TRAPPER'S POINT WILDLIFE CROSSING STUDY

WYDOT Sponsors:

John Eddins and Tom Hart
Wyoming Department of Transportation
5300 Bishop Blvd.

Prepared By:

Hall Sawyer and Chad LeBeau
Western Ecosystems Technology, Inc
200 South 2nd St., Suite B
Laramie, WY 82070

Submitted To:

Wyoming Department of Transportation
Programming Research Unit
5300 Bishop Blvd.
Cheyenne, WY 82009

June 17, 2011

Table of Contents

Problem Statement……. 2

Problem Background…….. 3

Study Objectives…… 4

Study Benefits…… 4

Work Plan/Scope…… 5

Work Schedule……... 6

Cost Estimate……. 7

Implementation Process……. 8

Technology Transfer……..……. 8

Literature Cited……. 8

Qualifications of Principal Investigators.……..……... 9

Problem Statement

The mule deer and pronghorn herds in Sublette County, Wyoming are among the largest in the world. Most of these animals are migratory and spend the winter months southwest of Pinedale, in an area locally known as "the Mesa". Every spring, thousands of animals migrate north and northwest to their respective summer ranges. The mule deer typically migrate 30-60 miles and summer in portions of four different mountain ranges, including the Gros Ventre, Snake River, Wyoming, and Salt River Ranges (Sawyer et al. 2005). The pronghorn typically migrate 10-40 miles to the upper Green River and Hoback Basins. A small segment of the pronghorn population (200-300 animals) migrates approximately 100 miles to Grand Teton National Park (Sawyer et al. 2005, Berger et al. 2006). Every fall, mule deer and pronghorn follow the same migration routes and return to the winter range near Pinedale. During these spring and fall migrations, thousands of animals cross US 191 at grade-level, posing a serious driving hazard for motorists and mortality risk to wildlife. Despite flashing lights and warning signs, vehicle-wildlife collisions have steadily increased, especially in the vicinity of Trapper's Point and immediately north of Daniel Junction. To improve motorist safety and maintain functional migration routes, WYDOT recently finalized construction plans for six wildlife underpasses and two overpasses in a 12-mile stretch of US 191 (Fig.1). Although similar efforts with mule deer and underpasses have been successfully implemented (e.g., Nugget Canyon), it is unknown how large concentrations of both mule deer and pronghorn will respond to underpasses and overpasses. The purpose of this study is to determine: 1) how mule deer and pronghorn respond to newly-constructed underpasses and overpasses, 2) how many animals use each type of structure, and 3) how effective the structures are at reducing wildlife-vehicle collisions.

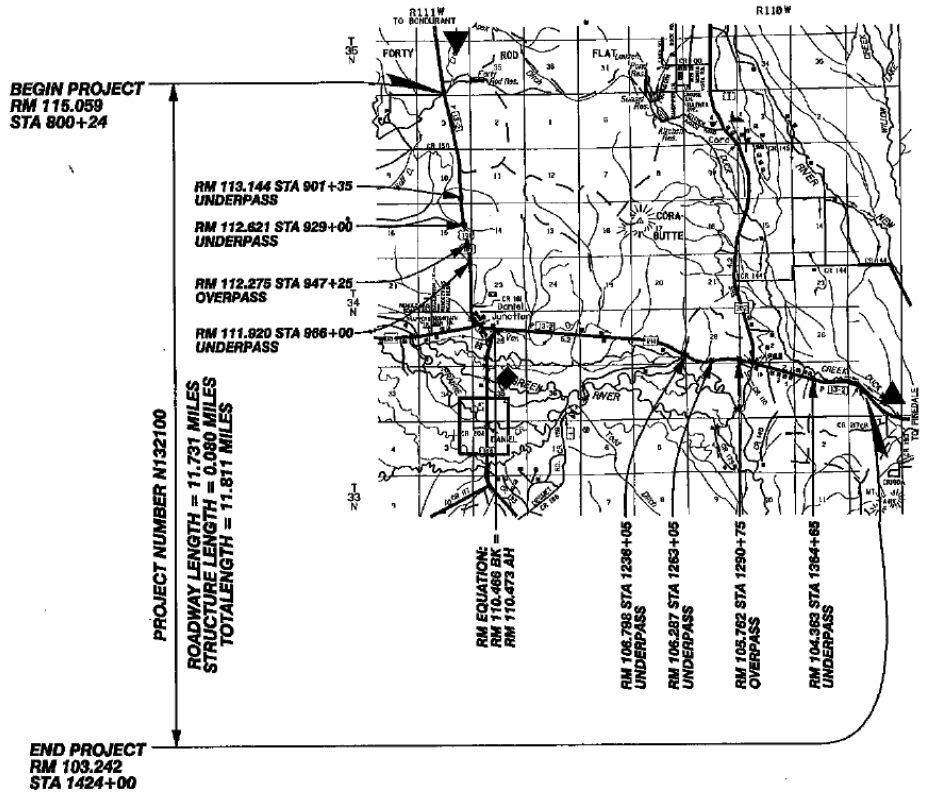


Figure 1. Location of six underpasses and two overpasses to be constructed in a 12-mile section of US 191, west of Pinedale, Wyoming.

Problem Background

Trapper's Point is a narrow sagebrush ridge that forms a naturally-occurring bottleneck, constricted by the Green River to the west and Duck Creek to the east. This sagebrush bottleneck connects large big game winter ranges south of US 191 with extensive summer ranges to the north (Fig. 2). Archeological evidence indicates mule deer and pronghorn have been using this migration corridor for approximately 5,000 years (Miller et al. 1999) and current research indicates 1,000-2,000 mule deer and pronghorn migrate through Trapper's Point each spring and fall (Sawyer et al. 2005). The grade-level crossing at Trapper's Point has a history of high numbers of vehicle-wildlife collisions, and those numbers have increased in recent years as traffic volume on US 191 has increased.

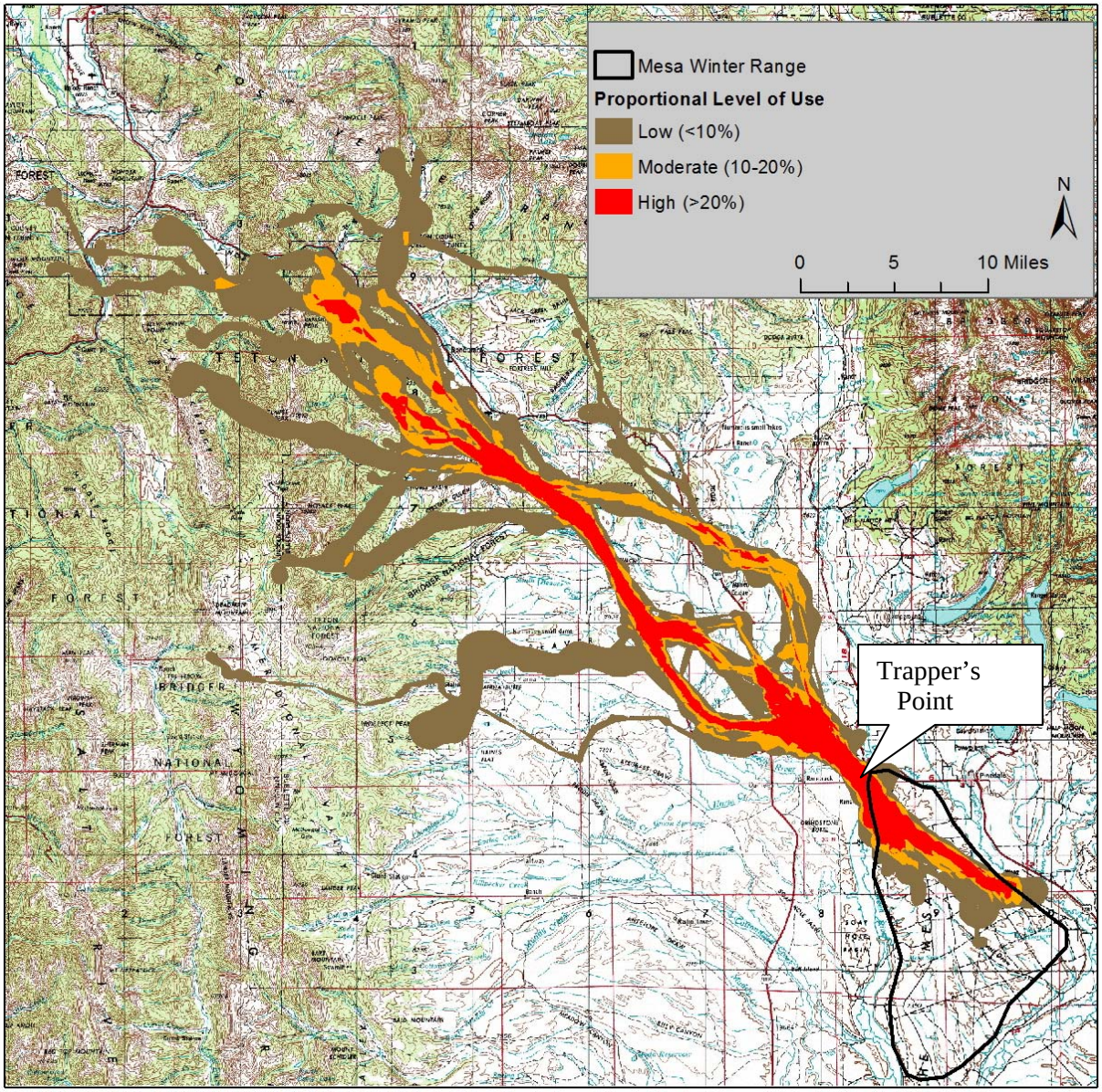


Figure 2. Population-level migration route for mule deer that migrate through Trapper's Point (from Sawyer and Nielson 2011).

To address this problem WYDOT approved construction of eight new crossing structures, including six underpasses and two overpasses. The location of these structures correspond with known migration routes (Fig. 2) and road segments that have high levels of wildlife-vehicle collisions. Knowledge of how mule deer and pronghorn respond to these structures, how many animals use the structures, and whether the structures effectively reduce wildlife-vehicle collisions will improve the ability of agencies to sustain migratory ungulate populations and maintain public safety on roadways. Of particular interest is how pronghorn utilize the overpasses relative to the underpasses. It has been suggested that pronghorn will only cross over roadways, either at-grade or via an overpass. However, monitoring from Nugget Canyon suggests they may be willing to move underneath the highway (Sawyer and LeBeau 2010). Documenting how pronghorn utilize the crossing structures in this project area will help transportation agencies across the Intermountain West determine whether overpasses are a cost-effective mitigation strategy.

Study Objectives

1) Evaluate the number of vehicle-wildlife (pronghorn & mule deer) collisions before (2002-2011) and after (2012-2015) construction.

2) Quantify the number of mule deer and pronghorn that use each of the crossing structures during spring and fall migrations.

    a. Evaluate the spatial and temporal patterns of mule deer and pronghorn use across the eight structures.

3) Estimate the proportion of mule deer and pronghorn that approach the structures versus those that successfully cross the structures, and determine if success rates change through time or across different structures.

Study Benefits

Because the Trapper's Point migration route is nationally recognized and highly visible to the public, interest in this project is expected to be exceptionally high. The anticipated benefits of this study include:

- Determining whether crossing structures combined with game fencing can effectively reduce vehicle collisions with pronghorn and mule deer will help the WGFD maintain migratory big game herds and allow WYDOT to improve highway safety.

- Understanding how mule deer and pronghorn respond to and utilize overpasses will improve future roadway planning. If, for example, pronghorn are willing to use underpasses rather than overpasses, the cost of future projects would be significantly reduced by focusing mitigation on the more cost-effective underpasses.

- This study will provide detailed information on wildlife species other than mule deer and pronghorn that utilize the crossing structures.

Work Plan/Scope

Objective #1: Wildlife-vehicle collision data will be obtained from WYDOT and analyzed across the entire 12-mi corridor and 2-mi either side of the corridor. We will examine the number of wildlife-vehicle collisions before (2002-2011) and after construction (2012-2015). This approach should clearly show how effective the new crossing structures are at reducing vehicle collisions with mule deer and pronghorn. Evaluating wildlife-vehicle collision data at each 2-mi end segment adjacent to the project area will help determine whether animals move around the fencing.

Objective #2: The number of mule deer and pronghorn that use each structure will be estimated from photo-data collected from Reconyx cameras mounted on each structure. Two cameras will be mounted on wood posts near the entrance and exit of each underpass (see Appendix A). At each overpass, cameras will be placed on existing fence posts on each side of the entrance. The two overpass cameras will face each other so the 150-ft width has full camera-coverage. These cameras are completely silent and produce high-quality, time-stamped images that were successfully used to monitor wildlife movements in Nugget Canyon underpasses (Fig. 3).

Objective #3. The response of mule deer and pronghorn to the structures will be evaluated using high-speed digital cameras mounted at the entrance and exit of all structures. The camera will record animal movements approaching the structure, such that the ratio of repels versus successful crosses can be estimated.

Figure 3. Example of time-stamped image documenting a mule deer moving through underpass.

Work Schedule

This work schedule is designed to begin data collection in fall of 2011, but dependent on contractors' completion of fence and structures. It is anticipated that only half of the structures (those north of Daniel Junction) will be completed during the 2011 construction season, while the other half (Trapper's Point) will not be completed until the fall of 2012. We propose to monitor through 2015, such that information is collected for 3 full migration cycles (spring and fall) after the project is completed.

2011

July -	Present proposal to RAC
August -	Secure WYDOT funding and order cameras
September -	Install cameras and begin structure monitoring of fall migration (north of Daniel Junction)
December -	End fall session and continue winter monitoring

2012

March -	Begin monitoring (north of Daniel Junction) of spring migration
May -	End spring session and continue summer monitoring
June – August	Data analysis & annual progress report to WYDOT
September -	Install cameras and begin structure monitoring (all 8 structures) of fall migration.
December -	End fall session and continue winter monitoring

2013

March -	Begin monitoring of spring migration
May -	End spring session and continue summer monitoring
June – August	Data analysis & annual progress report to WYDOT
September -	Install cameras and begin structure monitoring of fall migration.
December -	End fall session and continue winter monitoring

2014

March -	Begin monitoring of spring migration
May -	End spring session and continue summer monitoring
June – August	Data analysis & annual progress report to WYDOT
September -	Install cameras and begin structure monitoring of fall migration.
December -	End fall session and continue winter monitoring

2015

March -	Begin monitoring of spring migration
May -	End spring session and discontinue monitoring
June – August	Data analysis
September -	Final report to WYDOT

Cost Estimate

Year 1 (August 2011 - July 2012)		
Expense Item		Estimated Cost
Batteries		$700
Administration		$850
Project Manager		$8,578
Technician		$13,913
Vehicle/Travel/Lodging		$8,500
4 Reconyx cameras & accessories		$3,100
	Sub-total	$35,641

Year 2 (August 2012 - July 2013)		
Expense Item		Estimated Cost
Administration		$850
Project Manager		$9,007
Technician		$14,608
Vehicle/Travel/Lodging		$8,500
	Sub-total	$32,965

Year 3 (August 2013 - July 2014)		
Expense Item		Estimated Cost
Administration		$850
Project Manager		$9,436
Technician		$15,304
Vehicle/Travel/Lodging		$8,500
	Sub-total	$34,090

Year 4 (August 2014 - September 2015)		
Expense Item		Estimated Cost
Administration		$850
Project Manager		$11,838
Technician		$16,000
Vehicle/Travel/Lodging		$8,500
	Sub-total	$37,187
	Total	**$139,883**

*18 cameras from Nugget Canyon will be used for this project. Cameras and accessories are the property of WYDOT and will be returned to the WYDOT Research Center upon completion of the project.

Implementation Process

Monitoring efforts in Nugget Canyon have shown underpasses can effectively move deer underneath 2-lane highways and reduce wildlife-vehicle collisions. However, it is unknown whether pronghorn will respond to a similar mitigation approach involving both underpasses and overpasses. This study should provide valuable information on how effective overpasses are for moving pronghorn (and other wildlife) across roadways.

It is anticipated that the information gathered from this study will be utilized by WYDOT's Environmental Services, Project Development, and Highway Safety programs. This

information should benefit those involved with the project planning process well in advance of project design. It is not anticipated that this study will result in a change to Standard Specifications, but it is expected to expand WYDOT's knowledge base regarding the use of wildlife crossing structures to mitigate impacts to wildlife movement, reduce wildlife mortality from animal-vehicle crashes, and increase motorist safety.

Technology Transfer

Results of the study will be provided to WYDOT and WGFD in the form of a final report. Additionally, photos will be provided as requested to assist agencies with media coverage. Results of the study will be published in an appropriate outlet, such as the proceedings from the biannual meetings held by the International Conference on Ecology and Transportation (ICOET; http://www.icoet.net/).

Literature Cited

Berger, J., S. L. Cain, and K. M. Berger. 2006. Connecting the dots: an invariant migration corridor links the Holocene to the present. Biology Letters 22:528–531.

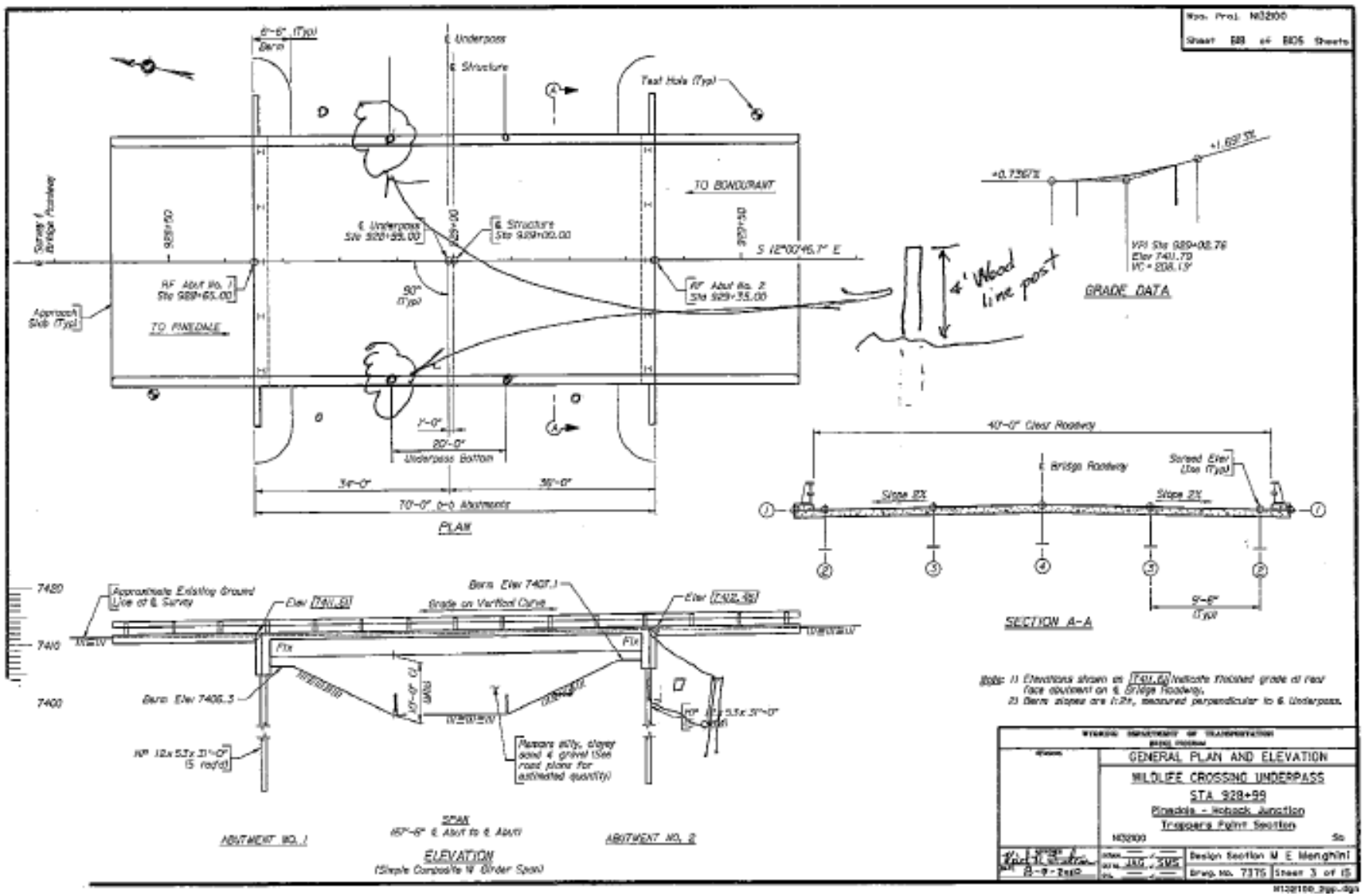
Miller, M. E., P. H. Sanders, and J. E. Francis, editors. 1999. The Trapper's Point Site (48SU1006): early archaic adaptations in the upper Green River Basin, Wyoming. Office of the State Archaeologist, University of Wyoming, Laramie, USA.

Sawyer, H., F. Lindzey, and D. McWhirter. 2005. Mule deer and pronghorn migration in western Wyoming. Wildlife Society Bulletin 33:1266-1273.

Sawyer, H., and C. LeBeau. 2010. Evaluating mule deer crossing structures in Nugget Canyon. Western Ecosystems Technology, Inc. Cheyenne, Wyoming.

Sawyer, H., and R. Nielson. 2011. Mule deer migration routes to and from the Mesa and Ryegrass winter ranges: 2010. Western Ecosystems Technology, Inc. Cheyenne, Wyoming.

Appendix A: Approximate location of wood post camera mounts in each underpass



Qualifications of Principal Investigators

Hall Sawyer, *Research Biologist*

PROFESSIONAL EXPERIENCE

2002-Present *Research Biologist,* Western EcoSystems Technology, Inc., Laramie, Wyoming

2011-Present *Adjunct Assistant Professor*, Department of Zoology & Physiology, University of Wyoming, Laramie, Wyoming

EDUCATION

Ph. D.
University of Wyoming
Laramie, Wyoming
2010
Zoology and Physiology

M.S.
University of Wyoming
Laramie, Wyoming
1997
Zoology
Minor: Statistics

B.S.
Colorado State University
Fort Collins, Colorado
1994
Wildlife Biology

SPECIALTY AREAS

Ungulate Research: Fifteen years experience conducting and coordinating research projects for a variety of state and federal agencies, as well as industry and non-government organizations. Responsible for the design, animal capture, data collection, analysis, and report writing for studies of resource selection, migration ecology, and demography for a wide range of ungulate species. Worked with state and local governments, NGOs, and industry to develop management guidelines and land-use plans that incorporate wildlife migration routes in western Wyoming (Sawyer et al. 2005, 2009). Conducted the first long-term study evaluating the effects of natural gas development on mule deer (Sawyer et al. 2006, 2009). Demonstrated the ecological importance of stopovers to migratory ungulates (Sawyer & Kauffman 2011).

Global Positioning System (GPS)-telemetry, Resource Selection, and Migration Ecology: Fifteen years of experience with radio-telemetry methodologies, and data analysis. Utilized both traditional VHF collars and GPS units to evaluate movement patterns and resource selection. Sawyer et al. (2006, 2007, 2009) present a state-of-the-art resource selection method that has broad application for estimating resource selection patterns with GPS data. Sawyer et al. (2009) developed a quantitative framework for identifying and prioritizing ungulate migration routes from GPS.

Animal Capture and Handling: Responsible for the capture and handling of >800 ungulates, including mule deer, white-tailed deer, pronghorn, moose, and elk. Experience with a wide range of capture techniques including corral traps, clover traps, helicopter net-gunning, and drug immobilization. Completed safe, efficient capture operations across a variety of seasons and landscapes.

REPRESENTATIVE PROJECTS

Long term study designed to assess potential impacts of energy development on mule deer in the Pinedale Anticline Project Area (*Bureau of Land Management, Wyoming Game and Fish Dept.)*

Large-scale GPS study designed to identify seasonal distribution and migration routes of mule deer prior to energy development in the Atlantic Rim Project Area *(Anadarko Petroleum Company, Bureau of Land Management, Wyoming Game and Fish Dept.)*

Before-after GPS study designed to evaluate potential impacts of bike path on elk distribution in Grand Teton National Park (*National Park Service)*

Mule deer underpass monitoring along US 30: Nugget Canyon *(Wyoming Department of Transportation)*

SELECTED PROFESSIONAL PUBLICATIONS

Sawyer, H. and M.J. Kauffman. 2011. Stopover ecology of a migratory ungulate. Journal of Animal Ecology DOI:10.1111/j.1365-2656.2011.01845.x

Sawyer, H., M. J. Kauffman, R. M. Nielson, and J. S. Horne. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. Ecological Applications 19:2016-2025.

Nielson, R. M., B. F. J. Manly, L. L. McDonald, **H. Sawyer**, and T. L. McDonald. 2009. Estimating habitat selection when GPS fix success is less than 100%. Ecology 90:2956-2962.

Sawyer, H., M. J. Kauffman, and R. M. Nielson. 2009. Influence of well pad activity on the winter habitat selection patterns of mule deer. Journal of Wildlife Management 73:1052-1061.

Sawyer, H., R.M. Nielson, F. Lindzey, and L.L. McDonald. 2006. Winter habitat selection of mule deer before and during development of a natural gas field. Journal of Wildlife Management 70:396-403

Chad LeBeau, *Biologist*

PROFESSIONAL EXPERIENCE

2009-Present *Biologist/Field Supervisor,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2007-2009 *Field Technician,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2006-2008 *Research Aide,* Ruckelshaus Institute, ENR, Laramie, Wyoming

EDUCATION

M.S.
University of Wyoming
Laramie, Wyoming
Ongoing
Rangeland Management and Renewable Resources

B.S.
University of Wyoming
Laramie, Wyoming
2008
Wildlife & Fisheries Biology Management, Environmental & Natural Resoures

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Wildlife Society

WILDLIFE, T&E AND SENSITIVE SPECIES SURVEYS

Black footed ferret and pygmy rabbit surveys in southwest Wyoming
Burrowing owl surveys in southeastern Wyoming and southern New Mexico
Rare plant surveys for the Overland Pipeline project, Wyoming
Sharp-tailed grouse and mountain plover surveys in northeastern Colorado
Conducted and supervised two greater sage-grouse telemetry and GPS studies in Wyoming and Nevada
Participated in multiple big game studies in northwestern Wyoming
Eagle and hawk nest monitoring throughout Wyoming and Colorado
Conducted and supervised multiple prey availability studies in Wyoming and New Mexico

SELECTED PROFESSIONAL PUBLICATIONS

Johnson, G. D., T. Rintz, **C. LeBeau**, J. Eddy, and M. Holloran. 2009. Greater Sage-Grouse telemetry study for the Simpson Ridge Wind Energy Projects, Carbon County, Wyoming. First Quarterly Report. Prepared for Horizon Wind Energy by Western EcoSystems Technology, Inc, and Wyoming Wildlife Consultants. 16pp.

Young, D.P., Jr., **C. LeBeau**, W. Erickson, S. Nomani, J.R. Boehrs, and B. Oakleaf. 2010. Status of Breeding Populations of Ferruginous Hawks, Golden Eagles and Bald Eagles in Albany and Carbon County, Wyoming. Prepared for the Wyoming Game and Fish Department (WGFD).

VOLUNTEER EXPERIENCE

Assisted with population estimation & marked recapture modeling of red squirrels in the Pole Mountain District of the Medicine Bow National Forest

ADDITIONAL TRAINING AND WORKSHOPS

2006 Conclave in Las Cruces, New Mexico