Wildlife Crossing Study: U.S. Highway 287/26, Moran Junction – Dubois

Wyoming Department of Transportation Projects:

Brooks Lake Section [NH-0N30-03(040)]
Buffalo Fork River Section [NH-0N30-01(013)]
Fourmile Meadows Section [NH-0N30-01(016)]
Togwotee Pass Section [NH-0N30-01(018)]
Rosies Ridge Section [NH-0N30-01(015)]

Prepared for:
Steering Committee
Wildlife Crossing Study
U.S. Highway 287/26. Moran Jct. – Dubois

Federal Highway Administration
2617 E. Lincolnway, Suite D
Cheyenne, WY 82001-5662

Wyoming Department of Transportation
5300 Bishop Blvd.
Cheyenne, WY 82009-3340

Prepared by:
David Young and Hall Sawyer
Western Ecosystems Technology, Inc.
2003 Central Ave.
Cheyenne, WY 82001

April 30, 2006

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Wildlife Movement Study
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Federal Highway Administration
2617 E. Lincolnway, Suite D
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5300 Bishop Blvd.
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INTRODUCTION

Between 1996 and 2002 the Wyoming Department of Transportation (WYDOT) and the Federal Highway Administration (FHA) prepared an environmental impact statement (EIS) through the National Environmental Policy Act (NEPA) process to evaluate alternatives associated with the reconstruction of US 287/26 between Moran Junction and Dubois, Wyoming. The project area includes approximately 38 miles of highway between Moran Junction and Dubois, and is comprised of five sections: Buffalo Fork River (MP 3.0-7.8), Rosies Ridge (MP 7.8-14.7), Fourmile Meadow (MP 14.7-21.3), Togwotee Pass (MP 21.3-30.9), and Brooks Lake (MP 30.9-40.7).

As outlined in Chapter 1 of the EIS, the primary purposes and needs for improvements to the highway included:

- Address safety issues, including higher than average accident rates.
- Address and accommodate future growth in traffic.
- Correct current roadway and bridge deficiencies.
- Enhance and improve visitor experience

The project area is heavily used by wildlife, particularly mule deer, elk, and moose and is within the range of three large free ranging predators protected under the Endangered Species Act (ESA), grizzly bear, Canada lynx, and gray wolf. Maintaining habitat connectivity and minimizing vehicle-wildlife collisions are two major concerns associated the with highway reconstruction. As part of continuing coordination with the U.S. Forest Service (USFS), the Wyoming Game and Fish Department (WGFD), and other affected interests, and to address concerns associated with wildlife crossings and vehicle collisions, FHA and WYDOT agreed to implement a long term study to gather data about wildlife movement across the highway to aid in project design and construction. The purpose of this study was to summarize existing data and collect additional information about wildlife crossing and wildlife-vehicle collisions on the highway to provide WYDOT with the best available information for identifying mitigation opportunities and accommodate wildlife crossings into highway design plans. The final product is intended to provide WYDOT and FHA the necessary information to identify, evaluate, and implement highway design and maintenance solutions that are effective for maintaining roadway permeability to wildlife and increasing highway safety by reducing vehicle-wildlife collisions.

STUDY AREA

The project area is located along U.S. Highway 287/26 between Moran Junction and Dubois, including portions of Fremont and Teton counties in northwest Wyoming. The highway in the project area generally follows an east-west course for approximately 38 miles from the east border of the Shoshone National Forest (SNF) through the Shoshone and Bridger-Teton National Forests (BTNF) to Grand Teton National Park (GTNP). The project area traverses approximately 18 miles of the SNF east of the continental divide, 18 miles of the BTNF west of the divide, and one mile of GTNP. There are minor amounts of privately owned land adjacent to the highway along the east and west ends of the project. Although some of the timber stands within ½ mile of

the highway are managed for timber production, the area along the highway corridor is managed primarily for recreation.

The project area is characterized by mountainous terrain. Elevation at the east end of the project is approximately 7,570 feet. The road then climbs to approximately 9,544 feet at the Continental Divide, Togwotee Pass, before dropping to approximately 6,790 feet at the east border of GTNP. The project area is dominated by coniferous forest intermixed with open grassy meadows, sagebrush slopes, aspen thickets, and rock outcrops and cliffs. The area contains small perennial streams, tributaries, and associated wetlands and riparian corridors of the Buffalo Fork and Blackrock Creek on the west slope and the Wind River on the east slope. Areas immediately adjacent to the roadway are influenced by scattered rocky cuts and filled areas created during the initial construction of the road. Annual average precipitation through the project is variable from approximately 16-40 inches depending primarily on elevation (Roberts 1989).

The highway corridor passes through several distinct vegetation types. Vegetation types differ primarily along elevational gradients; however, aspect and topography also influence vegetation in the project area. The dominant habitat type throughout the project area is conifer forest. This type consists primarily of lodgepole pine (*Pinus contorta*) and Douglas fir (*Psuedotsuga menziesii*) with variable ground cover of leaf litter, shrubs, forbs, and grasses. Interspersed throughout the lodgepole pine type are areas of spruce-fir forest, aspen deciduous forest, mountain big sagebrush shrub steppe, and willow riparian shrub (WGFD 1992). The coniferous forest becomes denser with increasing elevation and is interspersed with sagebrush meadows and willow riparian areas at the lower elevations on both the east and west slopes.

Open parks dominated by big sagebrush (*Artemisia tridentata*) occur at lower elevations on both the east and west ends of the highway corridor. In more mesic portions of this type, shrubs including antelope bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpus* sp.), shrubby cinquefoil (*Potentilla fruticosa*), and serviceberry (*Amelanchier alnifolia*) occur. Common understory plants include Oregon grape (*Berberis repens*), buckwheat (*Eriogonum* sp.), pussytoes (*Antennaria* sp.), lupine (*Lupinus* sp.), and fescue (*Festuca idahoensis*). Several areas dominated by aspen (*Populus tremuloides*) also occur within the sagebrush type, especially on south-facing slopes. Common plants in the understory in aspen communities include common juniper (*Juniperus communis*), buffaloberry (*Shepherdia canadensis*), currant (*Ribes* sp.), Wood's rose (*Rosa woodsii*), strawberry (*Fragaria virginiana*), and geranium (*Geranium* sp.).

As elevation increases towards Togwotee Pass from both the east and west, lodgepole pine communities become the dominant vegetation type. Within the lodgepole pine type are scattered stands of limber pine (*Pinus flexilis*) at lower elevations, and whitebark pine (*Pinus albicaulis*) at higher elevations. Engelmann spruce (*Picea englemanii*) and subalpine fir (*Abies lasiocarpa*) frequently occur in the understory of mature lodgepole pine communities. Common understory associates in the lodgepole pine communities include grouse whortleberry (*Vaccinium scoparium*), buffaloberry, kinnikinnik (*Arctostaphylos uva-ursi*), heartleaf arnica (*Arnica cordifolia*), and elk sedge (*Carex geyeri*).

The dominant habitat type on Togwotee Pass is spruce/fir forest dominated by Engelmann spruce, subalpine fir, and Douglas fir. Smaller stands of whitebark and lodgepole pine occur

within this type, especially on south-facing slopes. Common understory plants include common juniper, buffaloberry, snowberry, lupine, strawberry, and arnica. Within both the lodgepole pine and spruce/fir forests, density and composition of the understory varies greatly with the canopy cover of trees. Several successional stages are represented in the lodgepole pine and spruce/fir communities due to past logging activities and fire. Successional stages range from recent clearcuts within lodgepole pine communities to mature stands of spruce/fir forests.

At the upper elevations of the highway corridor, several large meadows occur within the spruce/fir zone. Plant composition within the meadows varies greatly with moisture regime. Some of the dryer meadows are dominated by big sagebrush, whereas more mesic meadows are dominated by willow (*Salix* spp.). Other common species within the high elevation meadows include shrubby cinquefoil, elephant's head (*Pedicularis groenlandica*), groundsel (*Senecio* sp.), larkspur (*Delphinium* sp.), American bistort (*Polygonum bistortoides*), geranium, yarrow (*Achillea millefolium*), and timothy (*Phleum alpinum*).

The highway corridor traverses several riparian areas associated with the Wind River, Blackrock Creek, Buffalo Fork, and tributaries to these rivers. Plant species diversity is higher within the riparian corridors than in any other habitat type. With the exception of the Buffalo Fork, riparian areas in the project area are dominated by several species of willow. The Buffalo Fork riparian corridor has an overstory of narrowleaf cottonwood (*Populus angustifolia*). Other species commonly associated with the riparian corridors include bog birch (*Betula glandulosa*), shrubby cinquefoil, Wood's rose, false lily-of-the-valley (*Maianthemum stellatum*), pussytoes, goldenrod (*Solidago canadensis*), sedges (*Carex spp.*), and a variety of upland and mesic grasses.

METHODS

Steering Committee

FHA and WYDOT requested participation in the study design, implementation, and analysis from resources agencies and the conservation community. A steering committee was initially formed with a representative each from the USFS (SNF), the WGFD, the Jackson Hole Alliance, FHA, and WYDOT. A representative from American Wildlands replaced the Jackson Hole Alliance representative after the first year and is currently a member of the steering committee. The primary role of the Steering Committee is overseeing the study through decision making about the study scope, design, methods, and data analysis. The primary data collection was conducted by WYDOT and FHA. Recommendations for study, analysis, and ultimately mitigation, are made to the Highway Technical Review Committee by the Wildlife Steering Committee.

Because of their relative importance to the agencies and their predominant role in wildlife-vehicle collisions (highway and resource safety), the Steering Committee focused the scope of this study on ungulates and mid-large size carnivores. Data on the movement of these species is readily collected with simple cost-effective methods and, as large free ranging wildlife species generally active year round, frequently cross highways presenting risks to vehicular traffic and themselves. The Steering Committee recognized that a wide variety of wildlife species occur in

the project area, including small mammals, birds, and amphibians, and potential highway impact concerns may exist with each. However, it was also recognized that: (1) any future mitigation measures that would be employed for large ungulates and predators would also likely benefit a variety of other wildlife; (2) that some crossing solutions for small animals (e.g., installation of culverts negotiable by small animals) may be easily implemented throughout the highway project without a rigorous study; (3) the methods proposed for large ungulates and predators may lend themselves to gathering data on other wildlife; (4) there are a number of existing data sources for ungulates and predators that may be incorporated into the overall analysis; and (5) focusing on ungulates and large carnivores was a more cost effective approach.

Wildlife Movements

Snow-tracking was used to identify areas consistently used by wildlife to cross US 287/26 during the winters of 2003-04 and 2004-05. In general, attempts were made to conduct snow tracking surveys 24-72 hours following a snowfall event. This allowed animals at least 24 hours to track the snow and put observers in the field before snow conditions deteriorated. If snow fall was too frequent to allow a 24 hour waiting period or no new snow fall occurred, surveys were conducted every two weeks. The highway corridor was driven at the slowest possible safe speed to survey for wildlife tracks in the right-of-way along either side of the highway. The date, species, group size, direction of travel, vegetation type, and mile post to the nearest tenth was recorded for each track observation. Only tracks that crossed the highway were recorded. For groups of animals it is often impossible to determine the size of the group from tracks. In these cases, the track observation was categorized as a group with approximate size (e.g., >10 or >20). For mapping purposes all crossing events were treated equally, whether the event included a single animal or group. Tracks were recorded to the nearest tenth of a mile to reduce spatial variability associated with GPS coordinates in mountainous and forested environments. A similar snow-tracking study was conducted under agreement with the USFS during the winter of 2002-03 (Nietvelt 2003). These data were purchased by FHA and WYDOT for use in this wildlife crossing evaluation.

Wildlife crossing locations were pooled across years and mapped for the Buffalo Fork, Rosie's Ridge, Fourmile Meadows, Togwotee Pass, and Brooks Lake sections. ArcView® software was used to plot highway crossing data, corresponding to nearest tenth of a mile. Areas with the highest concentration of crossings (i.e., "hotspots") within each of the 5 highway sections were defined by a kernel home range estimator (50% utilization polygon); a commonly used technique to delineate areas of high use. These areas of high use were delineated for moose, elk, and mule deer in highway sections that had a minimum of 30 crossing events for each species. Because the frequency of tracks for large predators and other wildlife was low, maps depicting only crossing locations were generated for other wildlife recorded.

Wildlife Use of Structures

During the summer and fall of 2005 a pilot study was conducted that used Active Infrared Trail Monitors (Trailmaster® 1550) attached to 35-mm cameras to document movements of mammals through existing highway structures including span bridges, concrete box culverts, and pipe culverts. The active infrared monitors were set approximately mid-way underneath the bridges, such than animals breaking the beam were more likely to be crossing through the structure rather

than feeding or loafing around the edge of it. For culverts, the infrared monitors were set on one of the outside entrances, such that animals breaking the beam had to be entering or exiting the culvert. Only two cameras were used so the number of structures monitored at one time was limited. Monitoring at the Buffalo Fork and Blackrock Creek bridges was conducted for the first 10 days of each month from July to December 2005. Following each 10-day monitoring period the cameras were retrieved and the film processed.

When the camera systems were not set up on the two bridge sites, they were moved to culverts that did not have flowing water which had the potential to interfere with the system. Because existing culverts in the project area were installed for drainage purposes and contain water through most spring and summer months, monitoring at culverts did not begin until late fall (October 2005) when water flow ceased.

Vehicle-Wildlife Collisions

The primary sources for wildlife-vehicle collisions were: (1) the WYDOT crash database; (2) WYDOT maintenance crew record of road killed wildlife; and (3) field observations made during snow tracking or roadkill surveys. Records from the WYDOT crash database included those accidents with wildlife which included more than $500 worth of damage up until July 1999 and more than $1000 worth of damage after July 1999. WYDOT maintenance personnel travel the project corridor multiple times per week and are responsible for removing large animal road kills from the highway corridor. When encountered, these road kills were documented on a form provided to WYDOT and the carcass removed. Additionally, all road killed carcasses of any wildlife encountered during snow-tracking were recorded and removed. During the summer the highway was driven approximately once a week to survey for small animal roadkills. A master database of all wildlife roadkills within the project area identified by source was compiled.

RESULTS

Big Game Herd Units and Seasonal Ranges

The WGFD has identified several types of seasonal ranges used by big game in the project area (WCWS 1990, Table 1).

Table 1. Wyoming Game and Fish Department Seasonal Ranges for big game populations.

Range	Definition
Crucial	Crucial range is any particular range or habitat component which determines whether a population maintains and reproduces itself at or above the WGFD population objective over the long term.
Winter	A population or portion of a population uses this habitat annually in substantial numbers only during winter (12/1-4/30).
Winter/Yearlong	A portion of a population uses this habitat yearlong, but during winter there is a significant influx of animals into this area from other seasonal ranges.
Yearlong	A population or substantial portion of a population uses this habitat yearlong.
Spring/Summer/Fall	A population or portion of a population uses this habitat annually (5/1-11/30), excluding winter.
Parturition	Birthing areas commonly used by a substantial number of females from a population.

Mule Deer

U.S. 287/26 is the boundary between the Sublette and Dubois Herd Units east of the continental divide. The Sublette Herd Unit encompasses 6,600 mi^2, includes 15 Hunt Areas (130, 138-142, 146, 150-156, and 162), and has a post-season population objective of 32,000 deer. The 2002 post-season estimate was 33,000 deer, with a 5-year (1997-2001) average of 29,850 (WGFD 2002). A total of 3,607 animals were harvested in 2002 and provided 49,940 recreation days to hunters.

The Dubois Herd Unit encompasses 2,700 mi^2, includes 3 Hunt Areas (128-129, 148), and has a post-season population objective of 10,000 deer. The 2002 post-season estimate was 5,700 deer, with a 5-year (1997-2001) average of 6,700 (WGFD 2002). A total of 502 animals were harvested in 2002 and provided 11,000 recreation days to hunters.

A variety of mule deer seasonal ranges occur in and adjacent to the project corridor, including winter, winter-yearlong, and spring-summer-fall range (Appendix A). No crucial mule deer ranges occur in the project corridor and most consists of spring-summer-fall range. Although mule deer occupy the project area on a year-around basis, they are generally distributed across a

large area during the spring, summer and fall, and concentrated in lower-elevation shrublands (e.g., Elk Ridge) during the winter.

Elk

The western two-thirds of the project area occurs in the Jackson Herd Unit**,** which covers approximately 2,050 mi^2, includes 13 hunt areas (70-72, 74-83), and has a post-season population objective of 12,000 elk (WGFD 2002). The 2002 post-season estimate was 13,500 elk, with a 5-year (1997-2001) average of 16,500 (WGFD 2002). A total of 2,250 elk were harvested in 2002 and provided 50,000 recreation days to hunters. The WGFD operates three feedgrounds in this herd unit: Alkali, Fish Creek, and Patrol Cabin. Additionally, the USFWS manages the NER which supports 8,000-10,000 elk. All three WGFD-operated feedgrounds are located in the upper end of the Gros Ventre River Drainage. These feedgrounds are believed to support more elk than could be sustained on native range, especially during severe winters. The Buffalo Fork is one of the few areas in the Jackson Herd Unit where elk are not fed and rely on native ranges.

The eastern one-third of the project area occurs in the Wiggins Fork Herd Unit**,** which covers approximately 3,000 mi^2, includes 4 hunt areas (67-69, 127), and has a post-season population objective of 6,200 elk (WGFD 2002). The 2002 post-season estimate was 6,500 elk, with a 5-year (1997-2001) average of 6,900 (WGFD 2002). A total of 940 animals were harvested in 2002 and provided 18,800 recreation days to hunters.

A variety of elk seasonal ranges occur in and adjacent to the project corridor, including winter, winter-yearlong, and spring-summer-fall ranges (Appendix A). No crucial elk ranges occur in the project corridor and most consists of spring-summer-fall range. Although elk occupy the project area on a year-around basis, they are generally distributed across a large area during the spring, summer and fall, and concentrated in lower-elevation (e.g., Buffalo Fork) and open, south-facing slopes (e.g., Rosies Ridge) during the winter.

Moose

The western two-thirds of the project area occurs in the Jackson Herd Unit**,** which covers approximately 2,050 mi^2, includes 9 hunt areas (7, 14-15, 17-19, 28, 32), and has a post-season population objective of 3,200 moose (WGFD 2002). The 2002 post-season estimate was 2,250 moose, with a 5-year (1997-2001) average of 2,500 (WGFD 2002). A total of 166 animals were harvested in 2002 and provided 1,680 recreation days to hunters.

The eastern one-third of the project area occurs in the Dubois Herd Unit, which covers approximately 1,250 mi^2, includes one hunt area (6), and has a post-season population objective of 400 moose (WGFD 2002). No population estimates were available for this herd unit; however a total of 40 moose were harvested in 2002 and provided 316 recreation days to hunters.

A variety of moose seasonal ranges occur in and adjacent to the project corridor, including crucial winter-yearlong and spring-summer-fall range (Appendix A). Although moose occupy the project area on a year-around basis, they are generally distributed across a large area during the spring, summer and fall, and concentrated in lower-elevation willow/riparian areas (e.g., Buffalo Fork, Wind River) during the winter.

Winter Wildlife Movements

During the 2002-03, 2003-04 and 2004-05 winters, 22, 18, and 26 snow-track surveys were conducted, respectively. A total of 965 big game crossings were recorded across the 3 winters, including 412 elk, 293 moose, and 260 mule deer. Moose and elk crossings were more common in the western sections (i.e., Buffalo Fork, Rosie's Ridge) of the project area, while mule deer were more common in the eastern section (i.e., Brooks Lake) (Table 2). The Fourmile Meadows and Togwotee Pass sections received little use by big game during the winter because of the high elevation and deep snowpack.

Table 2. Number of big game crossing events recorded per mile during winter snow-tracking surveys, 2002-2005.

Highway Section	Number of winter crossings per mile		
	Moose	Elk	Mule Deer
Buffalo Fork (MP 3.0-7.8)	40	34	9
Rosie's Ridge (MP 7.8-14.7)	13	41	4
Fourmile Meadows (MP 14.7-21.3)	9	6	2
Togwotee Pass (MP 21.3-30.9)	2	2	1
Brooks Lake (MP 30.9-40.7)	6	8	18

Buffalo Fork Section

The Buffalo Fork Section (MP 3.0 – 7.8) is characterized by willow/riparian habitats. During the last three winters 182 moose, 162 elk, and 45 mule deer crossing events were documented. Moose and elk were much more common in this section than mule deer.

Most moose activity occurred between mile post 3.4–4.6 (area adjacent to Buffalo Fork Bridge) and mile post 6.8–7.7 (area between Burrow Hill and Blackrock Ranger Station) (Map 1, Appendix B). Since 1995, 5 moose-vehicle collisions have occurred in this section and 4 have been in those areas identified as core use areas.

Most elk activity occurred between mile post 3.5 – 4.6 (Buffalo Fork Bridge) and 6.7 – 7.5 (Burrow Hill) (Map 2, Appendix B). Since 1995, 7 elk-vehicle collisions have occurred in this section and 6 have been in those areas identified as core use areas.

Most mule deer activity occurred between mile post 3.8 – 4.8 (Buffalo Fork Bridge) and 5.6 – 7.3 (Burrow Hill) (Map 3, Appendix B). Since 1995, 6 mule deer-vehicle collisions have occurred in this section and 3 have been in those areas identified as core use; however, because only 1 deer-vehicle collision has occurred during the winter, the core use areas were not expected to contain the majority of deer-vehicle collision locations.

The bridge structure across the Buffalo Fork was used by mule deer, elk, moose, coyote, badger, raccoon, and muskrat to cross underneath the highway, along the eastern edge of the creek, opposite the concrete retaining wall (Photos 1 and 2). Wildlife use was documented year-round, except for May through June, when high water run-off precluded wildlife access.

Photo 1. Buffalo Fork bridge (view northwest).

Photo 2. Mule deer using Buffalo Fork bridge to cross underneath highway, July 2005.

Rosie's Ridge Section

The Rosie's Ridge Section (MP 7.8 – 14.7) is characterized by mixed conifer and sagebrush habitats in steep, rugged terrain. During the last 3 winters 91 moose, 286 elk, and 31 mule deer crossing events were recorded in this section. Elk were most common, followed by moose and mule deer.

Most moose activity occurred in the willow/riparian habitats between mile post 7.7 – 8.7 (Blackrock Ranger Station) and 12.0 – 14.5 (Map 5, Appendix B; Fourmile Meadow). Since 1995, 5 moose-vehicle collisions have occurred in this section and 4 have been in those areas identified as core use areas.

Most elk activity occurred on the open south-facing slope of Rosie's Ridge between mile posts 8.8 – 11.8 (Map 6, Appendix B). Since 1995, 6 elk-vehicle collisions have occurred in this section and 4 have been in those areas identified as core use areas.

Most mule deer activity occurred between milepost 7.8 – 11.0 (Map 7, Appendix B). Since 1995, 13 mule deer-vehicle collisions have occurred in this section primarily during the non-winter months and, thus, did not necessarily occur in those areas identified as core use areas.

The bridge structure across the Blackrock Creek was used by mule deer, elk, moose, coyote, and cougar to cross underneath the highway, primarily along the western edge of the creek (Photos 3 and 4). Wildlife use was documented year-round, except for May through June, when high water run-off precluded wildlife access.

Photo 3. Blackrock Creek bridge (view north).

Photo 4. Mule deer using Blackrock Creek bridge to cross underneath highway, July 2005.

Fourmile Meadows Section

The Fourmile Ridge Section (MP 14.7 – 21.3) is characterized by high-elevation (8,100 – 8,900 feet) mixed conifer, lodgepole pine, and sub-alpine meadow habitats (i.e., Blackrock Meadows). Because of the high elevations, deep snow conditions exclude big game species from this area for most of the winter. During the early part (November – December) of the last 3 winters, 59 moose, 37 elk, and 10 mule deer crossing events were recorded.

Most moose activity occurred in the conifer/willow/riparian habitats between mile post 15.4 – 16.2 and 17.7 – 19.1 (Map 9, Appendix B; Blackrock Meadows). Moose use in this section was typically restricted to November and December, prior to deep snow accumulations. Since 1995, 2 moose-vehicle collisions have occurred in this section. Both occurred in August and were not in those areas identified as core use areas.

Most elk activity occurred between mile posts 14.6 – 16.1 and 17.5 – 20.5 (Map 10, Appendix B). Elk use in this section was typically restricted to November, prior to heavy snow accumulations. Since 1995, 2 elk-vehicle collisions have occurred in this section and both have been in those areas identified as core use areas.

Because of the high elevation and heavy snowpack, deer use during the winter months has been minimal and no core use areas were identified (Map 11, Appendix B). Since 1995, there have been 10 mule deer-vehicle collisions in this section. All of these roadkills occurred in the summer months.

Togwotee Pass Section

The Togwotee Pass Section (MP 21.3–30.9) is characterized by high-elevation (8,700 – 9,500 feet) spruce/fir and sub-alpine meadow habitats. Because of the high elevations, deep snow conditions exclude big game species from this area for most of the winter (Photo 5). During the early part (November – mid-December) of the last 3 winters, 22 moose, 24 elk, and 8 mule deer crossing events were recorded in this section. The few records of big game crossings did not allow accurate delineation of core use areas. However, most moose crossings occurred between mile posts 22.0 – 25.0 (Map13, Appendix B), and most elk crossings occurred between mile posts 29.0 – 30.0 (Map 14, Appendix B). Since 1995, there have been 5 elk, 4 moose, and 22 mule deer-vehicle collisions in this section. Consistent with the Fourmile Meadows section, the majority of these roadkills occurred in the non-winter months between May and September.

Photo 5. Togwotee Pass snow conditions on January 4, 2004.

Brooks Lake Section

The Brooks Lake Section (MP 30.9–40.7) ranges in elevation from 7,600 to 8,800 feet. Because of the wide range of elevation, a variety of habitats occur in this section, including spruce/fir, lodgepole pine, mixed conifer, willow/riparian, and sagebrush. During the last 3 winters, 59 moose, 83 elk, and 177 mule deer crossing events were recorded. Mule deer were more common in this section compared to moose and elk.

Most moose activity occurred adjacent to the willow/riparian habitats of the Wind River, between mile posts 32.5–36.5 (Map 17, Appendix B). Since 1995, 2 moose-vehicle collisions have occurred during in this section and 1 was in a core use area.

Most elk activity occurred on the open south-facing slope near Elk Ridge between mile posts 35.9 – 40.1 and above the Brooks Lake Creek/Wind River confluence between mile posts 33.0 – 33.7 (Map 18, Appendix B). Since 1995, 7 elk-vehicle collisions have occurred in this section and 5 have been in those areas identified as core use areas.

Most mule deer activity occurred on the open south-facing slope near Elk Ridge between mile posts 36.5 – 40.5 (Map 19, Appendix B). Since 1995, 53 mule deer-vehicle collisions have occurred in this section and 28 have been in those areas identified as core use areas; however, because most (72%) deer-vehicle collision occurred in non-winter months, the core use areas identified during the winter were not expected to contain the majority of deer-vehicle collision locations.

Wildlife Use of Structures

The infrared camera systems were set at the Buffalo Fork bridge and at the Blackrock Creek Bridge for the first ten days of each month. The system was set at three different culverts at varying times when not in use at the bridge:

Timing of Culvert Cameras
- MP 10.7 – October 11-31, November 12-30
  [round steel culvert approximately 4 feet diameter]
- MP 37.6 – October 11-31, November 12-23
  [round steel culvert approximately 4.5 feet diameter]
- MP 33.6 – December 11-31
  [round steel culvert approximately 4 feet diameter]

Wildlife of a variety of species were documented at all structures that were monitored with the remote cameras (see Appendix D). Preliminary results can be used to identify species using structures but they cannot quantify the level of use (e.g., number of crossings per night) because the cameras were sometimes triggered by recreational activities (e.g., hikers, fishermen, kayakers, snowmobiles) that used up the film before the monitoring session was complete. Additionally, at culvert locations, it was not known whether the animal that triggered the camera actually crossed through the entire length of the culvert. In some cases the animal was seen exiting the culvert only but in others it appeared as if the animal entered the culvert and then exited from the same side. Overall, the cameras provide valuable insight into which animals are likely to use culverts to cross under the highway.

Species photographed using the Buffalo Fork and Black Rock Creek bridges include: elk, moose, mule deer, coyote, red fox, badger, raccoon, and great horned owl. Species documented using culverts included red fox, badger, striped skunk, pine marten, long-tailed weasel, red squirrel, porcupine, snowshoe hare, and deer mouse.

Vehicle-Wildlife Collisions

During the last 11 years (1995 through September 2005), 150 big game-vehicle collisions were recorded in the project area, including 105 mule deer, 27 elk, and 18 moose. Frequency histograms (Figures 1) illustrate the seasonal and locational (i.e., mile post) distribution of big game-vehicle collisions (Figures 3-5). Mule deer accounted for 70% of all big game-vehicle collisions, while elk and moose contributed 18% and 12%, respectively. Most mule deer-vehicle collisions occurred during the summer (May - October) (Figure 1) and were concentrated along the eastern quarter (MP 30-40) of the project area (Figure 2). Most elk–vehicle collisions occurred during the winter (November – April) (Figure 1) and were concentrated on both edges of the project area (Figure 3), corresponding with the location of elk winter ranges. Moose-vehicle collisions were relatively rare events that occurred throughout the year (Figure 1) and were more common in the western half of the project area, specifically the Buffalo Valley and Fourmile Meadow (Figure 4).

A variety of other wildlife species have been documented as roadkills in the project area (Appendix E). Most non-big game roadkills occurred in the summer. Since inception of this study, approximately 78% of all big game roadkills have been documented by WYDOT maintenance crews.

Figure 1. Seasonal distribution of moose, deer, and elk–vehicle collisions, 1995 – 2005.

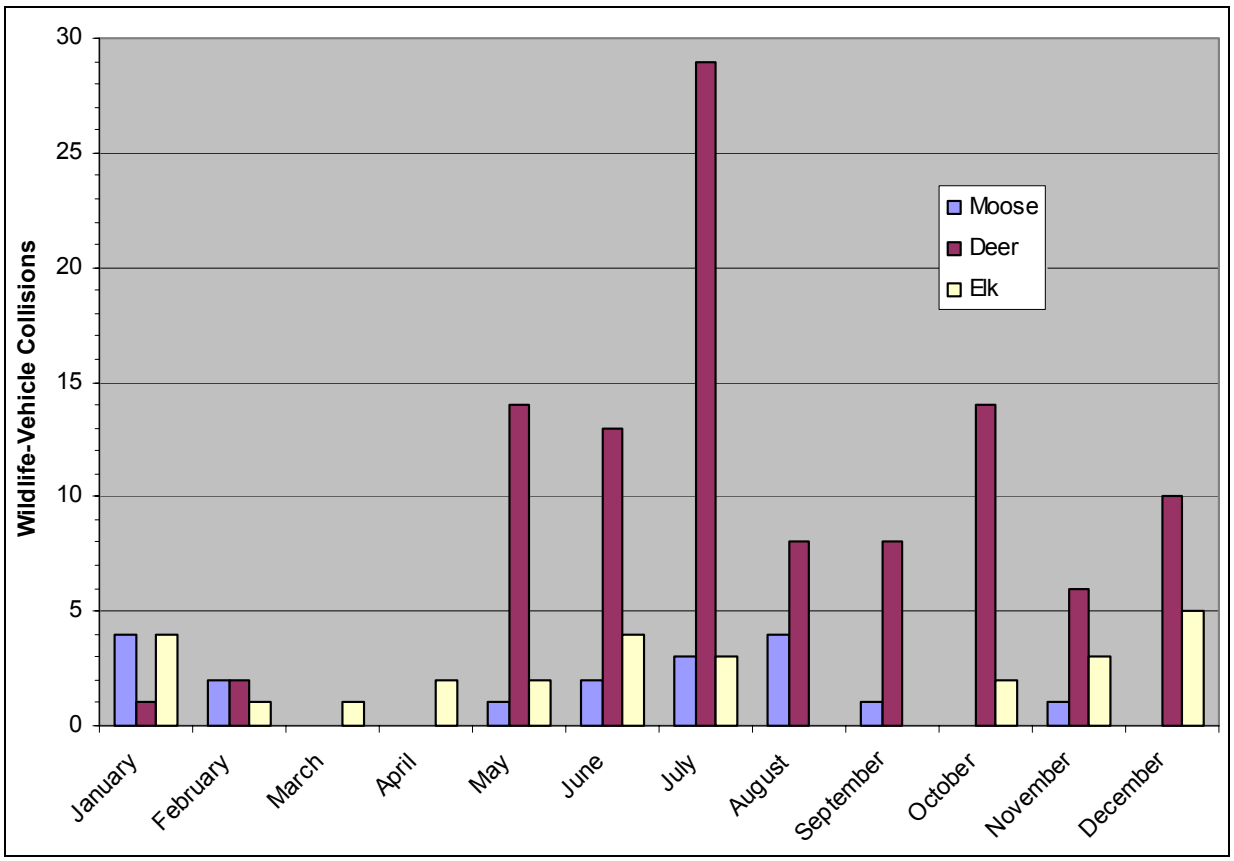


Figure 2. Distribution of mule deer-vehicle collisions (n=105) across project area, 1995 – 2005.

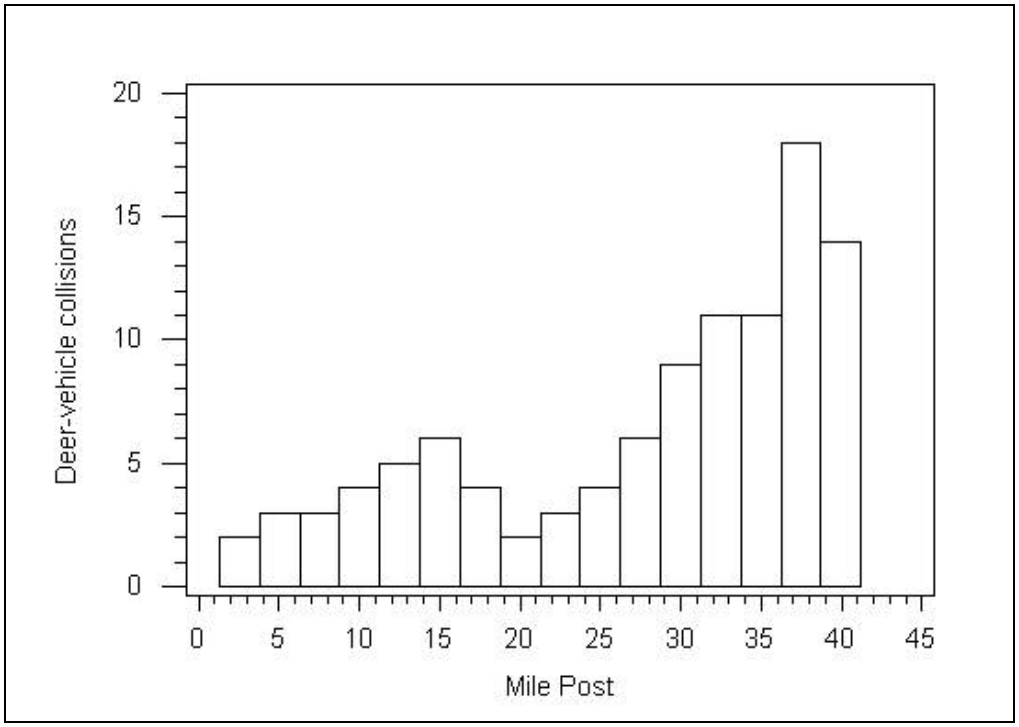


Figure 3. Distribution of elk-vehicle collisions (n=27) across project area, 1995 – 2005.

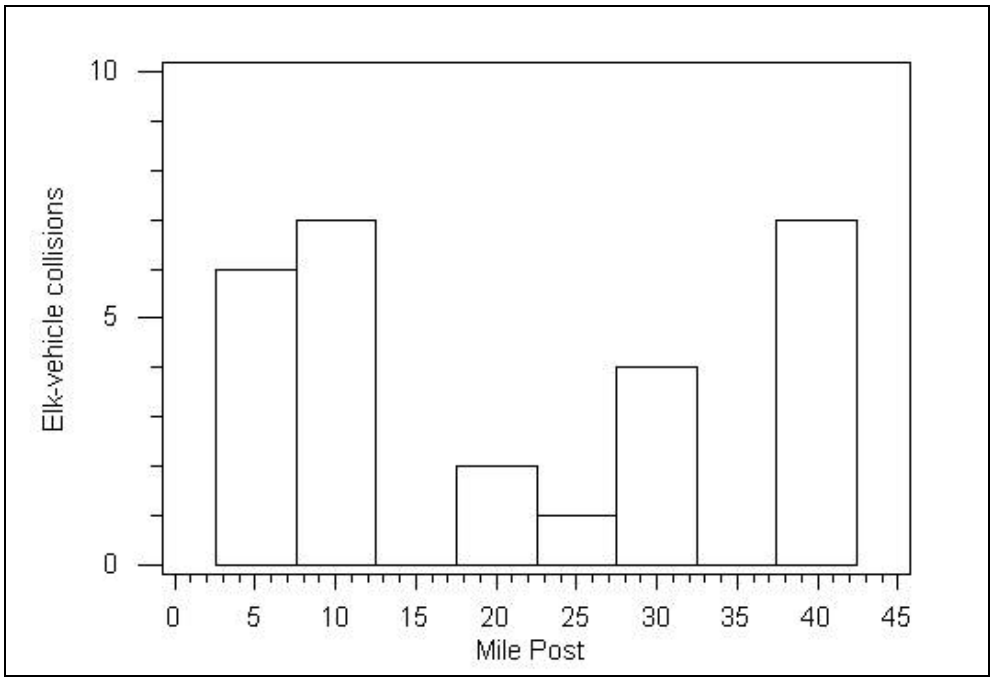
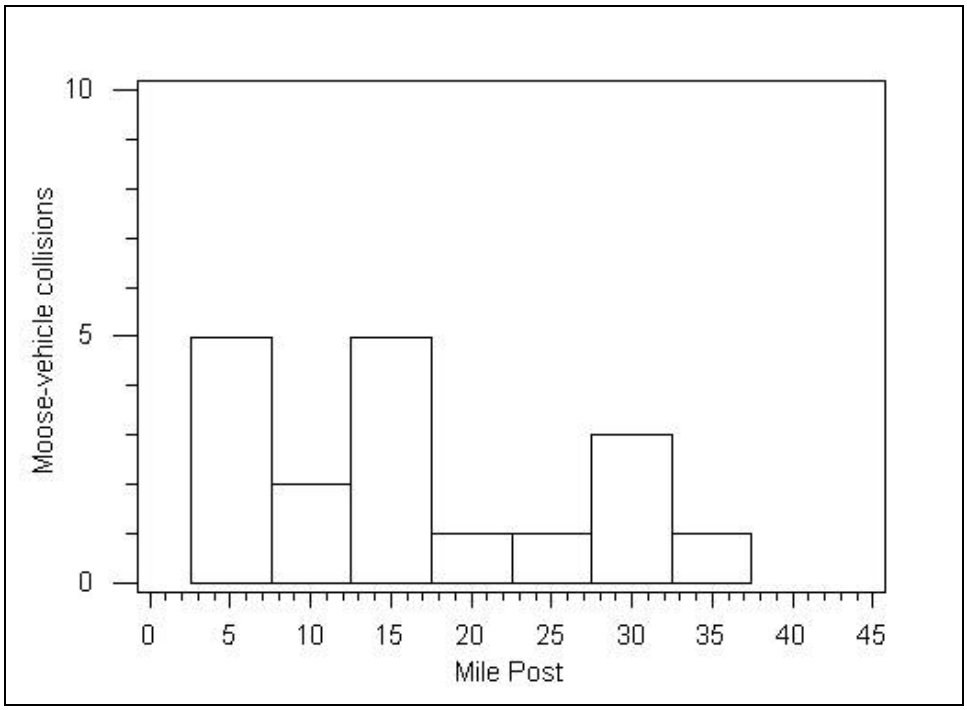


Figure 4. Distribution of moose-vehicle collisions (n=18) across project area, 1995 – 2005.



Other Wildlife

A wide variety of wildlife species have been documented crossing the highway either through snow tracking surveys, road-kill surveys, or direct visual observations. Species recorded and crossing locations from the winter snow tracking survey are recorded on maps in Appendix B. During the summer of 2004, the highway corridor was driven approximately twice a week to search for roadkills but to also record wildlife observations. While these observations provided a record of many species near the highway, observations of wildlife actually crossing the highway were rare so little information was gained about summer crossing patterns. The summer general wildlife observations surveys were discontinued in the 2005. The highway corridor was still driven approximately weekly to search for roadkills (Appendix E) but further field efforts were devoted to the remote camera set ups at the bridges and culverts.

Grizzly Bear

Two sets of grizzly bear tracks crossing the highway were recorded in 2003 at MP 17.2 on November 5 and MP 13.8 on December 9. No grizzly bear tracks were found in the winter of 2004-2005. The tracks at MP 17.2 crossed the highway south to north in an open meadow, meandered through several small timber patches, then crossed the highway again approximately 150 yards away in another open meadow. This bear entered another timber patch and paralleled the highway in a westerly direction. The tracks at MP 13.8 crossed the highway south to north.

Additional information about grizzly bear movements in relation to U.S. 287/26 was summarized by the WGFD based on radio collared bears monitored by the WGFD and Interagency Grizzly

Bear Committee (IGBC) (see Appendix C). The analysis was based on grizzly bear data from 1990–2003. The analysis units used by the WGFD did not correspond with the highway sections, however, the data indicate that the east end of the Rosie's Ridge and west half of the Fourmile Meadows section of the highway is the most frequently used crossing area for bears (25 bears). The east half of Fourmile Meadows and Togwotee Pass Section (19 bears) and Brooks Lake (16 bears) section also had a high frequency of bear crossings. The lower elevation Blackrock (n= 9 bears) section and Dubois (n= 5 bears) section (outside the project area) had relatively few crossings (Appendix C).

Canada Lynx

No lynx crossings were observed during any of the snow tracking surveys (winters of 2002-2003, 2003-2004 or 2004-2005). However, lynx tracks were documented approximately ¼ -mile south of the highway on January 26, 2004 near MP 14.0 (Nate Berg, pers. comm.).

Cougar

No cougar crossings were documented in the winter of 2003-2004. Three cougar crossings were observed during the 2004-05 winter at mile posts 8.4 (Blackrock Creek bridge), 9.1 (Rosie's Ridge), and 9.8 (Rosie's Ridge). Additionally, several radio-collared cougars in the project area are being monitored as part of a research project coordinated by Howard Quigley, Montana State University. Telemetry data indicate these cougars cross the highway, but specific crossing areas and frequency of crossing are unknown.

Wolf

One set of wolf tracks was recorded on December 17, 2003 at MP 5.2. Three sets of wolf tracks were recorded in the project area on January 16, 2003 at MP 9.0, 9.1, and 9.7; however, it is unknown whether these tracks were made by 1 wolf or 3 different wolves (Nietvelt 2003). No wolf tracks were observed in the winter of 2004-2005. Movement and distribution data from radio-collared wolves was not made available by the USFWS. However, seasonal wolf distribution undoubtedly overlaps with elk ranges. There was one wolf road kill in 2000 in the Buffalo Fork River Section near the Buffalo Fork bridge. This wolf appeared to have been using the highway as a travel corridor when it was struck (M. Hinschberger, USFS, pers. comm.).

Black Bear

No black bear tracks have been recorded during the snow tracking surveys for any of the years studied. However, an adult male black bear roadkill was recorded by the WYDOT maintenance crews in the Brooks Lake section in July 2005.

Wolverine

One set of wolverine tracks were located in the project area on January 24, 2005 (Photo 6). The wolverine crossed the highway from south to north at MP 25.6 in the Togowotee Pass section (see Appendix B, Map 14).

River Otter

River otter tracks were located in the project area on February 9 and March 4, 2005 (Photo 7). The tracks crossed under the highway using the double box culverts at MP 32.5, Brooks Lake

Creek, in the Brooks Lake section (see Appendix B, Map 20 and Appendix D). The otter was accessing open water holes on both sides of the highway.

Photo 6. Wolverine tracks at MP 25.6, January 24, 2005.

Photo 7. River otter tracks, double box culvert at MP 32.5, February 9, 2005

DISCUSSION AND SUMMARY

Based on 3 years of snow-tracking surveys (1,402 wildlife crossings) and 10 years of road kill data, the risk to big game species and other species appears to vary seasonally and spatially across the project area. Approximately 14 big game road kills per year occur in the project area, which is substantially lower than other highway sections across the state. For example, between July 2004 and June 2005 approximately 135 big game road kills were reported in the 30-mile section of US 287/26 immediately east (MP 41-71) of the project area. For each species, the total annual loss was less than 0.05% based on the estimated five year average population sizes for the herd units in which the mortality occurred. Generally, the number of crossings per mile of highway (see Table 2) reflected the areas of greatest risk to a given species based on the roadkill data (see Figures 2-4).

While the risk to wildlife on the existing highway appears low, it is unknown how, or if, this risk may change with the proposed highway. For example, would more wildlife-vehicle collisions occur on a roadway with slightly wider pavement widths and higher design speeds, but lower speed limits and wider clear zones? Unfortunately we do not know the answer to this question. Regardless, the potential risk to big game species could be reduced if development plans incorporate knowledge of high-use crossings areas, particularly in the Buffalo Fork, Rosie's Ridge, and Brooks Lake sections. The crossing areas identified in this study could be considered priority areas for implementing mitigation strategies aimed at improving highway safety and minimizing wildlife-vehicle collisions.

Seasonal and Spatial Risk to Big Game

Mule deer accounted for 70% of documented big game road kills in the project corridor. The risk of mule deer-vehicle collisions was greatest in the summer (i.e., July) and along the eastern portion of the project corridor (~MP 30-41) adjacent to Elk Ridge.

Elk accounted for 18% of documented big game road kills in the project corridor. The risk of elk collisions was greatest during the winter (November-April) and along portions of the highway that were adjacent to elk winter ranges on both ends of the project corridor (i.e. Buffalo Valley, Rosies Ridge, and Elk Ridge). The majority of vehicle-elk collisions occurred in the core use areas identified by snow-tracking data.

Moose accounted for 12% of documented big game road kills in the project corridor. There was no apparent seasonal increase in risk of moose collisions as they were distributed year-round. Moose-vehicle collisions were more common in the western half of the project area, and specifically in the Buffalo Valley and Blackrock Meadows areas – two areas characterized by expanses of willow riparian vegetation. Moose-vehicle collisions were most common in the winter core use areas in the Buffalo Fork and Rosie's Ridge sections but did not appear concentrated in the core use areas of the other sections.

These spatial and seasonal patterns of big game-vehicle collisions could provide a guide for some mitigation options such as lengthening bridges to include more upland area, determining where (or where not) to construct passing lanes, determining shoulder width or manipulating clear zone widths, determining speed limits, and identifying areas for signing. For example, the core use areas for elk could be good locations for testing interactive signing technology that would alert motorists to elk on or adjacent to the highway. Also, opportunities for funneling big game under the highway at the Blackrock Creek bridge, which falls within an elk core use area, could minimize risk associated with big game crossing over the surface of the highway.

Other Species Risks

Based on the number of snow tracks observed and the lack of roadkills, the risk to mid and large-sized carnivores appears low. While the risk to these species may be low, the consequences from road kills of these species may be higher to the population. Large predators are known to cross the US 287/26, but records of vehicle collisions are rare. Wolf, grizzly bear, coyote, cougar, wolverine, and bobcat were documented crossing US 287/26 during the winter snowtrack surveys. A set of lynx tracks were located near the highway but were not documented crossing the road. No grizzly bear roadkills have been found and based on the mortality database from the Interagency Grizzly Bear Study Team, no grizzly bear roadkills have occurred in the project area. Also, no record of lynx, cougar, bobcat, or wolverine roadkills could be located. One wolf roadkill record was located from the far western end of the project near the Buffalo Fork River bridge. One black bear was killed by a vehicle at mile post 37.6 in July 2005.

While the study effort was focused on big game and mid to large-sized carnivores, other wildlife snow tracks and roadkills were recorded as they were encountered and the highway was traveled

regularly during the summer months to look for roadkills. A few notable patterns were observed in the information about non-big game species:

- Risk to small animals is higher in the summer than winter based on the number of roadkills found.
- For most species recorded, the number of roadkills was too small to identify clear spatial or temporal patterns. However, for a few species some patterns were evident. For example, amphibians and snowshoe hares showed some concentration in space and weasel roadkills were concentrated in time.
  - Amphibian roadkills, boreal toad and tiger salamander, were concentrated between MP 15.7-16.7 and associated with weather events (summer rain) conducive to amphibian movement.
  - The majority of snowshoe hare tracks and roadkills occurred at higher elevations, between MP 20.0 and 35.0.
  - Weasel roadkills were concentrated during the month of July (see Appendix E). This was consistent with Buchanan (1987) who documented higher rates of long-tailed weasel road mortality during the breeding period (June-August) when mobility of male weasels increases.

Wildlife Use of Structures

The use of Infrared Monitors to detect and photograph wildlife use in existing highway structures was viewed as a pilot effort to determine if that technology and equipment was effective and should be considered in future, more rigorous monitoring efforts associated with highway wildlife crossing structures. The first year of study was primarily intended to determine how well the equipment functioned and develop the method (e.g., where the infrared monitor worked best). In general, the infrared camera systems appeared to work well in a variety of weather and environmental conditions. The only recurring problem occurred on the Buffalo Fork, where summer recreation (e.g., hiking, fishing, kayaking, etc.) levels were so high that the camera film was often used up on recreationists in a matter of hours, so that no film was available in the evening or subsequent days for photographing wildlife. This problem could be resolved by either programming the camera not to take photos during the day, or change film rolls on a daily basis.

The camera effort was not standardized in any way and primarily focused on presence or absence of wildlife using the structures. Calculating frequency of use from the first year of data was not done. The results were general in nature but a variety of wildlife was documented using the monitored structures either to cross under the highway or for temporary shelter (see Appendix D). While it was not always possible to determine if the individual that triggered the camera actually crossed all the way through the culvert, the trigger beam was set as close to an open edge of the culvert as possible so that an individual was most likely to trigger the camera by either entering or exiting the culvert.

The information gained from the cameras supports one of the premises on which this study was based. That is, some crossing solutions for small animals (e.g., installation of culverts negotiable by small animals) are easily implemented throughout the highway project (see Steering

Committee section above). Coupling this information with patterns seen in the roadkill or crossing data would likely maintain, or even improve, habitat connectivity and crossing options for small animals. For example, culverts between MP 15.7 and 16.7 could be designed to provide safe crossing locations for amphibians or culverts at high elevations could provide safe crossing opportunities for snowshoe hare. Also culverts constructed specifically for wildlife use (i.e., no water flow, ground-level entrances) could improve crossing opportunities post-construction.

Overall, this technology provides a reliable and low-cost method for identifying and monitoring animal use of crossing structures. Assuming this type of monitoring schedule can be maintained and standardized, useful year to year comparisons and before and after construction comparisons could be made.

Meeting Study Objectives and Future Study

The overall design for the wildlife movement studies on this highway was intended to occur in three phases which could be considered (1) pre-construction, (2) construction period, and (3) post-construction phases. The purpose of this study in the pre-construction phase was to collect information about wildlife crossing and wildlife-vehicle collisions on the highway to provide WYDOT with the best available information for identifying mitigation opportunities and accommodate wildlife crossings into highway design plans. This report, which incorporates data over a three year period, marks the end of the initial phase of study. Results from each year of the analysis were consistent in terms of locations of big game movement areas, general level of wildlife use across the study area, and magnitude of road kills recovered, and the wildlife movement study steering committee has agreed that the data set provides an accurate picture of big game movement across the highway. In addition, construction of the Brooks Lake section of the highway has begun (April 2006) marking a transition to the construction phase of study. From this point, the snow-tracking and general road kill surveys will be discontinued and the focus of the study will shift to more detailed evaluations of potential wildlife crossing solutions. A study plan for Phase 2 will be written by the Steering Committee to document the purpose and objectives of the next phase of study.

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