

Appendix E
WILDLIFE RELATIVE RISK ANALYSIS

Appendix E

Wildlife Relative Risk Analysis

Baseline road and watershed risk information is important in transportation planning, as road management activities need to consider the current condition and potential vulnerabilities of the areas where future activities will, or are proposed to, occur. The result of this analysis is a relative wildlife risk rating that approximates the potential risk of roads to wildlife. This rating is developed for roads and for each watershed. The wildlife road risk rating is one of eight risk ratings developed to estimate the overall risk potential from roads. This wildlife risk rating is divided into six sub-categories to show the potential effect on wildlife in general and on certain sensitive species in particular.

As one component of Steps 4 and 5 of the Road Analysis Process (RAP), information was collected and processed using Geographic Information System (GIS) computer technology. Only roads and watersheds, or portions of them, contained within the Forest boundary were evaluated and categorized. In this appendix, as throughout this document, numbers and mileages are based upon best available BHNF GIS data. Field verification of the data was not completed as part of this analysis. Land use and cover type were not included in this analysis and were assumed to remain relatively constant over the Forest.

The GIS analysis was evaluated for each Forest System Objective Maintenance level 3,4,and 5 road including those under county jurisdiction. Small campground loop roads and short roads at administrative sites were not included. All subsequent discussions under this roads analysis section refer to this selection of roads unless stated otherwise. The analysis was also evaluated for 6th-order hydrologic units (HUCS), commonly referred to as “watersheds”, on the Black Hills National Forest (BHNF)

In all cases, the individual risk indicators are based on relative amounts of a parameter found on the Black Hills National Forest. The actual or ‘absolute’ risk of roads to wildlife species could not be determined and would likely require site-specific information that is beyond the scope of this analysis. An attempt was made to be conservative in assigning risk conditions to increase the likelihood that high risk areas would be identified. The assigning of these risk conditions and the relative ranking of the results is based, in most cases, on the professional judgment of the specialists involved. It is important to note therefore that the relative risk rankings should only be used as an indicator of the road’s potential risk to wildlife and as a flag for project level analysis teams to look at a road or area in more detail.

In combining the individual risk factors into the overall wildlife risk rating, the factors were weighted equally. It is likely that certain risks would contribute more or less to the overall risk of a particular road, area, or watershed but a valid method of weighting them could not be arrived at. General relative risk categories were assigned as follows:

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- 0 - There are no or relatively low potential risks to wildlife.
 - 1 - There are relatively moderate potential risks to wildlife.
 - 2 - There are relatively high potential risks to wildlife.

The Road Relative Risk Analysis was performed to provide a relative ranking of individual roads based on their risks to wildlife and to provide the data at a scale that is frequently used during project level analysis. This allows managers to consider wildlife risks when considering management options for individual roads. These particular wildlife risk areas were chosen for analysis over others in the Forest because a reasonable amount of data is already available with which to do the analysis using GIS methods.

The Wildlife Relative Risk Analysis is divided into two parts, Road Relative Risk Analysis and Watershed Relative Risk Analysis. The Road Relative Risk Analysis was performed to provide a relative ranking of individual roads based on their risks to the wildlife of an area. This allows managers to consider wildlife risks when considering management options for individual roads. The Watershed Relative Risk Analysis was performed to provide a more general picture of concentrations of potential wildlife risks throughout the forest and to provide the data at a scale that is frequently used during project level analysis.

Each part was divided into the following related risk factors.

1. Road Density Risk
2. Riparian Area Proximity Risk
3. Goshawk Nest Proximity Risk
4. Marten Habitat Risk
5. Snail Colony Risk
6. American Dipper Stream Proximity Risk

Road Density Risk

This risk factor represents the risk of roads to wildlife in general terms. The general assumption is that the higher the road density, the more risk there is to wildlife. Although all roads can affect the various wildlife species found on the Forest in a variety of ways, this section of the analysis focused on the more improved roads due to the higher than average level of effects these roads have on wildlife in terms of habitat alteration, wildlife mortality, disturbance, and habitat fragmentation. When compared to more primitive roads (i.e., ML 1 and 2 roads), ML 3, 4, and 5 roads generally have a disproportionate affect on wildlife due to their larger ‘footprints’, increased vehicle speeds, and traffic volumes.

Riparian Area Proximity Risk

Riparian area proximity risk was chosen as a general risk category to represent potential risks of roads to riparian habitat. Riparian areas are an important habitat element for most wildlife species on the Forest. Potential risks from roads are habitat alteration, sedimentation, pollution,

and road mortality. Riparian areas in general could also be affected by noxious weeds that may be transported by vehicles and OHV access enhanced by the presence of a road.

Goshawk Nest Proximity Risk

The Northern Goshawk was chosen as a potential risk factor because it is on the Region 2 Forest Service Sensitive Species list, there are recommended disturbance dates and distances for goshawk nests (USFWS 1999), and GIS data is available for goshawk nest locations. Road noise and other activities such as road maintenance and road reconstruction may present some risk to goshawks, especially during nesting season.

Marten Habitat Risk

The American marten was chosen as a potential risk factor because it is a Region 2 sensitive species and GIS data is available from recent studies (Fecske 2003) of high quality habitat for marten. Risks to marten from roads include habitat alteration, habitat fragmentation, and road mortality.

Snail Colony Risk

Region 2 sensitive snail species (Cooper's mountainsnail) and other snail species of concern (callused vertigo, mystery vertigo, frigid ambersnail, and striate disc) were selected as a potential risk factor because they are sensitive to site disturbance and habitat alteration, and because GIS data is available on snail locations on the Forest. Snail colony surveys in the Black Hills show a high percentage of the sites occurring along roads. Whether this is due to survey sampling bias towards roads or some other factor is unclear.

American Dipper Stream Proximity Risk

The American dipper was chosen as a potential risk factor because they are susceptible to sedimentation and pollution. Dippers occur along, clear, fast moving streams. They nest close to the stream and feed on the stream bottom. The primary potential threat from a road is sedimentation or pollution that could reduce or eliminate their food supply.

ROAD WILDLIFE RELATIVE RISK ANALYSIS

Road Density Risk – by road

Road density is a simple indicator of the concentration of roads in an area and is calculated by dividing the length of roads found within the Forest and within a selected area by the selected area. The larger the area selected, the less precise the density information. For this analysis, the forest was divided into one mile square sections. Road densities were calculated using all roads (Forest Service system and non-system, county, and state) within each section (one mile square) within the Forest Boundary. The distribution of the section densities was evaluated and the sections were divided into three categories based on a logical break in the distribution. There

were 840 relatively low density sections within the forest boundary, 1,139 relatively moderate density sections, and 711 relatively high density sections. The values used to identify the areas as low, moderate or high density are as follows:

Relatively low road density: 0 to 2.5 miles per square mile. - (32% of all sections)

Relatively moderate road density: >2.5 to 4.5 miles per square mile - 42% of all sections)

Relatively high road density: >4.5 to 10.0 miles per square mile - (26% of all sections)

The road density risk indicator for each road was then calculated as the percentage of each level 3,4,5 road that was in a high density section. The distribution of the risk indicators of all 3,4,5 roads was reviewed and roads were divided into three ratings:

- 0 - Relatively low road density risk: 0 to 20 percent of the road is in high density sections
- 1 - Relatively moderate road density risk: >20 to 50 percent in high density sections
- 2 - Relatively high road density risk: >50 to 100 percent in high density sections

Because of the importance of road density, maps were prepared showing road density within the Forest Boundary in three ways. One map shows the relative density of all roads at low, moderate, and high intervals using three shades of grey for each one mile square in the Forest. Another map shows the relative density of just Forest Service System roads, both Forest Service and County jurisdictions. It shows the influence of the non-system roads on our density calculations. A third density map was developed to show the road densities by watershed.

Goshawk Nest Proximity Risk – by road

Road noise and other activities such as road maintenance and road reconstruction may present some risk to goshawks, especially during nesting season. A radius of one half mile from historically active nests was chosen as the area of concern (USFWS 1999). This risk factor is displayed as the miles of road within a half-mile of a goshawk nest. The relative risk ratings for goshawk nests are as follows:

- 0 - Relatively Lower Risk: 0 miles of the road is within .5 miles of a nest.
- 1 - Relatively Moderate Risk: .>0 to 1 mile of the road is within .5 miles of a nest.
- 2 - Relatively Higher Risk: > 1 to 2.4 miles of the road is within .5 miles of a nest.

Marten Habitat Risk – by road

Risks to marten from roads include habitat alteration, habitat fragmentation, and road mortality. The risk factor is displayed the miles of the road that is within high quality marten habitat as defined by Fecske (2003). The relative risk ratings for martin habitat are as follows:

- 0 - Relatively Lower Risk: 0 miles of the road is within high quality marten habitat.
- 1 - Relatively Moderate Risk: >0 to 1 mile of the road is within high quality marten habitat.
- 2 - Relatively Higher Risk: >1 to 5.9 miles of the road is within high quality marten habitat.

Snail Colony Risk – by road

The snail colony risk factor is displayed as the number of times a road is within 119 feet of a snail colony site per road. The 119 foot buffer distance is the estimated distance in the Black Hills at which the buffer zone is 97 percent effective in trapping sediment from roads in highly erosive soils, evaluated at large scale for long time periods (Williams no date). Roads within 119 feet of a stream would therefore pose some risk of delivering sediment. Sedimentation has the potential to alter the snail habitat. Site disturbance from road maintenance activities would also be within the 119 foot distance. The relative risk ratings for snail colonies are as follows

- 0 - Relatively Lower Risk: 0 times the road is within 119 feet of a snail colony.
- 1 - Relatively Moderate Risk: 1 to 3 times the road is within 119 feet of a snail colony.
- 2 - Relatively Higher Risk: 4 to 8 times the road is within 119 feet of a snail colony .

Riparian Area Proximity Risk – by road

The riparian area risk factor is displayed as the miles of road that is within 119 feet of a riparian area. This distance is primarily used to represent an approximate risk due to sedimentation (Williams n.d.) but it is a reasonable figure to use for the other parts of this risk factor as well (pollution, road mortality, OHV access, and weeds). The relative risk ratings for riparian area proximity are as follows:

- 0 - Relatively Lower Risk: <1 mile of the road is within 119 feet of a riparian area.
- 1 - Relatively Moderate Risk: 1 to 2 miles of the road is within 119 feet of a riparian area.
- 2 - Relatively Higher Risk: >2 to 17.2 miles of the road is within 119 feet of a riparian area.

American Dipper Stream Proximity Risk – by road

A recent survey showed populations along eight streams in the Black Hills (Blacklund n.d.). Those streams are Rapid Creek, Bear Butte Creek, Whitewood Creek, Spearfish Creek, Beaver Creak, Spring Creek, Sand Creek, and Crow Creek. This risk factor is displayed as the miles of the road that is within 119 feet of the streams listed above. Dippers are present only on portions of the streams but the analysis uses the entire length of the stream to be conservative. The 119 foot distance is used to represent an approximate risk due to sedimentation and pollution (Williams n.d.). The relative risk ratings for American Dipper are as follows:

- 0 - Relatively Lower Risk: 0 miles of the road is within 119 feet of a Dipper stream.
- 1 - Relatively Moderate Risk: >0 to 1mile of the road is within 119 feet of a Dipper stream
- 2 - Relatively Higher Risk: >1 to 3.08 miles of the road is within 119 feet of a Dipper stream

Overall Wildlife Relative Risk – by road

The risk rating for each of the above wildlife risk factors was added for each road with twelve being the highest sum. The distribution of these sums was reviewed and an overall wildlife relative risk factor was assigned. This factor is used in the overall road risk computation. The cumulative ratings are as follows:

- 0 - Relatively Lower Overall Risk: 0 to 3 Combined Wildlife Risk Score
- 1 - Relatively Moderate Overall Risk: 4 to 5 Combined Wildlife Risk Score
- 2 - Relatively High Overall Risk: 6 to 9 Combined Wildlife Risk Score

See Appendix H for maps showing each risk by road. The data is also presented in the following spreadsheet printout.

WATERSHED WILDLIFE RELATIVE RISK ANALYSIS

Relative watershed risk was evaluated using the same relative risk indicators that were used for roads. The evaluation by watershed was performed to provide a more general picture of concentrations of potential wildlife risks throughout the forest and to provide the data at a scale that is frequently used during project level analysis. Unlike the data used for the calculation by level 3,4,5 system road above, the data used for this calculation includes all roads (system and non-system, all jurisdictions). The risk indicators were added up in each 6th order watershed and divided by the square miles in that watershed. Therefore, the units of these risk factors are occurrences or miles per square mile. As with the analysis by road, the risks were summed up for each watershed and an overall relative wildlife risk was assigned to each watershed.

Road Density Risk – by watershed

For this analysis, the forest was divided into watersheds. Road densities were calculated using all roads (Forest Service system and non-system, county, and state) within the Forest Boundary. The distribution of the watershed densities was evaluated and the watersheds were divided into three ratings based on the same distribution used for the road density by section analysis in the analysis per road section above.

- 0 - Relatively Lower Road Density Risk: <1 mile per square mile
- 1 - Relatively Moderate Road Density Risk: 1 to 4.0 miles per square mile
- 2 - Relatively Higher Road Density Risk: >4.0 to 5.6 miles per square mile

A map was developed to show the density by watershed. By comparing this map to the two developed for the road risk analysis above, the reader can see how the scale of the presentation can sometimes change how information is perceived.

Goshawk Nest Proximity Risk – by watershed

The relative risk ratings for goshawk nests are as follows:

- 0 - Relatively Lower Risk: 0 miles of road within .5 miles of a nest per square mile.
- 1 - Relatively Moderate Risk: >0 to .2 miles of road within .5 miles of a nest per square mile.
- 2 - Relatively Higher Risk: >.2 to .7 miles of road within .5 miles of a nest per square mile.

Marten Habitat Risk – by watershed

The relative risk ratings for marten habitat are as follows:

- 0 - Relatively Lower Risk: 0 to .1 mile of road within high quality marten habitat per square mile.
- 1 - Relatively Moderate Risk: >.1 to 1 mile of road within high quality marten habitat per square mile.
- 2 - Relatively Higher Risk: >1 to 2.9 miles of road within high quality marten habitat per square mile.

Snail Colony Risk – by watershed

The relative risk ratings for Snail Colonies are as follows

- 0 - Relatively Lower Risk: 0 to .1 times a road is within 119 feet of a snail colony per square mile.
- 1 - Relatively Moderate Risk: >.1 to .2 times a road is within 119 feet of a snail colony per square mile.
- 2 - Relatively Higher Risk: >.2 to .54 times a road is within 119 feet of a snail colony per square mile.

Riparian Area Proximity Risk – by watershed

The relative risk ratings for riparian area proximity are as follows:

- 0 - Relatively Lower Risk: 0 to .5 mile of road within 119 feet of a riparian area per square mile.
- 1 - Relatively Moderate Risk: >.5 to 1 mile of road within 119 feet of a riparian area per square mile.
- 2 - Relatively Higher Risk: >1 to 2.25 miles of road within 119 feet of a riparian area per square mile.

American Dipper Stream Proximity Risk – by watershed

The relative risk ratings for dipper Stream proximity are as follows:

- 0 - Relatively Lower Risk: 0 miles of road within 119 feet of a Dipper stream per square mile.
- 1 - Relatively Moderate Risk: >0 to .1 mile of road within 119 feet of a Dipper stream per square mile.
- 2 - Relatively Higher Risk: >.1 to .19 miles of road within 119 feet of a Dipper stream per square mile.

Overall Wildlife Relative Risk – by watershed

The risk rating for each of the above wildlife risk factors was added for each road with twelve being the highest sum. The distribution of these sums was reviewed and a cumulative wildlife relative risk factor was assigned. This factor is used in the overall road risk computation. The cumulative ratings are as follows:

- 0 - Relatively Lower Overall Risk: 0 to 3 Overall Wildlife Risk Score
- 1 - Relatively Moderate Overall Risk: 4 to 6 Overall Wildlife Risk Score
- 2 - Relatively High Overall Risk: 7 to 10 Overall Wildlife Risk Score