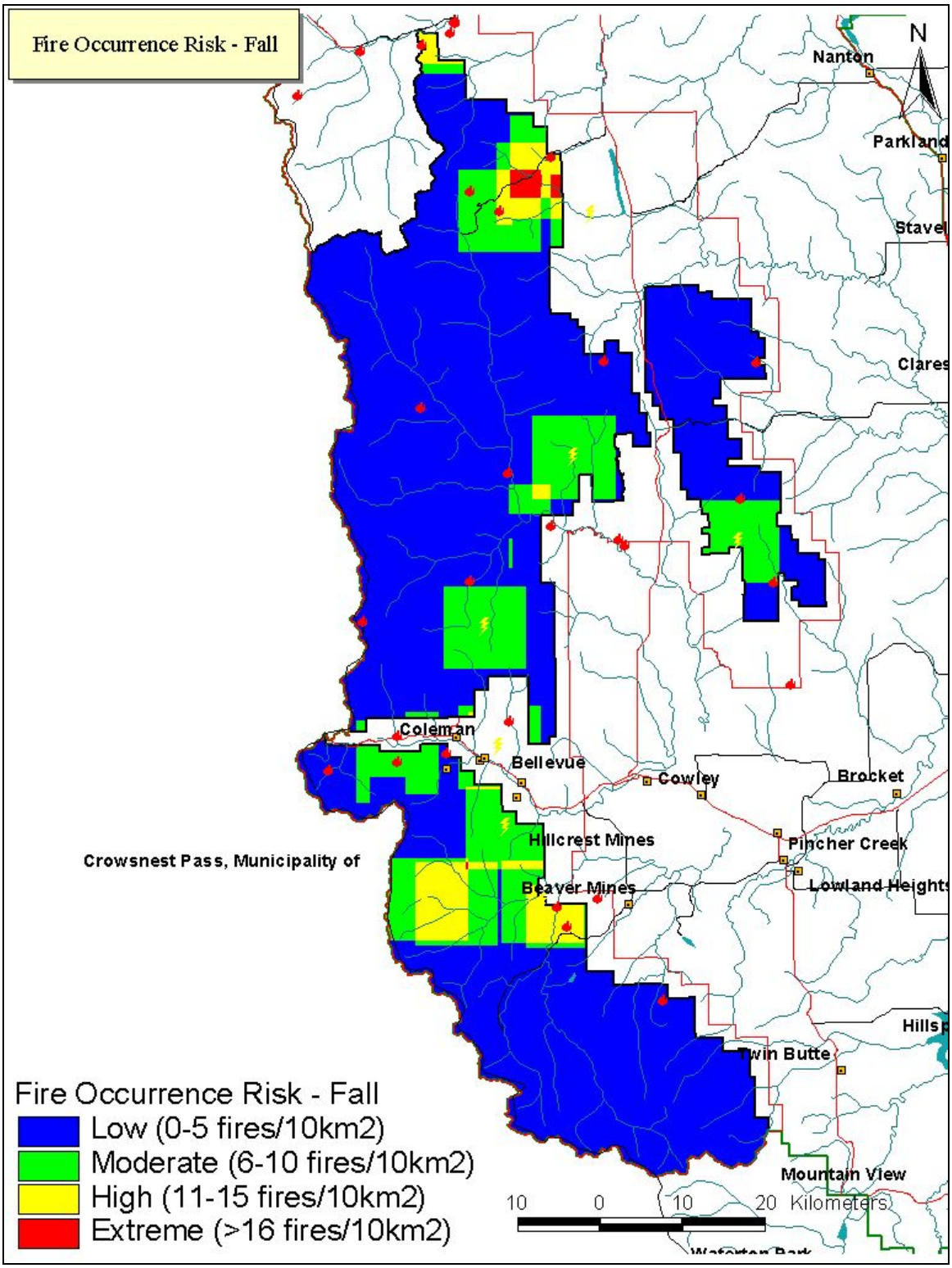


**Figure 29. Fall fire occurrence risk for C5.**

## VALUES AT RISK

Values at risk are a specific or collective set of natural resources and man-made improvements and/or developments that have a measurable or intrinsic worth, which could be potentially destroyed by fire. Life and community are the primary values at risk in the planning area, and these are concentrated mostly in the southern portion of the FMU (Figure 30). There is also critical watershed, and timber rights have been allocated throughout the management unit. This combination of values at risk contributes significantly to a high overall wildfire threat (Figure 31).

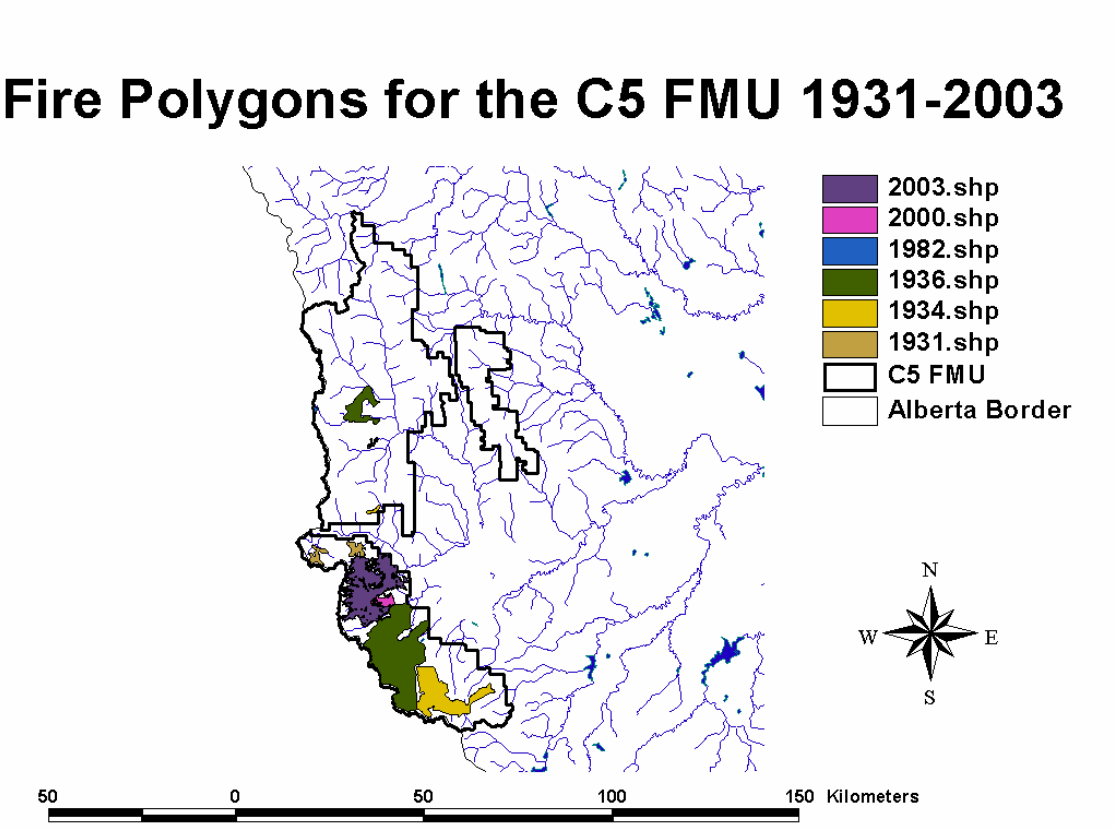


**Figure 30. Fire polygons for C5 (1931-2002).**

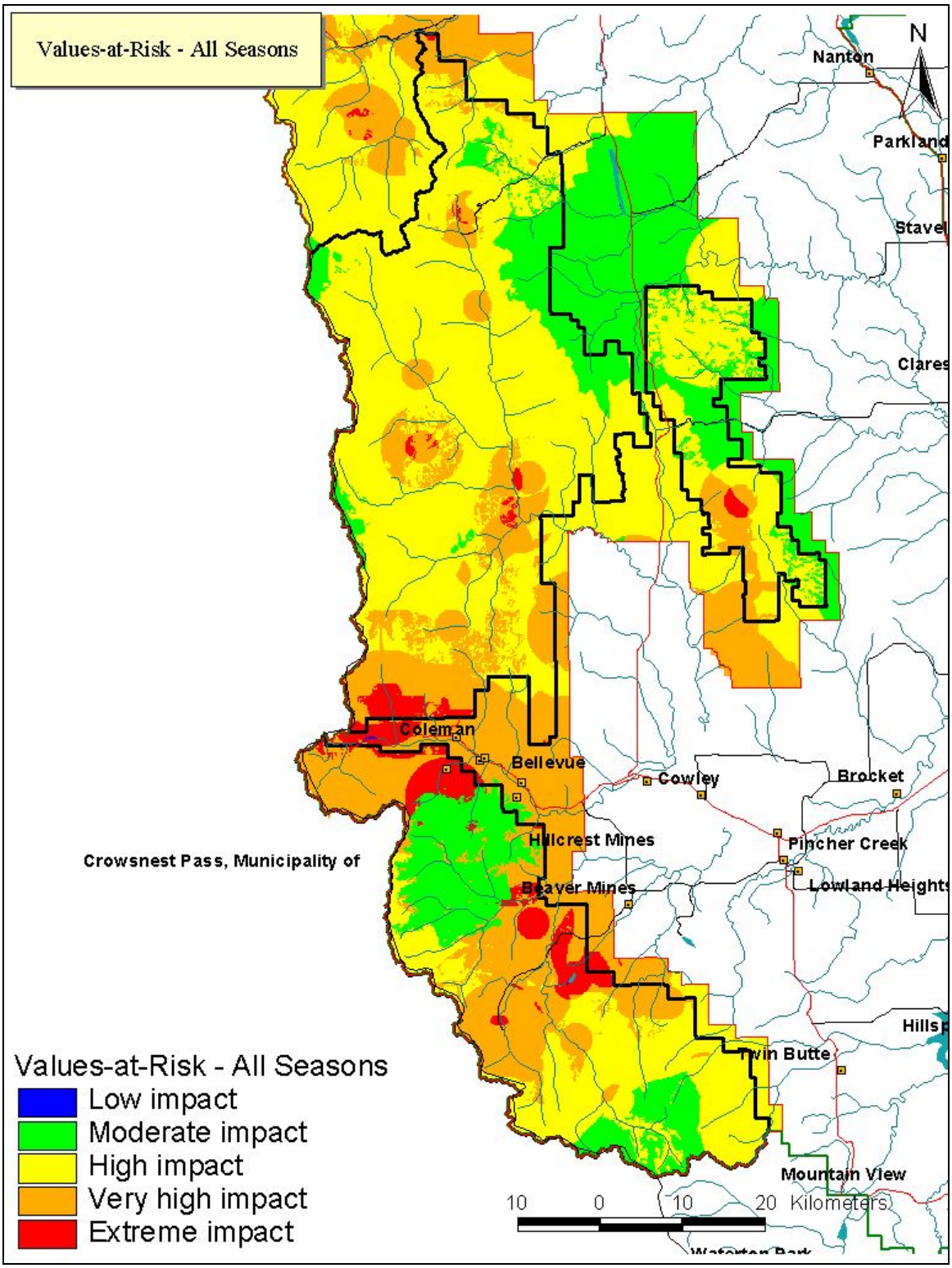


**Figure 31. Values at risk for C5.**

## SUPPRESSION CAPABILITY

Suppression capability includes factors and limitations that are related to ASRD's ability to contain a wildfire upon detection in order to protect values at risk. The suppression capability is good for much of the planning area (Figure 32). The proximity of fire bases, detection capability, good road access, and a number of water sources contribute to good suppression capability.

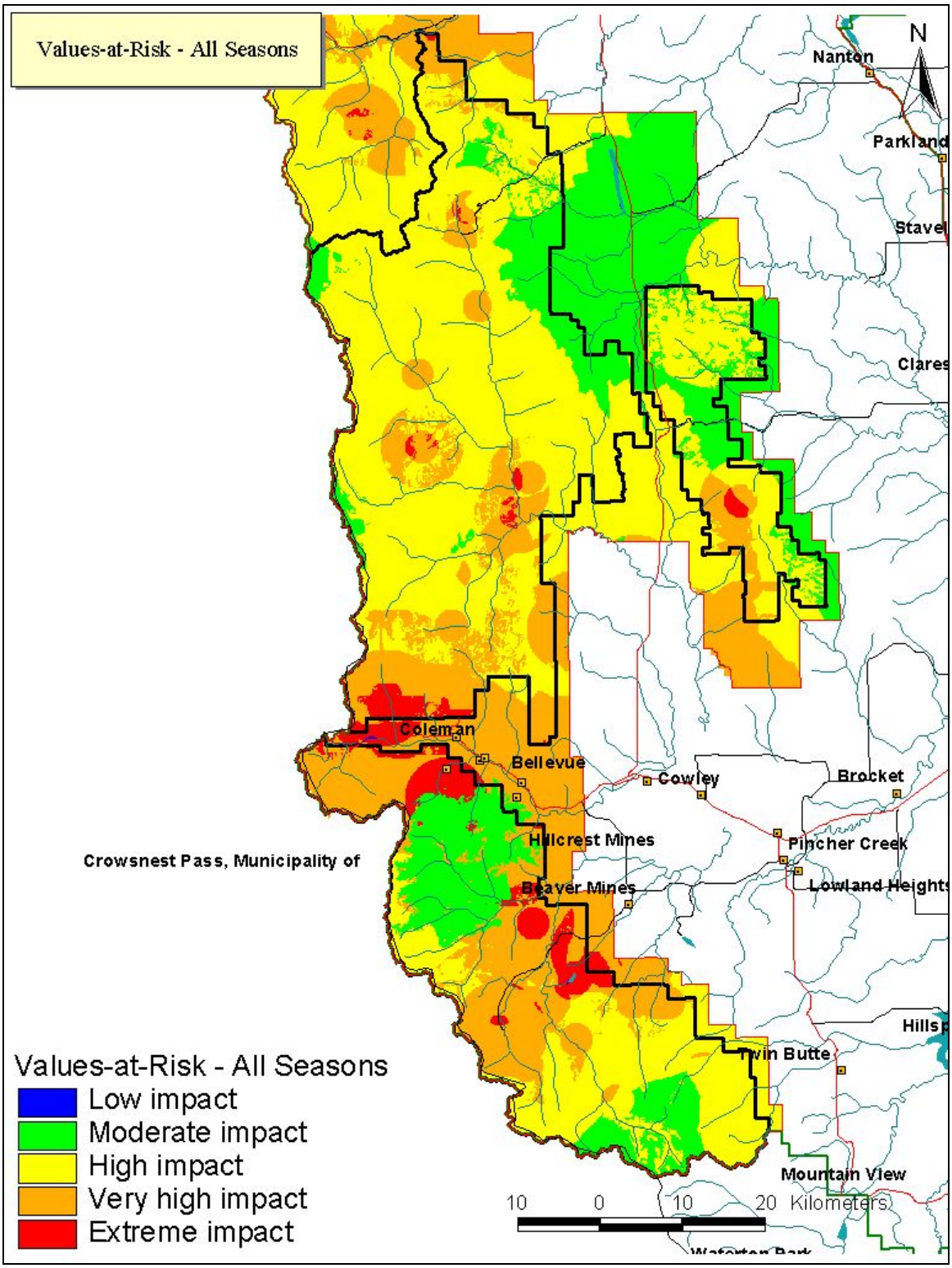


**Figure 32. Suppression Capability for C5.**

# 4.0 CULTURAL AND HISTORICAL RESOURCES

Located 40 km north of the U.S. border, the Crowsnest Pass is the most southerly highway and railway corridor through Canada's Rocky Mountains. The Crowsnest Pass is rich in coal mining history. This includes the tragedies of the Frank Slide and the Hillcrest Mine Disaster, the worst mine disaster in Canadian history. Although the coal mining era is over, its history is well preserved at excellent museums and interpretative stations.

There are five communities strung along this 32-km corridor to the B.C. border, which marks the Continental Divide. In 1979, these towns were amalgamated into the Municipality of Crowsnest Pass, which now has a population of 6200 people. Archaeological surveys indicate extensive use of the pass by pre-contact cultures from both sides of the Rocky Mountains, dating back perhaps 10,000 years.

Among the early white visitors were members of the Palliser Expedition of 1857-1860, which explored the area extensively as part of their reconnaissance mission through Canada's western prairies. Large deposits of coal were noted by G.W Dawson in an 1878 survey conducted for the Geological Survey of Canada. The first industrial activity, however, was the establishment of a sawmill around 1880.

The real impetus for development in the Crowsnest Pass was the arrival in 1898 of the Canadian Pacific Railway line, built to serve the lead, copper and zinc mines of southeastern British Columbia. The deposits of soft bituminous coals were perfectly situated to fuel the railway's steam engines and heat the homes of an influx of prairie settlers.

The boom was on, and soon the Crowsnest Pass developed into Alberta's largest coal mining region. The five communities that exist today making up the Municipality of Crowsnest Pass were formed between 1898 and 1905. Numerous coal-mining ventures occurred over the same period. Not all survived, however. Leitch Collieries, located at the east end of Crowsnest Pass, was one such failure. Established in 1907 as one of the largest mines in the pass, it suffered from strikes and poor markets, and was liquidated in 1919. When the mine closed, the buildings from the nearby company town of Passburg were moved to surviving communities. Fortunately, the walls of the mine manager's house and the remains of coal washers, a tipple and a row of 101 coke ovens have survived. They are preserved as the Leitch Collieries Provincial Historic Site.

South of Highway 3 is the Community of Hillcrest, where a large cemetery is witness to the town's sad history. In 1914, a huge explosion ripped through the tunnels of the Hillcrest Mine, killing 189 men and boys and leaving more than 500 widows and children behind. Such tragedies were not uncommon in the area's coal mines, where high concentrations of methane gas and coal dust were a lethal mix. Between 1902 and 1912, more than 350 people died in explosions. Workers in the coal mines of Alberta and British Columbia earned the worst safety records in the world for their time.

The most infamous tragedy in the Crowsnest Pass was not an underground explosion, but the Frank Slide. In the early morning of April 29, 1903, more than 80 million tonnes of limestone slid off the face of Turtle Mountain, sweeping across part of the sleeping town of Frank and continuing well up the other side of the valley. An estimated 70 people were killed. Many scientists believe the slide was likely triggered by coal mining tunnels in a mountainside already inherently unstable. Indeed, Aboriginal people in the area called it the Turtle — "the mountain that moves".

Alberta Environment continues to monitor Turtle Mountain, but to date there have been no further significant movements, although rock slides are commonly heard from the Community of Bellevue directly east of the slide. Today, visitors flock to the Frank Slide site and Interpretive Facility to marvel at the enormous jumble of boulders that litter the valley, and to gain an appreciation for the coal mining culture of the area.

Another industry that prospered briefly in the Crowsnest Pass was rum running. During Alberta's prohibition era, from 1916 to 1923, liquor was smuggled across the border from B.C., and sometimes from Montana, in fast cars and then bootlegged to thirsty patrons. One of the ringleaders was Emilio Picariello, known as Emperor Pick, who owned the Alberta Hotel, which is now a pharmacy in Blairmore. Cases of liquor were apparently taken from the hotel through a tunnel under the road and loaded onto railway cars. Picariello was hanged in 1923 after a policeman was killed in a shootout.

The westernmost community in the Crowsnest Pass is Coleman. Here visitors can tour the Crowsnest Museum and the Coleman Journal Building, home of a former Pulitzer Prize winning weekly newspaper, where early publishing machinery is on display. Just beyond Coleman are outcroppings of 93-million-year-old volcanic rock, the only surface evidence of volcanic activity in Alberta.

Archaeological surveys indicate extensive use of the Crowsnest Pass area by pre-contact cultures from both sides of the Rocky Mountains, dating back possibly 10,000 years. Portions of the C5 FMU are archaeologically important as being one of the first areas of the province to become ice-free following the last glaciation of North America — there is potential for very early sites to be present here. There are currently 311 archaeological sites recorded in the Crowsnest Pass area and another 296 sites within the C5 FMU. But there are undoubtedly many times this number still undiscovered throughout the C5 FMU.

Management of as yet undiscovered archaeological sites is achieved through the use of a spatial model that predicts the likelihood for archaeological sites to be present in a given location. Archaeologists know from studies here and in similar terrain elsewhere what kinds of locations were favoured for settlement in the past. This understanding is then used to define areas of high, moderate and low archaeological sensitivity. This archaeological model will be used to guide forestry and other activities in the C5 FMU.

## 5.0 PIIKANI NATION (PEIGAN FIRST NATION, I.R. 147)

(Note: The following text is from the Piikani web page at: http://www.treaty7.org/Article.asp?ArticleID=34.)

The Piikani Nation is located along Highway 3 midway between the towns of Fort Macleod and Pincher Creek. The Brocket townsite is located on the reserve along the highway.

By themselves, the Piikani were the smallest Blackfoot Tribe to sign Treaty 7, although with the Blackfoot Tribe in the neighbouring State of Montana, they form the largest tribe of the Blackfoot Nation.

When the Piikani signed the Treaty, they asked for "the Oldman River, the Porcupine Hills and Crow Creeks" to be their home base, as these were their favourite wintering areas, which provided a good base to hunt buffalo. When the buffalo began to disappear, the Piikani were encouraged to go to their new reserve to learn agriculture and become farmers. However,

agriculture was not favoured because of the climate. Instead, they directed their energy toward ranching and their success as ranchers is still in evidence today.

Over the years, the Piikani continued to be a quiet, independent people who were not afraid to try new ideas. For example, they were the first band in Alberta to demand a vote in provincial elections, the first to allow liquor onto a reserve, the first to assume administration of their reserve, and the first to host Indian Day Celebrations as a means of retaining and maintaining their culture.

The Piikani continue to strive for self-determination and economic independence for present and future generations. They have established business ventures to create employment for band members and in 1986, took control of their education by establishing and building a high school as an addition to the existing elementary school on the reserve.

## 6.0 KAINAIWA NATION (BLOOD FIRST NATIONS, I.R. 148)

(Note: Much of the following text is from the Kainaiwa web page at: http://www.treaty7.org/Article.asp?ArticleID=35.)

The Kainaiwa reserve, which is the largest reserve in Canada, is located approximately 200 km south of Calgary. It straddles Highway 2 south of Fort Macleod, and stretches west of Cardston in the south to the Lethbridge city limits in the northeast. The 9400 members of the tribe are scattered throughout the reserve, with many leaving the reserve to find more opportunities on the outside. The centre of the reserve and the hub of activity is in Stand-off located at the junction of Highway 2 and Secondary Road 505. The village was built in the late 1960s. It is the headquarters of many Tribal Administration Departments. The Kainaiwa business community is also located in the townsite of Standoff.

Early legends tell the story of a Blackfoot who visited a Kainaiwa camp. He asked, "Who is the Chief here?" When the men nearby heard this question, they all answered "I am." The Blackfoot then stated, "I will call you the Tribe of Many Chiefs." This was how they received the name Kana (from Aka - "many" and Nina - "chief").

With reference to the name "Blood", this was the name given to them from the first traders as a result of the Red Ochre, which they used on their faces and ceremonial objects. Chief Red Crow selected for the Bloods, the land between the Waterton River and the St Mary's River back to the Rocky Mountains and as far south as the Canada–U.S. International Boundary.

Early in the 1800s, the Kainaiwa lived and hunted primarily in southern and southeastern Alberta, and in northern Montana. At that time there were no man-made boundaries, and the favourite hunting places for the Kainaiwa were in the region of the Hand Hills near Drumheller, in the Sweetgrass Hills regions, and in the present Lethbridge district. Some of their best wintering grounds were along the Belly River, the Highwood River, and for the northern bands, along the Battle River.

Besides being the largest tribe in Canada, the Bloods are very industrious and are noted for having set up a large number of "entities" affiliated with their reserve management that include:

- Kainaiwa Board of Education
- Red Crow Community College
- Blood Tribe Health Department

- Blood Tribe Agricultural Project
- Kainaiwa Resources Inc.
- Kainai Agri-Business Corp.
- St. Mary's Projects
- Kanai Chamber of Commerce
- Kainaiwa Developments Ltd.
- Blood Tribe Emergency Services
- Blood Tribe Police
- Kainaiwa Childrens Services
- Kainai Legislation Initiative

# 7.0 EDEN VALLEY (STONEY I.R. 216)

(Note: The following is taken from the Stoney web page at: http://www.treaty7.org/Article.asp?ArticleID=37.)

The lands which make up the Stoney homeland are found in three separate locations. The Eden Valley reserve lies to the south of Morley; the Big Horn reserve to the north; the reserve at Morley, to the west of Calgary is the site of the Chief Goodstoney Rodeo Centre, where the Nakoda Pow-Wows are held annually.

As descendants of the great Sioux nations, the Stoney tribal members of today prefer to conduct their conversation and tribal business in the Siouan mother tongue. Like many other Indian nations in Alberta and across Canada, the three Stoney bands have Aboriginal treaty rights going back more than one hundred years.

# 8.0 FOREST HEALTH

Many insects and diseases found in the C5 FMU are found in endemic populations on a yearly basis. Table 33 provides a list of the most prevalent insects and diseases that occur in the FMU. This table identifies pests that may have a significant impact on commercial tree species.

**Table 33. Forest pests within the C5 FMU.**

| Agent | Target Species | Target Species Age | Damage Caused | Historical Occurrence | Management Implications |
|---|---|---|---|---|---|
| Mountain Pine Beetle | All pine | 80-120 years | Girdling by the larvae and the subsequent introduction of a blue-stain fungus carried by this beetle disrupts water flow within the tree. Mortality can occur in 1 year. | low | This insect has the ability to kill a large number of healthy pines in a few years. The C5 has several stands that are susceptible to pine beetle attack. A large outbreak may cause significant mortality of pine, change harvest sequences, result in salvage logging, increased fire risk, loss of future volume available for harvest. Blue stain fungus reduces value of wood. |
| Spruce Beetle | All spruce | 80+ | Mortality of entire tree in 1 year. | low | Similar to mountain pine beetle, however this insect prefers stressed/dying trees over healthy trees. Healthy trees can be attacked and killed once populations build. |
| Spruce Budworms | All fir, | All | Growth loss, top kill | low | Historically, spruce budworms are not much |

| Agent | Target Species | Target Species Age | Damage Caused | Historical Occurrence | Management Implications |
|---|---|---|---|---|---|
| | tamarack, spruce | | and mortality caused by defoliation. | | of a problem. The species normally found in the C5 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 and require salvage logging. |
| Aspen Defoliaters:<br>- forest tent caterpillar<br>- Bruce spanworm<br>- large aspen tortrix | Aspen, birch, other deciduous trees | All | Growth loss, top kill and mortality caused by defoliation. | high | These insects are common in C5. They defoliate deciduous trees in June to various degrees. Normally the trees recover and reflush leaves later in the summer. Some mortality of trees can occur if insect populations persist in one area over several years. |
| Root Collar Weevils | All pine, spruce, tamarack, fir | All ages are attacked but damage occurs on trees under 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. Often associated with Armillaria root disease. 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 are susceptible to wind throw. | high | This fungus can kill over 500 species of tree and woody plants and is found throughout the C5. The fungus spreads by root-to-root contact and rhizomorphs. This fungus can severely impact the productivity of a site, reduce/kill entire plantations, and cause significant blowdown in mature stands. Management options are in the experimental stage; 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 is a parasitic plant that infects pine trees. It is found in several locations of C5. The parasite spreads from mature overstory trees to the young trees. Management includes harvesting entire infested stands, planting spruce buffers in cutblocks that are surrounded by mistletoe-infected stands, and culling out young infected pine. |
| Tomentosis root disease | All conifer | Mature trees | Growth loss and mortality caused by root and butt rot. Infected trees are susceptible to wind throw. | moderate | This fungus is most prevalent in the west end of C5. It causes butt rot that can reduce the value of timber and predispose trees to wind throw. |

## MOUNTAIN PINE BEETLE (DENDROCTONUS PONDEROSAE)

The mountain pine beetle (MPB) is the most destructive insect pest of pine trees in western North America. The normal range of the MPB coincides with the geographical range of the Rocky Mountains; however, with recent warm winters, hot summers and an overabundance of large, mature pine trees, MPB have the potential to spread into Alberta and cause significant pine mortality. Alberta's goal is to treat all infestations on public forested land within one year of detection.

Recently, the pine beetle population has been increasing in southern Alberta. ASRD has been actively controlling infested trees since 2002 in the Bow Valley. In 2002, 1013 trees were either

felled and burned, or logged near the Town of Canmore. In 2003, the number of beetles dropped significantly; however, over 200 trees were still treated.

Infestations of MPB to the west of the C5 FMU in the Elk Valley of British Columbia are significant and increasing despite operational harvest of infected stands. The peak beetle year for the Elk Valley is expected in 2013. In the fall of 2004, the first red attacked trees were identified in the Crowsnest Pass. Twenty trees in two locations were identified south of Highway 3 in the Star Creek area. In 2005/2006, 250 trees south of Highway 3, and more than 850 trees north of Highway 3, were identified. Single tree falling and burning of noted trees, both in the C5 FMU and Crowsnest Corridor occurred in February/March of 2006. Monitoring is ongoing and an increase in MPB presence is expected in the C5 Forest during the period 2006 to 2013.

## Lodgepole Pine Dwarf Mistletoe (Arceuthobium americanum)

Dwarf mistletoe is a parasitic flowering plant that penetrates its host tree and interrupts the normal growth and function of the branch or stem. Infected branches are usually broomed, twisted and have spindle-shaped swellings. Dwarf mistletoe causes the greatest amount of loss of merchantable lodgepole pine in Alberta. This disease is prevalent in many mature lodgepole pine stands in southwestern Alberta. In the C5 FMU, dwarf mistletoe is noted in the Allison/Chinook FLUZ, and the disease can be found at endemic levels in many other locations.

## Armillaria Root Disease (Armillaria)

Armillaria root disease is one of the most serious diseases of young conifers in Alberta. This disease is widespread in Alberta. It may also predispose trees to other pests. Armillaris Root Disease is noted in the Allison/Chinook FLUZ of the C5 FMU. It is probably present in other locations yet to be identified through passive identification by ASRD staff while carrying out other responsibilities or through information received by the general public.

## Wind and Other Disturbance Factors

The C5 FMU is noted for the aggressive winds associated with Chinook conditions. Though winds are common in the range of 50 to 100 km per hour, the incidence of blowdown or windthrow in normal healthy stands is no different than anywhere else in the province. This is largely due to the natural adaptation of tree stems exposed to persistent wind and to stable soil conditions. Special attention to harvest design is required in this FMU to minimize blowdown events that can occur in the aftermath of logging.

In the early 1960s, an unusual event occurred in the Tent Mountain area of the C5 FMU. A tornado struck the area, progressing down the valley and bouncing back and forth creating a cut-and-leave pattern in the pine stands. Tree stands were knocked down and the swirling pattern of the winds was recorded with trees stems strewn in circles and piled up to 30 ft. high. The final patch that was knocked down was located on the south side of Highway 3 west of the Corbin River Bridge in B.C. This location is now a gravel/sand pit. Salvage harvesting of most of the merchantable volume was undertaken and today there are no obvious signs of this event.

# 9.0 TIMBER HARVESTING

Logging operations began in the Castle River area in the late 1800s to provide logs and dimensional lumber for railroad construction and human settlement. Commercial timber harvesting within newly established forest management units began in the mid 1960s. Since then, the timber resource of the FMU has provided many direct and indirect benefits to the local communities and the Province of Alberta. Managing this renewable resource on a sustainable basis provided opportunities for long-term investments in the forest products industry. These investments provide employment opportunities and form a foundation on which local communities can build.

A detailed description of the forest resource was provided earlier in this document. The primary commercial coniferous species managed and harvested in the C5 FMU are lodgepole pine, white/Engelmann spruce and subalpine/balsam fir. In 2005, the C5 FMU had an annual allowable cut of 174,920 $m^3$ of coniferous trees that has been fully allocated to four quota holders and the Community Timber Permit Program. Quota holders are allocated a specified volume of wood as a percentage of the available annual allowable cut. Volume distributions for the C5 forest management unit as of August 2004 (after adjustments for the Lost Creek Fire) are noted in Table 34.

**Table 34. Summary of timber dispositions and their annual allowable cut allocations (C5 FMU).**

| Post-Fire Conifer AAC (15/11 utilization) 3.13% mitigated reduction | | | |
|---|---|---|---|
| Company Name | Disposition | AAC ($m^3$) | Percentage |
| 793128 Alberta Ltd. | CTQC050002 | 2,886 | 1.65% |
| Atlas Lumber (Alberta) Ltd. | CTQC050009 | 102,661 | 58.69% |
| 770538 Alberta. Ltd. | CTQC050005 | 7,661 | 4.38% |
| Community Timber Permit Program (CTPP) | CTP –C5 | 10,863 | 6.21% |
| Spray Lake Sawmills (1980) Ltd. | CTQC050008 | 50,849 | 29.07% |
| Totals | | 174,920 | 100% |

Quota certificates are issued for a 20-year period; however, throughout that time period, AAC volumes are balanced over four 5-year periods (each 5-year period is referred to as a quadrant). The next quota renewal period is scheduled for the end of the forth quadrant –May 1, 2006.

The Community Timber Program consists of community timber permits, commercial timber permits, local timber permits and TM66 (poles, rails, Christmas trees, firewood) permits. The commercial timber permit program operates through a competitive bid process.

### HISTORICAL PATTERNS OF HARVESTING

Harvesting has occurred on the landscape for 50+ years. Map 15 illustrates the historical harvest patterns on the landscape.

### ACCESS DEVELOPMENT

There are a number of primary and secondary highways running throughout and adjacent to the C5 FMU. Highways 40 and 22 traverse the length of the planning area from the Crowsnest Pass in the south to Kananaskis Country in the north. Highway 3 (Crowsnest Pass) runs east–west and bisects the FMU. Other secondary access routes include #632, #507, #517 and #774. There are also numerous unnamed service roads and trails in the C5 FMU that are used by industry and recreationists. Other linear corridors include gas and power transmission lines and railroad lines.

An access management plan was implemented in the Castle River area in 1996 in response to direction contained in the 1985 IRP. This access management plan was to provide field level direction for the recreational use of on-highway and off-highway vehicles in the Castle River area. Signs were installed throughout the Castle River area, and a brochure was prepared that identified trails open to off-highway vehicles during the summer and winter seasons.

## 10.0 FISH AND WILDLIFE RESOURCES

The management unit supports a diverse range of habitat types. Habitat needs for individual species vary significantly. Many areas in the C5 FMU that are considered unproductive, from a forest management perspective, offer productive wildlife habitat. Many species require a mixture of forested and non-forested areas in close proximity to one another to satisfy their specific life-cycle needs.

The planning area provides important habitat for the following wildlife species: black and grizzly bear, cougar, wolf, coyote, red fox, mule and white-tailed deer, moose, elk, bighorn sheep, mountain goat, lynx, wolverine, other fur-bearers and a number of small mammals. All Zone 2 (Critical Wildlife) areas provide important winter range for ungulates. A large variety of bird species — song birds, waterfowl, upland birds and raptors also frequent the plan area.

Important stream and alpine lake fisheries are also present. Fish species that are native to the planning area include cutthroat trout, bull trout, mountain whitefish, white sucker, longnose sucker and longnose dace. In addition, brook trout, rainbow trout, brown trout and golden trout, as well as exotic strains of cutthroat trout have been stocked in lakes and streams in the Castle River area.

A list of plant and animal species of concern in the C5 FMU is provided in Table 35. Map 16 illustrates the locations of some of these species of concern within the C5 FMU.

**Table 35. Species at risk within C5 FMU.**

| Common Name | Scientific Name | Status Ranking* | Population Notes | Background |
|---|---|---|---|---|
| Western Maidenhair Fern | *Adiantum aleuticum* | May Be At Risk | Population size unknown but believed to be very small. Few locations known. | Distribution restricted to southwest corner of the province, on high altitude cliffs and among boulders. No threats to habitat or population known. |
| Ascending Grape Fern | *Botrychium ascendens* | May Be At Risk | Very small population. Currently known from only one location. | Very restricted distribution in Banff National Park as well as Upper Oldman watershed. |
| Field Grape Fern | *Botrychium campestre* | May Be At Risk | Population size unknown but believed to be very small. May be extirpated from Alberta. | Known from only one location in the Castle area. |
| Lance-leaved Grape Fern | *Botrychium lanceolatum* | May Be At Risk | Found in very small populations, in few locations. | Restricted distribution within the northern and central portion of the mountains and foothills. Known habitat in national parks is secure. |
| Mingan Grape Fern | *Botrychium minganense* | May Be At Risk | Population size unknown but believed to be very small. Known to occur in a number of locations. | Distributed within the southern portion of Alberta. Population is affected by grazing and other disturbances. |
| Paradoxical Grape Fern | *Botrychium paradoxum* | May Be At Risk | Very small population. Known from very few locations. Also rare outside of Alberta. | Distribution restricted to southwestern Alberta, where it may be threatened by grazing. |
| Northern Moonwort | *Botrychium pinnatum* | May Be At Risk | Population size unknown but believed to be very small. Known from only a few locations. | Distribution restricted to mountains and foothills. |
| Dwarf Grape Fern | *Botrychium simplex* | May Be At Risk | Population size unknown but believed to be very small. Known to occur in few locations. | Restricted distribution in southwestern Alberta and Elk Island National Park. Population believed to be in decline because of modification of habitat. |
| Steller's Rock Brake | *Cryptogramma stelleri* | May Be At Risk | Uncommon and found in very small numbers. | Distribution is restricted to mountains and foothills. Calcareous rock habitat is diminished from limestone quarrying. |
| Mountain Lady's-slipper | *Cypripedium montanum* | May Be At Risk | Found in very small populations. Few locations are known. | Very restricted distribution in mountains and foothills of southwestern Alberta. Population may be declining because of grazing and habitat loss from forestry and industrial activity in moist woods. |
| Slender Bog Orchid | *Platanthera stricta* | May Be At Risk | Found in very small numbers. Relatively few locations known. | Distribution very restricted in southwestern Alberta. Threats include grazing and dessication of wetlands from climate change. |
| Western Twayblade | *Listera caurina* | May Be At Risk | Found in very small populations. Few locations known. | Restricted distribution in mountains and foothills of southern Alberta. Habitat may be affected by grazing, forestry and industrial activity in moist woods. |
| Broad-lipped Twayblade | *Listera convallarioides* | May Be At Risk | Found in very small populations. Relatively few locations known. | Very restricted distribution in mountains and foothills of southwestern Alberta. Population may be declining because of grazing and threats to habitat (bogs, meadows) from off-road vehicles and forestry activity. |
| Harlequin Duck | *Histrionicus histrionicus* | Sensitive | Unknown. Restricted distribution in province. Population appears stable. | Site-specific mitigation of disturbances may be necessary. |
| Water Vole | *Microtus richardsoni* | Sensitive | Population estimated at between 1 000 and 5 000 individuals. Trend unknown. | Extremely restricted range with most specimen records from the Bow River to Turner Valley region and Waterton area. |
| Vagrant Shrew | *Sorex vagrans* | May Be At Risk | Extremely rare. Population size unknown but estimated at fewer than 100 breeding individuals. | Known from only seven verified records in West Castle area. |
| Red-tailed Chipmunk | *Tamias ruficaudus* | Sensitive | Population low; trend unknown. | Population localized in Waterton-West Castle area and is vulnerable to habitat loss. |
| Grizzly Bear | *Ursus arctos* | May Be At Risk | Numbers appear stable outside the national parks since 1980. | Found in the mountains, foothills and boreal forests of Alberta. 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. |

| | | | | |
|---|---|---|---|---|
| Columbia Spotted Frog | *Rana luteiventris* | Sensitive | Population status unknown. | Extremely limited distribution; possible population decline requires investigation. |
| Northern Leopard Frog | *Rana pipiens* | At Risk | Severe declines were noted in the late 1970s and early 1980s. Extirpated from North Saskatchewan River drainage basin. | Previously common and widespread species but has disappeared from most of its Alberta range. Similar but less extensive population declines have been documented throughout Canada. Protection of remnant breeding areas essential while investigations of biological needs continue. Designated as "Threatened" under the *Wildlife Act*. |
| Long-toed Salamander | *Ambystoma macrodactylum* | Sensitive | Locally common. Limited number of patchy, disjunct populations. | Isolated populations focused in mountain pass riparian areas. Vulnerable to potential habitat destruction/alteration associated with industrial, recreational and transportation development. Recommended as a "Species of Special Concern" in Alberta. |

| | |
|---|---|
| *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 or protection to prevent it from becoming at risk. |

# 11.0 WATER RESOURCES

The FMU is situated in the headwaters of the Belly, Castle, Crowsnest, Oldman and Highwood Rivers and Willow Creek. All these streams are ultimately tributaries of the South Saskatchewan River. Lesser, but significant, sub-tributaries include Drywood Creek, the Carbondale River, Mill Creek, Racehorse Creek, Dutch Creek, the Livingstone River, Pekisko Creek, Stimson Creek, Beaver Creek and Trout Creek. Map 2 shows the location of different watersheds in the FMU. Table 36 provides a summary of the area that is covered by these watersheds.

**Table 36. Size of watershed sub-basins within C5 FMU.**

| Watershed Name | Total Area (hectares) | Area Within C5 | C5 Area (ha) | % of C5 | % in C5 |
|---|---|---|---|---|---|
| Beaver Creek | 20,108.05 | 6,446.02 | 351,885.6 | 1.83% | 32.06% |
| Carbondale | 30,934.37 | 30,434.74 | 351,885.6 | 8.65% | 98.38% |
| Crowsnest River | 102,285.51 | 42,422.63 | 351,885.6 | 12.06% | 41.47% |
| Drywood Creek | 28,473.38 | 13,020.96 | 351,885.6 | 3.70% | 45.73% |
| Dutch Creek | 15,551.46 | 15,551.46 | 351,885.6 | 4.42% | 100.00% |
| Foothill Creek | 18,869.00 | 0.00 | 351,885.6 | 0.00% | 0.00% |
| Highwood River | 720.83 | 454.23 | 351,885.6 | 0.13% | 63.01% |
| Livingstone | 35,890.08 | 35,890.08 | 351,885.6 | 10.20% | 100.00% |
| Lower Castle | 14,649.23 | 0.00 | 351,885.6 | 0.00% | 0.00% |
| Lower Oldman | 77,673.76 | 30,225.97 | 351,885.6 | 8.59% | 38.91% |
| Meadow Creek | 9,166.05 | 1,166.9 | 351,885.6 | 0.33% | 12.73% |
| Middle Castle | 21,120.30 | 6,128.57 | 351,885.6 | 1.74% | 29.02% |
| Mill Creek | 19,037.79 | 10,537.46 | 351,885.6 | 2.99% | 55.35% |
| Mosquito Creek | 16,014.03 | 0.00 | 351,885.6 | 0.00% | 0.00% |
| Pekisko Creek | 14,448.11 | 7,882.71 | 351,885.6 | 2.24% | 54.56% |
| Pincher Creek | 43,439.95 | 3,011.23 | 351,885.6 | 0.86% | 6.93% |
| Racehorse Creek | 30,584.28 | 30,584.28 | 351,885.6 | 8.69% | 100.00% |
| Stimson Creek | 20,701.02 | 3,576.46 | 351,885.6 | 1.02% | 17.28% |
| Trout Creek | 40,384.66 | 16,700.67 | 351,885.6 | 4.75% | 41.35% |
| Upper Castle | 37,165.67 | 37,165.67 | 351,885.6 | 10.56% | 100.00% |
| Upper Oldman | 34,375.61 | 34,375.59 | 351,885.6 | 9.77% | 100.00% |
| Willow Creek | 90,902.93 | 26310 | 351,885.6 | 7.48% | 28.94% |
| | | 351,885.63 | | 100 % | |

Streams originating in FMU 5 are very productive as far as surface water is concerned. Generally, the more southerly and westerly streams are more productive than the northerly and easterly streams in this area. Only about 50-60% of the annual precipitation in this area ultimately shows up in streamflows. Table 37 provides streamflow statistics relating to the volume of runoff and rate of runoff for several tributaries for which hydrological data is collected.

**Table 37. Annual runoff statistics for selected tributaries originating within C5 FMU.**

| Station | Drainage Area | Normal Annual Runoff | Normal Mar-Oct Runoff | Mar-Oct as % of annual | Normal Mar-Apr Runoff | Mar-Apr as % of annual | Normal May-June Runoff | May-June as % of annual |
|---|---|---|---|---|---|---|---|---|
| | $km^2$ | mm | mm | % | mm | % | mm | % |
| Castle River near Beaver Mines | 823 | 616 | 568 | 92% | 45 | 7% | 401 | 65% |
| Castle River at Ranger Station | 376 | 695 | 639 | 92% | 51 | 7% | 425 | 61% |
| Crowsnest River at Frank | 404 | 354 | 319 | 90% | 27 | 8% | 168 | 47% |
| Oldman River near Waldrons Corner | 1,440 | 285 | 265 | 93% | 19 | 7% | 154 | 54% |
| Racehorse Creek near the mouth | 217 | 410 | 381 | 93% | 20 | 5% | 226 | 55% |
| Drywood Creek near the mouth | 238 | 383 | 363 | 95% | 26 | 7% | 210 | 55% |
| Cataract Creek near Forestry Road | 166 | 356 | 332 | 93% | 15 | 4% | 226 | 63% |
| Highwood River at Diebel's Ranch | 774 | 366 | 340 | 93% | 15 | 4% | 205 | 56% |
| Pekisko Creek near Longview | 232 | 111 | 109 | 98% | 13 | 12% | 65 | 58% |
| Stimson Creek near Pekisko | 263 | 64 | 63 | 98% | 16 | 25% | 35 | 54% |
| Trout Creek near Granum | 440 | 20 | 19.8 | 98% | 2.6 | 13% | 7.0 | 35% |
| Beaver Creek near Brocket | 256 | 16 | 15.8 | 98% | 3.4 | 21% | 6.3 | 39% |

As Table 37 shows, over 90 percent of the streamflow volume occurs from March to October each year. Typically, 50-60% of the volume occurs during the May-June period.

Much of the streamflow that occurs is attributable to the melt of the winter snowpack that accumulates from early October to late April each year. The melt runoff occurs primarily in May. During the snowmelt period, the streams respond to warm and cool weather, rising after a few days of warm weather and subsiding when cool weather dominates. In the headwaters of the Castle River, approximately two-thirds of the annual precipitation falls as snow. In the headwaters of the Crowsnest and Oldman Rivers, only about half the annual precipitation falls as snow. Chinook winds, which are common in southwestern Alberta, can trigger rapid snowmelt in a very short period of time.

Rainfall during the months of May and June is another major factor in the production of streamflow. Large low pressure weather systems originating off the coast of British Columbia sometimes bring warm, moist air from the Gulf of Mexico into the region. This weather pattern creates the heaviest rains and the largest flow rates for the streams of the FMU. In response to heavy rainfall, streams usually peak within 24 hours of the period of heaviest rainfall and then recede quickly. Flood events occur from time to time, particularly when heavy rainfall coincides with spring snowmelt. Peak flow statistics are provided in Table 38.

**Table 38. Flood peak flows for selected tributaries originating within C5 FMU.**

| Station | Drainage Area | 1-in-10-year flood peak flow (mean daily) | 1-in-100-year flood peak flow (mean daily) | Median Date of Peak Flow | Average Date of Peak Flow | Standard Deviation of Peak Flow Date |
|---|---|---|---|---|---|---|
| | $km^2$ | cumecs/$km^2$* | cumecs/$km^2$ | | | days |
| Castle River near Beaver Mines | 823 | 0.26 | 0.43 | May 28 | May 30 | 17 |
| Castle River at Ranger Station | 376 | 0.27 | 0.41 | May 28 | May 30 | 13 |
| Crowsnest River at Frank | 404 | 0.14 | 0.26 | May 30 | June 4 | 29 |
| Oldman River near Waldrons Corner | 1,440 | 0.16 | 0.33 | June 1 | June 3 | 17 |
| Racehorse Creek near the mouth | 217 | 0.24 | 0.44 | May 29 | May 31 | 19 |
| Drywood Creek near the mouth | 238 | 0.31 | 0.72 | June 5 | June 9 | 23 |
| Cataract Creek near Forestry Road | 166 | 0.23 | 0.45 | June 6 | June 7 | 15 |
| Highwood River at Diebel's Ranch | 774 | 0.18 | 0.31 | June 7 | June 8 | 14 |
| Pekisko Creek near Longview | 232 | 0.16 | 0.49 | June 6 | June 8 | 32 |
| Stimson Creek near Pekisko | 263 | 0.13 | 0.52 | June 1 | May 29 | 40 |
| Trout Creek near Granum | 440 | 0.05 | 0.32 | May 20 | May 6 | 50 |
| Beaver Creek near Brocket | 256 | 0.04 | 0.20 | April 27 | May 8 | 52 |

** cubic meters per second/$km^2$*

The months of July, August and September can bring some significant rainfall to the area, but the events are characterized more by convective activity in the air mass (thunderstorms) than by rainfall over the entire watershed, and runoff from these events is considerably reduced compared to events in May and June.

# 12.0 RANGELAND RESOURCE

Forestry and domestic livestock grazing on forested rangelands are integral to the economy and play an important role to the prosperity of the surrounding area. This economic reliance is evident with the growing demand upon the forests in C5 for both forage and fibre production.

Rangeland is land that includes riparian areas, supports indigenous or introduced vegetation that is either grazed or has the potential to be grazed, and is managed as a natural ecosystem. Rangeland includes grassland, grazeable forestland, shrubland and pastureland. Within the C5 FMU, the landscape diversity and vegetation communities means that much of the area, including a considerable portion of the productive forest, is considered rangeland. Forested rangelands provide a significant number of non-timber values. These include biodiversity, forage resources for wildlife and livestock, wildlife habitat, recreation values, watershed and aesthetic values.

The rangeland resources are managed by the Range Management Branch of Public Lands and Forests Division (PLFD), Alberta Sustainable Resource Development. Rangeland resources are managed with the goal of obtaining benefits from the resource in a manner that conserves rangeland sustainability[4] and maintains or enhances rangeland health[5]. Management planning for the forest resource must consider and integrate the innate non-timber values supplied by rangelands.

Domestic livestock grazing has been an integral component of the land use pattern in the planning area since the turn of the century. While large numbers of horses, sheep and cattle were grazed in the planning area following European settlement, domestic livestock grazing today (and in recent history) is largely confined to cattle use. Within the Green Area (the Rocky Mountains Forest Reserve), grazing is permitted through Forest Reserve grazing permits on grazing "allotments" which are issued under the Authority of the *Forest Reserves Act*.

Rangelands are currently being managed through various strategies and mechanisms to meet wildlife and livestock requirements. There are 48 grazing allotments with approximately 45,000 Animal Unit Months (AUM) of grazing permitted within the planning area. The management strategy for the rangeland within the planning area is to maintain a stable but sustainable grazing capacity for domestic livestock

## 13.0 TOURISM/RECREATION

This section includes information on tourism and recreation statistics from the C5 FMU area, bordering communities and White Area lands that are connected to the C5 FMU regardless of administrative boundaries.

The area offers tourist opportunities that include hiking, mountain biking, climbing, golf, hunting, fishing, watching wildlife, wind-surfing, cross-country and down-hill skiing, snowshoeing and snowmobiling. The diversity of ecosystems found in the C5 FMU offers a wide variety of wildlife that include bighorn sheep, moose, elk, deer, grizzly bear, and black bear species of interest to hunters and visitors who enjoy wildlife viewing. The area also has numerous streams that offer some of the best sport fishing opportunities in Alberta.

Businesses of the Crowsnest Pass provide a number of tourism opportunities, including sight seeing and eco-adventures. There are campgrounds and numerous random camping sites throughout the area that provide a variety of recreational opportunities, including camping, hiking, hunting, fishing and OHV use. Twelve provincial recreation areas (Table 39) currently exist within the C5 FMU.

[4] *Sustainability means the ability for a given rangeland (plant community, landscape, ecosystem, or pasture) to carry out necessary ecological processes and functions; for example, primary production, maintenance of soil/site stability, capture and beneficial release of water, nutrient and energy cycling, and plant species functional diversity. Healthy rangeland will provide sustainable grazing opportunities for livestock producers and sustain a long list of other resource products and values. Sustainable range is judged to be healthy and functional according to the standards defined in Rangeland Health Assessment Protocol (Short Form) developed by PLFD.*

[5] *Range Health is a term used to rate the ability of rangeland to perform certain functions. These functions include net primary production, maintenance of soil/site stability, capture and beneficial release of water, nutrient and energy cycling and plant species functional diversity. Range health is judged according to the standards and methods outlined in Rangeland Health Assessment Protocol (Short Form) developed by PLFD.*

**Table 39. Provincial recreation areas in the C5 FMU.**

| Name | Established | Size (Hectares/Acres) |
|---|---|---|
| Beaver Mines Lake Recreation Area* | 1998 | 118.39/292.54 |
| Castle River Bridge Recreation Area* | 1998 | 15.4/38.05 |
| Castle Falls Recreation Area* | 1998 | 37.39/92.40 |
| Lynx Creek Recreation Area* | 1998 | 23.76/58.72 |
| Syncline Recreation Area* | 1998 | 20.64/50.99 |
| Chinook Lake* | 1998 | 48.02/118.65 |
| Racehorse Recreation Area* | 1998 | 18.78/46.40 |
| Dutch Creek Recreation Area* | 1998 | 17.28/42.70 |
| Oldman River North Recreation Area* | 1998 | 37.38/92.37 |
| Livingstone Falls Recreation Area* | 1998 | 14.78/36.52 |
| Honeymoon Creek Recreation Area* | 1998 | 4.05/10.00 |
| Indian Graves Recreation Area | 1997 | 14.62/36.13 |

* formerly referred to as Forest Recreation Areas.

There is growing public interest in the recreational opportunities that are available in the greater C5 area. As a result, local communities have expressed an interest in expanding tourism development to diversify the regional economy.

# 14.0 PROTECTED AREAS

Alberta's network of parks and protected areas maintains essential ecological processes, and preserves the genetic diversity of species and the genetic variations within them. They also serve as ecological benchmarks against which to evaluate the long-term effectiveness of various management strategies on the surrounding landscape. Protected areas within the C5 FMU are managed in accordance with direction contained in protected area management plans that are in place. Seven protected areas currently exist within the C5 FMU (Table 40).

**Table 40. Protected areas in the C5 FMU.**

| Name | Established | Size (ha) | Management Plan |
|---|---|---|---|
| West Castle Wetlands Ecological Reserve | 1998 | 94 | To be developed |
| Bob Creek Wildland | 1999 | 21,291 | Under development |
| Upper Bob Creek Ecological Reserve* | 1989 | 2,600 | In place |
| Mt. Livingstone Natural Area | 1987 | 535 | To be developed |
| Beehive Natural Area | 1992 | 5,662 | In place |
| Plateau Mountain Ecological Reserve** | 1991 | 2,323 | Draft plan prepared |
| Don Getty Wildland Provincial Park*** | 2001 | 62,775 | To be developed |

* Upper Bob Creek Ecological Reserve will be dissolved when Bob Creek Wildland is re-designated and the management plan for the Wildland has been approved.
** Only a portion (i.e., 1546 ha/3820 ac.) of Plateau Mountain Ecological Reserve falls within the C5 FMU.
*** Don Getty Wildland Provincial Park consists of a number of non-contiguous parcels of provincial Crown land east and south of Elbow-Sheep Wildland Provincial Park. Only a small portion (i.e., 3590 ha/8871 ac.) of Don Getty Provincial Park falls within the C5 FMU.

# 15.0 FOREST LAND USE ZONES

Three forest land use zones currently exist within the C5 FMU (Table 41). It is anticipated that new FLUZs will be established within the C5 forest in the future to manage motorized recreational activities in the FMU more effectively.

**Table 41. Forest land use zones.**

| Name | Established | Size ($km^2$) |
|---|---|---|
| Castle Special Management Area | 1998 | 1003 |
| Allison/Chinook | 1986 | 5 |
| Cataract Creek Snow Vehicle* | 1979 | 503 |

* only a portion of the Cataract Creek Snow Vehicle FLUZ falls within the C5 FMU.

# 16.0 VISUAL RESOURCE

A visual resource is identified in the C5 FMU as one of the many intangible values of the forest, which should be considered for protection during harvest design. ASRD has adopted a standardized system for identifying and assessing visual values to ensure that proposed harvesting operations in visually sensitive areas are designed and developed in a consistent manner. The C5 FMP uses *A Field Guide to Visual Resource Assessment (VRA)* in conjunction with the manual *Forest Landscape Management Strategies for Alberta* for visual resource management.

The Visual Resource Assessment consists of four planning phases: Visual Resource Inventory (VRI), Visual Quality Objectives (VQO), Visual Impact Analysis (VIA) and the Total Resource Design (TRD). For this landscape analysis, only the VRI and the VQOs have been developed. The remaining phases will be carried out during implementation of the FMP (see map 17).

The VRI is simply a process of mapping the visual landscape and identifying those landscape features that have visual importance. For the C5 FMU, only the main travel corridors and viewsheds along those travel corridors have been mapped.

The VQOs are broad objectives for visual resource management for each viewshed polygon identified in the VRI as sensitive to resource development. VQOs set limits on the form and scale of visual alteration considered acceptable to most viewers that resulting from the effects on harvest levels and scheduling. Determination of these VQOs is based on the physical characteristics, social concerns and other related visual values identified in a corridor viewshed. In general, the greater the visual sensitivity to alteration, the more restrictive the VQO. The five VQOs (decreasing in order of restriction) are listed below with their corresponding accepted levels of alteration.

- P Preservation
- R Retention
- PR Partial Retention
- M Modification
- MM Maximum Modification

# 17.0 MINERALS, OIL AND GAS

### Livingstone–Porcupine Hills

This area has extensive reserves of thermal and metallurgical coals. Most of these reserves are confined to west of the Livingstone Range, and constitute 1,647 megatonnes of established initial in-place resource; there remains a recoverable reserve of 612 megatonnes. Coalbed methane (CBM) is also an energy resource that is gaining momentum for development. Test drilling occurred in 2001 in the middle ridge area (west of the Livingstone Range) along the Kananaskis Road just north of Coleman.

The Savanna Creek and Coleman gas fields were discovered in 1954 and 1959, respectively, and yield sour gas reserves from the Rundle and Palliser formations. The Coleman gas plant and its pipelines are the only production facility in the area. Exploration and development activities for oil and gas can be expected to continue.

Quarriable mineral development, particularly for limestone, continues to be an important activity in and around the Crowsnest Pass for Summit Lime Works Ltd. Few areas in the province have pure limestone found in close proximity to major transportation network. Future supply options for the plant appear to be most promising in the Phillip's Pass and Deadman Pass, as well as along the Ptolemy Creek valley of the Flathead Range. Other minerals in the area include lead-zinc-silver deposits along with quartz and gold; however, no development has occurred to date.

### Castle River

The Waterton gas field is the single largest field in Canada in terms of proven reserves. In addition to large reserves of natural gas, this field is a significant producer of gas liquids and sulfur. The extreme topography of the southern Eastern Slopes makes physical access to many sites within the Castle River area difficult; however, exploration has continued for oil and gas. There are approximately 95 Crown petroleum and natural gas dispositions within the Castle River area. There are approximately 44 active gas wells in the Castle Special Management Area as of April 2000. Limited interest has been shown in exploring for oil in the Castle River area. There is currently no coal or other mineral exploration or development in the area.