A MULE DEER
POPULATION MODEL

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1.0 INTRODUCTION

As part of the requirments for graduation from the second year of the Wildland Recreation program students were required to take part in a three week practicum from April 28 to May 16, 1986. During this three weeks students were required to spend a minimum of 10 days working on a suitable practicum topic. The remaining week was to be spent writing up a technichal report on the practicum.

I chose to do my practicum with the Cranbrook Fish and Wildlife branch. Here my practicum was to develop a working population model for mule deer within management units 4-21 and 4-22. This report will cover the methods, problems and conclusions in developing this population model.

2.0 PURPOSE

There has been an interest in the Cranbrook Region to develop a population model that would be suitable for the mule deer populations. Currently the status of the mule deer populations has been carried out by using aerial counts or carry over counts. These two methods do have there particular uses but are sometimes inacurate in determining the total population or the status of the mule deer herds.

With the proper use of a population model wildlife managers will be able to get a ball park figure on the total population number and the population make up of the mule deer in management units 4-21 and 4-22. As a result of these figures wildlife managers will be able to tailor their harvesting regulations so that over a period of time they can produce a deer population size and make up that they desire. If the mule deer population is left unmonitored then wildlife managers will not easily be able to determine if their harvesting regulations are having an adverse effect on the deer.

It has only been the lack of time and manpower that has prevented the Cranbrook Fish and Wildlife Branch from developing this population model before now.

3.0 LOCATION OF STUDY

The entire practicum was carried out at the Cranbrook Fish and Wildlife Office. The mule deer population model was developed primarily for management units 4-21 and 4-22. The total extent of these areas can be seen on the key map on the following page. Information required to develop the population model was collected mainly from these two management units.

4.0 BACKGROUND NEED AND DATA SOURCES

4.1 Deer Hunter Sample

An example of the Deer Hunter Sample can be seen in Appendix I.

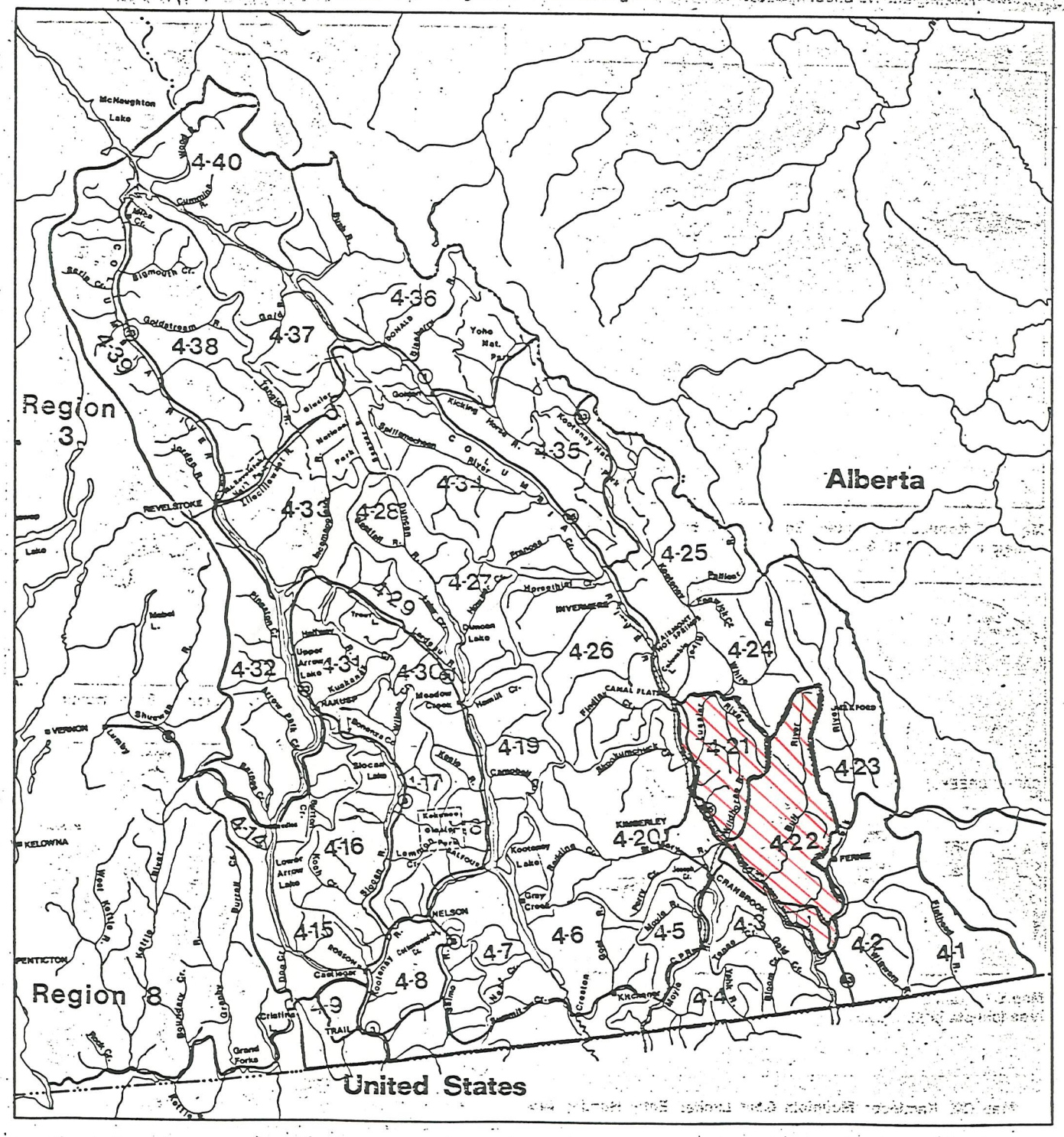
The deer hunter sample is basically documented information gathered on the yearly hunting results. It includes information on the; reported yearly harvest, estimated yearly harvest, reported distribution of deer hunters; estimated distribution of deer hunters and the reported harvest of deer by location.

For development of the population model I was mainly interested in the reported harvest of deer by location, the reported yearly harvest and the estimated yearly harvest.

First of all the reported harvest of deer by location was totalled for each year in m.u. 4-21 and 4-22. Those deer not located within these management units were subtracted from the total.

Using the above totals the reported number of deer harvested by management unit could then be corrected. This correction factor could then be applied directly to the estimated number of deer harvested by management unit. This gave us a new estimate of the total number of white tail and mule deer harvested within management units 4-21 and 4-22 from 1980 to84. (see table 1)

KEY MAP



STUDY AREA

table 1

TOTAL WHITE TAIL AND MULE DEER HARVEST

YEAR	MAN. UNIT	OLD ESTIMATE	CORRECTED ESTIMATE
1980	4-21	314	265
	4-22	624	631
1981	4-21	276	205
	4-22	662	584
1982	4-21	316	285
	4-22	1115	1114
1983	4-21	175	170
	4-22	466	445
1984	4-21	461	426
	4-22	1182	1165

4.2 Hunter Return Tooth Data

The hunter return tooth program asks succesful hunters to send in a tooth from the animal they killed along with information on its sex, species, date of kill and location of kill. Fish and Wildlife Technichians then grind these teeth and count the Cementum layers to get an accurate idea of the animals age.

Even though the number of teeth sent in is far below the actual number of deer killed the return tooth data still enabled me to do three important revisions to the deer hunter sample data. These revisions included;

(1) Seperating the yearly harvest into mule deer and white tail totals.
(2) Breaking the above into male and female kills.
(3) Breaking this kill down by age class.

An example of the hunter return tooth data can be seen in appendix II.

table 2

WHITE TAIL AND MULE DEER BREAKDOWN

YEAR	MAN. UNIT	M.D. KILL	W.T. KILL	TOTAL
1980	4-21	167	98	265
	4-22	203	316	519
1981	4-21	88	95	183
	4-22	213	300	513
1982	4-21	149	113	262
	4-22	440	543	983
1983	4-21	234	107	341
	4-22	321	310	631
1984	4-21	211	184	395
	4-22	524	582	1106

4.3 Aeriel Survey Data

An example of the aeriel survey data can be seen in appendix III.

Aeriel survey data collected from 1980 to 1984 gave me information needed to compute adult to juvenile ratios. This information was required to calculate starting populations for the computer population model.

4.4 Library Data

For the population model I was required to research information on mule deer fertility by age class, winter and summer survival rates, plus harvest vulnerability by age class. Even though the Cranbrook Fish and Wildlife Branch has a fairly extensive library this information proved difficult to find. Fertility rate by age class seemed to be mutch to high for the Cranbrook region. Information on the other variables was simply not available.

4.5 Personal Knowledge

The most important factor in the success of the mule deer population model was the personal knowledge of the persons I worked with. Bill Warkentin, Ray Demarchia, Peter Davidson and Anna Walters. It was their knowledge of the mule deer that allowed us to determine factors

such as fertility rates, winter survival, summer survival and harvest vulnerability of the mule deer.

5.0 MATERIALS AND EQUIPMENT

All materials and equipment needed to complete the population model were supplied by the Cranbrook Fish and Wildlife Branch. This included note pads, computer printout paper and use of their two computers and word processors. Initialy the population model was carried out on a digital computer and word processor. A crashed disc forced us to complete the model on a apple computer.

6.0 DEVELOPING THE MODEL

6.1 Methods

The mule deer population model is a modified version of a population model created by D. Stevenson. In order for the program to run you must change the variables to suite the population you are working with. These variables include:

(1) Buck harvest vulnerability by age class.

(2) Doe harvest vulnerability by age class.

(3) Fertility by age class.

(4) Winter survival of fawns.

(5) Winter survival of adults.

(6) Summer survival of fawns.

(7) Summer survival of adults.

These are the determined survival rates for adult and fawn mule deer (m.u. 4-21 and 4-22).

- Winter survival of fawns = 50%
- Winter survival of adults = 90%
- Summer survival of fawns = 65%
- Summer survival of adults = 97%

The following is a table of other variables for deer in management units 4-21 and 4-22.

AGE	FERTILITY	DOE VULNERABILITY	BUCK VULNERABILITY
0	0	0.3	0.1
1	0	1.9	1.0
2	1	4.4	3.6
3	1.2	2.1	3.5
4	1.3	1.3	2.0
5	1.5	1.7	3.5
6	1.5	1.3	3.2
7	1.5	1.0	1.7
8	1.5	0.5	0.7
9	1.5	0.5	1.0
10	1.5	0.5	0.2
11	1.5	0.5	0.2
12	1.5	0.5	0.2
13	1.5	0.5	0.2
14	1.5	0.5	0.2
15	1.5	0.5	0.2
16	1.5	0.5	0.2
17	1.5	0.5	0.2
18	1.5	0.5	0.2

The vulnerability is actualy a ratio of the animals chances of being shot. From the table you can see that a two year old doe has the most chance of being shot.

From the deer hunter sample and hunter tooth returns we were able to get the total harvest for each year (1980 -84). This information could now be used to put into the computer population model program with the adjusted variables. The starting population however, had to be changed each time the program was run untill the age structure and kill matched our collected data.

Wildlife managers at the Cranbrook Fish and Wildlife Branch had estimated the mule deer population in management units 4-21 and 4-22 to be a minimum of 2100. The mule deer population model puts the starting population in 1980 at between 3500 and 4500.

Our tooth return data gave us a buck:doe:fawn ratio of 40:100:50. Thus with this information we can assume our starting mule deer population in 1980 was roughly:

2448 Does
979 Bucks
1224 fawns

6.2 Results

One of the main reasons for the development of the population model is because wildlife managers have been aware of over harvests of mule deer in m.u.'s 4-21 and 4-22 over the past few years. In 1984 this lead to an early closure of the deer season and a lessened harvest in 1985. It was thought that by keeping this reduction in effect for three years the mule deer population could be brought back to normal. However in running this reduction on the population model it becomes apparent that it will take at least seven years or more before the population becomes stable.

The population model will also be able to give the general public a look at how the Fish and Wildlife harvesting regulations are actualy helping increase the mule deer population.

7.0 TIME SCHEDULE

The following table shows a rough breakdown of the activties completed during the two week practicum period.

DATE	ACTIVITY
APRIL 28	Introduction/Deer hunter sample compilation
29	Deer hunter sample compilation/Field
30	Hunter tooth return breakdown
MAY 1	Hunter tooth return/Library research
2	Library research
3	--
4	--
5	Computer population model
6	Computer population model
7	Computer population model
8	Computer population model
9	Field

8.0 CONCLUSIONS

The mule deer population model can be a valuable tool to wildlife managers if it is used properly. It should be noted that the population model tends to over or under exaggerate the numbers in question. Our estimation of the mule deer population using the population model is about 4000 this is allready 1900 over the original estimate of 2100. Also when using the population model one has to remember that it does not take into account some important factors such as disease. You cannot strictly manage the deer population using only the model. Along with it you need field counts and information such as the hunter tooth return to reinforce yourmanagement decisions. After all the population model can only be as good as the information that you put into it.

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APPENDIX I
DEER HUNTER SAMPLE

APPENDIX II
HUNTER RETURN TOOTH DATA

APPENDIX III
AERIEL SURVEY DATA

SP

APPENDIX IV
SAMPLE RUN OF POPULATION MODEL