Rosebud Lake Deer Winter Range
Habitat Appraisal

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APPRAISAL

ROSEBUD LAKE DEER

WINTER RANGE HABITAT

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I. Summary

The Rosebud Lake study area provides a relatively good deer wintering area. To this date no major human developments have occured on the Rosebud Lake area that will prevent it from remaining a wintering range.

The terrain within the Rosebud Lake study area varies considerably. Deer choose various sites within the study area in respect to the snowdepths at different periods of the winter. In the early-winter period deer can be found throughout the study area while by mid-winter most deer have concentrated at low elevation, thickly forested sites. As the late-winter period approaches deer move up to snow free open slopes to feed on the new growth. During the early-spring period many deer utilize the agricultural fields because of the abundance of new grasses.

The winter of 1981-82 was particularly hard on the wintering deer. By late January snowdepths exceeded 85 centimeters in many areas. Deer were confined to steeply sloping, west or south aspects at low elevations. These sites were densely forested and provided protection from the snow. Red-stem ceanothus was found to be the preferred browse plant, although it was not abundant in many areas. In areas where red-stem ceanothus was lacking, deer consumed the twigs of saskatoon, waxberry, buffaloberry, falsebox and other plants.

The combination of deep snow and the absence of the preferred browse plant in many areas caused most deer to become weakened. One deer that had been killed by a pair of coyotes was found to have a 12 percent bone marrow fat content. This deer was on the verge of starvation and had made easy prey for the coyotes.

The Rosebud Lake study area has an adequate if not excessive amount of cover in some areas. The main habitat improvement technique that would be beneficial to deer in the Rosebud Lake study area is controlled burns. Controlled burns would help stimulate new growth on many of the shrubs that have become old and decadent. The logging of small openings in the mid-winter deer sites would provide new shrub growth. A more abundant food source seems to be the answer to preventing further deaths either directly or indirectly through starvation.

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

IV. Introduction

Along with other wildlife values, deer wintering ranges are becoming increasingly scarce. Man's relentless pressure on the wilderness through agricultural development, hydroelectric development, and human settlement is creating serious ecological ramifications.

This technical report was written for the Wildland Recreation Technology Program 1982 on the intent that the habitat within a small deer wintering area would be appraised. From this habitat appraisal a series of recommendations would be proposed. These recommendations would outline various habitat improvement techniques to increase the value of the Rosebud Lake area as a deer wintering area.

V Rosebud Lake Study Area

A. Location and Physical Boundaries

The Rosebud Lake study area is located within the Bonnington Range of the Selkirk Mountains in lower south-eastern British Columbia.

The study area may be reached by travelling approximately 15.5 kilometers south from Salmo along highway 3-6. At this point there is an intersection where highway 3 branches east and highway 6 continues south. To reach the turn off to Rosebud Lake one continues south along highway 6 for another 8 kilometers. The lower portions of the study area may be viewed on the east and west sides of the highway as one travels towards the Rosebud Lake turn off. The road to Rosebud Lake is a well-travelled gravel secondary road which heads in a northerly direction for 4.5 kilometers to Rosebud Lake. The turn off to Rosebud Lake may also be reached by travelling along highway 6; 2.5 kilometers north of Nelway at the Canada-United States border. The exact location and boundaries of the study area are shown in Figure (I).

The study area lies between 615 metres above sea level and 1077 metres above sea level. This significant elevation change of 462 metres gives the landscape with the study area variety. A detailed contour map of the study area is provided in Appendix (A).

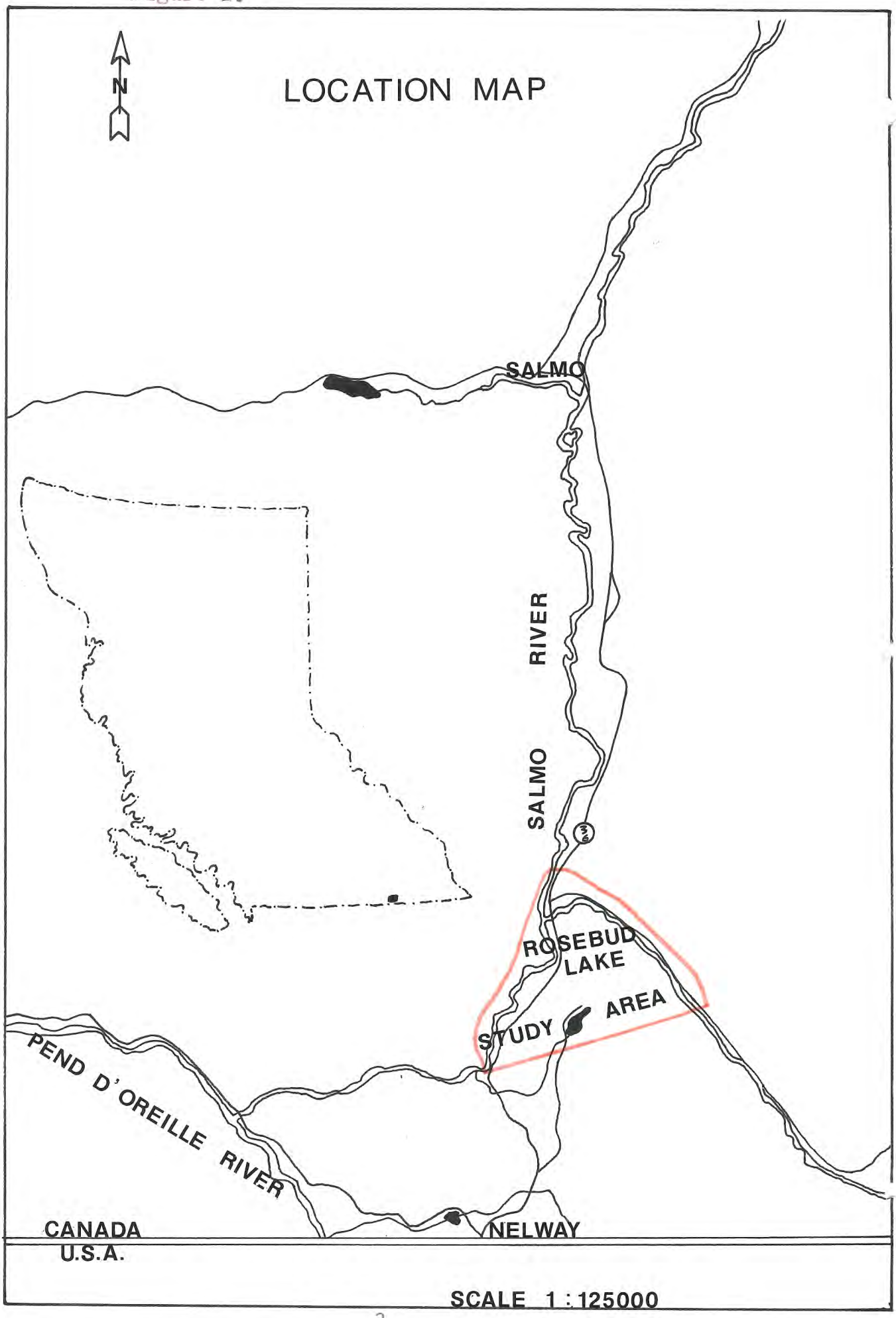
The approximate size of the study area is 1350 hectares. The terrain within the study area varies from 0-100 percent slope.

B. Biophysical Data

1. Landform and Geology

According to Fyles and Hewlett (1959) the study area is

Figure I.


N
LOCATION MAP
SALMO
SALMO RIVER
ROSEBUD LAKE
STUDY AREA
PEND D'OREILLE RIVER
CANADA
U.S.A.
NELWAY
SCALE 1 : 125000

divided into main geological areas or belts. The first belt is the Black argillite belt and the second belt is the Mine belt (I).

The Black argillite belt underlies most of the study area as shown in Figure (2). The belt consists mainly of black argillite but includes minor amounts of slate, phyllite, limestone and dolomite. The soils produced from these rocks are usually black or dark grey and have good growing capabilities. Shrubs and trees grow well here and help to provide good habitat for wintering deer.

The Mine belt underlies a small portion of the study area and consists of thick sedimentary rocks. The characteristic rocks of this area are calcareous argillites, slate, phyllite, grey limestone, chert and quartzite. These rock types produce a soil which is characteristically good for growing trees and providing thick cover for deer.

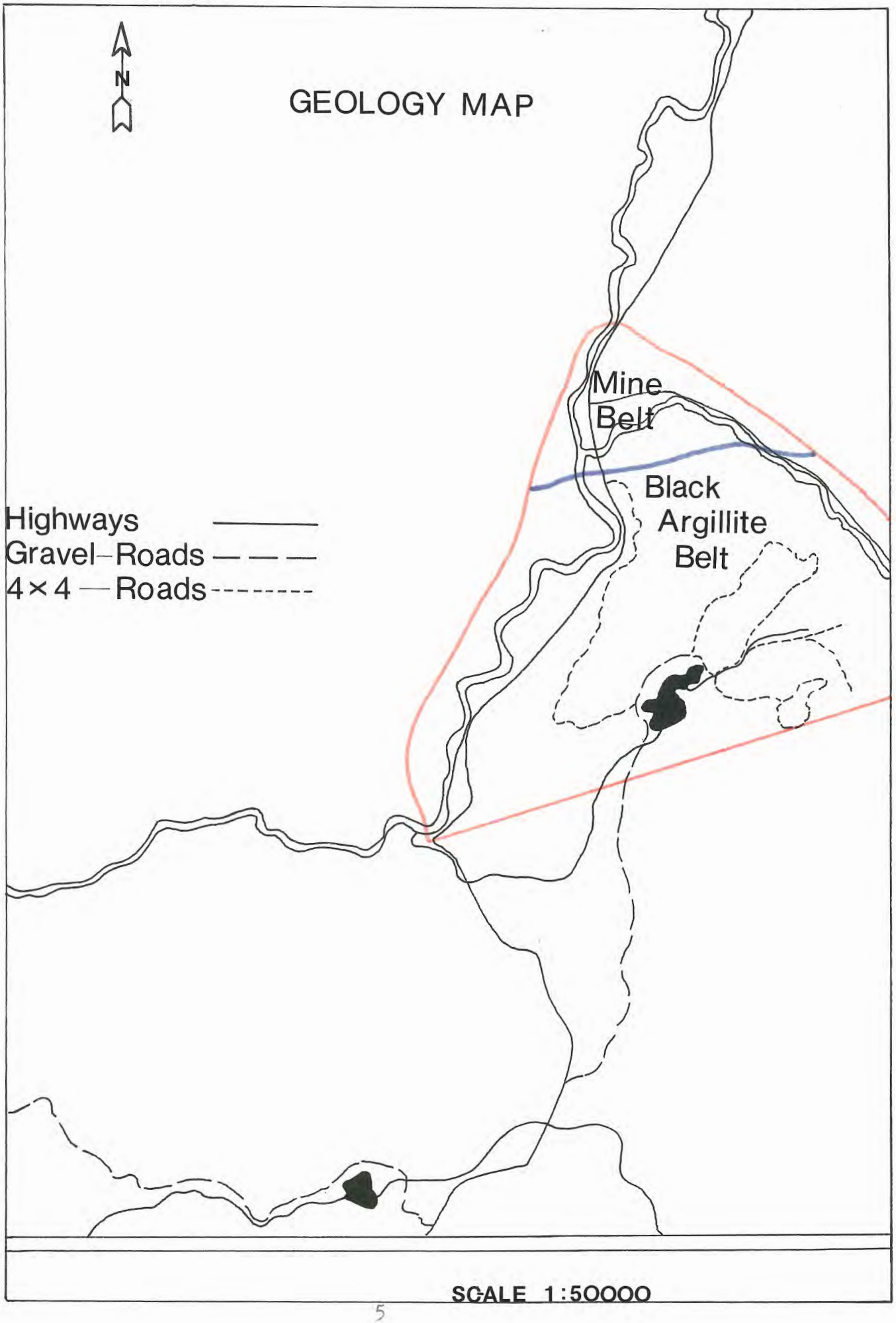
2. Biogeoclimatic Zones

The Rosebud Lake study area is located within the Interior Western Hemlock Zone (Dry Subzone) Biogeoclimatic Zone. Within the Interior Western Hemlock Zone (IMH) the following trees are dominant: Western hemlock, Western red cedar, Douglas fir, Western white pine, Western birch and Grand fir (2).

A fire that swept through much of the study area in the 1930's changed the succesional stage of the plants to a pioneer community. Therefore much of the study area is characterized by Lodgepole pine, Paper birch and numerous shrub species. The pioneer stage of the study area provides ideal food and cover areas for the deer.

The Interior Western Hemlock Zone usually lies between

Figure 2.


N
GEOLOGY MAP
Mine
Belt
Black
Argillite
Belt
Highways
Gravel–Roads
4×4 — Roads
SCALE 1:50000

1400-4400 feet which is above the Interior Douglas fir Zone and below the Interior Subalpine Zone. The annual precipitation within this zone is 20-45 inches with 30 percent as snow. Most of the precipitation occurs in winter with summers being warm and fairly humid. The area experiences 3-5 months above 50 degrees F and 3-5 months below 32 degrees F. Temperatures are usually never very harsh and therefore do not inhibit the deer population.

3. Soil

According to the publication, Soil and Vegetation Resources of the Pend d'oreille Valley B.C., the two main soil orders that occur within the Rosebud Lake study area are the Brunisolic and Podzolic orders.

The Brunsolic soils are dominant in the lower elevations of the study area. These soils occur on a variety of slopes of east to north aspect. The soils are well drained and have a good nutrient status. Climax tree species such as Western hemlock and Western Red cedar provide ideal cover areas for wintering deer.

The Podzolic soils are dominant in the higher elevations of the study area. These soils occur on slopes from 15-50 percent with a south or west aspect predominating. These soils are rapidly drained with a good nutrient status. A podzolic soil supports many forms of shrubs which include waxberry, oceanspray, saskatoon berry, ceanothus and mahonia species (3). This abundant and varied shrub growth provides ideal food and cover areas for deer.

4. Drainage

The Rosebud Lake study area is drained by a dendritic

drainage system consisting of many small tributary streams emptying into a larger river channel. Many of these tributary streams exist only during the heavy spring run off, then dry up as summer progresses. These small tributary streams distribute water throughout the study area thereby increasing the abundance and vigor of various trees and shrubs. This has implications on the deer because it provides them with abundant food and cover areas.

Rosebud Creek is the main creek draining the study area. Rosebud Creek flows out of Rosebud Lake at an elevation of 2650 feet and empties into the Salmo River at the 2000 foot elevation. The Salmo River flows in a southwesterly direction through the lower portion of the study area. The Salmo River eventually joins the Pend d'orielle River which then becomes one of the numerous major tributaries of the Columbia River System.

VI Techniques Used to Undertake a Habitat Analysis of the Rosebud Lake Area.

A. Landform, Geology and Soil

The information for landforms, geology and soil types was the result of research into previous reports and articles done on or near the Rosebud Lake study area. The growing capabilities of the soils were obtained from various reports along with visual observations. Plant types, abundance and vigor helped me make general conclusions on the nutrient status of

the soils.

A study of the landform is critical in a habitat analysis because landform affects soil conditions, drainage, vegetation characteristics and microclimate which in turn affects deer populations.

Underlying geology of the study area is important also as it determines to a great extent the soil conditions within an area. A study of the soil in an area gives a good indication of the habitats suitability for vegetation and in turn wildlife.

B. Drainage

The drainage of the study area was determined through visual observations. Topographical maps and aerial photographs were also used to establish the drainage pattern.

The drainage system of an area is important because it affects the location of vegetation types. The abundance, distribution and type of vegetation then controls the deer activity and location throughout the winter season.

C. Vegetation Characteristics and Browse Preference

Vegetation types were distinguished by using the fixed-radius plot method or quadrat method to calculate the frequency, abundance and density of each plant species.

From a predetermined point I ran a compass line at a randomly selected bearing for a distance of 100 meters. At this point I established a circular plot with a radius of 3.99 meters. This gave me a plot size of 1/200 of a hectare or .005 hectares, at each sample point. A sample point was established every 100 meters along the compass line. Compass lines or transects were run in various areas throughout the

study area which were used by deer most often.

At each plot I recorded the following:

a) Total number of trees by species

b) The height and diameter of one tree of average size in the plot for each species.

c) Total number of shrubs by species

d) The average crown diameter and height of one shrub of average size in the plot for each species.

e) For each shrub species the percentage of browsing

Browse preferences by deer were determined by visual observations of each shrub species. A number of browse clippings were taken and measured using calipers to determine the average diameter of browse that deer and elk would consume.

D. Aspect and Slope

The aspect of the study area is important because it influences the intensity and duration of sunlight that reaches the ground. The sun's energy provides for abundant plant growth and early snow melt. Early snow melt areas are important to deer ranges. Aspect was determined from compass readings in the field and from topographical maps of the area.

Slope is also important as it affects the intensity of sunlight which increases plant growth and causes early snow melt areas. Slope was calculated using topographical maps of the study area combined with clinometer readings in the field.

The aspect and slopes most frequented by deer during the winter are the areas that need the most intensive management programs.

E. Snow Depth

Snow depth was recorded each time I was out in the field.

The snow depth was recorded using a plastic metric scale. Two different locations were used; one location was out in the open while the other was under the tree canopy. The snow depths were taken in these two locations to calculate how much snow is intercepted by tree branches. Snow interception by trees is critical to deer wintering areas and this is why deer utilize thick cover types.

F. Temperature and Wind

Temperature and wind levels were obtained from the Castlegar airport weather office. Temperature and wind levels were used to figure out if they had any affect on deer movements and activities during the winter season.

G. Predation

Information on predators and predation was obtained mainly through visual sightings of tracks and spoor. Information on predators was also derived from actual predator sightings and from predator kills. Local people were helpful and lended their knowledge about predators in the area.

H. Competition

Information on competition between deer and elk was obtained from visual observations of elk browse preferences along with elk movements and location in relation to the deer. Competition for food and cover on a winter range could prove critical to deer during a hard, long winter.

VII White-tailed Deer Winter Range Selection

As winter sets in deer are forced to change their habits

in terms of movement patterns, home range location and food selection. Deer are forced out of their high-elevation summer range to lower winter-range areas.

Deer migration from the summer range is initiated by the accumulation of about 20cm of snow (4). The migration is usually a rapid event, although in years of gradual snow accumulation the deer move onto the winter range over periods as long as two months.

Deer habitat selection is influenced mainly by snow depth and snow hardness. Few deer are found where snow depths exceed 24 inches because the deers movement is severely hindered. Deer usually winter in areas with less than 18 inches of accumulated snow if possible. Deer use favourable cover, slopes, elevations and aspects to avoid excessive snow accumulation and cold winds.

Studies have shown that escape from cold winds is more important to deer than a supply of food (5). At these times deer seek shelter in thick coniferous cover on the lee sides of ridges. The deer will remain in heavy cover even if food is not available.

During the winter season the movements of deer are severely restricted. Deer at this time move only enough to obtain food because snow increases the energy expenditure of deer significantly. Studies conducted by Mattfeld (1973) suggest that a 45 kilogram deer expends four to five times as much energy walking in 40 cm of snow as it does on bare ground (6).

Besides restricting movements of deer and increasing energy expenditures the snow also limits energy intake by deer. Deer are forced to change their feeding habits to primarily browse plants rather than herbaceous plants because snow buries the herbaceous plants. These browse plants have less protein in winter. The basic metabolic rate for a deer requires about 1,140 calories

This is wrong!

per day for each 45.4 kg. of body weight if the air temperature is 0°C or higher (7). If temperatures drop below freezing level, the metabolic rate of a deer drops rather than increases. This works against the deer because even if food is abundant the deer will still lose 12 to 15 percent of their body weight. This results in weakened deer which are more susceptible to diseases and predation (8).

Winter range is important to the deers' survival; therefore the selection of winter range is extremely critical.

Habitat selection for wintering deer can be divided into four main categories. These categories relate to snow accumulation at different times during the winter season(9).

Early Winter During this portion of the winter season snow depths are insufficient to hinder deer movements. The early winter period begins with deer migration to wintering areas and ends when deer are unable to negotiate easily in open areas. If herbaceous plants are buried by snow at this time, the deer tend to select areas with high shrub levels. At this time deer may or may not use coniferous trees for cover. In early winter the deer are distributed on all slopes and aspects. The main restriction to deer during the early winter period is with elevation because snow depth increases with elevation (10).

Mid-Winter The mid-winter period is the critical and usually longest time for deer on their winter range. Snow depths are sufficient to restrict deer movements in all open areas. The mid-winter period begins when snow accumulations restrict deer movement and ends when snow melts from the steep south and west aspects sufficiently to allow deer free movement in open areas. Deer select thick coniferous cover to reduce snow accumulation

through interception. The deer move out of the cover only to feed (II).

Late Winter Due to increased radiation from the sun the snow depths decrease at this time. Snowmelt first begins on south, southeast and west aspects respectively. At this time the deer select snow-free slopes with cover nearby. The openings provide warmth and, more importantly, shrub forage and herbaceous plants which may grow as soon as the snow disappears (I2).

Early Spring In this period snow has left most low-elevation sites although it still restricts deer movement at high-elevation sites. Deer begin their upwards migration to the summer range. During this time deer switch from day-time feeding to nocturnal feeding. At this time deer often use cultivated fields which have new grasses sprouting in them (I3).

VIII Habitat Preferences of White-tailed Deer and Available Habitat on the Rosebud Lake Study Area.

Deer, like humans, are individuals; therefore their habitat preferences may vary from region to region. Habitat preferences of the White-tailed deer in the west Kootenays will be outlined here. Available habitat of the study area will also be discussed as a comparison to the preferences.

A. Food

1. Preferences

The fantastic growth of vegetation in the summer gives a false impression of abundance. Summer vegetation is important but the critical vegetation is that which is available during winter. Especially important is the vegetation near or in dense coniferous stands where the deer are often forced to stay.

In the winter the protein level of browse plants drops as much as 25 to 40 percent and the plants digestibility also lessens (I4). Low digestibility means that even less of the protein content can be utilized. A crude protein level of 7 percent is required to maintain deer. However, a protein level of 13 to 18 percent is needed to maintain young white-tailed deer in a healthy condition (I5).

Food preferences by white-tailed deer are usually determined by plant palatibility. Palatability is defined as plant characteristics that stimulate a selective feeding response by animals (I6). In red-stem ceanothus, an important deer browse, the terminal 2-5 inches of a twig is selected with an average diameter of 2.4 millimetres (I7). Protein levels, phosphorous levels, calcium levels, moisture levels and some fourty other nutrients all determine the palatibility of a browse plant (I8). Deer are selective feeders and are able to choose the plants and twigs with the highest protein and nutrients content.

Depending on the quality of the browse a white-tailed deer will consume approximately 1.5-2 kg. per day (I9). Some of the prefered browse species of the Pend d'oreille Valley are listed here (20).

Figure - White-tailed Deer Browse Preferences

Common Name:	Scientific Name:
Redstem ceanothus	Ceanothus sanguineus
Saskatoon	Amelanchier alnifolia

Western choke cherry	Prunus virginiana
Black cottonwood	Populus trichocarpa
Western red cedar	Thuja plicata
Douglas fir	Pseudotsuga menziesii
Snowbrush ceanothus	Ceanothus velotinus
Oregon grape	Berberis nervosa

2. Available

The most important browse species available to deer on the Rosebud Lake study area are: Red-stem ceanothus (Ceanothus sanguineus), Falsebox (Pachistima myrsinites), Saskatoon (Amalanchier spp.), Waxberry (Symphoricarpos albus), Buffalo berry (Shepherdia canadensis), Thimble berry (Rubus parviflorus), Oceanspray (Holodiscus discolor), and Western red-cedar (Thuja plicata).

The plant frequency or percent occurence gives a good indication of what percentage of the total study area a given browse species occurs on. The following is the percent occurence of the most important browse species available to deer on the Rosebud Lake study area: red-stem ceanothus (23.), false box (76.), saskatoon (46.), waxberry (61), buffalo berry (69), thimble berry (23), oceanspray (15), and western red cedar (23).

All the vegetation plots were done while snow was still present so only plants above the snow were included. Most herbaceous plants, grasses nad forbs were covered by snow.

B. Cover

1. Preferences

Adequate percentages of cover contribute to the health

of a deer herd. Cover provides a shelter from the elements such as wind, snow, rain and cold weather conditions. Cover also provides an escape area from predators and also increases the deer's sense of security. With adequate cover a deer will feel less threatened by predators, hunters, roaming dogs and snowmobilers. Some studies have indicated that a sense of security is needed to maintain deer in good physical condition (2I).

60% forage to 40% cover

This is confused

The ideal ratio of forest cover to shrub cover varies with the season of use. During the summer months a ratio of 60 percent shrub cover to 40 percent forest cover is ideal. This ratio provides adequate protection from predators and human related harrassments while still providing a plentiful food source. In the winter months a ratio of 40 percent shrub cover to 60 percent forest cover is ideal. This ratio provides snow interception from the trees, protects the deer from harrassment and allows them access to shrub feeding areas.

2. Available

During the winter season deer utilize thick coniferous cover because of the increased snow interception. Decidious trees provide little or no snow interception so they are not usually used as snow cover in winter.

The lower elevations of the study area from 2000 feet above sea level to 2400 feet above sea level consist of dense stands of even aged coniferous trees. This dense coniferous cover consists mainly of lodge-pole pine, cedar with small amounts of Douglas fir and groves of paper birch trees.

The study area from 2400 feet above sea level to 2650 feet above sea level is occupied with medium to dense stands of coniferous cover interspersed with openings of decidious vegetation. The coniferous cover is primarily lodge-pole pine trees and douglas fir with minor quantities of engelmann spruce. Decidious vegetation consists of numerous paper birch trees.

The study area from 2650 feet above sea level to 2800 feet above sea level consists of open coniferous cover with large areas of decidious cover. The coniferous vegetation is comprised of mainly douglas fir and lodge-pole pine. Smaller quantities of western white pine and engelmann spruce occur while some cedar grows in moister areas along the creeks.

The study area from 2800 feet above sea level to 3500 feet above sea level consists mostly of low shrub cover with occasional coniferous groves occuring on north and west facing slopes and in moister gully areas. The coniferous stands are mainly lodge-pole pine and douglas fir with some engelmann spruce. The shrub cover is comprised mainly of red-stem ceanothus, buffalo berry, waxberry, mallow ninebark and willow.

Differences of the above cover analysis will occur due to changing aspects and soil moistures within the area. Along many of the creek areas a predominance of moisture tolerant plants such as western red cedar will survive.

C. Aspect and Slope

1. Preferences

The aspect of an area is one element which decides where a deer population will winter. Deer usually utilize

slopes that face south, southeast or west (22). The reason they use these slopes is because of the increased solar radiation which lessens snow depths, hastens snow melt and causes increased vegetation growth.

Deer on winter ranges often utilize steep slopes of 20-60 percent because the snow is usually lighter on these slopes. Snow melts off faster and vegetation is used for feeding, protection from predators, protection from nature's elements and bedding areas.

2. Available

Due to the significant elevation changes within the study area and the varying topography, all aspects and slopes can be encountered.

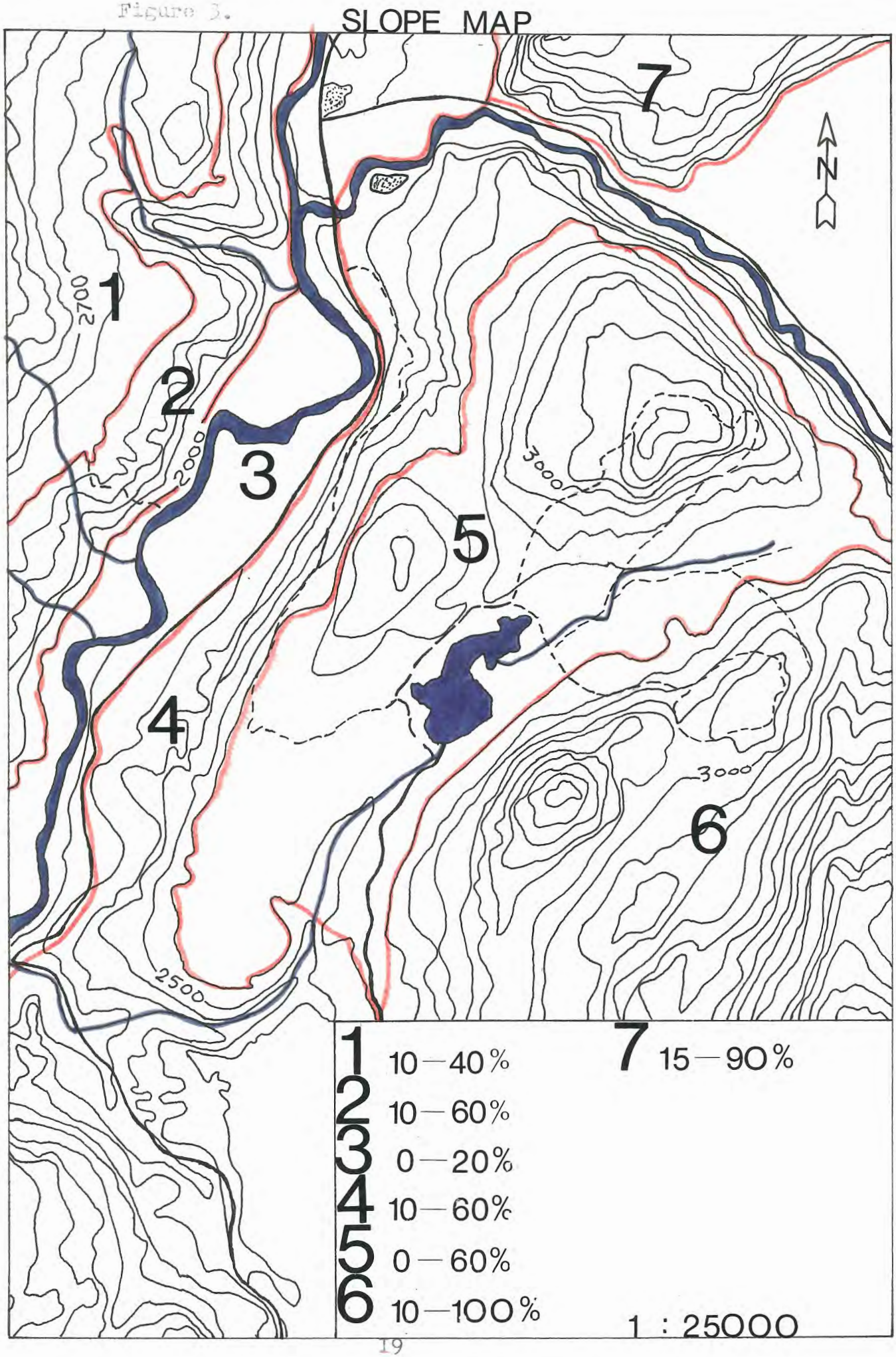
Most of the study area is situated on a westerly and southerly aspect while easterly and northerly aspects represent a small fraction of the total study area. Slopes within the study area vary from 0 to 100 percent although most slopes are in the range of 10-40 percent. See figure (3).

D. Water

1. Preferences

The water supply of an area is affected by climatic conditions, soil types, geologic structure, range condition, vegetation density and fire history. Water is imperative to the survival of a deer. A white-tailed deer of 100 pounds requires about 2 quarts of water each day. Open water in the form of lakes, rivers or streams are most often used by deer. However, deer will often consume snow to obtain needed water if open water is not available. The conversion of snow to water requires the deer to produce

Figure 3.


SLOPE MAP
7
N
1
2700
2
2000
3
3000
5
4
3000
6
2500
1 10—40%
2 10—60%
3 0—20%
4 10—60%
5 0—60%
6 10—100%
7 15—90%
1 : 25000

extra body heat which in turn causes an energy drain on on the deer. Therefore, a supply of open water is regarded as best for winter ranges.

2. Available

During the fall season the deer population of the Rosebud Lake study area may obtain water from numerous sources. Many small creeks trickle along the forest floor as they make their way down to the Salmo river.

When winter sets in all of the open water on the study area except for the Salmo river freezes over. This effectively prevents the deer from reaching open water because of the long distance to the Salmo river from the main deer wintering areas. The deer can not afford to expend great amounts of energy travelling through deep snows to the Salmo river. The alternative is for the deer to obtain their water from snow and browse plants.

E. Snow Depth

1. Preferences

The snow depth in an area influences a deer's movement or location at any one time. Deer move down from high elevations when the snowpack reaches approximately 20 centimetres. Deer are restricted in movement when the the snow depth exceeds 40 centimetres (23).

Ease of movement for an ungulate through snow varies with the snow conditions at the time and the chest height of the ungulate. The chest height of a white-tailed deer varies between 50 and 60 cm. When an ungulate sinks to 70 percent or more of its chest height, it becomes very difficult to move and high energy expenditures occur.

The activity and home range size of a deer is reduced as snow depth increases. White-tailed deer usually seek heavy coniferous cover and only move out of it to obtain food.

2. Available

The snowdepth on the study area greatly influenced the distribution of deer. Snow depths in the winter of 1981-82 became so great above 2700 feet that deer were almost virtually excluded from these areas. Snow depth and temperature records are shown in Figure (4). Snow depths were recorded on the days I was out in the field while temperatures were obtained from the Castlegar weather office.

Figure (4). Minimum-Maximum Temperatures and Snow Depth at Rosebud Lake Study Area in Winter of 1981-82

Date	Min.Temp.°C	Max. Temp.°C	Snow Depth	
			Open	Dense
Jan 16	-6.6	-5.6	57	48
Jan 17	-11.3	-1.4	59	48
Jan 23	-5.4	-1.2	85	68
Feb 7	-11.8	-2.4	73	64
Feb 22	-4.8	0.6	52	41
Mar 6	-4.0	6.7	47	39
Mar 14	1.8	4.8	40	32
Mar 21	-0.3	13.7	33	18

F. Temperature and Wind

1. Preferences

Temperature and wind conditions do not usually determine the location of a wintering area. In exceedingly cold weather deer will seek shelter in thick coniferous cover, although the insulating quality of their hairs usually prevents them from discomfort. Deer tend to avoid windy areas probably because its harder to locate the source of any smells or noises.

2. Available

The lowest recorded temperature during the 1981-82 winter season was -19.8 degrees celsius. This temperature would not present a hazard to the deer population. The average low temperature for the three months of January, February and March was 04.56 degrees celsius. These temperatures would not severely affect the white-tailed deer in any manner.

The prevailing winds for the months of December and January were south/southwest but they changed in February and March to north winds. The average windspeed for the three months of January, February and March was 7.13 km/h.

G. Predatation ??

1. Preferences

The cougar (Felis concolor) and the coyote (Canis latrans) cause the death of some deer on winter ranges. The cougar is a solitary hunter and has the capability to kill a deer in prime condition. The coyote is a less

formidable predator and usually kills young, old or weakened deer.

Other possible predators of very young deer or weakened deer are the black bear (Ursus americanus), bobcat (Felis rufus), lynx (Felis lynx), and red fox (Vulpes vulpes). A variety of carnivous birds such as hawks, owls or eagles may occasionally take very young deer.

Predators are neccessary in nature because they maintain a balance in the deer populations and prevent them from reaching too high a population. Man has replaced the role of the predator to a great extent. Less predators are needed because man controls deer numbers through recreational hunting.

2. Available

The coyote (Canis latrans) is the most common predator of white-tailed deer found on the study area. I would estimate that at least five coyotes use the study area and nearby areas for feeding. I personally observed four seperate pairs of coyote tracks indicating four coyotes. One young white-tailed doe was found that had been killed by a pair of coyotes.

I also observed one set of lynx or bobcat tracks on the study area. I talked with a couple of people who reported to have seen a couple of cougar west of the study area, across the Salmo river in the Shenango Canyon. I did not see any cougar signs on my days out in the field although it is highly probable that they do hunt within the study area. Black bear also inhabit the area and

pose a potential threat to young or weakened deer. The presence of an immature bald eagle feeding on the coyote killed deer suggests that a few fawns could be lost to predatory birds. See Appendix (B).

H. Competition

1. Preferences

a. Elk

Elk are primarily grazers but resort to browse plants during the winter season. Where elk and white-tailed deer utilize the same winter range direct competition will inevitably result.

Elk are much larger than deer with a chest height of about 90 cm. Therefore, elk are able to negotiate in deeper snow to obtain food. Because of their large size elk are able to reach twigs that would be out of a deer's reach. Elk also consume a greater amount of browse than a deer and utilizes larger twigs than a white-tailed deer can.

With all these factors combined elk have the ability to deplete a small winter range quickly and thereby limit the number of deer able to survive on that range.

b. Cattle

Cattle are primarily grazers so deer face competition with them only when the cattle are forced to consume browse as well as grassed. This commonly occurs where overgrazing is the situation. Cattle are normally put onto the range early in spring so they can graze on new leaves, buds and flowers. As the grasses on a range mature and dry out, cattle increase their intake of decidious

browse. This usually happens in late summer an fall and therefore places a further stress on the deer by reducing their winter forage supply (24).

2. Available

a. Elk

Approximately twenty-five elk inhabit the study area or nearby locations. This herd of elk competes extensively for a favoured browse plant called red-stem ceanothus (ceanothus sanguineus). This plant is heavily browsed; in many areas almost to 100 percent. Through the mid-winter period of 1981-82 the white-tailed deer and elk were segregated most of the time because of elevation. The elk utilized the more open shrub covered areas above 2800 feet while the deer for the most part remained below 2600 feet. Just because the white-tailed deer and elk were segregated for most of the winter does not mean that competition does not exist. As the winter snows recede, many deer move higher up the hillside only to find areas heavily browsed by elk. The elk also utilized the lower portions of the study area when snow depths became excessive. This caused some direct competition with wintering white-tailed deer.

b. Cattle

Some ranchers do range their cattle in the Rosebud Lake area. However, the number of cattle using the main wintering area is few. The cattle appear to prefer grasses rather than browse material so not much competition occurs at this time. If more cattle are ranged on the

study area competition could result.

I. Human Interactions

White-tailed deer have the instinct and adaptability that allows them to live in close proximity to man.

The winter period is critical for the deer. While on the winter range the white-tailed deer is subject to many stressful situations such as deep snows, lack of food and interaction with predators. Any further stresses such as harrassment by humans or dogs could cause massive energy expenditures which could cost the deer its life. Winter range areas for white-tailed deer should be avoided sothat wintering deer have to face only natural stresses and not the additional stresses of human interaction.

2. Available

Rosebud Lake and the area immediately adjacent to it are extensively used by winter recreation enthusiasts. Rosebud Lake is used by ice fisherman while the roads and trails around the lake are used by cross-country skiers and snowmobilers. Ice fisherman and cross-country skiers do not disturb the wintering deer. These recreationists stay close to the lake and avoid conflicts with deer. Snowmobilers do however disturb deer to a certain extent because they often used old roads and trails which cross through prime deer wintering areas. One good feature is that snowmobilers usually stayed on the roads and trails because the forest was too thick to allow them to go elsewhere. In this way the disturbance of the wintering deer was reduced.

IX Results of Habitat Analysis in Association with the Four Winter Periods

A. Early Winter

1. Location of Deer in Relation to:

a) Snowdepths

The early winter period began when the deer moved onto the winter range in September and October in preparation for the breeding season and ended by December 15th when snowdepths had reached approximately 15 inches.

At the start of the early winter period the deer were distributed throughout the winter range to take advantage of the food source. During the main breeding season in October and November the deer concentrated in an area just north of Rosebud Lake. See Figure (5). As the early winter period progressed the snowdepths began to hinder deer movements. At this time many deer relocated themselves to a lower elevation area in preparation for the harsh mid-winter period. A small group of deer however remained in the area just north of Rosebud Lake. See Figure (5).

b) Food

The early winter period is a time of relative abundance in comparison with the other winter periods. Deer take advantage of this time and feed on a wide variety of plants. Herbaceous plants are available along with the woody browse plants which will consist of the main food available to deer during the long winter. As the snows arrive the deer are forced to abandon their feeding on herbaceous plants and turn almost entirely to woody browse plants. During the early winter period the favoured browse plant was red-stem ceanothus. Areas covered in false-box were also used as a food source.

c) Cover

When the deer first moved onto the winter range they sought sanctuary from hunters and a place to carry out their breeding. The deer utilized the thick decidious cover along Rosebud Creek for this purpose. The presence of numerous scrapes and rubs along these areas indicates this.

When the snow came the deer were forced to leave the higher elevations along Rosebud Creek and move to lower elevations. At the low elevation areas the deer concentrated in thick coniferous cover. As snow depths increased deer movements decreased so that less energy would be expended.

d) Aspect and Slope

At the beginning of the early winter period the deer utilized all aspects and slopes within the study area. No snow was yet present to restrict the movements and thereby the location of the deer. When the snow did arrive most of the deer migrated to a lower elevation area with a predominantly westerly aspect. Much of the area consisted of steep slopes up to 60 percent. The deer used this area because the steep slopes helped lessen snow depths and the thick coniferous cover helped intercept snow.

e) Water

For most of the early winter period deer were able to obtain water from small creeks and the Salmo River. When the creeks froze over most of the deer probably used snow as a source of water. From observing deer tracks crossing the highway I concluded that few deer continued to travel down to the Salmo River because of the long distance through quickly deepening snow.

f) Health of the Deer Population.

The deer population entered the early winter period in excellent condition. The large summer range that they had occupied had left them in good shape.

When the deer first arrived on the winter range food was fairly abundant in the form of herbaceous and woody plants. The only competition the deer faced was a herd of about 25 elk. The elk competed heavily for a preferred browse plant called red-stem ceanothus. The deer were in good health and I would conclude that they had little trouble avoiding predators.

When the snow arrived the deer were restricted to a smaller area and were forced to consume low nutrient woody browse plants. Less of the preferred browse plant, red-stem ceanothus, was available to the deer. The deer consumed mainly saskatoon, waxberry, thimbleberry, and falsebox plants. The deer faced little competition at this time because the elk had remained at the higher elevations. The deepening snow forced the deer to expend more energy in obtaining food and in avoiding predators.

B. Mid-Winter.

1. Location of Deer in Relation to:

a) Snowdepths

The mid-winter period began about December 15th when snowdepths of approximately 15 inches hindered deer movement in open areas. The mid-winter period ended by March 15th when reduced snowdepths on steep south or southeasterly slopes allowed deer easy movement in open areas.

By the start of the mid-winter period most of the deer had relocated themselves to low elevation slopes. Areas with a west, southwesterly aspect below 2600 feet were most often used. See Figure (6). Some deer however remained above 2600 feet in an area north of Rosebud Lake. See

Figure (6).

b) Food

The mid-winter period is the most difficult and longest winter period that the deer must endure. It is at this time that food is at its lowest abundance and a deers mobility is reduced due to great snowdepths.

Snowdepths during the mid-winter period reached a high of about 85 centimeters. This large amount of snow buried all herbaceous plants and forced deer to consume woody browse plants.

When deer could locate it, red-stem ceanothus was by far the preferred browse plant. However the densely forested mid-winter area provided an unfavourable growing area for red-stem ceanothus. Therefore deer browsed on less preferred plants such as saskatoon, waxberry, buffaloberry, thimbleberry and cedar. The deer also spent much time and energy pawing away the snow to obtain the leaves of falsebox plants.

c) Cover

At the start of the mid-winter period the deer had already moved onto the low elevation slopes. For the most part these slopes are densely covered with coniferous trees and shrubs.

The ratio of coniferous cover to decidious is approximately 75 percent coniferous to 25 percent decidious. The coniferous cover is mainly lodgepole pine and douglas fir with paper birch making up most of the decidious cover. Shrubs such as saskatoon, waxberry and buffaloberry are also abundant.

The deer on the mid-winter range do not lack cover, but in fact may have more cover than needed as the ideal cover ratio is 60 percent coniferous to 40 percent decidious.

During the mid-winter period the deer remained in thick cover as much as possible. Deer often used old roads and trails while moving from one browse area to another.

d) Aspect and Slope

The mid-winter period found the deer on a westerly aspect with steep slopes of up to 60 percent. The combination of westerly aspect and steep slopes helped reduce snowdepths by as much as 15 percent from a level north or east aspect. Therefore deer were better able to move in search of food and escape enemies.

e) Water

During the mid-winter period snowdepths were sufficient to severely hinder deer movement. Even with all this snow I observed as many as thirteen deer trails leading to the highway. Most of these trails ended at the highway although a few continued down to the Salmo River. Evidently some deer were using the river as a source of water while others may have obtained water from the snow.

f) Health of the Deer Population

The deer population began the mid-winter period in relatively good health. The mid-winter period lasted 3 months and the deep snow and lack of preferred browse left many deer in a weakened state.

I would suspect that a few deer did succumb to the hardships of this stage of winter. Some deer may have died directly by starvation while others may have provided an easier prey for predators. I did not find any deer carcasses during the mid-winter period however I did observe coyote feces which contained deer hair.

The deer on the mid-winter range faced some competition with the elk herd although the elk only remained in this

area a short time.

C. Late Winter

1. Location of Deer in Relation to:

a) Snowdepths

The late winter period began approximately March 15th when most of the snow had melted off steep, open, south, southeasterly and westerly aspects. The late winter period ended by May 15th when snow had receded off most low elevation sites.

At the start of the late winter period snow over much of the study area was still at least 12 inches in depth. Many deer abandoned their low elevation mid-winter ranges and moved up to higher open slopes which were void of snow. The deer fed in these open sites and bedded in thick cover nearby. See Figure (7) for the location of the deer during the late-winter period.

b) Food

During the late winter period the deer moved to the open hillsides to feed on new growth that would appear quickly. New grasses, herbs and buds on woody shrubs would soon appear. Deer took advantage of this new growth as well as the easier access to old growth plants. Before the new growth appeared the deer fed on old growth shrubs such as red stem ceanothus, waxberry, buffaloberry, falsebox, saskatoon and some oceanspray.

As the late winter period progressed the deer began to feed in some agricultural fields. The deer began feeding nocturnally as they ventured out in the fields to obtain new grasses.

c) Cover

During the late winter period the deer became less dependant on cover. They fed on the open slopes and fields at night and used nearby cover during the day to hide from enemies.

The cover they chose at this time of the winter was not necessarily coniferous cover. The snow was quickly melting and the deer did not need the shelter of conifers for protection against the snow. Therefore the deer usually sought out thick decidious cover such as that found in old growth oceanspray and red-stem ceanothus.

d) Aspect and Slope

The late winter period began with the deer moving up to open south, southeasterly and southwesterly aspects. These open slopes varied in grade from approximately 20-6- percent. The southerly aspects combined with a steep grade accelerated the snows withdrawal. The deer favoured these slopes because of their early snow melt and the early appearance of new grasses and herbs.

e) Water

More deer began to travel down to the Salmo River for their water. However at the start of the late winter period the snows were still quite deep along the river flatlands. Therefore many deer probably still relied on snow or found small melt water streams. As the late winter period progressed small creeks would appear to satisfy the deer's needs.

f) Health of the Deer Population

The deer population within the Rosebud Lake study area had just finished a hard three month mid-winter period. Deep snows attributed to a loss of mobility and therefore the deer

found it harder to find food.

All of the deer population weakened as a result of the mid-winter period but the young deer suffered the most.

On March 21st we found a dead deer on the study area. Evidently the deer had been killed by a pair of coyotes as we found coyote tracks and two puncture holes in the does neck to confirm this.

The deer was a young doe approximately 10 months old. The deer appeared to be in very poor condition. I removed lung, heart, liver, stomach and leg bone samples. The lung, heart and liver samples were found to have no abnormalities. Upon examination of the stomach contents it was found that the doe had been feeding almost entirely on falsebox (paxistima myrsinities). From the leg bone samples I removed some fresh marrow and then weighed it. I then placed the marrow in an oven at 70°C for 96 hours. After this time the marrow was again weighed and the percentage of fat in the marrow was calculated. The doe was found to have 12.08 percent bone marrow fat which indicates the deer was in a fairly advanced stage of starvation. Any deer with a bone marrow fat content of less that 25 percent is in a very weak condition. The young doe found on the study area must have been very weak and therefore it became easier prey for the two coyotes. The snow depth at the kill site was only 6 inches and should not have hindered the deer too much.

The young doe was also carrying two fetuses; one male and one female. No deformities were associated with the fetuses. The fetuses appeared to be at the 86-90 day old development stage. This would make the 10 month old doe a late breeder at around December 20, 1981.

The post-mortem examination of the doe indicated that the deer was in a weakened state therefore becoming easier prey to coyotes. Under the same snow conditions a pair of coyotes chasing a healthy deer would have had a more difficult time catching it.

The results of the post-mortem examination conclude that the mid-winter period was very hard on the deer and must have resulted in the death of other deer.

D. Early Spring

I was not available to make observations of the deer on the Rosebud Lake study area during the early spring period. Therefore I will make some general comments and conclusions on the deers use of the study area at this time.

The early spring period began around May 15th and ended during the deers fawning period. White-tailed deer usually fawn between late May and July.

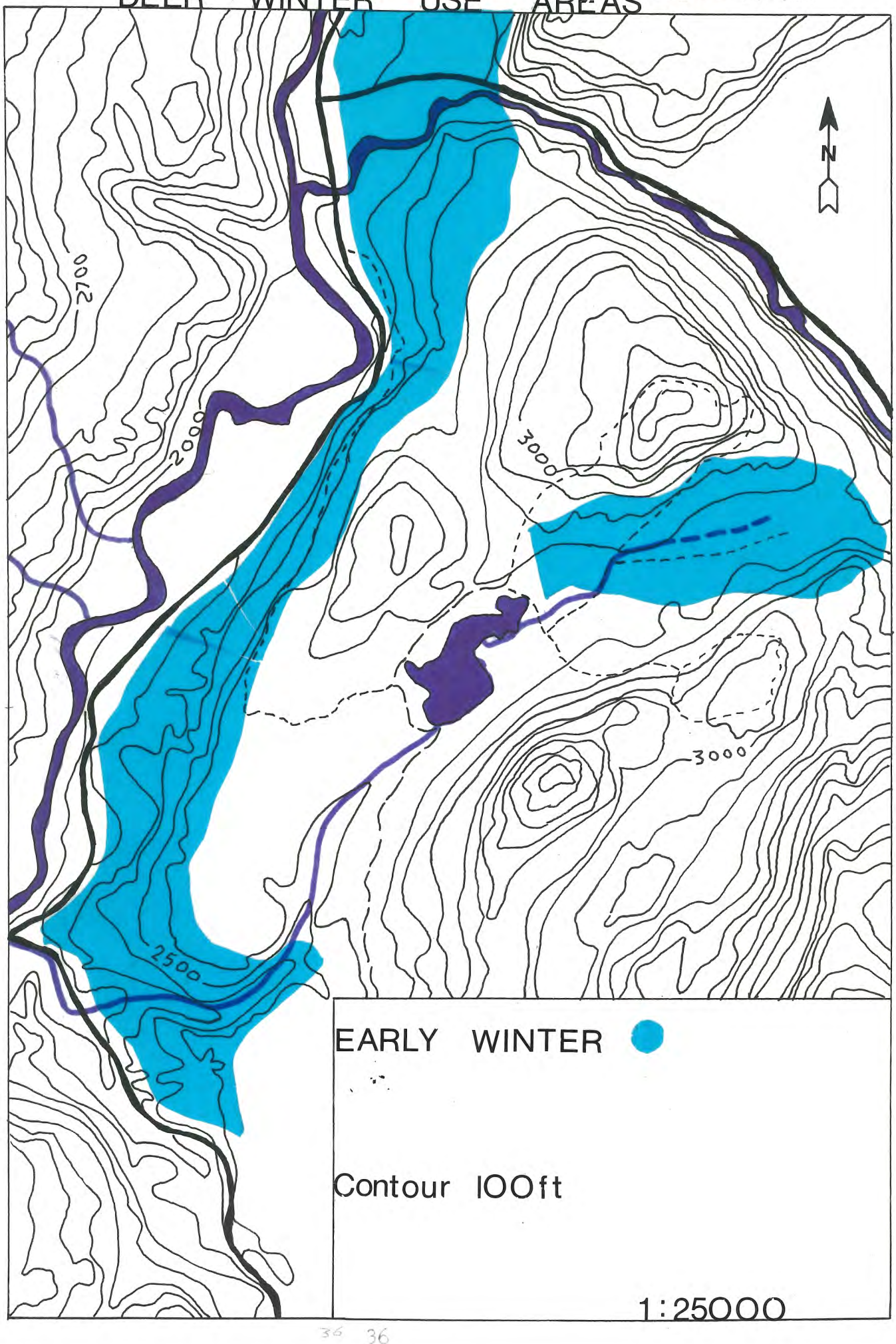
By May 15th the snow would have disappeared off low elevation slopes. Many of the deer, except the bucks, would remain behind to have their fawns. The deer would feed nocturnally; often taking advantage of the new grasses in the agricultural fields. The does would feed in open areas and use thick cover nearby for bedding and fawning.

During the early spring period the deer would form small groups consisting of a doe, her yearlings and that year's fawns. As the fawns were born the does would also begin their upward migration to summer ranges. The deer would disperse over the summer range and would utilize all aspects and many slopes. During the early spring period water is abundant in the form of small creeks and melt water channels.

The early spring and summer period is a time in which the deer feed heavily on the lush vegetation so that they may build fat reserves for the oncoming winter weason. A wide variety of

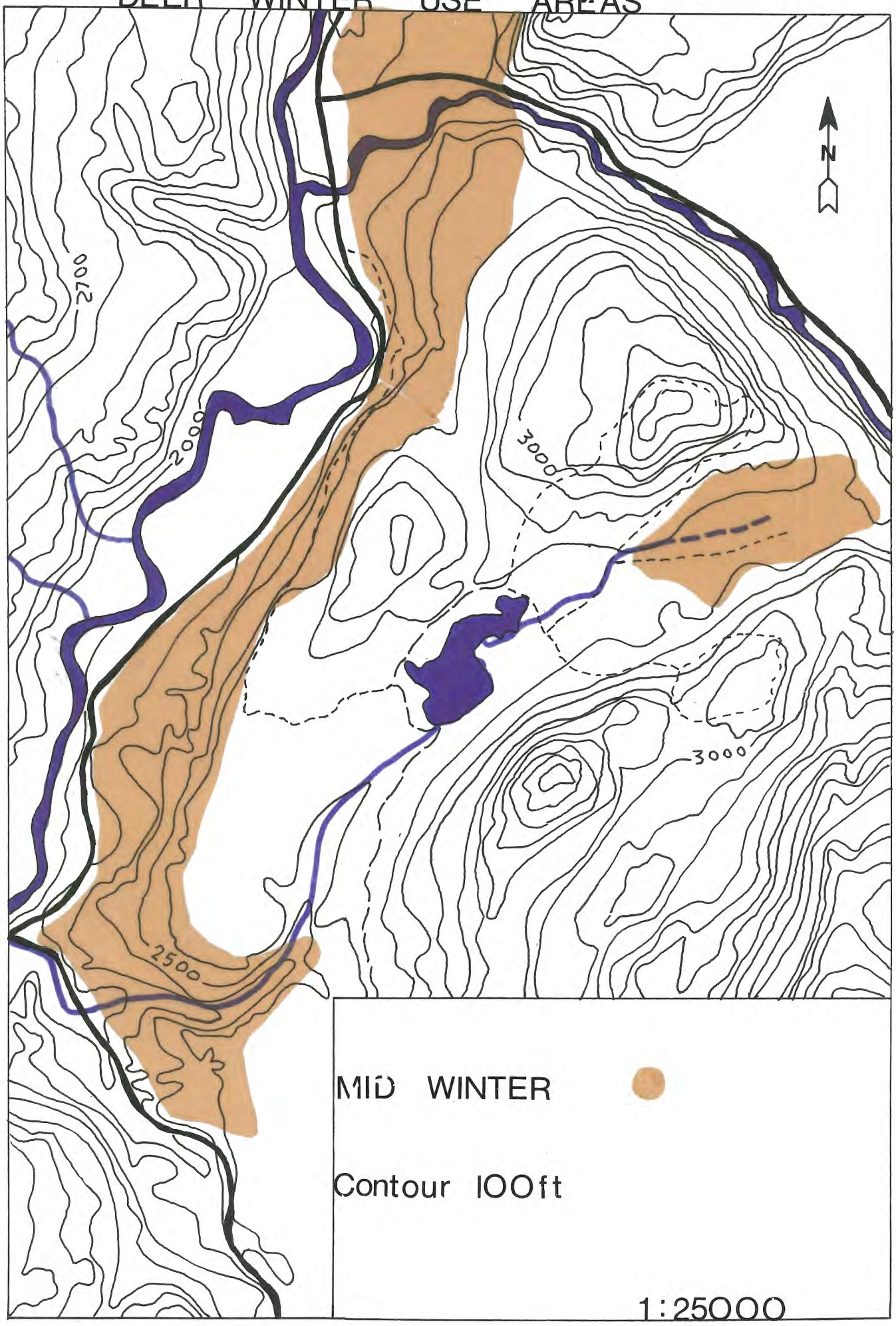
DEER WINTER USE AREAS

Figure 5,6,7.



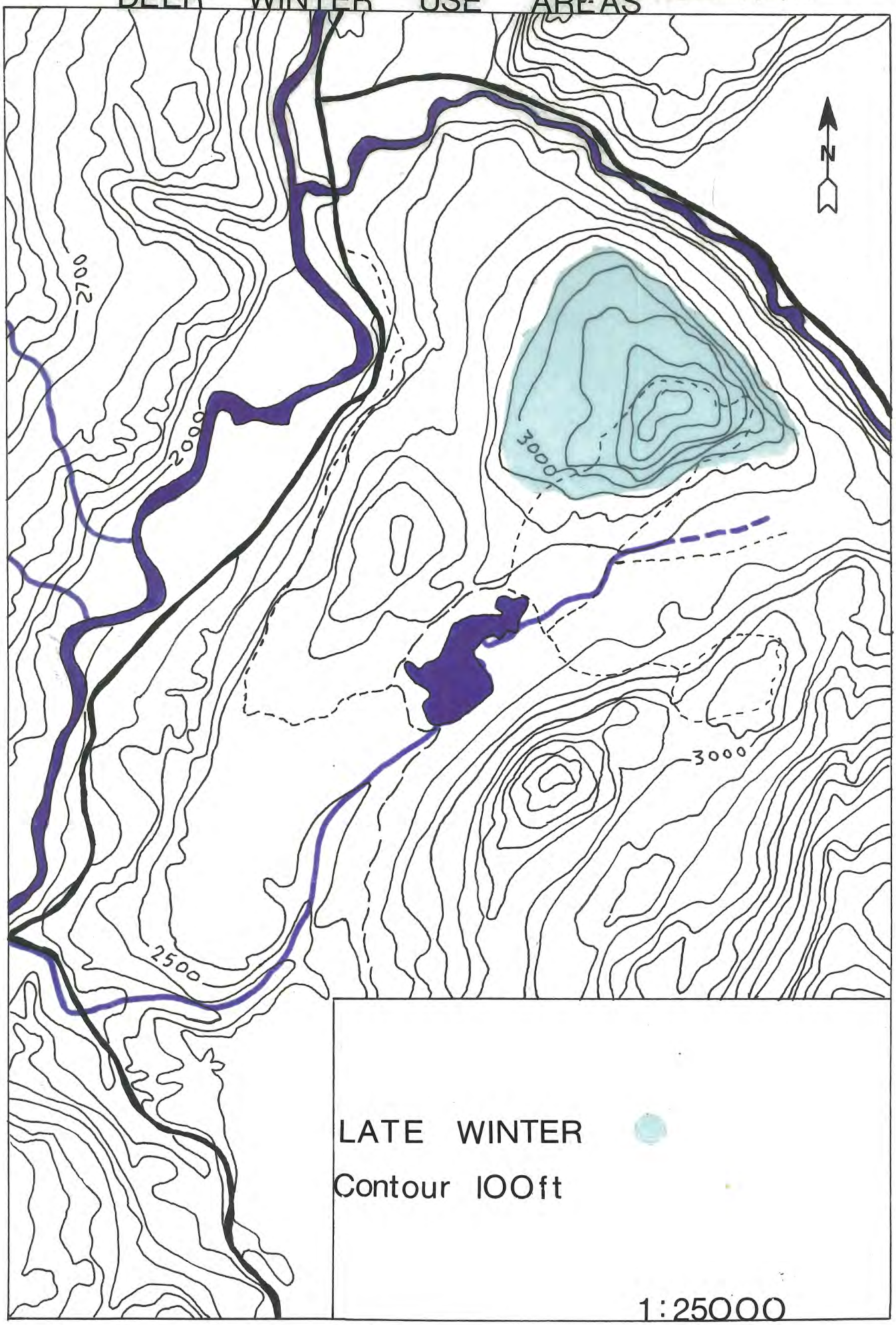
DEER WINTER USE AREAS

Figure 5,6,7.



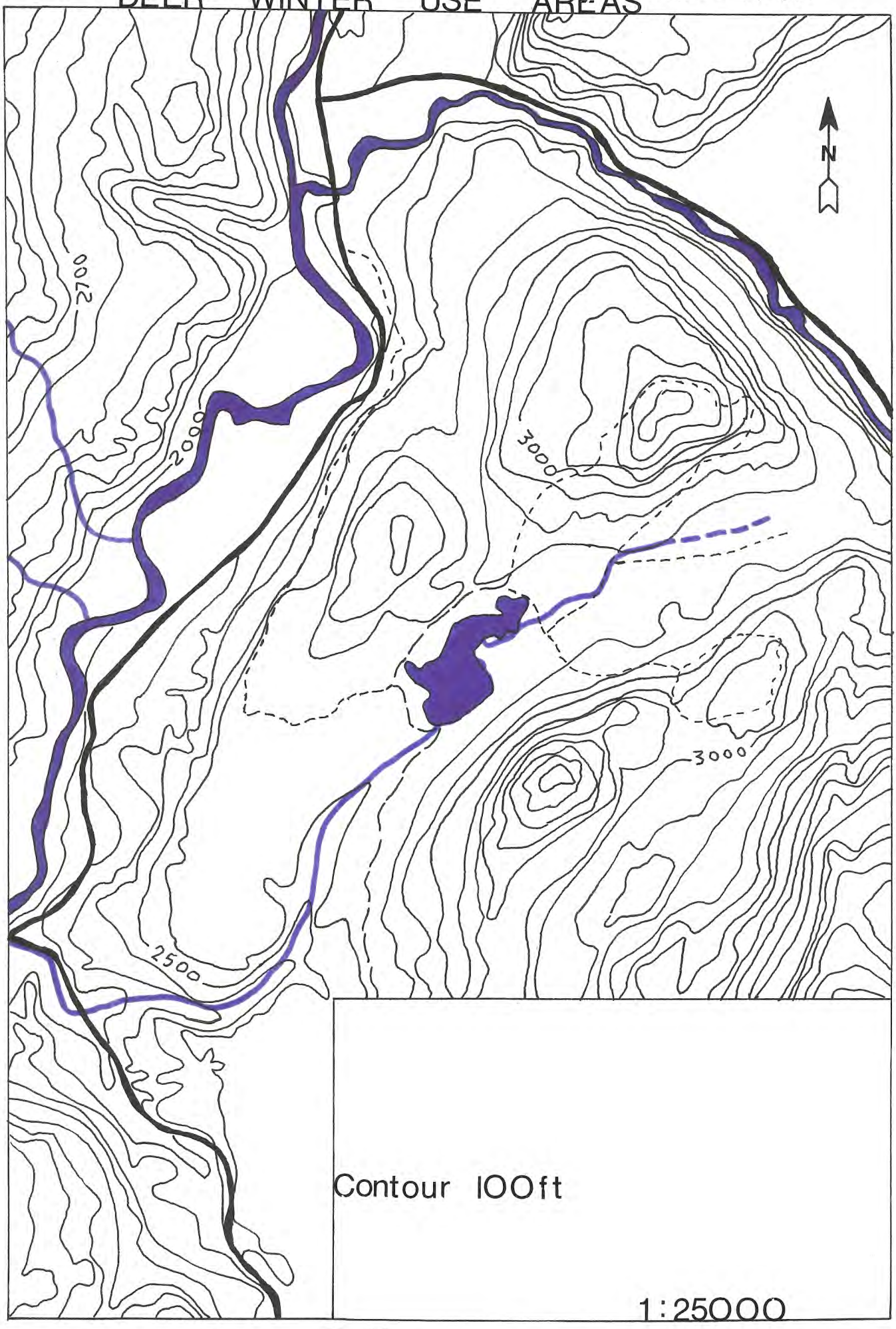
DEER WINTER USE AREAS

Figure 5,6,7.



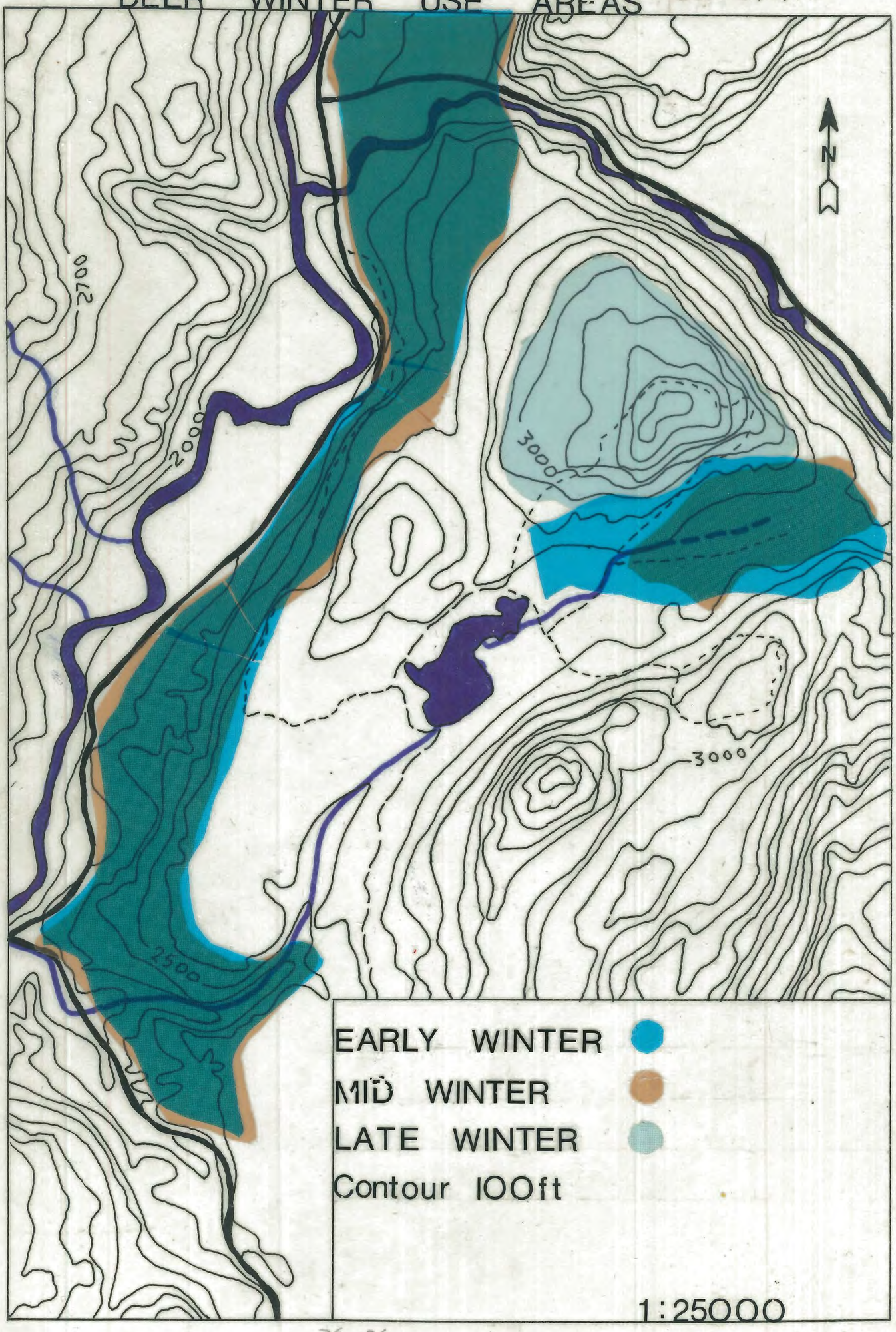
DEER WINTER USE AREAS

Figure 5,6,7.



DEER WINTER USE AREAS

Figure 5,6,7.



grasses, herbs and shrubs would constitute the deers diet. The deer would quickly regain their health which had suffered during the mid-winter period.

X Habitat Management Recommendations

A. General Recommendations

1. High elevation summer range slopes should be managed to ensure that deer stay on these areas as long as possible to reduce impact on winter range areas. Summer ranges could be manipulated through the use of selective logging and prescribed burning. When logging occurs in the summer range area a ratio of 60 percent forage to 40 percent cover should be maintained. After an area is logged it should be burned to promote plant growth. The area should be burned every 10-15 years to keep the shrubs within the deers level.

2. Conduct a detailed soil analysis of the Rosebud Lake study area to determine its erosional properties after a prescribed burn.

3. Vegetation manipulation in the Rosebud Lake study area should mainly involve prescribed burning and shrub cutting. Shrub planting and fertilization are rather detailed habitat management options. Planting and fertilization should only be used as a last resort because of its high expense and time involved.

4. Any openings created through prescribed burns or selective logging should be kept to a maximum diameter of 50 meters. All openings should be of irregular shape to maintain a large edge ratio which is beneficial to deer.

5. Adopt snowmobile use restrictions within the Rosebud Lake area. Confine all snowmobiles to the lake area to prevent harrassment of the deer during the critical winter periods.

6. Signs warning motorists of deer crossings should be established from the 3-6 intersection south to Nelway.

7. Elk populations in the Rosebud Lake area should be monitored. If the elk population rises steadily a hunting season may be necessary to regulate the elk numbers. This would prevent excessive competition between the larger elk and the smaller white-tailed deer.

8. Adopt some type of a Coordinated Resource Management Plan to control use within the study area. Recreationists, ranchers and loggers could work together to ensure that the Rosebud Lake area remains a well established deer wintering range.

B. Specific Recommendations

1. Rejuvenation and Controlled Burn Program

The Rosebud Lake study area generally has sufficient cover for wintering deer. Most of the study area supports a high density and wide variety of shrub plants. A lack of the preferred browse plant (Red stem ceanothus) does occur on much of the winter range. When red-stem ceanothus and other favorite browse plants are found they are often old and decadent. The purpose of a rejuvenation and controlled burn program on the study area is to open up these old growth shrub areas and revitalize these areas by stimulating new shrub growth.

In this report the term rejuvenation will refer to the practice of either logging to create small openings or controlled burns to stimulate new plant growth. On small logged openings an increase in shrub forage yield usually occurs. Controlled burns also increase forage yields by increasing soil fertility and promoting plant vigor by the removal of old shoots. Controlled burns release nutrients into the soil, thereby leading to an increase in the protein content of resprouting shrubs.

The first area of concern is the area indicated by Figure (6). This area is the main wintering area during the early winter and critical mid-winter periods. Except for the small area north of Rosebud Lake the main early and mid-winter use

area lies below 2600 feet on a westerly aspect. Much of the area is covered in dense stands of lodge-pole pine and douglas fir with small amounts of cedar. Natural openings contain paper birch trees and a wide variety of shrubs such as saskatoon, waxberry, buffaloberry, thimbleberry and falsebox plants. Many of these shrubs have grown out of the reach of deer. The dense coniferous canopy also provides an unfavourable location for ceanothus shrubs.

The objective in the mid-winter area is to create a number of well spaced openings where new shrub growth can appear. Small irregular shaped openings 25-50 meters across should be designed. One or two of these openings in every 5 hectares of mid winter range would provide much needed browse. After openings such as these have been constructed a controlled burn could be conducted to increase soil fertility and help stimulate new shoot production. These openings could be managed on a rotational basis. When the shrubs in one opening are reaching maturity another opening could be burned to establish new growth and a food source for the deer.

The second area of importance is the area indicated by Figure (7). This area is used extensively by the deer during the late-winter period. It is also a favoured area for the elk herd during the winter months.

During the late-winter period the deer utilize these open, higher elevation slopes which first become free of snow. These slopes provide an ideal site for the growth of numerous red-stem ceanothus shrubs. Many of these shrubs however have become old and decadent and few new shrubs are there to replace them. The objective in the late-winter area is to stimulate new growth on these old ceanothus shrubs and also establish new plants. A

controlled burn could be conducted on the entire hillside. A controlled burn done in the fall would release nutrients into the soil and could also help activate the ceanothus seeds buried in the soil. Next spring the old plants would produce new buds and shoots while new shrubs would also establish themselves. The deer after facing a hard mid-winter period would have a bountiful food source during the late winter period. Adequate cover should be left nearby so that the deer will have bedding areas and predator escape routes.

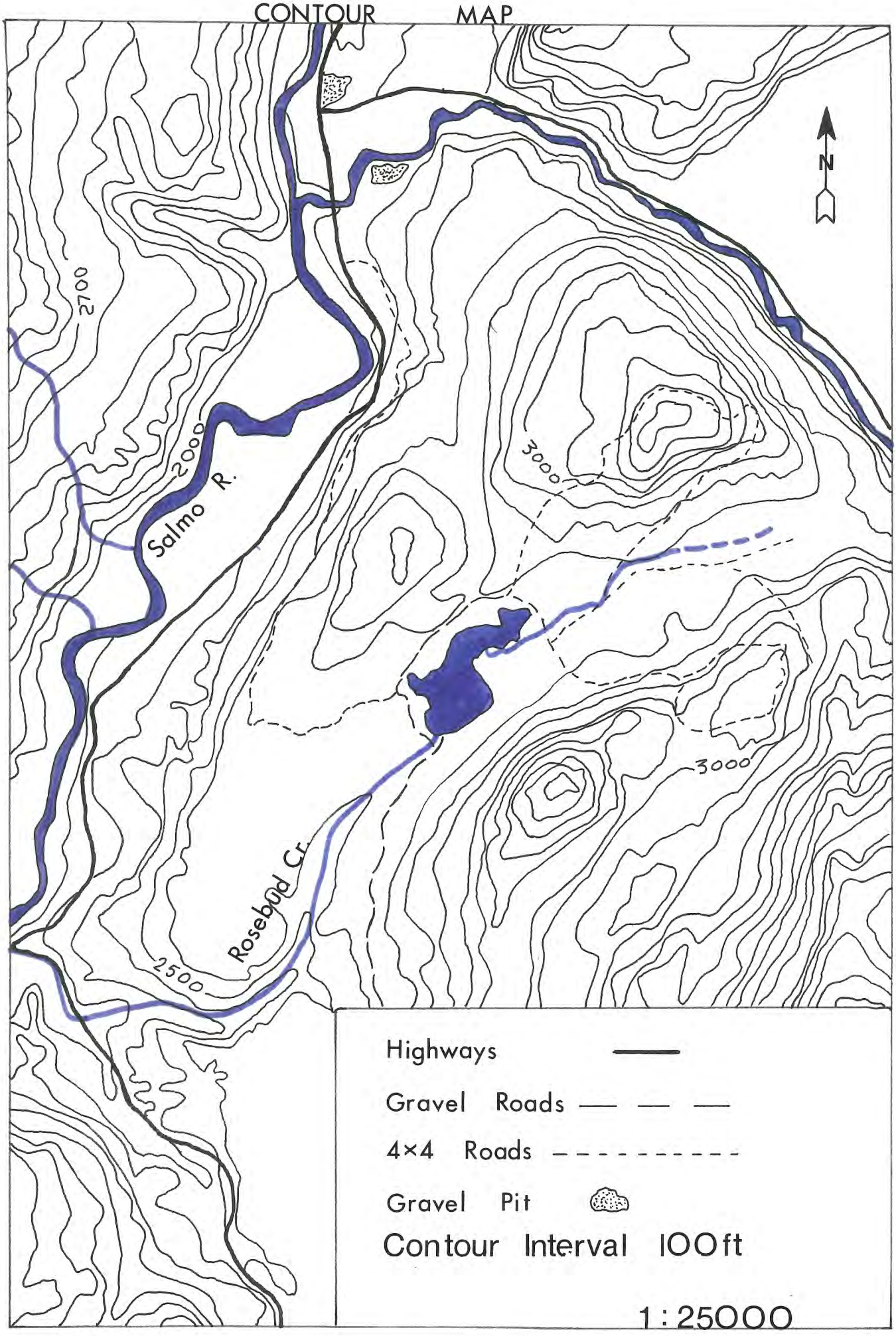
2. Planting Program

A planting program although expensive may be benificial in areas. A less expensive form of planting would be to direct seed rather than the transplanting of shrubs.

Ceanothus seeds can be collected in the fall and stimulated to germinate by boiling them in water for two to four minutes. The seeds are then planted and after a four month cold period they will germinate in the spring. This type of planting program would best be suited for the late winter use area. Ceanothus grows well here and is the preferred browse plant by both deer and elk.

Appendix A

CONTOUR MAP


N
2700
2000
Salmo R.
3000
3000
Rosebud Cr.
2500
Highways
Gravel Roads
4×4 Roads
Gravel Pit
Contour Interval 100ft
1:25000

Appendix B

Post-mortem Examination Results of White-tailed Doe Found on Rosebud Lake Study Area March 21, 1982.

Site and Kill Description:

-White-tailed doe found March 21 approximately 50 feet from power line right of way.

-Snowdepth 15-18 cm, snow was crusty, coyote walked on top of snow while deer sank approx $\frac{1}{2}$"

-Two sets of coyote tracks were present.

-Two holes in neck indicate method of kill, holes in neck are 5.2 cm apart, first hole is approx. 7cm x 1.5cm and second hole is 1.2cm x 1cm.

-The doe appears to have been killed approx. 24 hours before we found it, most of the blood had collected in the abdominal cavity which had been torn open by the coyotes.

-The doe appeared to be quite thin

Post-Mortem Examination Results:

-Samples were taken of the following: lung, heart, liver, leg bone, tooth, stomach, ovaries and fetuses

-Lung, heart, liver and ovary samples observed under the microscope indicated no abnormalities

-Stomach contents were primarily falsebox leaves

-Tooth samples indicated the doe was approx. 10 months old

-Two fetuses were found inside the doe. No deformities were associated with the fetuses.

FETUSES

Male	Female
23 cm	20.5 cm - Length
376.23 grams	231.97 grams - Weight

-The two fetuses were at the 86-90 day developmental stage

-A sample of the bone marrow was taken and dried at 70°C for 96 hours

Fresh Marrow = 7.78 grams

Dried Marrow = .94 grams

$$\frac{.94}{7.78} = 12.08\ \%\ \text{fat}$$

-12.08 percent bone marrow fat indicates the doe was in a state of advanced starvation

PHOTOGRAPHS OF WHITE TAILED DEER FOUND ON ROSEBUD LAKE STUDY AREA.

Photo I. Doe lying dead on old road.

Photo 2. Holes in deers neck made by coyotes.

Photo 3. Immature bald eagle found feeding on dead deer.

Photo 4. Abdominal region of deer torn open by coyotes.

Photo 5. Close ups of the does placenta and two fetuses.

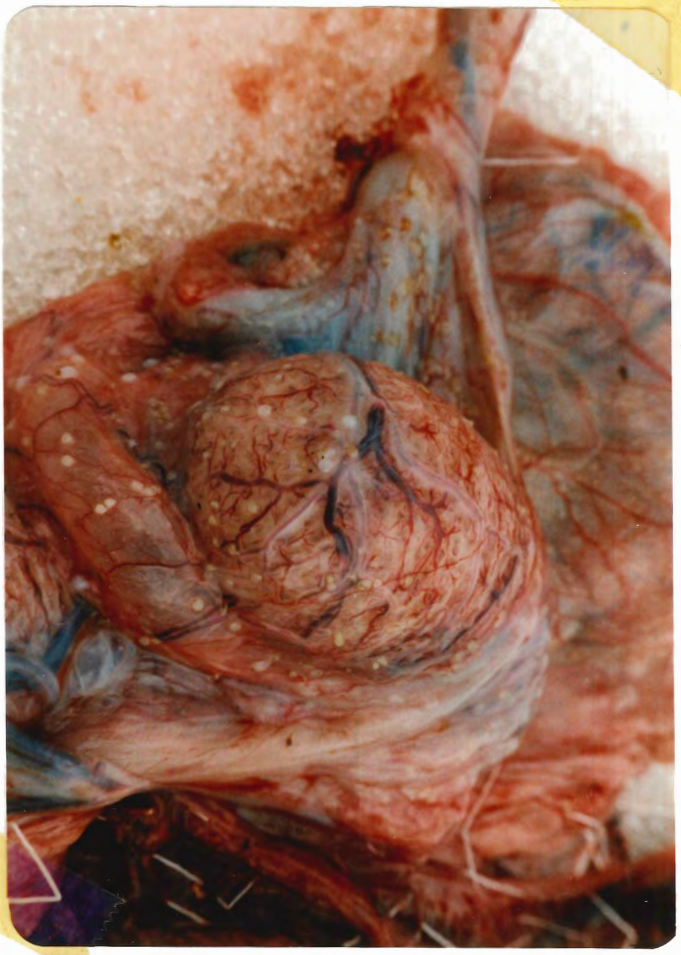


Photo 6. Does stomach contents containing a large amount of falsebox leaves.

Appendix C

Location: Rosebud Lake
Date: March 6, I982
Weather: Clear and Sunny

Plot Size: radius 3.99m
Distance Between Plots I00m

Browse Rating:

L/ Trace to I0%
M/ I0 to 50%
H/ 50 to I00%
N/ None

FIXED RADIUS PLOT METHOD

Plot No#	Layer	Species	Total No#	Ave Ht.(m)	Ave Crown Dia.(m)	Browse Rating	Aspect % Slope
I0I	Tree	L.P. Pine	3	23.5	3.2	N	20/25% Ea
	Shrub	L.P. Pine	3	I.60	.30	N	" "
		Ocean Spray	I	I.90	I.53	N	" "
		Paper Birch	4	5.0	.90	N	" "
		Mallow Ninebark	3	I.2	.40	N	" "
		Willow	I	2.I	.25	N	" "
		Buffaloberry	4	I.3	.55	N	" "
I02	Tree	Douglas Fir	3	I5.5	2.4	N	I0% Ea.
		Black Cottonwood	2	I5.0	I.8	N	" "
		White Pine	2	I2.0	2.I	N	" "
	Shrub	Saskatoon	4	2.I	.35	M20%	" "
		Waxberry	2	.73	.60	LI0%	" "
		Mallow Ninebark	I	I.2	.50	N	" "
I03	Tree	Paper Birch	5	I2.0	I.9	N	I3% S.E.
	Shrub	Cedar	I	3.2	.75	N	" "
		Engelmann S.	I	2.06	.58	N	" "
		Saskatoon	I5	2.40	.30	L5%	" "
		Waxberry	I	I.I7	.65	N	" "
		Black Cottonwood	4	I.25	.70	N	" "
20I	Shrub	Ocean Spray	7	2.0	I.2	L5%	25% S.E.
		Waxberry	5	.50	.25	N	" "
		Mallow Ninebark	3	I.2	.40	N	" "
		Redstem Ceanothus	2	2.9	I.0	MI5%	" "
202	Tree	Douglas Fir	I	I6.8	2.6	N	I5% S.E.
	Shrub	Willow	2	4.5	I.5	N	" "
		Engelmann S.	I	2.43	I.I	N	" "
		Thimbleberry	25	.80	.20	N	" "
		Bracken Fern	I0	.50	.40	N	" "
		Buffaloberry	I	I.27	.60	N	" "
30I	Shrub	Willow	I	3.3	2.5	N	39% S.
		Waxberry	2	I.97	I.5	L5%	" "
		Mallow Ninebark	I2	I.2	.45	N	" "
		Buffaloberry	3	I.45	.43	N	" "
		Oregon Grape	I0	.20	.20	N	" "
		Redstem Ceanothus	4	I.8	I.30	H90%	" "
302	Shrub	Waxberry	5	I.45	I.23	L5%	42% S.
		Mallow Ninebark	8	I.I	.55	N	" "
		Buffaloberry	4	I.4	.45	L5%	" "
		Oregon Grape	7	.30	.25	N	" "
		Redstem Ceanothus	5	I.6	I.I5	H90%	" "

Location: Rosebud Lake
Date: March 14, 1982
Weather: Cloudy, Cool and Rainy

Plot Size: radius 3.99m
Distance Between Plots: 100m

Browse Rating:

L/ Trace to 10%
M/ 10 to 50%
H/ 50 to 100%
N/ None

FIXED RADIUS PLOT METHOD

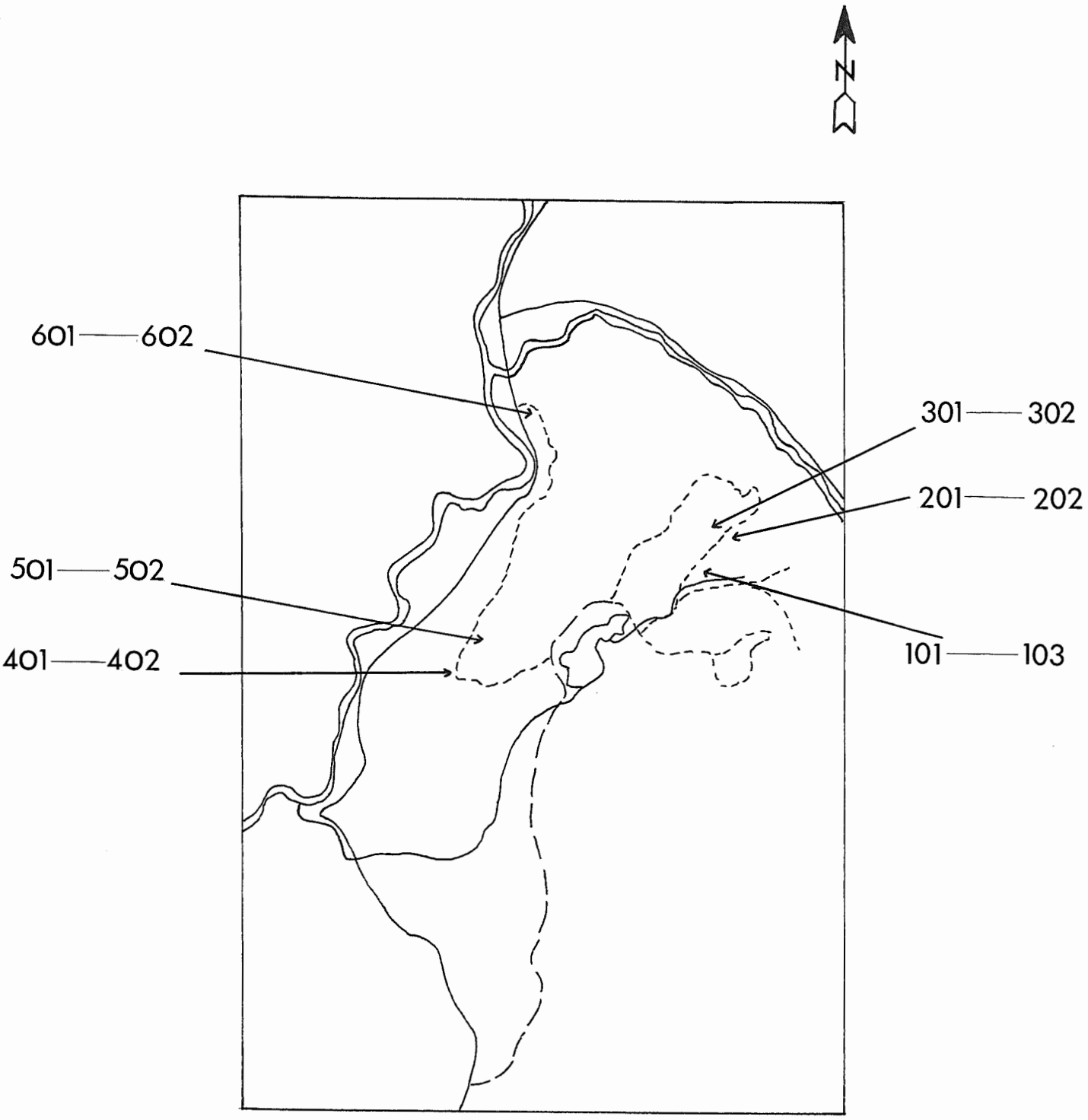
Plot No#	Layer	Species	Total No#	Ave Ht.(m)	Ave Crown Dia.(m)	Browse Rating	Aspect % Slope
401	Tree	L.P. Pine	2	9.5	1.0	N	0/7% Ea
		Douglas Fir	1	8.0	1.2	N	" "
		Paper Birch	8	8.0	1.0	N	" "
	Shrub	Saskatoon	27	1.90	.70	N	" "
402	Tree	L.P. Pine	3	18.0	2.0	N	15% Ea
		Larch	1	20.0	1.8	N	" "
	Shrub	Douglas Fir	1	1.3	.50	N	" "
		Saskatoon	30	1.4	.60	N	" "
		Buffaloberry	7	.60	.54	N	" "
		Waxberry	3	.50	.45	N	" "
		Paper Birch	5	1.8	.40	N	" "
501	Tree	L.P. Pine	5	18.0	1.5	N	5% S.W.
		Paper Birch	1	7.0	1.2	N	" "
	Shrub	Douglas Fir	1	2.6	.70	N	" "
		Engelmann S.	1	.55	.35	N	" "
		Buffaloberry	14	.85	.65	N	" "
		Saskatoon	5	1.1	.53	N	" "
502	Tree	Douglas Fir	2	8.0	1.8	N	" "
		L.P. Pine	1	9.0	2.2	N	" "
	Shrub	Douglas Fir	1	1.7	.90	N	" "
		Engelmann S.	1	1.9	.88	N	" "
		Saskatoon	17	2.1	.70	N	" "
		Buffaloberry	7	.65	.60	N	" "
601	Tree	L.P. Pine	25	9.5	1.3	N	0/5% W.
		Cedar	1	4.5	1.8	L5%	" "
		Paper Birch	2	9.0	1.5	N	" "
	Shrub	Buffaloberry	7	.60	.65	L10%	" "
		Waxberry	3	1.2	.75	N	" "
		False Box	10	.50	.35	L10%	" "
		Thimbleberry	5	.63	.25	L5%	" "
		Douglas Fir	1	.80	.45	N	" "
		Queens Cup	5	.70	.20	N	" "
602	Tree	L.P. Pine	18	8.0	1.2	N	0/10% W.
		Paper Birch	3	6.0	1.4	N	" "
		Cedar	2	4.0	1.5	L5%	" "
	Shrub	Buffaloberry	9	1.1	.55	L10%	" "
		Waxberry	4	.80	.50	L10%	" "
		False Box	11	.45	.40	L10%	" "
		Thimbleberry	6	.60	.35	N	" "

FIXED RADIUS PLOT CALCULATIONS

Plots: 101,102,103,201,202

Species	%Frequency	%Relative Frequency	%Abundance	Density	%Relative Density
L.P. Pine	20.0	3.70	5.13	240	5.31
Ocean Spray	40.0	7.41	6.84	320	7.08
Paper Birch	40.0	7.41	7.69	360	7.96
Mallow Ninebark	60.0	11.11	5.98	280	6.19
Willow	40.0	7.41	2.56	120	2.65
Buffaloberry	40.0	7.41	4.27	200	4.42
Douglas Fir	40.0	7.41	3.42	160	3.54
Black Cottonwood	40.0	7.41	5.13	240	5.31
White Pine	20.0	3.70	1.71	80	1.77
Waxberry	60.0	11.11	6.84	320	7.08
Cedar	20.0	3.70	.85	40	.88
Engelmann S.	40.0	7.41	1.71	80	1.77
Saskatoon	20.0	3.70	12.82	600	13.27
Redstem Ceanothus	20.0	3.70	1.71	80	1.77
Thimbleberry	20.0	3.70	21.37	1000	22.12
Bracken Fern	20.0	3.70	8.55	400	8.85
Plots: 301,302					
Willow	50.0	9.09	1.64	100	1.64
Waxberry	100.0	18.18	11.48	700	11.47
Mallow Ninebark	100.0	18.18	32.79	2000	32.79
Buffaloberry	100.0	18.18	11.48	700	11.47
Oregon Grape	100.0	18.18	27.87	1700	27.87
Redstem Ceanothus	100.0	18.18	14.75	900	14.75
Plots: 401,402,501,502					
L.P. Pine	100.0	18.18	7.64	550	7.64
Douglas Fir	100.0	18.18	4.17	300	4.17
Paper Birch	75.0	13.64	9.72	700	9.72
Saskatoon	100.0	18.18	54.86	3950	54.86
Larch	25.0	4.55	.69	50	.69
Buffaloberry	75.0	13.64	19.44	1400	19.44
Waxberry	25.0	4.55	2.08	150	2.08
Engelmann S.	50.0	9.09	1.39	100	1.39
Plots: 601,602					
L.P. Pine	100.0	12.5	38.39	4300	38.39
Cedar	100.0	12.5	2.68	300	2.68
Paper Birch	100.0	12.5	4.46	500	4.46
Buffaloberry	100.0	12.5	14.28	1600	14.28
Waxberry	100.0	12.5	6.25	700	6.25
False Box	100.0	12.5	18.75	2100	18.75
Thimbleberry	100.0	12.5	9.82	1100	9.82
Douglas Fir	50.0	6.25	.89	100	.89
Queens Cup	50.0	6.25	4.46	500	4.46

VEGETATION PLOT LOCATION MAP



Scale : 1 : 50000

March 9, I982

Calculations of Percent Water Content in Redstem Ceanothus Twigs

The twigs were dried at 70 degrees celcius for 72 hours. Twigs were collected from plots 20I and 30I.

Twig length at 2.4mm diameter point bite	Wet twig wt.	Dry twig wt.	Weight lost	% Water content
I.8cm	.I00g	.04g	.06g	60
2.0cm	.I00g	.02g	.08g	80
2.8cm	.05g	.03g	.02g	40
3.Icm	.I50g	.085g	.065g	43.33
3.3cm	.025g	.02g	.005g	20
3.5cm	.I00g	.02g	.08	80
4.Icm	.I25g	.05g	.075g	60
4.9cm	.075g	.05g	.025g	33.33
6.0cm	.075g	.07g	.005g	6.66
6.Icm	.I75g	.I0g	.075g	42.86
6.3cm	.225g	.I8g	.045g	20
6.5cm	.I75g	.08g	.095g	54.29
6.6cm	.250g	.I3g	.I2g	48
7.8cm	.I75g	.I5g	.025g	I4.28
8.2cm	.I00g	.02g	.08g	80
I0.2cm	.270g	.I6g	.II0g	40.74
I0.7cm	.275g	.22g	.055g	20
II.7cm	.325g	.26g	.065g	20
I2.0cm	.350g	.I8g	.I70g	48.57
I3.6cm	.450g	.32g	.I3g	28.89

Average % water content is... 42.05%

Calculations of Average Diameter Point Bite of Redstem Ceanothus Browse

Samples were obtained from plot no# 30I.

Stem No#	DPB(mm)
I.	4
2.	3.5
3.	3.0
4.	5.0
5.	4.25
6.	3.75
7.	2.75
8.	4.0
9.	4.0
I0.	2.0
II.	3.25
I2.	2.5
I3.	3.5
I4.	3.5
I5.	2.5

Average DPB is 3.43mm.

Appendix D

GENERAL PHOTOGRAPHS OF THE ROSEBUD LAKE STUDY AREA

Photo I. Rosebud Lake and the main late wintering area to the northeast.

Photo 2. Lower portion of the study area west of Rosebud Lake. This area serves as the mid wintering region.

Photo 3. Transmission line northeast of Rosebud Lake.

Photo 4. Whitetailed deer along the Salmo river.

Photo 5. Redstem ceanothus that has been browsed.

Photo 6. Buffaloberry; a common browse plant.

Photo 7. Waxberry.

Photo 8. False box that has been uncovered by deer and browsed on.

END-NOTES

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[3]R.F. Ferster, Soil and Vegetation Resources of the Pend-d'oreille Valley b.c. (Ministry of Environment, 1980). pp. A-18

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