OLDMAN RESERVOIR MULE DEER STUDIES

Capture and Radio-Collaring

Winter 1993-94

Prepared for

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EXECUTIVE SUMMARY

Mule deer were captured with Clover traps during a 4-week period in late January and early February 1994. This research is part of an on-going program designed to monitor the response of mule deer to the newly constructed Oldman Dam and Reservoir.

One hundred and eleven (111) trap-nights were conducted using nine Clover traps among 11 sites. The trapping effort yielded 21 captures of 21 different individuals; no mule deer were recaptured. Capture success averaged 5 trap-nights per capture. One trap-related mortality occurred; a male fawn died in the trap overnight, apparently from a broken neck. This fawn was captured with an adult female.

The majority of deer captured were fawns; fawns of both sexes comprised 52% of the deer captured (8 male fawns and 3 female fawns). Seven adult females comprised 33% of captures. One yearling male and two young adult males were captured. Ear tags were attached to all deer and adults were fitted with radio-collars; expandable collars were fitted to males.

There was a 2 kg difference in mean body weight between female and male fawns; 37.6 kg vs 40.3 kg, respectively. Fawns of both sexes were heavier than recorded during winter 1991-92. No yearling females were captured during the current program. The yearling male weighed 46.7 kg, which compares to an average male yearling weight obtained in 1992 of 59 kg. The weight loss indicates the debilitating effects of its leg injury. Adult female mule deer averaged 63.3 kg, which was on average 2.3 kg less than recorded for adult females during winter 1991-92. The two adult males (both carrying antlers) weighed 67.6 kg and 74.4 kg.

In terms of general health, 80% the mule deer were judged to be in good and medium body condition based on the presence of subcutaneous fat. As discussed, the injured yearling male was in poor condition, its reserve of body fat was depleted. Only a single winter tick was found on one deer. The body condition profile appears similar to 1992, which indicated that most of the deer were in good and medium body condition during late winter 1991-92. The overall lack of winter ticks on deer during mid-winter 1994 is in contrast to late winter 1991-92 when 15 of the trapped deer carried an average of 3 ticks each.

Blood samples from captured deer were submitted to Alberta Fish and Wildlife, Forensic Unit, Edmonton for hybrid testing. All deer showed mule deer banding only.

ACKNOWLEDGMENTS

The report contains results of a combined effort between Axys Environmental Consulting Ltd. (formerly the Delta Environmental Management Group Ltd.) and Alberta Environmental Protection, Development and Operations Division, Water Management Headworks Branch. Mr. John Mahoney, project biologist, Water Management Headworks Branch coordinated the study with the Axys Group. John Mahoney also reviewed the draft and improved the report.

We would like to acknowledge employees of the Water Management Headworks Branch who assisted with baiting and setting traps and also with handling of the captured deer.

Jimmie Potts	Robert Plante
Scott Gerber	Piet Oosterlee

Students from the University of Lethbridge were also invited to assist with the project and their help was greatly appreciated.

We would like to thank Peter Balagus of the Axys Group who assisted with the first week of deer trapping. Mr. Tom Packer, Forensic Scientist, Alberta Environmental Protection, Fish and Wildlife Services, Edmonton, conducted hybrid testing on blood samples.

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1.0 INTRODUCTION

This progress report is part of a long-term monitoring program of the Oldman Reservoir mule deer population. A monitoring program was initiated in order to assess the effects of the operation of the Oldman Dam and Reservoir with respect to various aspects of the mule deer's life history.

Axys Environmental Consulting Ltd. (formerly the Delta Environmental Management Group Ltd.) was retained by Alberta Environmental Protection, Development and Operations Division, Water Management Headworks Branch to assist with a mid-winter trapping and radio-collaring program. The Axys Group assisted during the first week of trapping, providing techniques, guidance and advice, thereafter the project biologist conducted the program. The objectives for the Axys Group's limited involvement was to provide technical help to the project biologist. The results were subsequently returned to the Axys Group for the preparation of this report. Where appropriate, results of the previous trapping effort during late winter 1991-92 are presented for comparison.

1.1 BACKGROUND

Mule deer are the most highly visible and economically important wildlife in the Oldman Reservoir basin. Early studies indicated that the reservoir basin supported about 200 mule deer during summer (Young *et al.* 1986). Recent information suggests that 740 to 930 mule deer currently inhabit in the Reservoir basin (Hornbeck 1994).

Various predictions have been made regarding the effects of the Oldman Reservoir on the local mule deer population. These predictions have ranged from severe population decline to changes in movement and habitat utilization patterns, particularly during winter when lack of habitat in the reservoir basin may cause deer to move to adjacent farmland. There is also the possibility of increased numbers of road kills on the paved grid road surrounding the reservoir.

Effects of the Oldman Reservoir are being studied with respect to:

- Seasonal habitat utilization and local movement patterns of mule deer with particular reference to the maturation of habitat mitigation projects;
- Regional movement patterns and seasonal distribution of mule deer with respect to winter severity;
- Fawning habitat and site fidelity with particular concern for use of reservoir perimeter and islands;
- Accidental drowning, and increased occurrences of road kills.

1.2 OBJECTIVES

The objective for the current trapping effort was to attach radio-collars to adult mule deer, however, all captured deer were measured and given ear tags. Subsequent relocation and ecological study (social behavior, movements and habitat utilization) of instrumented deer is being conducted by the project biologist as financial resources allow.

2.0 STUDY AREA

The Oldman River and its main tributaries, the Castle River and the Crowsnest River, are located in the fescue grassland ecoregion of southwestern Alberta, approximately 8 km northwest of Pincher Creek (Figure 1). Sections of these three rivers formed the basin of the Oldman Reservoir. The reservoir was completed in 1991 and initially filled during spring of that year, following a 5-year construction schedule. The reservoir volume is 400,000 acre-feet with a surface area of approximately 1,842 ha at full supply level (1118.6 m asl). The shoreline length at full supply is approximately 104 km. The purpose of the reservoir is to regulate downstream flow by storing water for use during dry periods. The reservoir will permit 170,000 acres of dry land to be irrigated for agricultural purposes (Alberta Public Works, Supply and Services, Oldman River Dam Project Fact Sheet).

2.1 PHYSIOGRAPHY AND VEGETATION

The Oldman Reservoir is in an area of the province where fescue grassland is adjacent to the Montane ecoregion (Strong and Leggat 1981). Because of its increased elevation and proximity to the Rocky Mountains, the Oldman River area experiences cooler summers and warmer winters compared to the typical weather patterns of the prairies in Alberta. The mean annual precipitation is 520 mm. The mean summer temperature (May to September) is 12.5°C. The mean winter temperature (December to February) is -8.0°C.

Land surrounding the reservoir is largely cultivated farmland with little or no tree cover. Undisturbed areas of prairie and slopes of the river valleys are dominated by rough fescue (*Festuca scabrella*) and parry oat grass (*Panthonia parryi*) with western wheat grass (*Agropyron smithii*)-june grass (*Koeleria gracilis*) associations. Shrub communities within the coulee formations are composed primarily of saskatoon (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), wolf willow (*Elaeagnus commutata*), skunk brush (*Rhus trilobata*) and creeping juniper (*Juniperus horizontalis*).

Prior to clearing of the reservoir basin, the river bottoms were dominated by cottonwood (*Populus spp.*) stands. Poplar trees from the bottomlands and including the Douglas fir (*Pseudotsuga menziesii*) trees that were growing on steep, north-facing slopes of the river valleys have been removed from the river basin up to the full supply level. A detailed description of the vegetation at the Oldman River Dam site is provided by Reid *et al.* (1985).

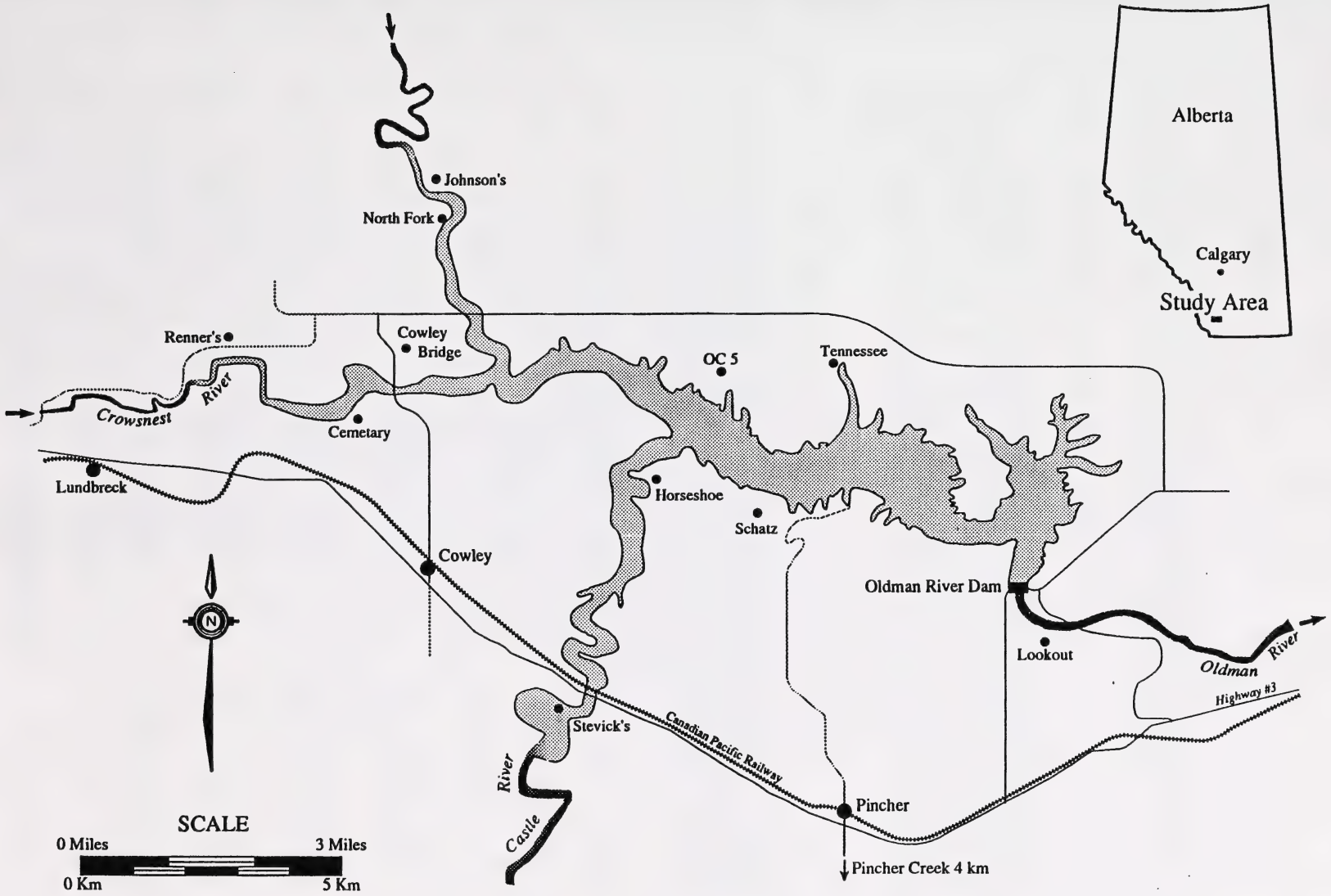

Figure 1. Oldman Reservoir at full supply level, showing the location of mule deer trap sites used during January and February, 1994.

3.0 METHODS

Mule deer were captured using modified Clover traps (Clover 1956 reported in Giles 1971). Nine traps were operated in various locations around the reservoir during a 4-week period from 25 January to 16 February 1994 (see Figure 1 for trap locations).

3.1 MODIFIED CLOVER TRAP DESIGN

Traps were initially built by the Environmental Sciences program at Lethbridge Community College. The traps were later re-fitted by replacing the original frost fence with nylon netting (Figure 2). The dimensions of the trap were approximately 85 cm wide, 120 cm tall, and 180 cm long. The frame was made of 2.5 cm (1") galvanized pipe. The door opening was 100 cm (± 10 cm) high. Two designs were used; single door and double door closures. Nylon cord was used to attach the drop gate(s) to the release mechanism. A nylon monofilament trip line was placed about 20 cm above the ground across the width of the trap.

3.2 TRAP LOCATIONS

Traps were located in sheltered areas accessible by vehicle. A number of potential trap sites were pre-baited with a bale of second cut alfalfa for several weeks. Promolas™ was added as a top dressing on the hay to serve as an additional attractant for the deer. Bait piles that were regularly visited by deer were chosen for trap placement. Over the course of trapping effort, nine traps were used among 11 sites (Table 1, also Figure 1).

Table 1. Location of traps used for capturing mule deer around the Oldman Reservoir during late January and early February 1994.

No.	Trap Site	Location of Trap (UTM Grid Coord. Map Sheet)	Local Area of Reservoir
1.	Lookout	908 932 82H/12	South of Dam Buildings
2.	Schatz	844 955 82H/12	South side Main Stem
3.	Horseshoe	167 962 82G/9	Castle-Main Confluence
4.	Stevick's	148 917 82G/9	Castle near Highway #3
5.	Cemetery	099 972 82G/9	South of Crowsnest R.
6.	Cowley Bridge	110 985 82G/9	North of Crowsnest R.
7.	Renner's	079 986 82G/9	North side Crowsnest R.
8.	North Fork	122 013 82G/9	West side of North Stem
9.	OCO 5	845 984 82G/9	North side Main Stem
10.	Tennessee	865 990 82H/12	North side of Main Stem
11.	Johnson's	118 027 82G/9	East side of North Stem

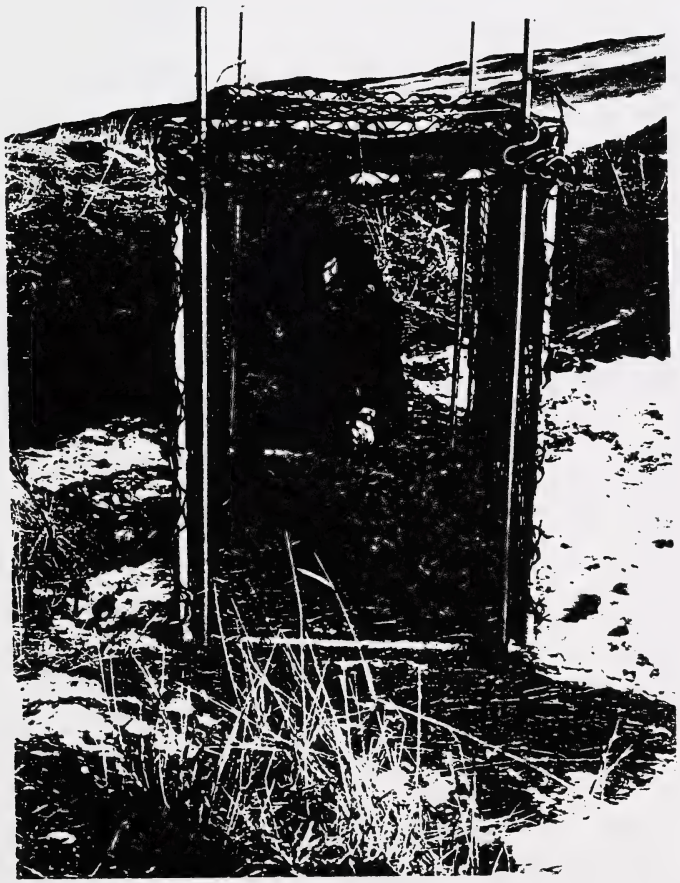

Figure 2. Modified Clover trap design used to capture mule deer at the Oldman Reservoir during January and February 1994. Both single door and double door designs were used.

3.3 HANDLING PROCEDURE

Traps were set in the late afternoon and early evening, and checked each morning. The trapline was conducted in a circuit and traps were approached from concealment to determine the sex and age of captured deer before assembling the capture equipment. The procedure was to rush the trap containing a deer and physically subdue the animal as quickly as possible. Traps were entered by two people, the lead person carried a "kick board." Deer were held to the ground in the trap, blindfolded, and then three legs were tied with 1/4" nylon rope.

Once tied, deer were carried out of the trap and placed onto a canvas tarp. The tarp was used for slinging the deer beneath a dial scale (Ballard Scale, Calgary, Alberta - graduated in lb. increments) attached at the center of a beam. A series of body measurements were recorded and photos of the incisor bar were taken. Live weights were recorded in lbs and then converted to kg (both units of measure are presented in the report). Student's *t* tests were conducted with the original measurements recorded in lbs. The tooth row of most deer older than fawns was inspected for irruption of the third molar (indicating adult age class), and was inspected for tooth wear as an indication of approximate age. The jaw was held open by a wooden dowel inserted on the tooth row; the mouth was then rinsed with water to remove saliva. A flashlight was necessary to view the tooth row. Each deer received a numbered dangle tag in the right ear (black letters on white tag). Long-life (48 months), mortality sensitive, radio collars manufactured by Lotek (Aurora, Ontario) were fitted to all adult deer.

A few drops of blood from each deer were collected on a paper towel in order to test for hybridization that might be occurring between mule deer and white-tailed deer. Hybridization studies of captive deer have been ongoing for some ten years by the Alberta Fish and Wildlife Division (B. McClymont, Forensic scientist, Alberta Environmental Protection, Fish and Wildlife Service, pers. comm.). Blood samples were submitted to Alberta Fish and Wildlife Services, Forensic Unit, Edmonton for analysis.

4.0 RESULTS AND DISCUSSION

4.1 TRAPPING EFFORT AND SUCCESS

One hundred and eleven (111) trap-nights were conducted during four weekly trapping periods from 25 January to 16 February 1994. A trap-night is the number of traps multiplied by the number of nights that they were operated. The trapping effort yielded 21 mule deer captures of 21 different individuals (Figure 3) (Appendix Table 1). Unlike the previous trapping season (Hornbeck and Balagus 1992), there were no recaptures of deer. Female #39, initially captured as a fawn on 6 March 1992, was recaptured as an adult. In 1992, #39 was trapped at Renner's, recaptured during 1994 at Cowley Bridge. One mortality occurred to a male fawn that was captured with an adult female at Horseshoe trap. External examination indicated that the fawn had broken its neck in the trap.

The number of trap-nights, summarized on a weekly basis, varied during the 4-weekly trapping periods, but generally provided between 20 and 30 trap-nights per week. The number of mule deer captured, by weekly trapping period, varied from 4 to 7 deer. The number of trap-nights and the number of captures varied independently.

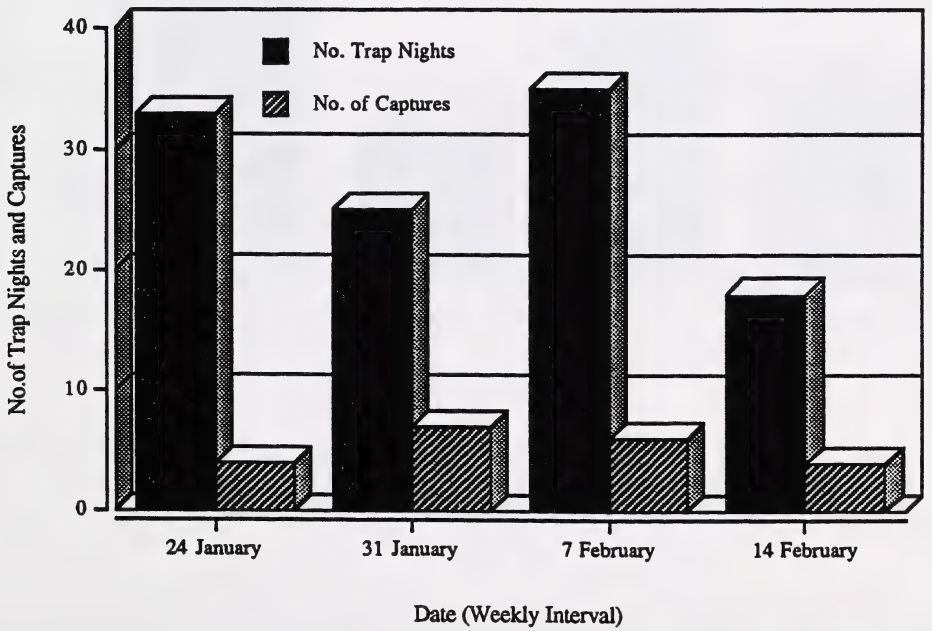

Figure 3. Trapping effort (trap night [n = 111] = number of nights x number of traps set) and number of mule deer (*Odocoileus hemionus*) captured during a 4-week period of trapping effort at the Oldman Reservoir during January and February 1994.

In terms of trap efficiency (no. of trap-nights/capture), mule deer were readily caught in the modified Clover traps, and both single door and double door closures seemed equally effective. Trapping success averaged about 5 trap-nights for each capture, ranging from 3.6 to 8.2 trap-nights/capture by weekly period (Figure 4). The highest trapping efficiency occurred during the last week of January. Most captures were of single deer, however, we had two captures with 2 deer in a trap. Both double captures occurred at Horseshoe trap; a doe and a male fawn, and two fawns (male and female).

Two deer were captured and then subsequently escaped before we could handle them. Although coyotes are common in the project area, to our knowledge these animals were not cueing on the trap sites. We recorded one instance of coyotes harassing trapped deer during the 1991-92 trapping season (Hornbeck and Balagus 1992).

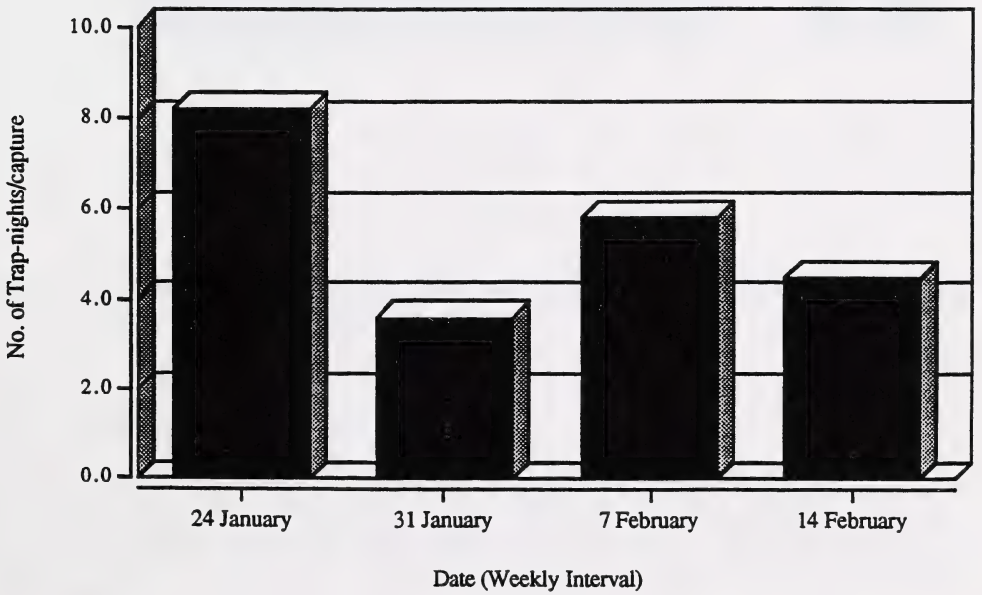

Figure 4. Number of trap nights (trap night [n = 111] = number of nights x number of traps set) per capture of mule deer (*Odocoileus hemionus*) during a 4-week period of trapping effort at the Oldman Reservoir during January and February 1994.

Some sites were better for catching deer than others. Trapping success (no. of deer captured) was greatest at Horseshoe, with six deer caught (1 doe and 5 fawns) (Figure 5). It is likely that these traps occurred near winter home range centers for relatively large groups of deer. Relocation data suggests that mule deer are sedentary and localized in their use of range.

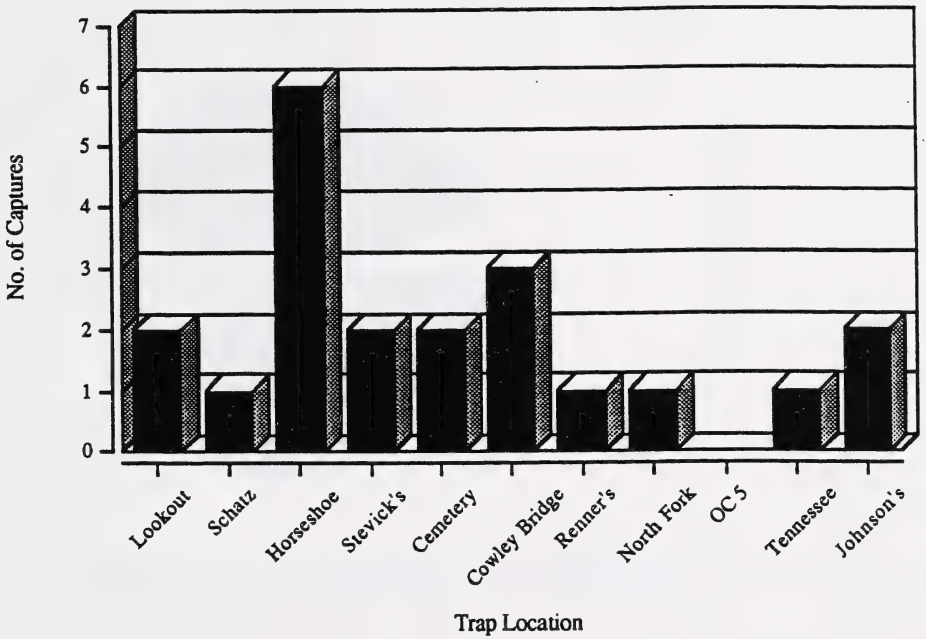

Figure 5. Number of mule deer captured by trap location at the Oldman Reservoir during January and February 1994.

4.2 AGE-SEX COMPOSITION

The majority of captured deer were fawns, (52% of captures) (Figure 6). Within the fawn class, most of the fawns were males; 73% males (n = 8) and 27% females (n = 3). Two young adult males were captured, as well as a yearling male. Seven adult females were captured (33% of captures). No yearling females were caught in the traps during the current season.

The number of fawns and adult females captured during the current season occurred in about the same proportion compared to winter 1991-92; 52% vs 56% fawns, and 33% vs 32% adult females, respectively. The proportion of male and female fawns, however, was different between the two trapping periods; more females than males were trapped during 1992 compared to 1994. Unlike 1992, two young adult males were trapped in 1994. Four yearling females were captured in 1992, but no deer in this age class were trapped in 1994. During both years, few yearling males were captured.

4.3 BODY CONDITION AND GENERAL HEALTH

In terms of body condition and general health, most of the mule deer, with the exception of the injured yearling male, were in good health, having palpable reserves of subcutaneous fat on the ribs and pelvic girdle.

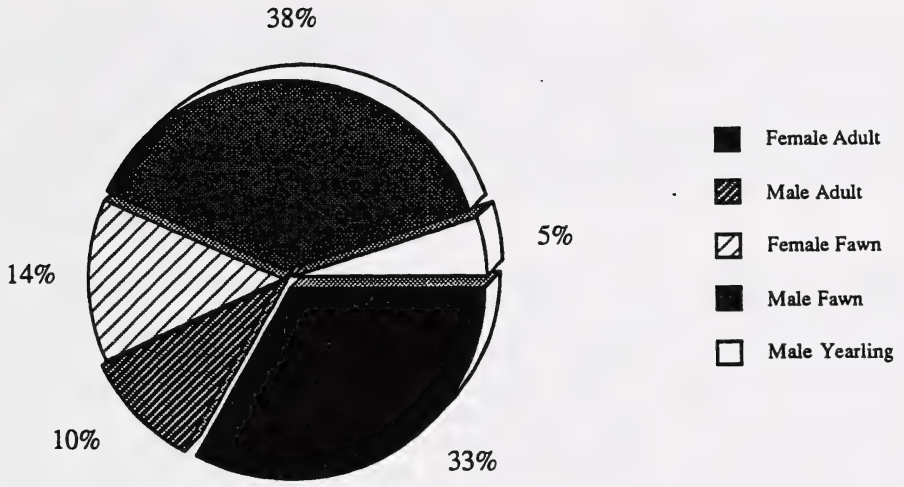

Figure 6. Age and sex composition of mule deer (*Odocoileus hemionus*) captured at the Oldman Reservoir during January and February 1994.

Compared to the 1991-92 trapping season, the general appearance and health of the Oldman mule deer remains about the same, but may have declined slightly (Table 2). The differences between the two years may be attributed to the small sample size in 1994 and the fact that different biologists were making the subjective assessments. During both trapping seasons, the prevalence of winter tick (*Dermacentor albipictus*) were noted. Ticks were only seen on the anal region of deer, and the incidence was greater in 1992 than 1994. In February - March 1992, 60% of the deer were carrying engorged ticks, averaging 3 ticks per deer. In the current year, only 1 deer (< 5%) had a single tick. It is not known if these differences between years can be attributed to population levels of the tick or the timing of its life cycle. The overall impression is that winter ticks are not present in large numbers and are not in any way debilitating the deer.

Table 2. Percent of mule deer in various classes of body condition compared between two trapping seasons. Condition classes in descending order were Good, Medium, Fair and Poor. (Number in brackets is number of deer examined.)

February - March 1992				January - February 1994			
Good[1]	Medium	Fair	Poor	Good	Medium	Fair	Poor
86% *(43)*	6% *(3)*	4% *(2)*	4% *(2)*	65% *(13)*	15% *(3)*	15% *(3)*	5% *(1)*

[1] *Condition class was based on the subjective assessment of the amount of body fat reserves.*

There were small differences between mean body weight of male and female fawns (Figure 7). Male fawns were slightly heavier than female fawns at 40.3 kg ± 1.6 SE (n = 8) vs 37.6 kg ± 0.5 SE (n = 3), respectively. Adult female mule deer averaged 63.3 kg ± 1.3 SE (n = 7). The two young adult males weighed 67.6 kg and 74.4 kg each, and they were assessed to be in fair and good body condition. Additional body measurements that have been recorded from each captured deer included: chest girth, head length, neck circumference, tarsal length, tarsal gland length, shoulder height and chest height. These measurements are provided in Appendix Table 2.

For comparison, winter 1991-92 body weights are summarized with the current year's data (Table 3). The mean weight of male fawns was not significantly different between years ($P > 0.05$; Student's $t = -1.451$ with equal population variances). Female fawns, however, were heavier in 1994 ($P < 0.05$; Student's $t = 2.975$ with unequal population variances). It should be noted that sample sizes are very small. In contrast to the apparent weight gain in the female fawn age class between 1991-92 and 1993-94, the adult female age class was on average somewhat lighter in 1994 compared to 1992. This difference, however, is not significant ($P > 0.05$, Student's $t = 0.994$ with equal population variances).

Figure 7. Body weight of fawn and adult age classes of mule deer (*Odocoileus hemionus*) captured at the Oldman Reservoir during late January and early February 1994.

Table 3. Live body weight of mule deer (mean ± SE) compared between winter 1991-92 and winter 1993-94 at the Oldman Reservoir. Italicized numbers in brackets are number of deer weighed.

Date	Female (kg)			Male (kg)		
	Fawn (9 mo.)	Yearling (21 mo.)	Adult (≥ 32 mo.)	Fawn (9 mo.)	Yearling (21 mo.)	Adult (≥ 32 mo.)
Feb-Mar'92	34.7±0.8 *(16)*	40.1±1.4 *(4)*	65.6±1.4 *(16)*	37.4±1.2 *(12)*	59.0 *(2)*	N/d[1]
Jan-Feb'94	37.6±0.5 *(3)*	N/d	63.3±1.3 *(7)*	40.3±1.6 *(8)*	46.7[2]	70.9 *(2)*

[1] *N/d = no data*

[2] *The single yearling male that was captured during January 1994 was injured and its physical condition was very poor, hence low body weight.*

4.5 HYBRIDIZATION WITH WHITE-TAILED DEER

Nineteen (19) blood samples were submitted for hybrid testing. All samples showed mule deer banding only. By comparison, 35 blood samples were submitted for testing during the winter 1991-92 capture program and three hybrid deer were identified.

5.0 SUMMARY

Mule deer were captured with Clover traps during a 4-week period in late January and early February 1994. One hundred and eleven (111) trap-nights were conducted, resulting in the capture of 21 mule deer. The majority of captured deer (52%) were fawns. Most of the fawns captured were male (73%). One yearling male was captured, but no yearling females were captured. Five adult females and two young adult males were captured and fitted with radio collars. There was one trap-related mortality, a male fawn.

Most of the mule deer, with the exception of the injured yearling male, were in good or medium body condition. This body condition profile was similar to the one obtained during the late winter 1991-92 trapping season. However, the incidence of winter tick was much higher on deer during late winter 1991-92 compared to the current year mid-winter trapping season.

There was a 2 kg difference in mean body weight between male and female fawns, males were heavier. This difference in fawn weight between sexes was also noted during 1991-92. Overall, the 1993-94 fawn weights of both sexes were somewhat heavier compared to 1991-92. On average, adult females weighed 4 kg less during 1994 compared to 1992. No yearling females were captured during the current study. Two young adult males captured during this study weighed 68 and 74 kg.

No hybrids were identified among 19 blood samples tested.

6.0 LITERATURE CITED

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7.0 APPENDIX TABLES

Appendix Table 1. List of captured mule deer (Odocoileus hemionus) at the Oldman Reservoir, January and February 1994.

Capture No.	Capture Date	Trap Site	Sex	Age Class	General Body Condition	No. of Ticks on Body	Ear tag i.d.	Radio collar freq. (MHz)
1.1	26-Jan-94	Lookout	Female	Young Adult	Good	0	51	150.205
2.1	26-Jan-94	Tennessee	Male	Fawn	Good	0	52	----
3.1	27-Jan-94	Renner's	Male	Yearling	Poor	0	53	----
4.1	27-Jan-94	Lookout	Female	Young Adult	Medium	0	54	150.555
5.1	1-Feb-94	Cowley Bdg	Female	Young Adult	Good	0	39	150.263
6.1	2-Feb-94	Horseshoe	Female	Adult	Good	0	55	150.303
7.1	2-Feb-94	Horseshoe	Male	Fawn	----	----	----	----
8.1	2-Feb-94	Stevick's	Female	Fawn	Good	0	56	----
9.1	2-Feb-94	Cowley Bdg	Male	Young Adult	Good	0	57	150.023
10.1	4-Feb-94	Stevick's	Female	Prime adult	Good	0	59	150.295
11.1	4-Feb-94	Cemetery	Female	Prime Adult	Fair	0	60	150.314
12.1	8-Feb-94	Cowley Bdg	Male	Fawn	Good	0	58	----
13.1	8-Feb-94	Schatz	Female	Fawn	Good	0	61	----
14.1	9-Feb-94	Johnson's	Female	Young Adult	Good	0	62	150.194
15.1	10-Feb-94	Horseshoe	Male	Fawn	Good	0	63	----
16.1	11-Feb-94	North Fork	Male	Fawn	Fair	0	64	----
17.1	11-Feb-94	Cemetery	Male	Young Adult	Fair	0	65	150.005
18.1	15-Feb-94	Horseshoe	Male	Fawn	Medium	0	66	----
19.1	16-Feb-94	Johnson's	Male	Fawn	Good	0	67	----
20.1	16-Feb-94	Horseshoe	Male	Fawn	Good	0	68	----
21.1	16-Feb-94	Horseshoe	Female	Fawn	Medium	1	69	----

Age class was assigned based on tooth replacement and wear.
General body condition was assessed on the basis of subcutaneous fat reserves on ribs and pelvic girdle.
Ticks are presumed to be the winter tick, Dermacentor albipictus.

Appendix Table 2. Physical measurements of mule deer captured at the Oldman Reservoir, January and February 1994. Measurements are metric (cm) unless otherwise noted. Age was estimated by tooth replacement and wear.

Ear tag No.	Sex	Age Class	Chest Girth	Weight (kg)	Weight (lbs.)	Head Length	Neck Circum.	Tarsal Length	Tarsal Gland Length	Shoulder Height	Chest Height
56	Female	Fawn	80.00	36.74	81.00	24.50	30.00	39.00	13.50	80.00	49.00
61	Female	Fawn	81.00	37.65	83.00	26.00	32.00	39.00	12.00	81.00	52.00
69	Female	Fawn	85.00	38.56	85.00	25.50	32.00	40.50	12.00	83.00	49.00
Female Fawns		Mean	82.00	37.65	83.00	25.33	31.33	39.50	12.50	81.33	50.00
		Stdev	2.65	0.91	2.00	0.76	1.15	0.87	0.87	1.53	1.73
		SE	1.53	0.52	1.15	0.44	0.67	0.50	0.50	0.88	1.00
52	Male	Fawn	80.00	38.10	84.00	23.50	31.00	38.50	11.00	77.00	43.00
----	Male	Fawn		34.93	77.00	25.00	38.00	40.00	12.00	80.00	49.00
58	Male	Fawn	84.00	38.56	85.00	24.00	33.00	41.00	11.00	80.00	48.00
63	Male	Fawn	88.00	43.55	96.00	26.00	36.50	41.00	11.00	90.00	48.00
64	Male	Fawn	88.00	48.08	106.00	28.00	36.00	41.00	12.50	92.00	54.50
66	Male	Fawn	86.00	44.00	97.00	26.50	35.50	44.00	11.00	93.00	57.50
67	Male	Fawn	89.00	39.01	86.00	24.50	34.00	41.50	12.50	81.50	46.00
68	Male	Fawn	84.00	36.29	80.00	26.00	35.00	38.00	13.00	78.00	45.00
Male Fawns		Mean	85.57	40.31	88.88	25.44	34.88	40.63	11.75	83.94	48.88
		Stdev	3.15	4.46	9.83	1.47	2.18	1.87	0.85	6.59	4.86
		SE	1.19	1.58	3.48	0.52	0.77	0.66	0.30	2.33	1.72
51	Female	Adult	102.00	68.95	152.00	32.00	39.00	44.00	11.00	95.00	
54	Female	Adult	138.00	59.42	131.00	25.50	39.00	41.00	14.00	93.50	51.00
39	Female	Adult	100.00	59.42	131.00	30.50	35.00	43.00	15.00	90.00	55.00
55	Female	Adult	98.00	62.14	137.00	28.50	41.00	42.00	16.00	87.00	48.00
59	Female	Adult	100.00	66.23	146.00	32.50	40.00	42.50	15.00	89.00	48.00
60	Female	Adult	99.00	63.96	141.00	28.00	36.50	44.00	15.00	95.00	52.00

Appendix Table 2. Physical measurements of mule deer captured at the Oldman Reservoir, January and February 1994. Measurements are metric (cm) unless otherwise noted. Age was estimated by tooth replacement and wear.

Ear tag No.	Sex	Age Class	Chest Girth	Weight (kg)	Weight (lbs.)	Head Length	Neck Circum.	Tarsal Length	Tarsal Gland Length	Shoulder Height	Chest Height
62	Female	Adult	102.00	63.05	139.00	30.00	39.00	43.50	16.00	91.50	56.00
Female Adults		Mean	105.57	63.31	139.57	29.57	38.50	42.86	14.57	91.57	51.67
		Stdev	14.37	3.47	7.66	2.44	2.06	1.11	1.72	3.09	3.39
		SE	5.43	1.31	2.89	0.92	0.78	0.42	0.65	1.17	1.28
53	Male	Yearling	138.00	46.72	103.00	31.00	39.50	46.00	12.50	91.00	56.00
57	Male	Yound adult	110.00	67.59	149.00	24.00	44.00	44.00	16.00	94.00	56.00
65	Male	Young adult	106.00	74.39	164.00	32.00	42.00	46.50	13.00	115.00	58.00
		Mean	108.00	70.99	156.50	28.00	43.00	45.25	14.50	104.50	57.00

Appendix Table 3. List of captured mule deer (Odocoileus hemionus) at the Oldman Reservoir, February and March 1992.

No.	Capture Date	Trap Site	Sex	Age Class	General Body Condition	No. of Ticks on Body	Ear tag i.d.	Radio collar freq. (MHz)
1.1	5-Feb-92	Glass East	Female	Yearling	Good	-----	1-183	
1.2	20-Feb-92	Downstream	Recapture				1-183	
1.3	28-Feb-92	Glass East	Recapture				1-183	
1.4	27-Feb-92	Glass West	Recapture				1-183	
2.1	5-Feb-92	Glass West	Female	Fawn	Good	10	2-184	
2.2	6-Feb-92	Glass East	Recapture				2-184	
2.3	20-Feb-92	Glass East	Recapture				2-184	
2.4	27-Feb-92	Glass East	Recapture				2-184	
2.5	7-Mar-92	Glass East	Recapture				2-184	
3.1	5-Feb-92	Glass West	Female	Fawn	Good	5	3-185	
3.2	14-Feb-92	Glass West	Recapture				3-185	
3.3	20-Feb-92	Glass East	Recapture				3-185	
3.4	27-Feb-92	Glass East	Recapture				3-185	
3.5	7-Mar-92	Glass East	Recapture				3-185	
3.6	11-Mar-92	Glass West	Recapture				3-185	
4.1	6-Feb-92	Renner North	Female	Yearling	Good	----	4-186	
4.2	21-Feb-92	Renner North	Recapture				4-186	
4.3	6-Mar-92	Renner North	Recapture				4-186	
5.1	6-Feb-92	Brockwell South	Female	Fawn	Good	----	5 -187	
5.2	12-Feb-92	Brockwell South	Recapture				5-187	
5.3	28-Feb-92	Brockwell South	Recapture				5-187	
6	6-Feb-92	Glass West	Female	Young adult	Good	----	6-188	148.731
7	10-Feb-92	Renner North	Female	Young adult	Good	----	7-189	149.921
8.1	11-Feb-92	Spillway	Female	Young adult	Good	----	8-139	149.951
8.2	28-Feb-92	Spillway	Recapture				8-139	
9	12-Feb-92	Downstream	Male	Yearling	Good	----	9-140	
10	12-Feb-92	Island View	Female	Fawn	Good	----	10-141	
11	12-Feb-92	Brockwell South	Male	Fawn	Good	----	11-142	
12	13-Feb-92	Glass East	Female	Fawn	Good	----	12-143	
13	13-Feb-92	Glass West	Female	Senior Adult	Good	----	13-144	150.095
14.1	14-Feb-92	Spillway	Female	Fawn	Good	----	14-145	
14.2	28-Feb-92	Spillway	Recapture				14-145	
15	14-Feb-92	Spillway	Male	Fawn	Poor	----	15-146	
16.1	14-Feb-92	Downstream	Female	Young Adult	Good	----	16-147	150.114
16.2	28-Feb-92	Downstream	Recapture				16-147	150.114
17	20-Feb-92	Spillway	Female	Fawn	Good	----	17-148	
18	20-Feb-92	Brockwell South	Female	Fawn	Good	----	18-149	

Appendix Table 3. List of captured mule deer (Odocoileus hemionus) at the Oldman Reservoir, February and March 1992.

No.	Capture Date	Trap Site	Sex	Age Class	General Body Condition	No. of Ticks on Body	Ear tag i.d.	Radio collar freq. (MHz)
19	20-Feb-92	Brockwell South	Male	Fawn	Good	----	19-150	
20	20-Feb-92	Renner South	Male	Fawn	Good	----	20-151	
21.1	20-Feb-92	Renner North	Female	Yearling	Good	----	21-152	
21.2	28-Feb-92	Renner North	Recapture				21-152	
22.1	27-Feb-92	Spillway	Female	Prime Adult	Medium	----	22-154	150.014
22.2	5-Mar-92	Spillway	Recapture				22-154	
22.3	10-Mar-92	Spillway	Recapture				22-154	
23	27-Feb-92	Glass West	Female	Yearling	Good	8	23-153	
24	27-Feb-92	Renner North	Male	Yearling	Good		24-155	
25	28-Feb-92	Brockwell South	Female	Young Adult	Good	1	25-156	150.045
26	28-Feb-92	Renner South	Female	Prime Adult	Good	0	26-157	150.055
27	28-Feb-92	Renner South	Female	Fawn	Good	0	27-158	
28	4-Mar-92	Island View	Female	Senior Adult	Light	3	28-159	148.565
29	4-Mar-92	Brockwell South	Female	Prime Adult	Good	0	29-160	150.064
30	4-Mar-92	Concrete West	Female	Fawn	Good	0	30-161	
31	4-Mar-92	Spillway	Male	Fawn	Good	3	31-162	
32	5-Mar-92	Brockwell South	Female	Fawn	Good	3	32-164	
33	4-Mar-92	Spillway	Male	Fawn	Good	3	33-163	
34.1	5-Mar-92	Brockwell North	Male	Fawn	Very Poor	0	34-165	
34.2	7-Mar-92	Brockwell South	Recapture				34-165	
34.3	10-Mar-92	Brockwell South	Recapture				34-165	
34.4	13-Mar-92	Brockwell South	Recapture				34-165	
35	5-Mar-92	Concrete West	Female	Prime Adult	Good	0	35-166	150.073
36.1	5-Mar-92	Concrete West	Male	Fawn	Good	2	36-167	
36.2	7-Mar-92	Renner South	Recapture				36-167	
37.1	5-Mar-92	Renner South	Female	Fawn	Medium	3	37-168	
37.2	10-Mar-92	Renner South	Recapture				37-168	
38	5-Mar-92	Castle West	Female	Prime Adult	Good	0	38-169	150.083
39	6-Mar-92	Renner North	Female	Fawn	Good	1	39-170	
40.1	6-Mar-92	Castle West	Female	Fawn	Light	7	40-171	
40.2	11-Mar-92	Castle West	Recapture				40-171	
41	7-Mar-92	Glass West	Female	Fawn	Good	1	41-172	
42	7-Mar-92	Tennessee	Female	Young Adult	Good	0	42-173	150.104
43	7-Mar-92	Island View	Female	Fawn	Good	0	43-174	
44	10-Mar-92	Renner North	Male	Fawn	Good	----	44-175	
45	10-Mar-92	Renner South	Female	Prime Adult	Good	0	45-138	150.124
46	11-Mar-92	Brockwell South	Female	Young Adult	Good	4	46-190	150.156
47	11-Mar-92	Renner North	Female	Young Adult	Good	4	47-191	150.164

Appendix Table 3. List of captured mule deer (Odocoileus hemionus) at the Oldman Reservoir, February and March 1992.

No.	Capture Date	Trap Site	Sex	Age Class	General Body Condition	No. of Ticks on Body	Ear tag i.d.	Radio collar freq. (MHz)
48	11-Mar-92	Castle East	Female	Fawn	Good	----	48-192	
49	13-Mar-92	Tennessee	Male	Fawn	Medium	1	49-192	
50	13-Mar-92	Concrete West	Male	Fawn	Good	1	50-194	

NOTE - Adult age classes were based on relative amounts of incisor and tooth row wear, and assumes a birth date of June 1 and a longevity of 20 years.
NOTE - Body condition was assessed on the basis of subcutaneous fat reserves on ribs and pelvic girdle.
NOTE - Ticks are presumed to be winter tick, Dermacentor albipictus.