



Appendix III. Grizzly Bear Habitat Analysis, MPB Harvest Plan

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1. Introduction

Habitat analysis was done using Phase 6 models and scripts from GBRP_2006_Deliverables_II; scripts were run in ArcGIS 9.1.

The Sundance FMA harvest plan was received as shapefile `sundance_sequence.shp` from Pat Golec on 21 Jan. 2008, consisting of 38,070 ha of blocks distributed over 4,852 openings, with a harvest year from 2007 to 2016. Note: features in which `HarvestYear = 2007`, consisting of 14,249 ha distributed over 1966 openings, were incorporated into calculation of current habitat conditions; all other features with `HarvestYear >= 2008` to `HarvestYear <= 2016` were grouped into a single shapefile for calculation of forecast conditions. Thus, 37% of the area in the harvest sequence is assumed to be already logged.

The Sundance FMA is 2,679 km² and is equivalent in size to 4 female grizzly bear home ranges, but it overlaps 15 GBRP watershed units. This analysis uses the Sundance FMA as the analysis extent.

2. Select Habitat Zone, determine management objectives

The entire FMA lies within grizzly bear range (brown, Fig. 1) and habitat models extents (red). Therefore the management objective is to improve or maintain grizzly bear habitat quality as indicated by an increase in Safe Harbour Index. The Safe Harbour Index is the mean Safe Harbour pixel value in the analysis unit.

The southwest portion of the Sundance FMA lies within the draft Priority Area (yellow, Fig. 2), therefore an additional management objective is to maintain open route density below 0.6 km/km² within the Priority Area. (Note that this access density threshold applies to the entire Priority Area, and not necessarily to the FMA).

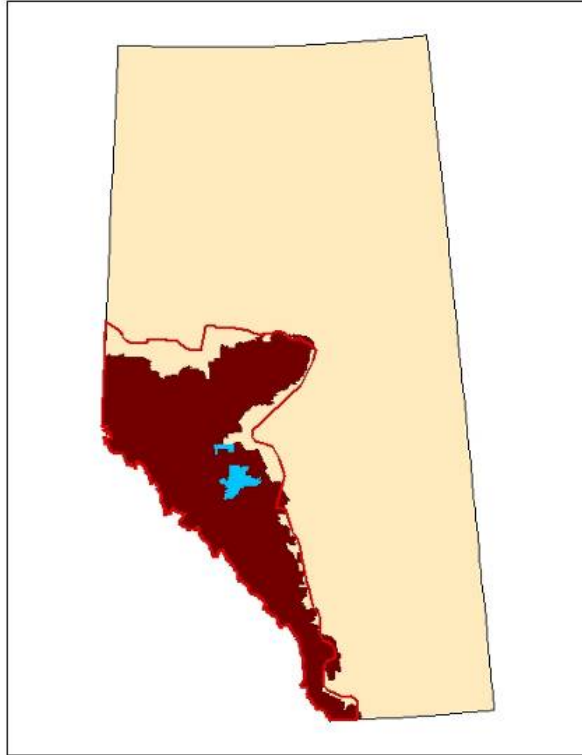


Figure 1. Sundance FMA Area (blue) within the Provincial Grizzly Bear Range

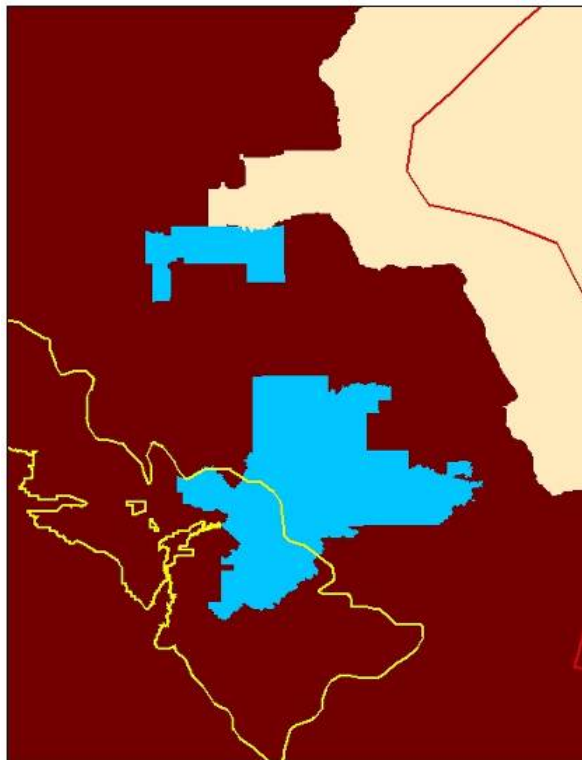


Figure 2. Sundance FMA Area and the Draft Priority Area (yellow)



3. Current Conditions at Regional (FMA) and Grizzly Bear Watershed Unit levels.

- i. RSF: Seasonal RSFs were generated from scripts (Fig. 3), with 2007 blocks included, and a seasonal maximum RSF was calculated using Spatial Analyst raster Calculator:

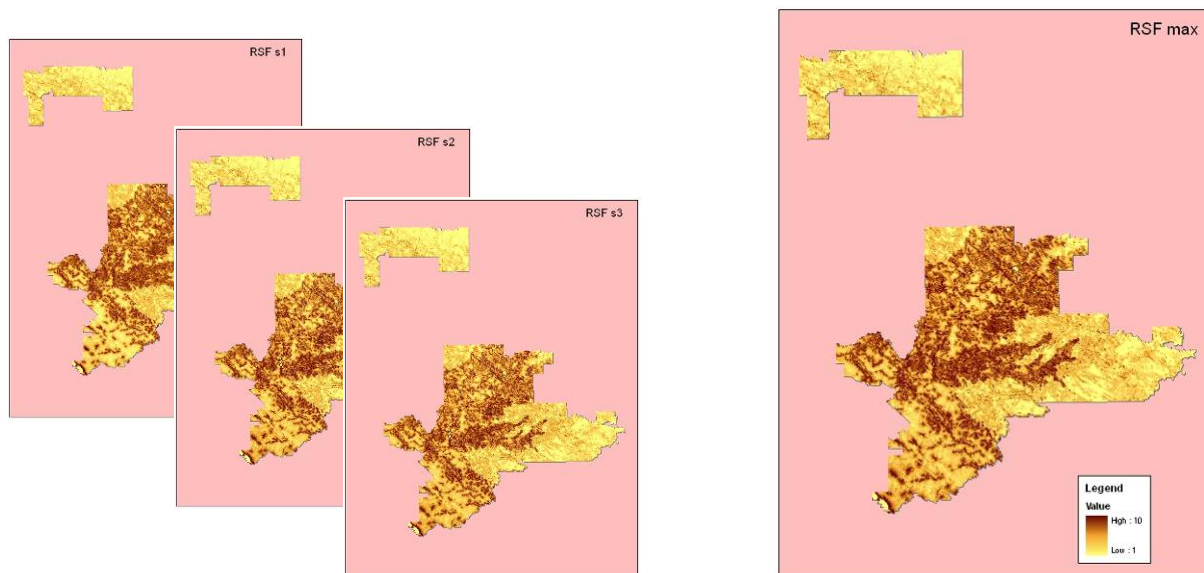


Figure 3. Calculation of Seasonal RSF Values for the Sundance FMA Area.

Current Mean seasonal maximum RSF was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $x = 4.907$ (range 0-10)

- ii. Mortality Risk: Mortality risk surface was regenerated for Sundance FMA using scripts (Fig. 4), with 2007 blocks included:

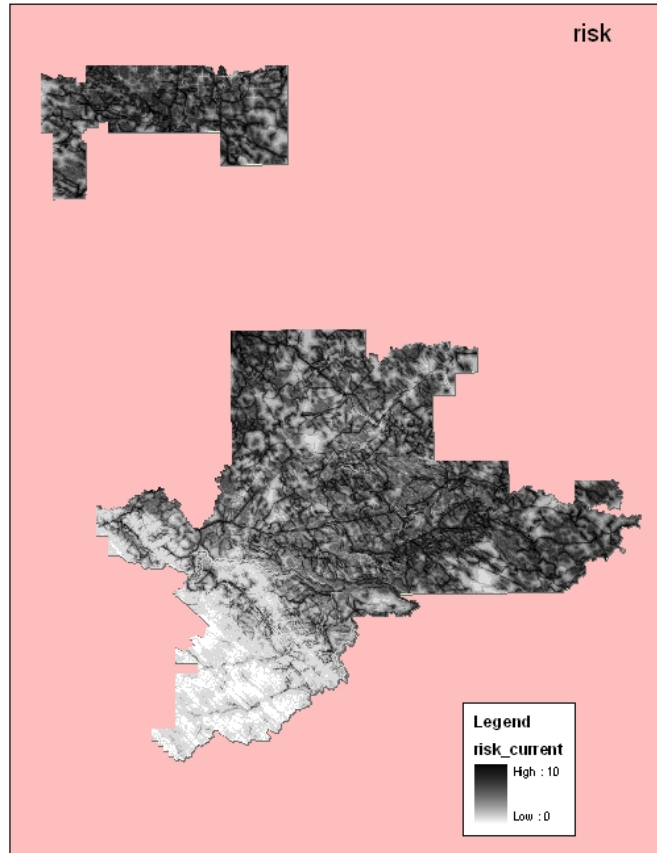


Figure 4. Mortality Risk on the Sundance FMA Area.

Current Mean mortality risk was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $\bar{x} = 4.689$ (range 0-10)

Note: FMFGBRP linear features dataset (roads, pipelines, seismics) was used for risk calculations, as this layer was more complete than the layer provided by Janice Traynor (Forestry Corp) on 22 Jan. 2008. The dataset provided was generated from polygon features and included many redundant arcs. While this would not affect the proximity analysis in the risk calculation, it rendered this dataset less suitable for route density calculations.



- iii. Open Route Density: There are 2800 km of linear access features (roads, pipelines, power lines, railway) in the FMA, for an overall density of 1.045 km/km² (Fig. 5). Within the Priority Area, there are 506 km of linear access within 669 km² for a density of 0.76 km/km². In the FMA outside of the Priority Area there are 2294 km of linear access in 2010 km² for a density of 1.14 km/km².

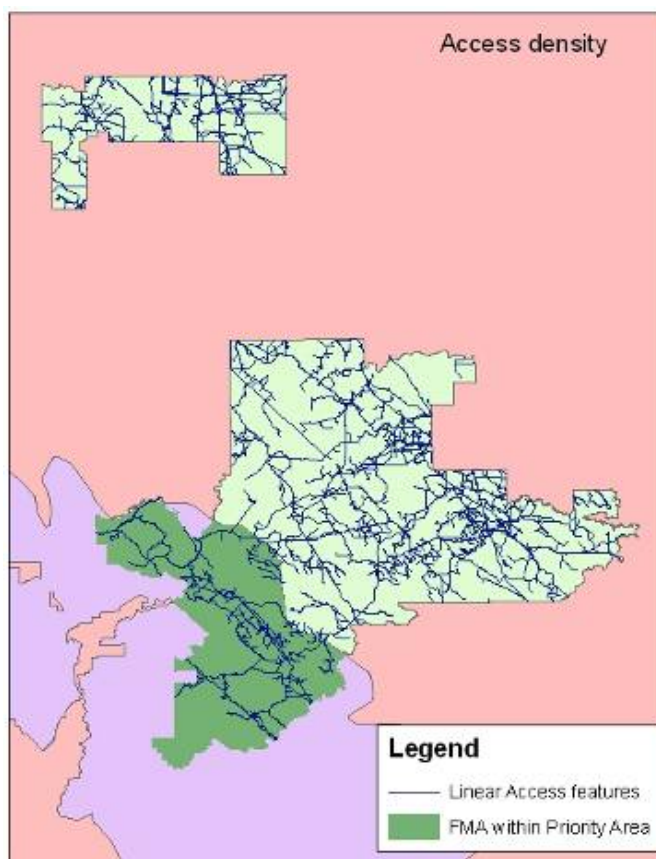


Figure 5. Open Route Density on the Sundance FMA Area.

iv. Safe Harbour Index: Safe harbour for the Sundance FMA was calculated as

$$\text{SAFEHARB} = [\text{RSFMAX}] * (10 - [\text{RISK}])$$

using Spatial Analyst Raster Calculator (Fig. 6).

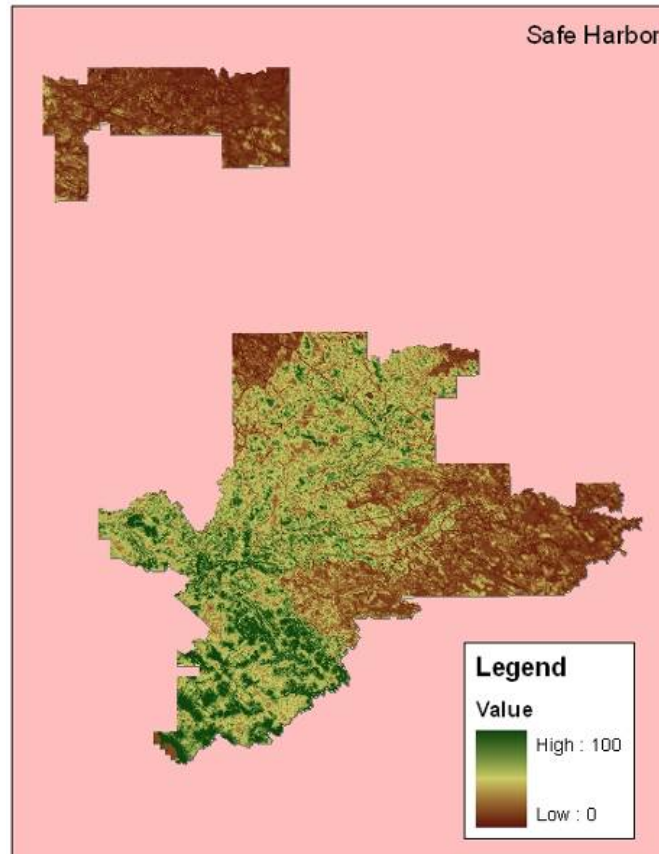


Figure 6. Safe Harbour Indices on the Sundance FMA Area.

Current Safe Harbour Index (Mean safe harbour) was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $\bar{x} = 25.5536$ (range 0-100)



4. Future Conditions

- i. RSF: Seasonal RSF models for the Sundance FMA were regenerated with the entire 2007-2016 spatial harvest sequence (Fig. 7).

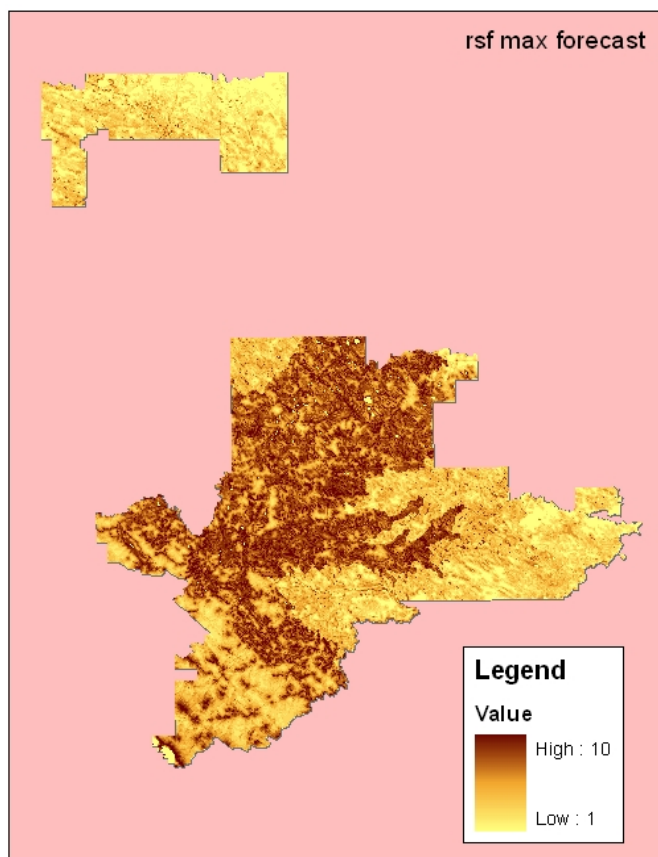


Figure 7. Forecast RSF Values on the Sundance FMA Area.

Forecast Mean seasonal maximum RSF was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $x = 5.2992$ (range 0-10)

- ii. Mortality Risk: Forecast Mortality risk surface was regenerated for Sundance FMA using scripts (Fig. 8), with 2007-2016 blocks included, but no additional roads or trails (see Sec. 6):

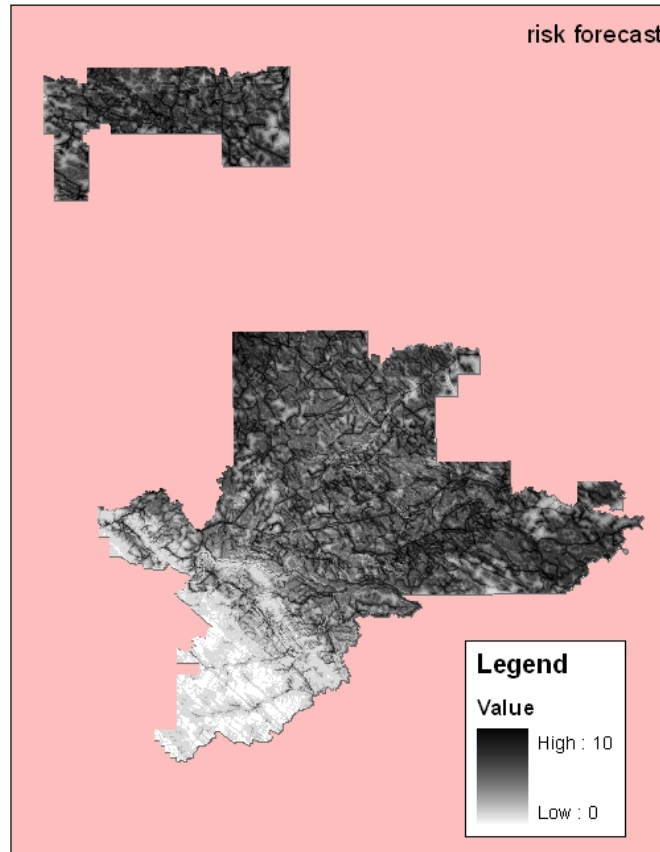


Figure 8. Forecast RSF Values on the Sundance FMA Area.

Current Mean mortality risk was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $x = 5.0181$ (range 0-10)

- iii. Open Route Density: Open route density is not expected to change with this harvest plan (see Sec. 6)



- iv. Safe Harbour Index: Forecast Safe harbour surface was regenerated for Sundance FMA using forecast RSF seasonal maximum and risk, and was calculated as

$$\text{SAFEHARB}_{\text{fcst}} = [\text{RSFMAX}_{\text{fcst}}] * (10 - [\text{RISK}_{\text{fcst}}])$$

using Spatial Analyst Raster Calculator.

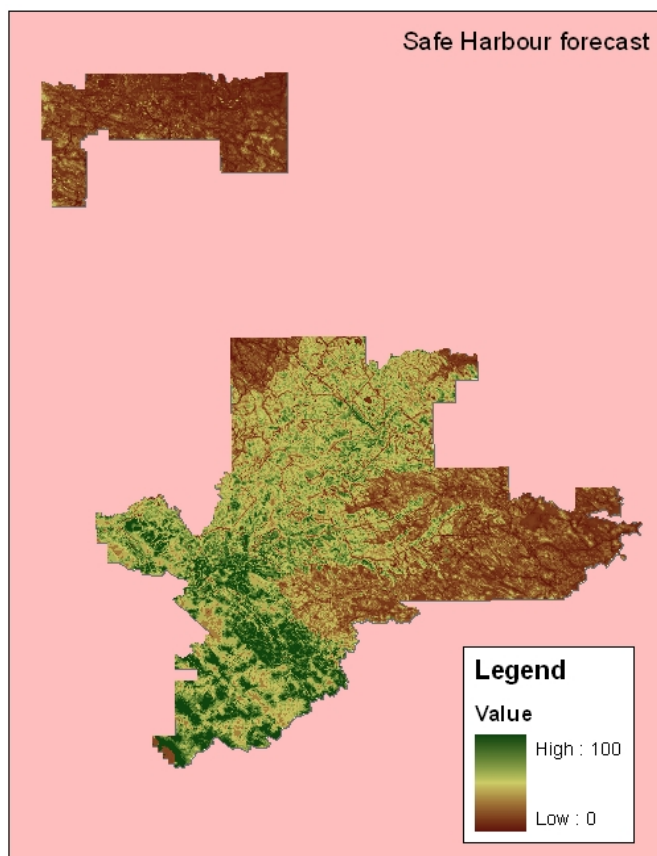


Figure 9. Forecast Safe Harbour Indices on the Sundance FMA Area.

Forecast Safe Harbour Index (Mean safe harbour) was calculated for the Sundance FMA using Spatial Analyst Zonal Statistics: $\bar{x} = 26.034$ (range 0-100)

5. Compare Current and Future Conditions

Figure 10. Grizzly Bear Habitat Assessment Form.

Date of Analysis:	14 Feb 2008			
Analysis performed by:	JC FMFGBRP			
1 Watershed Unit #	N/A			
2 GB Population Unit	FMF			
3 Priority/Dispersal Area:	Yes			
Analysis Variables:	Current	Forecast	% Change	Increase/Decrease
Mean RSF score	4.907	5.299	+ 8.0%	+
Mean Mortality Risk	4.689	5.018	+ 7.0%	+
Open road density	1.045	1.045	0*	N/A
Safe Harbour Index	25.5536	26.034	+ 1.9%	+

* see section 6

Subtracting the current Safe Harbour surface from the forecast safe harbour surface, using Spatial Analyst Raster calculator (Fig. 11), shows how projected changes in Safe Harbour status are distributed across the FMA.

The mean value of this surface is 0.480, a positive value reflecting the overall increase in Safe Harbour Index.

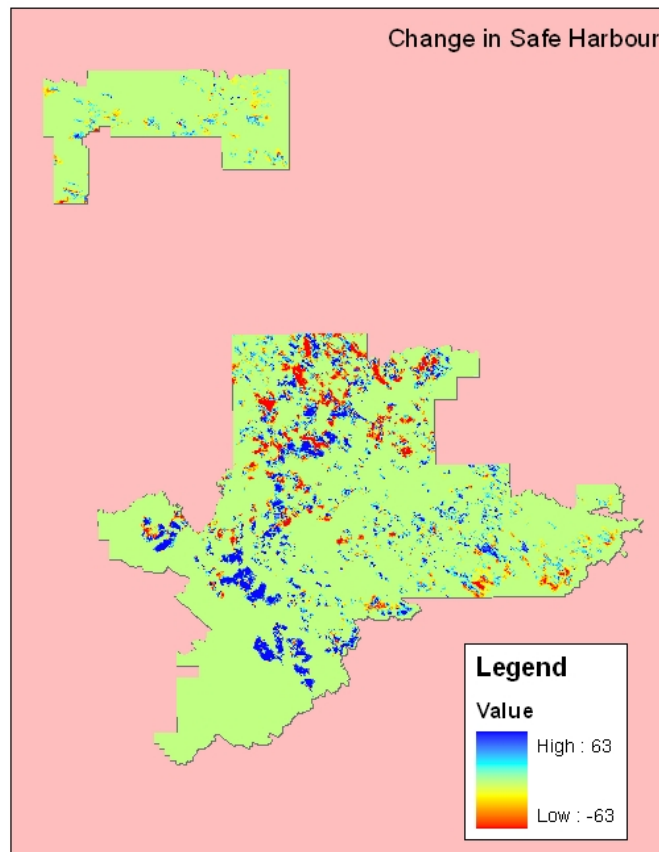


Figure 11. Forecast Change in Safe Harbour Indices on the Sundance FMA Area.



6. Investigate and Analyse Options for Mitigation

The Mean RSF and Safe Harbour Index are both forecast to increase with implementation of the Spatial Harvest Sequence. Although the Open Road Density will not change, there will be some increase in mortality risk, associated with public use of temporary access structures, over the duration of this harvest sequence (2008-2016) and for a couple of years afterward.

These analysis results are based on Sundance's intention to construct no new permanent roads for this harvest plan. As described in Section 3.2 and Appendix IV of the Sundance Forest Management Plan 2007, all access required for this Spatial Harvest Sequence will be temporary and will be reclaimed as soon as possible following harvesting and silvicultural activities. The use of visual buffers in core habitat areas will also help to reduce the visibility of bears in new and existing openings.

