THE LOIS WEBSTER FUND

FINAL REPORT OCTOBER 2007

Project Overview:

Grant monies in the amount $2500 were awarded for genetic analysis of scat and hair samples obtained during the study entitled ***Using multiple sampling techniques to test roadway permeability and to monitor wildlife presence at Shrine Pass Road and Interstate 70, Vail Pass, Colorado***. For this project, four sampling methods are being assessed (track transect surveys, scat transect surveys, hair snares, and remotely-triggered camera surveys) in baited and unbaited study sessions to determine which monitoring techniques are most effective at documenting species presence. This report will focus on preliminary results from this part of the study. In addition, data from remotely-triggered cameras obtained during unbaited study sessions at three different roadway types will be analyzed to assess the response of mammalian species to roadways of varying permeability. Finally, genetic analysis of scat and hair samples collected at sites on both sides of I-70 will be used to investigate possible genetic variances among the same species on opposite sides of the interstate.

Cost effective monitoring strategies are of great importance when working within a limited budget. This study will contribute to the development of an appropriate long-term monitoring strategy for the Vail Pass linkage. This linkage serves as one of the last remaining forested routes for wildlife moving north-south through the heart of the Rocky Mountains. In addition, these results will help inform the decision of where to place a proposed wildlife bridge on I-70 just west of Vail Pass. The bridge will help reconnect this critical habitat linkage. The results will also be used to evaluate wildlife crossing behavior once the bridge is built.

To date, two study sessions have been completed. In August 2006, an unbaited and a baited study period were completed at sites along Shrine Pass Road near I-70 at Vail Pass. This report will center on results from this part of the study, focusing on genetic analysis done on scat and hair samples acquired from these sites. In July 2007, one baited study period was completed at sites along I-70 on the east and west side of Vail Pass. If possible, a third study session will be completed in the future.

DNA Analysis Results:

Unknown scat and hair samples from the 2006 Shrine Pass Road sites were sent to the Wildlife Genetics Laboratory at the Rocky Mountain Research Station in Missoula, MT for genetic analysis.

<u>Hair samples:</u> Ninety unknown hair samples were sent in for DNA analysis. The lab technicians were not able to find hair samples in nine of the envelopes. Of the remaining eighty-one hair samples, sixty-seven (82.7%) contained sufficient DNA for species identification. Four of these samples were from red fox (*Vulpes vulpes*) and 63 were from wolf/domestic dog (*Canis sp.*). Wolves and dogs are genetically indistinguishable without detailed, local genetic databases so these samples were listed as "wolf/dog". Since the likelihood of finding evidence of wolves in Colorado is very low, it is assumed that all of these samples are from domestic dogs.

Scat samples: Remaining funds allowed for ten of twenty six scat samples sent in to be genetically analyzed. This was about a quarter (23%) of the 44 total scat samples collected during the baited session at Shrine Pass Road. All 10 scats contained sufficient DNA for analysis and, prior to analysis, were thought to be from marten with varying degrees of certainty. Genetic analysis confirmed that nine scats were from marten and one scat was from red fox. This is an important indicator of the accuracy of identifying samples in the field. In this case, field identifications were accurate 90% of the time for marten. Though a decent percentage, it also confirms the importance of genetic analysis to achieve 100% accuracy.

Ten of the remaining scat samples that were not analyzed were from unknown species, one was thought to be from a marmot, and five were either from elk or deer, but were not distinguishable in the field. These samples were not used in the statistical analysis of the results. The scat samples that were not sent in for analysis were given a certainty level of 3 (very certain of species of origin) in the field and are used in the statistical analysis.

Analysis of Results:

Preliminary analysis of data from the study sessions on Shrine Pass Road indicate some very exciting results. At this time, several basic statistical tests have been run on the data from all four methods during the baited session on Shrine Pass Road as well as three of the methods during the unbaited session. These preliminary analyses were run using the paired t statistical test. An alpha level of .05 was used to determine significance. Additional statistical analysis will be done using the Analysis of Variance (ANOVA) and the Kruskal-Wallis statistical tests.

Comparison of Methods During Baited Session: The detections recorded from each of the four methods during the 2006 baited session were compared to determine if any method was more effective at detecting the presence of a specific species. Statistical tests were run on data for four species: mule deer (*Odocoileus hemionus)*, elk (*Cervus elaphus*), marten (*Martes americana*), and red fox (*Vulpes vulpes*).

Mule Deer: The number of detections recorded with track surveys are significantly greater than detections with camera surveys ($p=.01$), scat surveys ($p=.001$) and hair snares ($p=.0007$). In addition, there are significantly more detections with scat surveys ($p=.02$) and camera surveys ($p=.01$) than with hair snares. However, there is no difference between detections of mule deer with camera and scat surveys ($p=.1$).

Elk: The number of detections documented with track surveys are significantly greater than detections with camera surveys ($p=.01$), scat surveys ($p=.035$), and hair snares (.02). There was no difference between the number of detections with scat surveys and both camera surveys ($p=.46$) and hair snares (.33) as well as between camera surveys and hair snares (.14).

Marten: Detections recorded with scat surveys are significantly greater than detections with track surveys and hair snares ($p=.002$ for both) but scat detections are not significantly greater than detections with camera surveys ($p=.06$). Detections with camera surveys are significantly greater than detections with both tracks and hair ($p=.04$ for both).

Red fox: The number of detections documented with hair snares are significantly greater than detections with track and scat surveys (p=.04 for both). Detections with hair snares are not significantly greater than detections with camera surveys however (p=.2). In addition, detections with camera surveys are not significantly greater than detections recorded with both scat and track surveys (p=.33 for both).

Comparison of methods during baited and unbaited sessions: The detections recorded from three of the methods during the 2006 baited session were compared to the 2006 unbaited session. This was done to determine if any method was more effective during the baited session than the unbaited session or vice versa. Hair snares are not included in this analysis because they were only used during the baited session. This analysis investigates whether baiting the techniques increases the number of animals detected per method.

Mule Deer: There were significantly more track survey detections during the baited session than during the unbaited session (p=.004). There is no difference between the baited and unbaited sessions for both scat (p=.085) and camera surveys (p=1).

Elk: There is no difference between detections recorded during the baited session and unbaited session for any of the methods (track p=.17; scat p=.11; camera p=1).

Marten: Detections with scat surveys recorded during the baited session are significantly greater than the number of detections recorded during the unbaited session (p=.006). No tracks were recorded in either session, and there is no difference between the two sessions for the camera surveys (p=.33).

Number of species detected per night by method: For this analysis, data from each method was assessed to see the number of species detected per night. For instance, in one night, a camera might take pictures of four deer, two elk, one fox and one porcupine for a total of four species for that night. Records from a tracking survey might indicate the presence of five elk and six deer for a total of two species in one night. Statistical tests were run to see if there is a difference between each of the methods during the baited session. In addition, data from the baited and unbaited sessions were compared to see if there was a difference in the number of species detected depending on whether each method was baited or not. Hair snares were not included in this analysis because they were not used during the unbaited session. This analysis gives an idea of how effective each method is at detecting a variety of species which is an important consideration when a study is focused on several species rather than just a few. It also gives a sense of whether baiting the techniques increases the number of species detected per method.

Baited Session: The data from the baited session indicate that cameras surveys detect significantly more species than scat surveys (p=.02) and hair snares (p=.02), but not track surveys (p=.06). Detections with track surveys are not more significant than detections with hair snares (p=.08) or scat surveys (p=.13).

Baited and Unbaited Session: There were significantly more species detected with the track surveys during the baited session than the unbaited session (p=.001). There was no difference in

the number of species detected for camera surveys (p=.06) and scat surveys (p=.17) during the baited and unbaited sessions.

Discussion of Results:

Overall, these preliminary results indicate that track surveys are a better method to use to detect deer and elk presence, scat surveys are a more effective method to detect marten, and hair snares are more efficient at detecting red fox. However, if a study is focused on several species rather than these specific species, it seems that camera surveys are the more effective method since they detected significantly more species per night than both hair and scat. This study indicates that adding a scent lure to study sites can increase the number of scat survey detections recorded for marten and track survey detections recorded for mule deer. The scent lure only significantly increased the number of species detected by track surveys; however, this method only detected mule deer and elk.

A large number of domestic dogs were detected using the hair snares. It is assumed that most, if not all, of these dogs were accompanied by humans while they were in the Shrine Pass Road area. Indeed, there is considerable human traffic on Shrine Pass Road especially in the summer months. Tourists and locals come to the area to hike at a couple of trailheads accessible by this road, mountain bike the road, view wild flowers and autumn leaves, and to pick mushrooms. It is also a very popular off road vehicle and jeep tour destination. Though the domestic dog results may seem disappointing, they are very important because they indicate the amount of human activity in the area which, in turn, could affect the presence of wildlife in the area.

In addition, it is very exciting that four of the hair samples were from red fox. During the 2007 baited session, it is thought that all eleven of the hair samples recovered from sites along I-70 are also from red fox. Though genetic analysis is needed to confirm these results, they should bolster the significant statistical results found from analysis of the 2006 study results.

Future Research Needs:

The baited session completed in 2007 at sites along I-70 is very important to this project. It will be essential to get the unknown hair and scat collected during this study genetically analyzed so that all of the samples can be used for statistical analysis. In addition, it will be vital to get all of the scat samples (unknown samples and samples with certain field identification) genetically analyzed so that they can be used to investigate possible genetic variances among the same species on opposite sides of the interstate. Finally, another baited study session would really fortify this study as it would increase the number of samples. Increasing the number of samples for each method will strengthen the statistical results.

Final Note:

Thank you again for this wonderful funding opportunity. These results would not have been possible without the Lois Webster Fund of the Audubon Society of Greater Denver's generous grant for genetic analysis.