Mule Deer Buck Migrations and Habitat Use in the Bridge River, British Columbia: Preliminary Results

(FWCP Project # 12.W.BRG.03)

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PREPARED FOR:
Fish & Wildlife Compensation Program-Coastal

MARCH 31, 2013

EXECUTIVE SUMMARY

In recent years, both the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and the St'at'imc First Nation have become concerned with the status of the mule deer population west of the Fraser in southcentral British Columbia. These concerns provided the impetus for the recently completed two years of research on the female components of the deer population in the St'at'imc territory. This project seeks to build and expand on that data set by investigating habitat use and migration ecology of mule deer bucks in the area to provide further information on this population that can be applied to deer management.

The primary purpose of this report is to report preliminary results from the first sampling session (i.e., first 2 years of the project). During April and May 2011, 9 mule deer bucks were captured and collared in the study area through free-range chemical immobilization. Collars were retrieved during April and May 2012 and data was downloaded for analysis. Overall, 78% of bucks migrated to distant summer ranges entirely separated from spring/winter ranges. Migrations were generally characterized as relatively straight in a westerly direction along the south aspect slopes on the north side of Carpenter Lake with use of interspersed transitional ranges along the way. Migration and seasonal range statistics and other details are reported.

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

In recent years, the St'at'imc Nation has become concerned that deer within their traditional territory, west of the Fraser River in south central British Columbia, are experiencing a negative population trend. Unpublished data from the Fish, Wildlife and Habitat Management Branch (FWHMB), Ministry of Forests, Lands & Natural Resource Operations (MFLNRO), supports the notion that deer have experienced a decline since the early 1990's in the area. Overall, although deer numbers have rebounded from earlier declines, they continue to remain below levels seen in the 1960s and 1970s (Hatter et al. 1989). While causes for these declines are not known with certainty and are likely the result of several different factors relating to habitat and direct mortality, broad scale landscape changes from timber harvests and hydroelectric development have contributed, and in some cases, are likely still contributing. These concerns provided the impetus for the recently completed two years of research on the female components of the deer population in the St'at'imc territory (i.e., Poole and Wright 2010). This project seeks to build and expand on that data set by examining the buck component of this mule deer population. Information on habitat use and migration ecology of mule deer bucks is essential to ensure sound management (Brown 1992; Kie et al. 2002; Walter et al. 2009; Sawyer et al. 2009).

2. GOALS & OBJECTIVES

The overall goal of this project is to investigate mule deer buck habitat use and migration ecology to provide information to enhance harvest and habitat management of the deer population in the Bridge River drainage. This will be accomplished through 8 long-term objectives:

1. Assess residency patterns (i.e., resident vs. migratory) of bucks.
2. Describe habitat characteristics of mule deer buck seasonal ranges (summer, fall, rut, winter and spring).
3. For migratory bucks, describe mule deer buck migration patterns, including timing and movement routes between seasonal ranges.
4. For migratory bucks, describe habitat selection during spring and fall migrations and understand why bucks selected those habitats.
5. Describe daily habitat use and movement patterns of bucks and does during November 10 to December 31.
6. Compare winter ranges utilized by bucks with model-predicted winter ranges to test the model
7. Assess how these variables might vary between years and understand why they might have varied.
8. Understand how this knowledge could influence deer management and generate practical recommendations for managing deer harvests and habitats and designing post-hunt composition surveys.

For the 2012/13 project year, the short-term objectives were to:

1. Recover radio-collars and retrieve spatial data
2. Begin preliminary data analyses

3. STUDY AREA

The project area is situated within the northern St'at'imc Nation Territory in southwestern British Columbia, and represents portions of Wildlife Management Unit (MU) 3-32. Specifically, the study area is situated in the area immediately north of Carpenter Lake, namely 5 Mile and Marshall Ridges and the southern slopes of the Shulaps Range (Figure 1). This area is prime mule deer winter and spring range.

The Central Interior and Southern Chilcotin Ecosections are represented within the project area. Average mean temperatures at Lillooet were -3.6 and 21.4 degrees Celsius for January and July (Environment Canada 2005). The project area is situated within the xeric rain-shadow of the southern coastal mountains of the Cascades Forest District (BCWRP 2004) and as result vegetation tends to be those trees and plants adapted to dry conditions. Predominant forest cover includes interior Douglas-fir (*Pseudotsuga menziesii*) and Ponderosa pine (*Pinus ponderosa*) and localized patches of bunchgrass grasslands are interspersed throughout. The area overlaps the BC Hydro Bridge River complex, namely the La Joie and Terzaghi Dams which impound Downton and Carpenter Lakes (BCWRP 2004).

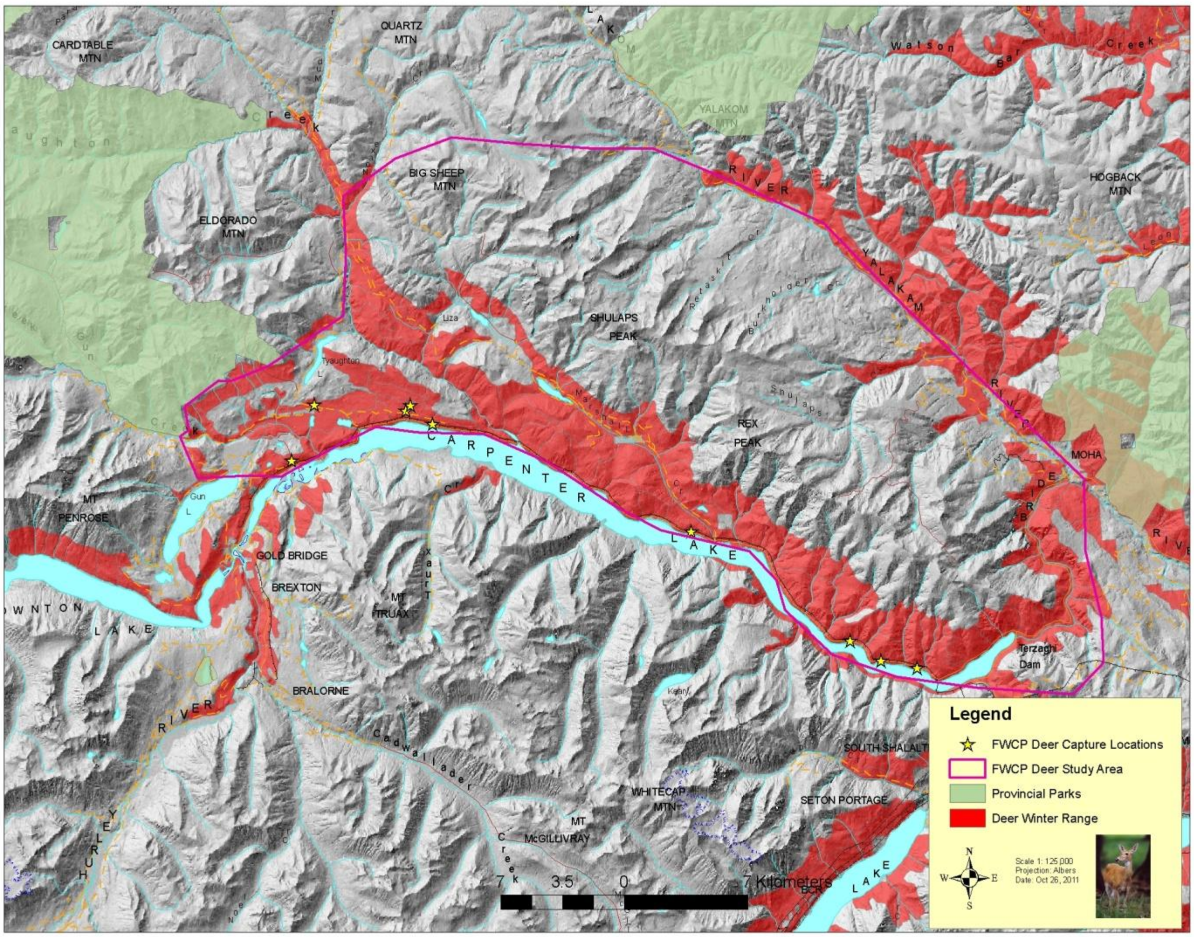

FIGURE 1. Map of Bridge River study area in Management Unit 3-32. Stars represent capture locations for 9 mule deer bucks during spring 2011.

4. METHODS

Buck captures & data retrieval

During April and early May 2011, when deer were congregating on lower elevation spring ranges, 9 mule deer bucks were captured by ground-based chemical immobilization with XZT (i.e., Telazol/Xylazine cocktail). Drugs were administered via darts fired from a specialized rifle. Captured bucks were fitted with Advanced Telemetry Systems (ATS) G2000 GPS collars. Collars had specialized expandable/retractable inserts, manufactured by ATS, so they could expand when bucks' necks swelled during the fall rut and retract again afterwards. Collars were programmed to collect location data for approximately 12 months. To meet objectives, collars were programmed to collect locations for a one year period, including every 3 ½ hours from January 1 –April 30, when deer are on winter and spring ranges, and July 1 to August 31, when deer are on summer ranges. Locations were attempted every 45 minutes May 1 – June 30, when deer are migrating to summer range and September 16 to December 31 when deer are migrating to their fall and/or winter ranges. Deer were periodically monitored for mortality and distribution. During April and May 2012, collars were remotely released, recovered and data downloaded for analysis.

Preliminary data analyses

We removed all obvious erroneous locations and all locations with a PDOP value <x. Location data from individual bucks were loaded into ArcGIS 9.3 for visual assessment and analysis. Deer were classified as migrants if spring and summer ranges did not overlap. Seasonal ranges (spring, summer, rut and winter ranges) were identified through visual assessment of movement patterns and areas of seasonal concentration. If localization on or between a seasonal range was not evident, spring, summer and winter ranges were assumed to cover March 1-May 31, June 30-September 30 and December 1-February 29, respectively. The rut was assumed to cover November 1-30 for all deer.

For migratory bucks, spring and fall migration initiation was assumed to have occurred when a seasonal range was vacated for the final time. Migration was deemed over when the next seasonal range was reached the first time. Vacation and arrival times were determined and summarized and migration duration was calculated as the number of days spent between seasonal ranges (i.e., spring: spring to summer; fall: summer to winter). We estimated 90% fixed kernels (Worton 1989; Seaman & Powell 1996) around all seasonal ranges using the Home Range Tools extension in ArcGIS. Bandwidths, or smoothing factors, were varied and iteratively applied until visual assessment of estimated kernels revealed a reasonable fit to the data. In the majority of cases, a constant proportion of 60-80% of the reference bandwidth was used as this generally appeared to fit the data best, as reported by others (e.g., Bertrand et al. 1996; Kie & Boroski 1996; Kie et al. 2002). Given the variable multimodal (i.e., non-normal) nature of deer use on the landscape within seasonal ranges, the reference bandwidth tended to be too broad for accurate characterization of seasonal use areas, as suggested by Seaman & Powell (1996). Migration distances between spring and summer range, summer and rutting range (if a separate rutting range was used) and summer/rutting and winter range were calculated by estimating horizontal distance between centroids of seasonal ranges.

5. RESULTS

Data quality was high; fix success was 91.4% and approximately 85% of locations were 3D fixes. In total 47,133 locations were obtained from the nine bucks over the course of the year. Observed (naive) annual survival for bucks was 66.7%. Three mortalities were recorded and all were human-caused. One was harvested by a resident hunter in October 2011 during the lawful buck season and two others were considered unregulated harvests outside the regular season during early summer 2011 and February 2012.

Seven of nine collared bucks (78%) migrated to distant summer ranges entirely separate from winter/spring ranges. Two bucks were considered non-migratory due to overlap of seasonal ranges. Migrations were generally characterized as relatively straight in a westerly direction along the south aspect slopes on the north side of Carpenter Lake with use of interspersed transitional ranges along the way (Figure 2). In many cases, the same transitional ranges were used during spring and fall migrations and where deer were monitored for 2 spring migrations (n=2), the same transitional ranges were used in 2011 and 2012. Spring and winter ranges were generally located in central and eastern portions of the study area north of Carpenter Lake while summer ranges were located in western portions of the study area west, north and south of Carpenter Lake (Figure 3). Summer and winter ranges were approximately 800m and 500m, respectively, in elevation higher than spring ranges (Figure 4). Rutting ranges for migratory bucks either overlapped winter ranges or were in areas nearby. All bucks were back in the vicinity of Carpenter Lake for the rut.

The median date for initiation of spring migration was May 6, 2011 (range April 23 – May 20). This might be biased slightly late as two migratory bucks were captured during their migration. On average, spring migrations lasted for 28.5 ±12.3 days ($\bar{x}$ ±SE; range 4-62 days) and the median date of arrival on summer ranges was June 4, 2011 (range May11 – June 28). On average, migratory bucks moved 29.5 ±3.6 km ($\bar{x}$ ±SE; range 16.4 - 39.5km) from spring ranges to summer ranges. The median date bucks left their summer ranges was October 21, 2011 (range October 6 – November 1). Two different strategies were observed during the fall migration; 4 bucks migrated to their winter range and rutted in the general area, while 2 bucks migrated to distinct rutting ranges before moving to their winter range. Overall, fall migration distance to either rutting range or winter range was 29.4 ±3.5 km ($\bar{x}$ ±SE; range 17.9 - 39.7 km). The median date of arrival on winter range was November 22, 2011 (range October 29 – December 13). Duration of fall migration averaged 23 ±5.4 days ($\bar{x}$ ±SE; range 9 – 43 days).

Sizes of seasonal ranges were variable across seasons and within seasons across individual deer. Spring, summer, rut and winter ranges averaged 2.71 ±0.77 ($\bar{x}$ ±SE; range 0.54 – 6.59 km^2), 4.32 ±1.17 ($\bar{x}$ ±SE; range 0.58 – 9.38 km^2), 14.23 ±5.04 km^2 ($\bar{x}$ ±SE; range 4.04 – 38.31 km^2) and 2.59 ±0.55 km^2 ($\bar{x}$ ±SE; range 1.05 – 5.28 km^2), respectively. Where deer were monitored for more than a year, 100% fidelity to spring (n=4) and summer ranges (n=2) was observed.

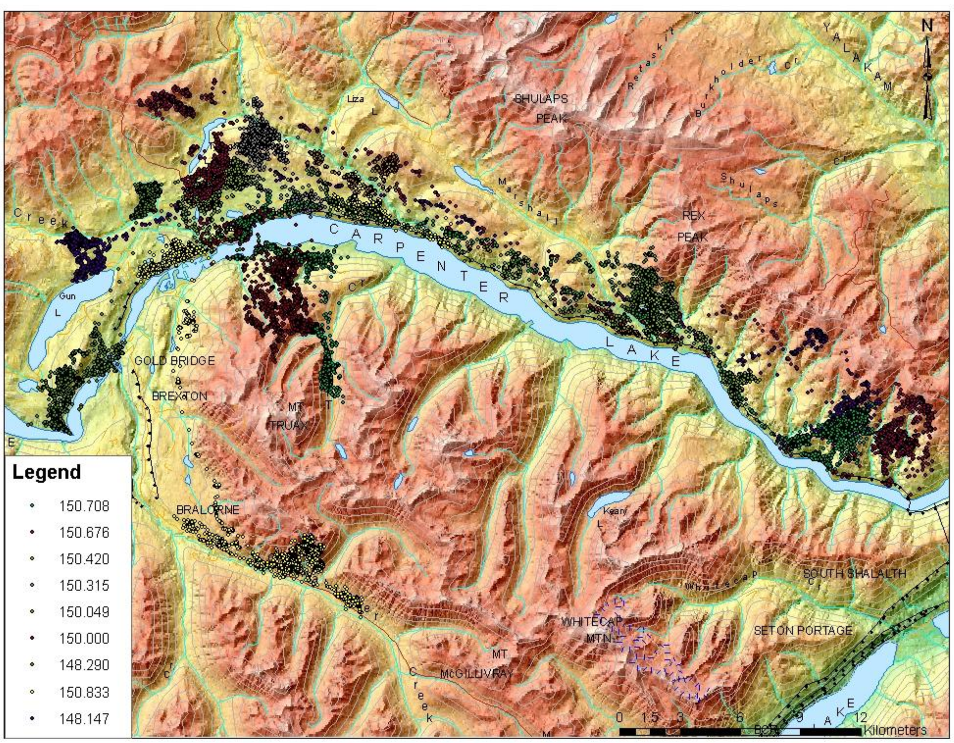

FIGURE 2. Movements from 9 radio-collared mule deer bucks, April 2011 – April 2012, near Carpenter Lake, BC

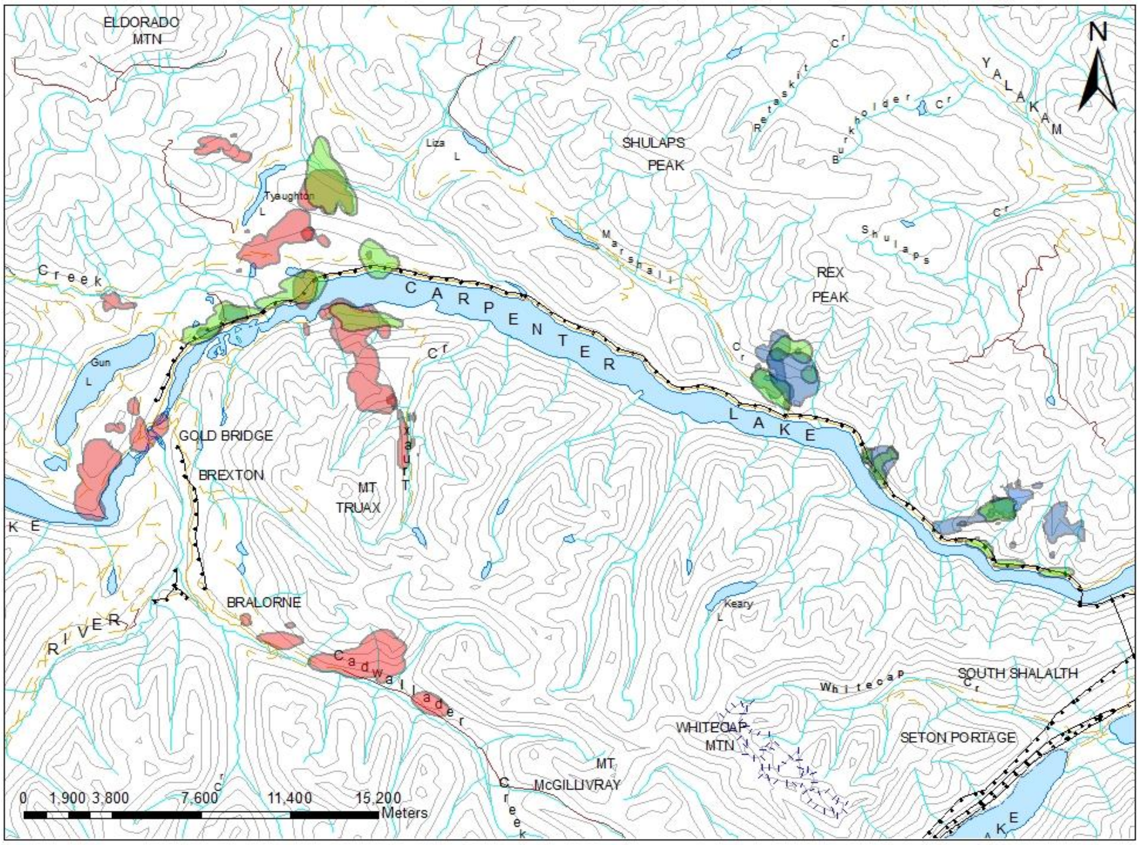

FIGURE 3. Seasonal ranges for 9 radio-collared mule deer bucks near Carpenter Lake, BC, in Management Unit 3-32, April 2011 – April 2012. Green, red and blue shading denotes spring, summer and winter ranges, respectively.

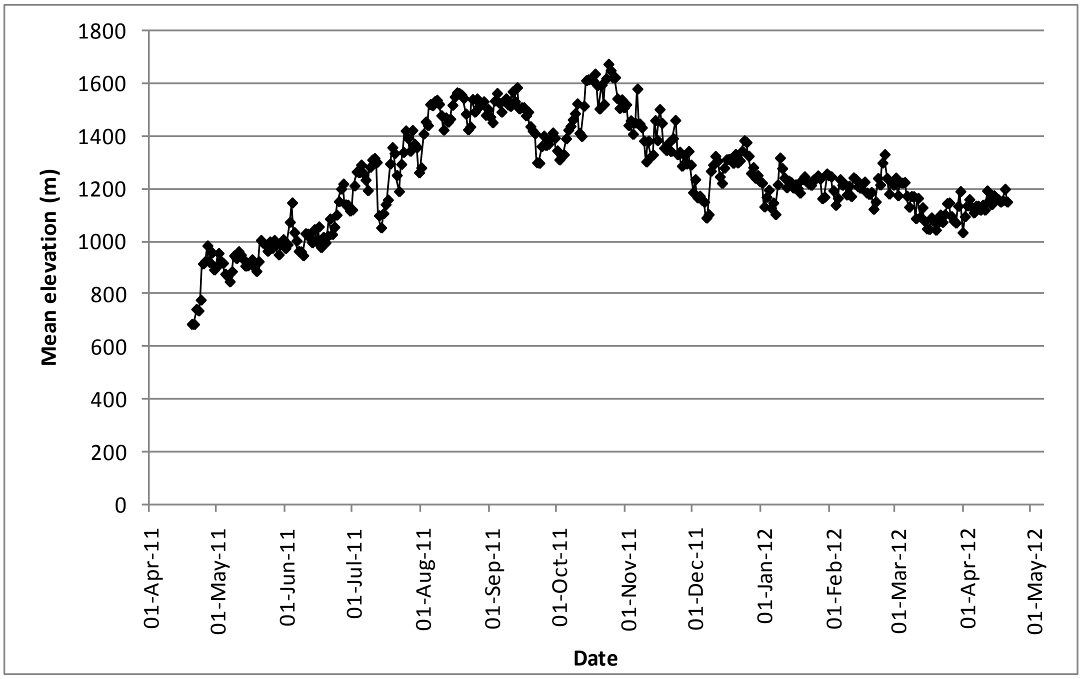

FIGURE 4. Mean daily elevation for 9 radio-collared mule deer bucks near Carpenter Lake, BC, April 2011-April 2012. Residents pooled with migrants due to small sample size and similar use of elevation.

6. DISCUSSION

Data presented here are preliminary in nature and further analyses concerning seasonal habitat use and selection will be completed following the second sampling session (i.e., April 2013-April 2014). Due to potential environment-related variation in migration timing and seasonal range and habitat use, a second round of sampling is currently underway and may change inferences and conclusions drawn to date. Thus, discussion of most data reported here is reserved for a later date.

Unexpected patterns of migrations were observed. None of the collared deer crossed the reservoir in eastern portions of the study area to summer in mountainous areas immediately south and none of the collared deer from eastern areas summered in the Shulaps Range immediately north, which is odd given the abundance of apparently suitable summer habitat in both areas, the adjacency of these areas to wintering areas and the apparent ease in which deer could access these habitats. Rather, all collared deer migrated west up the lake and those that migrated south of the reservoir crossed near the head of the reservoir. At a broad level, these bucks showed very similar migration patterns to several female mule deer collared in the same study area in 2009 (Procter, unpub. data).

7. RECOMMENDATIONS

The primary recommendation resulting from this project is to capture and radio-collar a second sample of bucks within the study area to assess annual variation in migration timing and routes, seasonal range use and habitat use and selection.

8. ACKNOWLEDGEMENTS

We'd like to thank the Fish & Wildlife Compensation Program for providing financial support to initiate and continue this project. Thanks to Doug Jury, Bob Butcher, Gilbert Redan, Gerry Kuzyk, Kevin VanDamme, Mike Burwash, Tim Cody and Matt Manual for assisting with capturing, collaring and monitoring bucks. Thanks to Kevin Jackson and Katie Jerez of CC Helicopters for providing safe helicopter services.

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10. APPENDIX 1. Financial Statement

	BUDGET		*ACTUAL*	
	FWCP	**Other**	**FWCP**	**Other**
INCOME				
Total Income by Source	31,620.00	28,700.00	31,620.00	44,500.00
Grand Total Income **(FWCP + other)**	***60,320.00***		***76,120.00***	
EXPENSES	**Note: Expenses must be entered as negative numbers (e.g. – 1000, etc.) in order for the formulas to calculate correctly.**			
Project Personnel				
St'at'imc Technician	2,100.00		2,100.00	
Contract Biologist	1,920.00		0.00	
MOE Biologists		15,000.00	0.00	15,000.00
St'at'imc NRO		1,000.00	0.00	1,000.00
Materials & Equipment				
Equipment Rental/In-kind	8,800.00	1,500.00	8,107.20	0.00
Materials Purchased	13,800.00	9,200.00	0.00	25,000.00
Equipment maintenance	5,000.00	0.00	1,702.70	0.00
MFLNRO Travel	0.00	2000.00	0.00	2000.00
Administration				
Office Supplies				
Photocopies & printing				
Postage/customs fees				
Computer costs				
Communications				
Admin Fee				
Total Expenses	**31,620.00**	***28,700.00***	***11,909.90***	***43,000.00***

Grand Total Expenses **(FWCP + other)**	***60,320.00***	***54,909.90***
BALANCE **(Grand Total Income –** **Grand Total Expenses)**	***The budget balance should equal $0***	*The actual balance might not equal $0** ***21,210.10***

11. Appendix II. Performance Measures

Performance Measures

Performance Measures – Target Outcomes												
Project Type	**Primary habitat benefit targeted of project (sq.m.)**	**Primary Target Species**	Estuarine	In-stream Habitat Mainstream	In-stream Habitat – Tributary	Riparian	Reservoir Shoreline Complexes	Riverine	Lowland Deciduous	Lowland Coniferous	Upland	Wetland
Impact Mitigation												
Fish passage technologies												
Drawdown zone revegetation/stabilization												
Wildlife migration improvement	Provision of baseline data on location and characteristics of corridors	Mule deer				x	x	x	x	x	x	
Prevention of drowning of nests, nestlings												
Habitat Conservation												
Habitat conserved – general												
Habitat conserved – general												
Designated rare/special habitat (subset)	Identification of migration corridors and important seasonal ranges (i.e., spring & winter ranges)	Mule deer				x	x		x	x	x	
Maintain or Restore Habitat forming process												
Artificial gravel recruitment												
Artificial wood debris recruitment												
Small-scale complexing in existing habitats												
Prescribed burns or other upland habitat enhancement for wildlife												
Habitat Development												
New habitat created												