U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TECHNICAL NOTE

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MULE DEER HABITAT GUIDELINES
BY RICHARD M. KERR

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INTRODUCTION

The purpose of this Mule Deer (*Odocoileus hemionus*) Habitat Management Guide is principally to assist BLM managers and biologists in planning for and managing mule deer habitat on public lands administered by the Bureau of Land Management. For many years Federal land management agencies have made the distinction between the Federal responsibility for managing habitat and the State prerogatives of managing native wild ungulate populations. Certainly the two are inseparably linked. These responsibilities, and up to now "symbiotic relationships", are probably best described succinctly in Title 43 of the Code of Federal Regulations Part 24.

Outlook

The mule deer is well adapted to semiarid western lands. Although from time to time the white-tailed deer (*Odocoileus virginianus*) appears to be increasing in importance on some mule deer ranges, this smaller more secretive deer will probably never replace the mule deer as the West's most important big game animal. The small size of the mule deer's home range and its ability, at least in small herds, to tolerate to some extent human beings and their facilities will probably assure its continued importance as a big game animal in the western United States when other species have become scarce, endangered, or extirpated.

The present accelerated "development" of the West makes it imperative that biologists manage mule deer habitat if any significant herds are to remain after much important historic habitat has been lost.

BACKGROUND

Historical

Although the Spanish and French were the first white men to see mule deer, these large-eared ungulates were not described until Lewis and Clark left descriptions in their records in 1804. Apparently miners and others who followed the trappers west were nearly as hard on mule deer herds as they were on bison. The Columbian blacktail slaughter described by Seton blames gold diggers for the slaughter of thousands. Commercial use and waste diminished many herds (Seton, 1929). Of a later period Dr. Frank Stanton summarizes:

> "Records of various parties of the 1820 and 1830 period indicate that deer were scarce over large areas of the western mountains and Great Basin country where today deer are abundant. Conversely, many of the original deer ranges (e.g., the Sacramento Valley) are now virtually deer-less because of agricultural development (Leopold, 1950).
>
> . . .
>
> Deer seem to achieve maximum densities in areas of disturbed vegetation which produce palatable shrubs or tree reproduction as secondary stages in plant succession. Logging, fire, and grazing are the three principal influences.
>
> . . .
>
> Prior to settlement, deer seem to have occurred principally along edges where forest and grassland met or on recent burns in the forest." (Stanton, 1974)

Dr. Stanton is quoted here since he has pinpointed the very heart of vegetation's long term and historic influence on deer habitat.

While Seton is quoted as estimating some ten million mule deer on their original home range (prior to white man's disturbance), he estimated only 400,000 remaining on their North American range in 1904 (Seton, 1929).

By the turn of the century concern for reduced populations of deer gave support to the game preserve as a solution to the alarming decrease in population. The Kaibab case is briefly related to illustrate the rate at which fully protected mule deer can increase under appropriate vegetational succession conditions.

Set aside as a game preserve in 1906 by Teddy Roosevelt, about 1000
square miles of the Kaibab National Forest held 3000 mule deer.
Four thousand head were estimated two years later. In 1912 there
were 10,000. (Seton, 1929)

By 1924 there were an estimated 100,000 mule deer and inspite of this
large starving over population, intense predator control continued
(Russo, 1970).

A drastic decline and die-off caused by livestock and deer overgrazing
and poor range condition occurred leaving 30,000 deer (Russo, 1970), as
die-offs and range destruction continued. Many ill-conceived plans for
solutions failed including trapping, an unsuccessful deer drive to move
deer off of the range, and feeding farms for fawns. The later appears
so uninformed in light of available knowledge that it is an excellent
example of the "beating around the bush" accomplished in resource manage-
ment if the real solution is emotionally, economically, or politically
distasteful. One must really read Russo's account to appreciate the
story.

Catastrophic conditions finally led to U.S. Government action which was
contested to the Supreme Court. The killing of deer by government
hunters was begun to lower the deer population. In the first year of
shooting, over 1000 head were killed and removed (Russo, 1970).

In 1929 authorized sports hunting by the public took 3600 deer and
provided the tool which discontinued the government hunting and began
management of the herd. Even though the extreme over-population (mule
deer) had been eliminated, scars of range abuse remained decades later
(Russo, 1970).

As fully protected herds become large, mule deer eventually reach
populations which damage the food producing capacity of the range,
permanently impairing its capacity even after die-offs reduce
populations.

The author of the Deer of North America adequately describes the
progression:

> "In most State and National Parks where deer have been
> given full protection from man, their numbers have usually
> declined." (Taylor, 1956)

Distribution and Abundance

Illustration 1, "Approximate Distribution of Mule Deer Subspecies in
Relation to Physiographic Regions 1978", serves to illustrate that the
Rocky Mountain mule deer, *Odocoileus hemionus hemionus*, is the most

widely distributed of the mule deer subspecies, as well as being the most common on public lands. It is therefore of most interest to BLM biologists and managers. With the exception perhaps of the Columbian black-tailed deer and the Sitka mule deer, management varies more by the variable of physiographic regions or vegetation associations than it does between subspecies of deer. Consequently the management guidance given here should be applicable to all subspecies with the exception perhaps of *Odocoileus hemionus columbianus* and *Odocoileus hemionus sitkinas*.

Because of the ubiquitousness of mule deer, reiterating estimates of North American populations over a period of years may be a very inaccurate exercise and reminiscent of the plight of the young biologist who discovered after hunting season that hunters had killed more deer than his total population estimate. A typical mule deer state such as Colorado, however, might be used to illustrate the trend in abundance of mule deer throughout its ranges in the West. On public lands administered by the Bureau of Land Management in Colorado, mule deer ranges sustained approximately 161,000 mule deer in 1947 (the first BLM report) (BLM, 1947). The same ranges reportedly supported approximately 265,000 deer in 1955 (BLM, 1956), 320,000 in 1965 (BLM, 1966), and 164,000 in 1975 (BLM, 1976). Although the correctness of these field estimates may leave much to speculation, to an observer associated with mule deer ranges in the West for over 25 years, it seems to give an indication of what has occurred on many western ranges during that time period.

SPECIES LIFE HISTORY
AND GENERAL HABITAT REQUIREMENTS

A great deal of information on life history, habitat description, and
species requirements has been covered in a general sense by Dr. Frank
Stanton in BLM 6601 - Species Life History and Habitat Requirements
Technical Supplement 6601-6, Mule Deer (BLM, 1974). The excellent job
done by Dr. Stanton does not require redundant coverage, and it is not
the purpose of this effort to do so. One interested in an excellent
treatment of these subjects should refer to Dr. Stanton's supplement
available from BLM. It is the purpose of this effort to briefly
describe how the job of habitat management is done.

THE REGIONAL HABITATS

Before entering the discussion of habitat management for mule deer, it
would be well to provide a general discussion of the composition,
structure, and use of various regional ecosystems which provide habitat
for mule deer populations.

A framework has been provided based upon accepted physiographic regions
and regional ecosystems based on potential natural vegetation as described
by A.W. Kuchler in BLM's Integrated Habitat Inventory and Classification
System (BLM, 1977). A map of these ecosystems regionalized by physio-
graphic regions is provided in Appendix 1 (BLM 6602).

These ecosystems as mapped by Kuchler were referred to as associations
by BLM-6602. In order to provide continuity, we may refer to these as
subformations in accordance with the Forest Service Ecoclass Hierarchy
(Hall, 1978).

HABITATS AND THEIR USE

Mule deer are principally animals of forest, woodland, or brush types. This is probably because of their innate requirement to remain close to visual or escape cover. Examples indicate that where vegetation does not provide sufficient cover, habitat will be important only if topographic cover replaces vegetation cover or supplements limited vegetation (Severson and Carter, 1978). Even tall dense grass provides escape cover for desert mule deer (*O. h. crooki*) in the valleys between rough desert hills on the McGregor firing range in New Mexico, north of El Paso.

Illustrations 2 through 13 illustrate typical types of habitats found on public lands that are of important value to mule deer.

In addition to vegetation, regional and local topography play important roles in the development and use of habitat by mule deer, as with other ungulates (Linsdale and Tomich, 1953); (Loveless, 1974); (Hudson, Hebert, and Brink, 1976). One of the most important values of varying topography within a habitat area is that differences in elevation can offset adverse weather or climatic conditions, since several elevation levels offer better possibilities of favorable conditions in time of drought, heavy snow, etc. 1/ In an undifferentiated land area such as a flat plain, if conditions are bad in one place, they are bad all over. Where no one particular elevation induced vegetation cover type provides complete year-round requirements, the mixture of these elevation zoned cover types formed by diverse topography does provide total yearlong requirements.

This phenomena has resulted in the forming of large migratory mule deer herds of the West. The need for various cover types located at different elevations produces the goal of the migration, while cold, snow, or dry forage are usually the causative agents starting the movement in the winter. In the spring it is the desire for green succulent forage or lack of forage on the winter range. Once learned, these movements become habitual (Bartram and Rempel, 1977) and in adult animals are generally faithfully repeated year after year with the same seasonal ranges being occupied by the same animals (Gruell and Papez, 1963) or their offspring. Illustration 14 is an illustration of the use of cover types on a regional basis used by a migrating mule deer herd.

Most of the time winter ranges will occupy smaller areas than summer ranges (Dasmann, 1971). This led to the viewpoint in the 1950's that winter ranges were generally the critical problem areas. Although this

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1/ Personal examination by the author.

Illustration 2. A good mule deer range in northern New Mexico. Variation in topography has developed ponderosa pine forests used for summer use and juniper-pinyon with sagebrush openings immediately adjacent at lower levels for winter use. Pine-Douglas Fir Forest and Great Basin Sagebrush.

Illustration 3. A typical hay meadow near Saguache, Colorado, which serves as crucial spring range for mule deer. Wheatgrass-Needlegrass.

Illustration 4. The spruce fir type of mule deer summer range. The highest (elevation) type utilized by mule deer. Western Spruce-Fir Forest.

Illustration 5. The juniper-pinyon type, perhaps one of the most valuable on public lands, furnishes crucial forage, especially in winter from the subclimax interspersed browse areas. Juniper-Pinyon Woodland.

Illustration 6. Juniper or juniper-pinyon areas are also valuable for
escape and thermal cover, especially in fall, winter, and spring where
feeding areas are adjacent. Juniper-Pinyon Woodland.

Illustration 7. A juniper-pinyon forest slightly past the best successional stage for mule deer. Juniper-Pinyon Woodland.

Illustration 8. A ponderosa pine type with an understory of oak brush (*Quercus gambeli*). This type generally affords spring, summer, and fall range depending on its location. Pine-Douglas Fir Forest.

Illustration 9. The high elevation lodge pole pine-sagebrush combination
provides extensive spring, summer, and fall range in the mountain West.
Pine-Douglas Fir Forest.

Illustration 10. The high elevation lodge pole pine-sagebrush combination provides extensive spring, summer, and fall range in the mountain West. Pine-Douglas Fir Forest.

Illustration 11. This excellent deer range in Wyoming provides good
yearlong habitat except in years of deep snow when this high inter-
mountain basin offers no lower elevation for escape. Snow depths in
excess of 20 inches effectively prohibit mule deer movement and use
(Loveless, 1967). Pine-Douglas Fir Forest and Sagebrush Steppe.

Illustration 12. Even grassy plains like these west of Cheyenne,
Wyoming, offer deer habitat in draws covered with mountain mahogany
(*Cercocarpus montanus*). Grama-Buffalo Grass.

Illustration 13. Where vegetation is sparse and offers poor visual
cover, topographic relief supplements the vegetation cover as in this
area north of Phoenix, Arizona. Creosote Bush-Bur Sage.

Illustration 14

COMPOSITE MULE DEER HABITAT PHENOLOGY CHART

MONTHS OF THE YEAR	SUBFORMATION OR ASSOCIATION USE IN A NORMAL YEAR		SEASONAL USE ↓	REPRODUCTION ↓
JANUARY	Juniper-piñon Woodland	This could be Mountain Mahogany - oak scrub, juniper shrub step or associations of these in a grassland subformation.	WINTER	
FEBRUARY				
MARCH				
APRIL	Openings, meadows or elevational belts of green forage in the piñon-juniper zone		SPRING HOLDING AREAS & MIGRATION	
MAY				
JUNE	Ponderosa pine	This could be Douglas fir, lodge pole or mixed conifer		FAWNING & HEAVILY DEPENDENT NURSING
JULY	Spruce fir	This might be ponderosa pine subformations or associations or Douglas fir lodge pole associations or subformations if elevation or climate do not provide spruce fir.	SUMMER	
AUGUST				NORMAL WEANING PERIOD
SEPTEMBER				
OCTOBER				
NOVEMBER	Ponderosa pine	Same as above	WINTER FALL MIGRATION	BREEDING RUT
DECEMBER	Piñon-juniper Woodland	Same as above		

may be a valid concept, we have found in many ranges, especially on BLM or Public Lands, that spring and summer ranges can be severe problems, especially where there is competition with livestock for cool season grasses and forbs 1/.

Illustration 14 presents the concept that different habitats have different seasonal and life history uses for migrating mule deer. It is of course impossible to construct a chart such as this that is accurate for all years and regions where mule deer are found. A biologist entering a new herd area would do well to prepare such a chart from inventory information or field investigation. It should be remembered that while snow date, snow depth, forage succulence, and storm dates will influence migration dates, these can only directly affect the rutting period. Fawning and subsequent nursing will take place approximately 200 days thereafter, regardless of the weather. It should also be remembered that traditional migration routes, seasonal home ranges, and fawning and rearing areas will be used unless catastrophic weather occurs.

Some general interpretations can be made from a chart similar to Illustration 14. If the habitat manager were attempting to improve occupied mule deer range which was in the spruce-fir cover type and utilized in early summer, he would probably try to increase succulent forbs and cool season grasses for does with nursing fawns. He would generally not try to increase browse plants. If he were improving spring holding areas, he would be encouraging succulent forbs and cool season grasses and maintaining meadows in good condition for prefawning conditioning of pregnant females (Kerr, 1968). If he were trying to improve crucial winter ranges in the juniper-pinyon, he would encourage browse in woodland parks or clearings for the maintenance of the total deer herd. Illustration 15 gives a table of reproductive chronology as displayed in various regional research or records, and Illustration 15A gives an idea of when the migration periods occur.

While several broad interpretations may be made from a locally constructed chart such an Illustration 14, on-site management interpretation must be made from on-site information. Further, the seasonal cover types or associations shown are not meant to indicate that these are the only associations used during a particular season, but they are examples of typical situations.

Migrating mule deer herds are common in the Sierra Mountains, Cascade Mountains, Columbia Plateau, Northern Rocky Mountains, Middle Rocky Mountains, Southern Rocky Mountains and portions of the Colorado Plateau, Wyoming Basin, Upper Basin and Range, Lower Basin and Range, and Upper Missouri Basin and Broken Lands which lie adjacent to more mountainous

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1/ Author's personal observations through range examination - Nevada BLM, HMP Evaluation, 1976.

Illustration 15

TABLE OF REPRODUCTION

	BREEDING SEASON		GESTATION PERIOD (days)	FAWNING	REFERENCES
	Range	Peak			
MULE DEER					
Northern -					
Alberta, Canada		Oct 24 - Nov 14		Jun 7-14	Taylor, W. P. 1956. p. 372
Vancouver Island (Black-tailed deer)		late Oct - early Nov	183-212	May - June	Taylor, W. P. 1956. p. 372
Central Oregon		Nov 9-30	210	Jun 5-15	Taylor, W. P. 1956
Central -					
Colorado	Nov 15 - Jan 15			Jun 15 - Jul 15	Taylor
Utah	Nov 15 - Jan 15			Jun 10 - Jul 10	Taylor
Utah	late Oct-late Jan	Nov 20 - Dec 2	199-207	Jun 5 - Aug 19 Peak Jun 11-20	Robinette, G.
Canada, Oregon, Nevada, Utah, Colorado (Rocky Mt. Deer)	late Oct - Nov			June	BLM. 1974. p. 6.
Southern -					
California	Dec 10 - Jan 27	late Dec - Jan		Jul 9-30	Taylor, W. P. 1956. p. 372.
Calif. (Hastings Reservation)	mid Oct - early Dec			late Apr - Jun 9	Linsdale, J. M. 1953.
Calif. Chaparral	mid Oct - mid Dec	early Nov		2nd wk May - early Jun	Taber, R. D. 1958.
Calif. coastal	Sept - Oct			Apr - May	BLM. 1974. p. 6.
Calif. Interior	Nov - Dec			July	BLM. 1974. p. 6.
Calif. (Inyo Mule Deer)	Dec - Jan			July	BLM. 1974. p. 6.
Calif. (Burro Deer)	Jan - Feb			Jul - Aug	BLM. 1974. p. 6
Nevada	Nov 15- Dec. 15			Jun 10-Jul 10	Taylor, W. P. p. 372
New Mexico	Nov - Jan			Jun - Jul	Taylor, W. P. p. 372
New Mexico (Desert Mule Deer)	Dec - Jan			Jul - Aug	BLM. 1974. p. 6
New Mexico (Rocky Mtn. Deer)	Nov - Jan	late Nov	210	Jun - Jul	Lang, E. M. 1957.
(Desert Mule Deer)	Dec - Jan	late Dec		Jul - Aug	Lang, E. M. 1957.
Arizona	Dec 1-Feb 20	Jan 1		Jul 15-Sept 10	Swank, W. G. 1958.
Arizona	Dec 15 - Jan 15			Jul 15-Aug 15	Taylor, W. P. p. 372.
General	Oct - Dec		224-266	May - Jun	Wing, L. W. 1951.

Illustration 15 A

MULE DEER

Table 2. Migration Periods

Location	Fall	Spring	Literature Cited
California	Oct-Nov	Apr-May	Leopold et al 1951
W. slope Sierras	Oct-Nov	Apr-June	Longhurst et al 1952
Yosemite	Oct-Nov	Apr-June	Dixon 1934
Sequoia	Oct	Apr-May	Schneegas et al 1972
Cal-Ore	Oct	Mar	Interstate Comm. 1947
Colorado	Oct-Nov	Apr-May	Bartmann 1968
			Loveless 1964
Idaho	Nov-Dec		Jensen 1968
Nevada	Sept	Mar-May	Papez 1967
Oregon	Oct-Nov		Zalunardo 1965
Utah	Oct-Nov	May-June	Richens 1967

FROM: Bureau of Land Management. 1974. Species life
       history and habitat requirements for mule deer.
       BLM Manual Technical Supplement 6601-6.

regions containing associations of needleleaf forest 1/ (BLM, 1977);
(Gruel and Papez, 1963); (Bertram and Remple, 1977); (Dasmann, 1971)
(Wood, 1970). Since regional topography is generally the boundary
determination between physiographic regions, in some cases migratory
mule deer herds will summer in one region and cross the boundary and
winter in another region. This is true of the North King's deer herd
in Fresno County, California (Bertram and Remple, 1977) and Colorado's
Piceance herd, as well as many others (McKeen and Bartman, 1971).

It is not uncommon for mule deer to travel significant distances in
migration. The interstate deer herd which ranges between a winter area
in California and its summer range principally in Oregon may travel
between 50 and 100 miles (Taylor, 1956). Shorter migrations are
necessary where topographic change drops from summer to winter range
in a short distance. This is true of the herd which summers on the east
side of the La Sal Mountains in Utah and in 5 miles or less drops
2000 feet to the winter range in Sinbad Valley in Colorado.2/

Illustration 15B shows the effects of local topography on the selection
and use of habitat sites during migration by mule deer. A manager must
protect and maintain areas made unique by topography and proper
associated vegetation if he is to provide complete habitat for mule
deer. Because of the topographic uniqueness of these areas and their
traditional use, if they are lost, they are many times irreplaceable.
Their loss will either reduce or eliminate the deer herd.

Some mule deer do not migrate 3/ (Lang, 1957). This is because they
have never learned to do so, there is no change in cover types or
weather within practical distance, or old migration routes were cut off.
These animals must make do with the habitat they have at hand and make
do with it yearlong. Sometimes they seasonally share it with migrants
from other areas.

Non-migrating herds or individuals are not uncommon on portions of the
Colorado Plateau, the Lower Basin and Range, the Southern Pacific
Border, the Upper Basin and Range, the Columbian Plateau, the Wyoming
Basin, the Rocky Mountain Piedmont, and the Upper Missouri Basin and
Broken Lands. Within these regions one would expect mule deer to occupy
on a yearlong basis, plant formations of Western Shrubs, Western
Grasslands, Western Shrub and Grassland combinations and the associations
or subformations of: California Oakwoods, Oak-Juniper Woodland, Juniper-
Pinyon Woodland, and Juniper Step Woodland. The latter two are
particularly interesting since they, as well as some others, are the
nucleus for both migratory and resident herds.

1/ Personal observations of the author.
2/ Personal observations of the author.
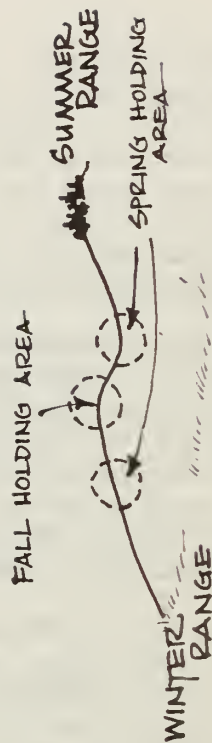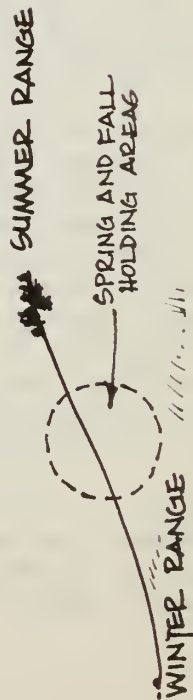3/ Personal observations of the author.
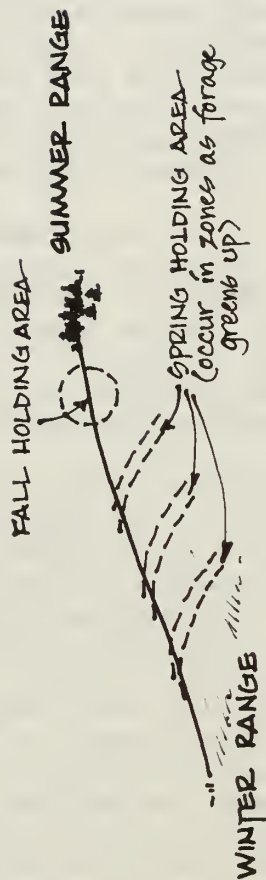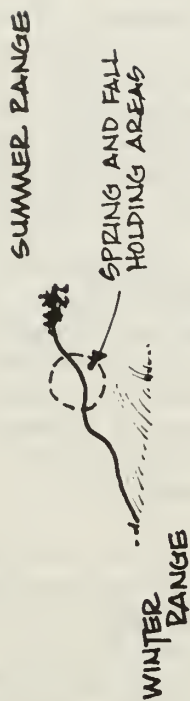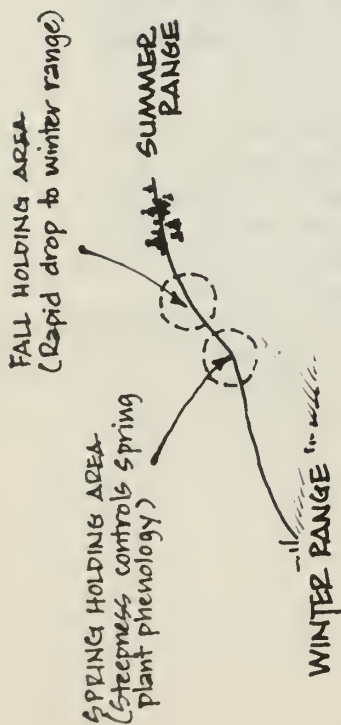
ILLUSTRATION 15 B   EFFECT OF TOPOGRAPHY ON SPRING and FALL HOLDING AREAS.
Adapted from California Fish and Game 63-(3) 151-175, 1977.

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INFORMATION FOR THE HABITAT MANAGEMENT JOB

Information necessary for the management of mule deer habitat can be
divided into two types based on the level of information and kinds of
information needed. The two types are strategic information (regional,
extensive) and tactical information (on-site, intensive).

Strategic Information

Some of the elements of strategic information will be different from
those of the tactical type. The following information of the strategic
kind is needed.

(1) Herd Unit Maps - In order to manage habitat for a herd of mule
deer, one must first know which habitat that herd occupies. It is not
sufficient to say that ponderosa pine provides mule deer habitat and
proceed to protect or improve all ponderosa pine for mule deer. In most
cases this effort would be wasted, since all ponderosa pine stands are
not important occupied mule deer range.

We must determine which areas are occupied and proceed from there. "In
view of the necessity for individual herd management, the combined
summer-winter range used by each herd must be considered as the minimum
management unit." (Taylor, 1956).

For herd unit or game management area maps, the scale is usually one-half
inch to the mile. These are normally produced with information from Game
and Fish Departments, animal counts or inventories, BLM personnel
observations, BLM habitat inventories, or miscellaneous recorded information.

The maps should contain as a minimum the following information:

1. The location of towns and cities, major highways, and other
    important landmarks.

2. A map of the drainage pattern.

3. BLM rectangular survey grid.

4. Ownership status (private, State, USFS, BLM, and other Federal
    land).

5. An overlay showing mule deer seasonal use areas for winter,
    spring, summer, and fall migration routes, fawning areas, and
    other crucial areas.

This information is generally in spatial relationships only, and actual use areas are usually included with areas that receive little or no use. An example of the herd unit map is given in Illustration 16.

(2) Population and Harvest Statistics - These statistics are necessary in order to allow sufficient forage, cover, and water for herds of deer. These deer population estimates are normally received from the State Game and Fish Departments and are usually compared to demands of other grazing ungulates using an area, to determine if the overall grazing capacity is in balance with the livestock and ungulate wildlife using the area. Illustration 17 is an example of a method used to store and record these figures.

If population data is not available, an estimate of the total harvest and the percent of the herd being harvested can be used in the formula:

$$\text{TOTAL POPULATION} = \frac{\text{NUMBER HARVESTED}}{\text{PERCENT OF HERD HARVESTED}}$$

Normally, these population estimates will be useful to managers principally as a way of establishing mule deer demand in the allocation of forage resources between big game and domestic livestock; therefore, total accuracy of numbers is not only impossible but is not required. A defendable estimate is. A classification of animals as to sex (bucks, does, fawns) may be helpful in allocating forage, and a more intensive breakdown of age classes might be helpful in allocating forage over period of time with use of a forage allocation model based on continuing and compounding allocation impacts (see Illustration 18). Game managers, on the other hand, will use this and other supplemental population information to establish hunting seasons and harvest goals.

Tactical Information

There are various types of tactical or on-site information that are necessary to manage mule deer habitat.

(1) Inventory Information - Many times wildlife biologists will be able to obtain information from other disciplines or activities which will be very useful in the management of mule deer habitat. An inventory of homogeneous vegetation and landform cells normally developed under range or forest surveys can be a beginning point, providing a system for locating, quantifying, and describing mule deer habitat. These cells (habitat sites), if given a unique number, are used as pieces of a deer range which can be accumulated to give a total picture of the size, location, and productivity of the deer range. See Illustration 19 for an example of habitat sites (homogeneous cells). The habitat sites are normally delineated in the field on 1/24,000 aerial photographs and then mapped at that scale on USGS 7.5' topographic quadrangle maps.
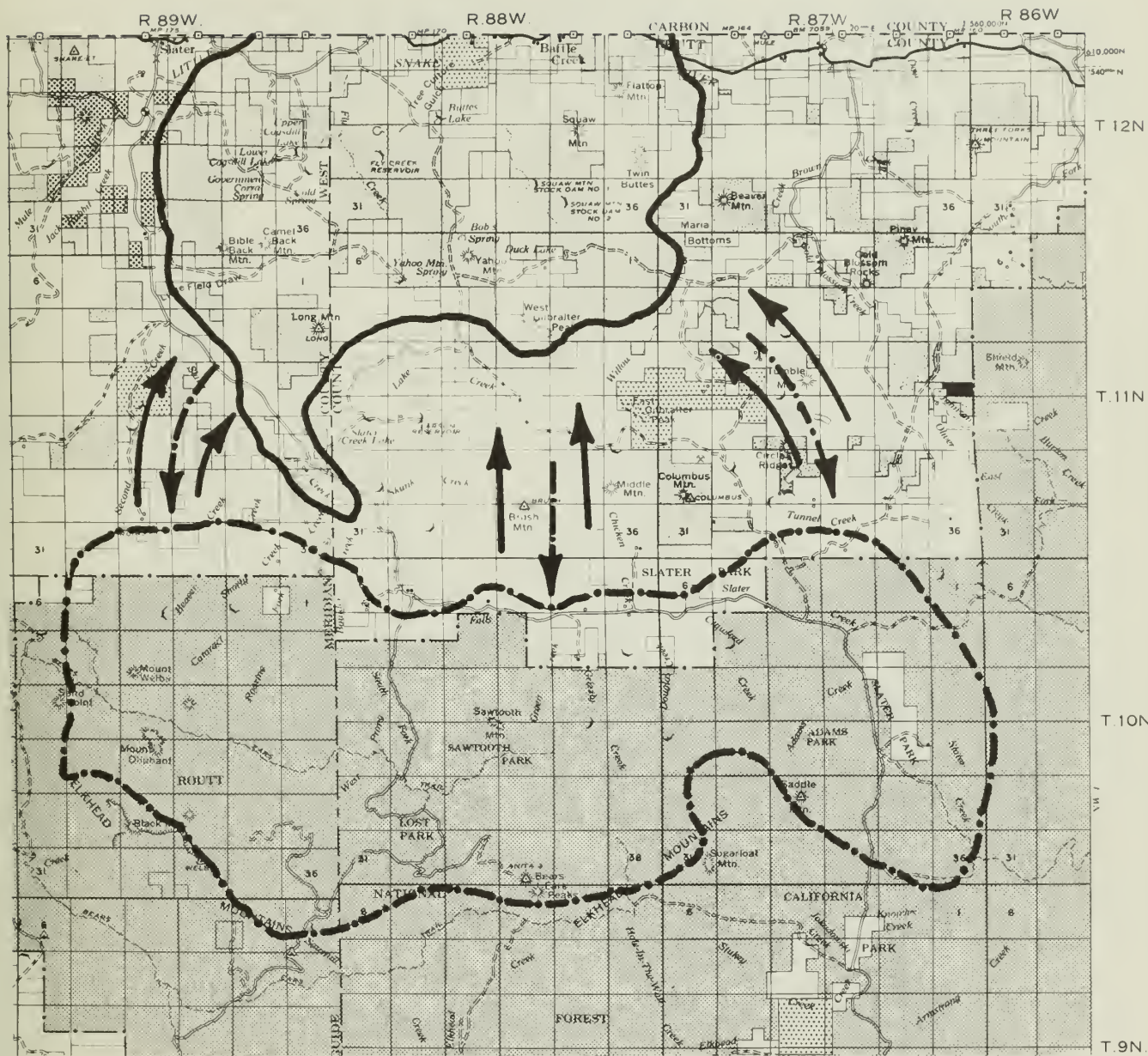
BLM
MULE DEER MIGRATION STUDY
IN
NORTH CENTRAL COLORADO
1980

1 1/2 0   1   2
Scale in Miles

LEGEND

| FALL MIGRATION | ⟶ | WINTER RANGE |
| SPRING MIGRATION | ⟵- | SUMMER RANGE |

LAND STATUS

| Public Land | | State Land |
| Forest Land | | Private Land |

LOCATION MAP

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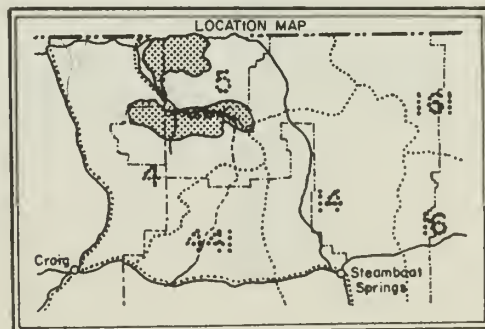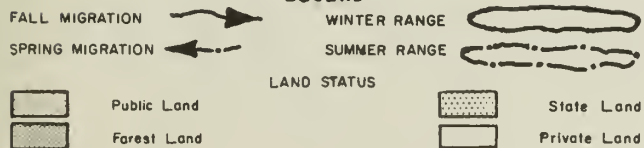
Illustration 16

POPULATION ESTIMATES BY HERD UNIT

State _____ District _____ Species _____

Herd Unit	1972	1973	1974	1975	1976	1977	1978	1979	Year
1									
2									
3									
4									
5									
6									
7									
8									

Illustration 17.

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AGE AND SEX RATIOS 1/

State _____ District _____ Species _____

Herd Unit		1972	1973	1974	1975	1976	1977	1978	1979	Year
1	Bucks 2/									
	Does									
	Fawns									
	Yrlgs 3/									
2	Bucks									
	Does									
	Fawns									
	Yrlgs									
3	Bucks									
	Does									
	Fawns									
	Yrlgs									
4	Bucks									
	Does									
	Fawns									
	Yrlgs									
5	Bucks									
	Does									
	Fawns									
	Yrlgs									
6	Bucks									
	Does									
	Fawns									
	Yrlgs									

1/ Numbers of animals for each one hundred population.

2/ Bucks over two years; does over two years; fawns under one year; yearlings one to two years (not always possible to classify unless check stations are used.)

3/ Depending on how classifications are done, bucks, does, fawns, and yearlings may add up to 100% or more than 100% if all animals over one year are classified as to sex.

Illustration 18.

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Illustration 19
ALWAYS IDENTIFY TOWNSHIP, RANGE, MERIDIAN AND/OR STATE, AND LEGEND ITEMS

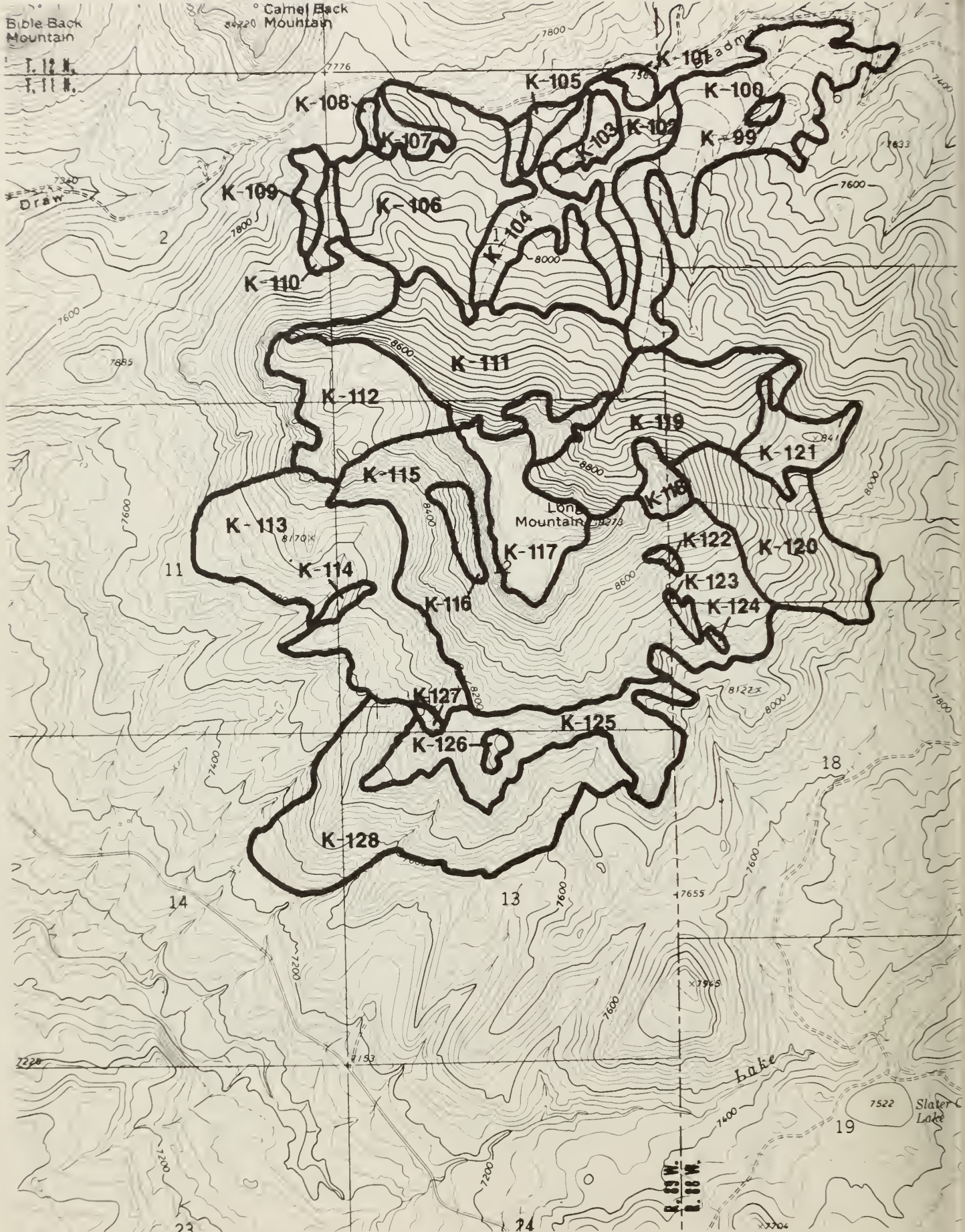A. Habitat Use Areas - Even though we know generally where deer-use areas are from the herd unit maps, if an inventory is to be of use in management decisions, more specific on-site tactical data is necessary. A good form (approved by BLM) for collecting mule deer use information is shown in Illustration 19A and B. The form is used to list all the animals and their uses of a habitat site. (For further information see BLM 6602).

For mule deer habitat inventories, the delineated cell or habitat site, if it is within suspected habitat (herd unit map), is inspected to determine if it is actually used by mule deer. This can be done by ground inspection for tracks, fecal pellets, browse use on plants, or other evidence of use. Aerial inspection can also be used to verify mule deer use and season of use. Illustration 20 gives a brief description of the applicability of verification techniques. The instructions for filling out the habitat site form in Illustration 19A are self-explanatory. Where more specific information is necessary such as exact dates of occupancy of the site or deer days use per acre (see BLM 6630), in the comments column.

Having verified all of the sites used by deer, their season of use, and their general and specific uses, the biologist can then construct maps of deer habitat by any season, for any specific or general use, or any combination. This is done by listing by their numbers either manually or by computer the habitat sites with the characteristics selected to construct either an overlay or a computer map. An acreage quantification can be made by merely summing the recorded acreages of each cell listed and on the map.

It is possible then to further quantify or map mule deer habitat within selected characteristics. For instance, one could obtain a list and map or overlay all habitat sites which are mule deer spring range and feeding areas, or other combinations of available characteristics.

B. Vegetation Inventory - An inventory of the quality (species composition), quantity (cover density), structure (percent overhead cover and horizontal canopy layering), production (pounds per acre of forage by species), and age and form class characterization by habitat site is usually necessary for further analysis of deer range. Production is not always necessary depending on the forage allocation system used to distribute annually produced forage between livestock and wild ungulates including mule deer. This vegetation data is normally obtained from inventories completed for use by various disciplines (integrated inventories). Forage allocation is not discussed in detail here. The Bureau of Land Management has used various allocation procedures over a period of time. Through these various processes, the vegetation production of a piece of public land was divided between the portion of the production that was unavailable because of use by small mammals, for structure maintenance, because of trampling, for

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANIMAL SPECIES OCCURRENCE BY HABITAT SITE

(1) Record type
(2) State
(3) District
(4) Planning unit
(5) Site writeup number
(6) Action

SECTION I — GENERAL

(7) Date ——————— (8) Habitat site name ——————— (9) Acreage ———

(10) Wildlife habitat area ——————— (11) Structural height (vegetation) ———

(12) Map or overlay reference ———————

SECTION II — HABITAT CLASSIFICATION

(13) Physiographic region ——— (14) Sub-physiographic region ——— (15) Association ——— (16) Standard habitat site ——— (17) Special habitat feature ———

SECTION III — CROSS-REFERENCES

(18) Biome ——— (19) United States Forest Service ecoregion ——— (20) Standard habitat type ———

SECTION IV — ANIMAL OCCURRENCE

SPECIES	ECOTONE	STATUS	DENSITY	USE		CRUCIAL	OCCURRENCE		COMMENTS
				GENERAL	SPECIFIC		HYPO	VERIFIED	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

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(Instructions on reverse)

Form 6602—1 (April 1978)

Illustration 19A.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ANIMAL SPECIES OCCURRENCE BY HABITAT SITE
CONTINUATION SHEET

(1) Record type
(2) State
(3) District
(4) Planning unit
(5) Site writeup number

SECTION IV – ANIMAL OCCURRENCE (CON.)

SPECIES	ECOTONE	STATUS	DENSITY	USE		OCCURRENCE			COMMENTS
				GENERAL	SPECIFIC	CRUCIAL	HYPO	VERIFIED	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

Illustration 19B.

⋇ U.S. Government Printing Office:1978- 782-057/302 Reg 8

Form 6602—1a (April 1978)

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BIG GAME VERIFICATION *
TECHNIQUES

SPECIES	STATE ** AGENCY RECORDS	FIXED WING ANIMAL LOCATIONS	HELICOPTER ANIMAL LOCATIONS	GROUND INSPECTION FOR ANIMAL LOCATIONS	TRACK CON-CENTRATIONS AND WALLOWS	BROWSE FORM CLASS	PELLET CON-CENTRATIONS	TREE RUBBING, TEETH MARKS, ROOTING, ETC.	MONITOR-ING SALT LICKS	MONITOR-ING WATER HOLES
MULE DEER	O	O	O	O	[]	[]	O	[]	[]	[]
WHITE TAIL DEER	O	X	X	O	[]	[]	[]	X	X	X
ELK	O	O	O	O	[]	[]	[]	[]	X	[]
ANTELOPE	O	O	O	[]	[]	[]	X	X	X	[]
MOOSE	O	O	O	O	[]	X	[]	X	X	O
BIG HORN SHEEP	O	[]	[]	O	[]	X	[]	X	[]	O
DESERT BIG HORN SHEEP	O	[]	[]	O	[]	X	[]	X	[]	O
JAVELINA	O	[]	O	O	[]	X	X	[]	X	[]

*Techniques used to verify big game use within habitat sites
**General herd locations

Legend
O primary tool
[] useful
X questionable for this species

Illustration 20.

watershed cover, and because of the physiological needs of the plant; that part that could be consumed by domestic livestock; and that part that could be consumed by wild ungulates. This was done by use of the theoretical concept of "forage acres" corrected by actual use adjustments and the "forage acre requirement" in the ocular reconnaissance method, or the actual weighing and estimating of the forage production in various other methods. In any event, the original allocation is only a beginning point for stocking and must be corrected by livestock control (numbers, seasons, etc.) and mule deer control (appropriate hunting seasons) after regular reviews of the management prescription and how it is working. For further information on range surveys or vegetation inventory methods, one can refer to BLM Manual 4412.

C. Water Inventory - The mule deer habitat manager will need to know the location, general quality, and approximate quantity of water available on deer ranges. Many times just knowing that a perennial stream traverses a deer range is sufficient. In more arid areas, however, information on water becomes more critical to management. A form similar to Illustration 21 can be used for recording drinking water not reflected in other inventories.

D. Human Disturbance - The need to know the extent and penetration of man and his facilities onto mule deer range is a recent phenomenon brought on by the migration to the West. Cities such as Phoenix, Denver, and Los Angeles have, for several decades, been focal points for eastern migration. Recently smaller cities such as Aspen, Reno, Santa Fe, and Boise have been heavily impacted. This will have an impact on mule deer habitat all over the West where new roads, housing areas, power lines, sewage plants, water works, etc. will be necessary. Major impacts will be: the cutting of migration routes by new roads, or widening and traffic increase on old roads; disturbances in fawning areas by recreationists; elimination of lower winter ranges by land subdivision, new towns or cities, or other construction or industry; disturbance on the winter ranges by snowmobiles, etc. In most cases these impacts will be adverse to the mule deer herd. They certainly will not be helpful. Major impacts from man's expansion or immigration should be documented, at least in narrative form, for each herd for the record and later analysis.

(2) Tools for Inventory - Several tools are almost indispensable for habitat inventories of the nature necessary for land and habitat management today. Aerial photos at the scale of approximately 1/24,000 are usually a prerequisite for inventorying mule deer habitat. These can be black and white, color, or color infrared films. They must provide the capability for delineating homogeneous cells of vegetation and land form down to approximately ten acres. After final delineation on photos, the cells are transferred to a map base as in Illustration 19.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SPECIAL HABITAT FEATURE

	W	2

(1) Record site

(2) State

(3) District

(4) Planning unit

(5) Site writeup number

SECTION I – GENERAL

(6) Date ———————— (7) Habitat site name ———————— (8) Acreage ————

(9) Special habitat feature code ———— (10) Location: T——— R——— S——— ¼——— ¼——— (11) Relationship to other habitat sites ———

(12) Other habitat sites involved ————————

(13) Map or overlay reference ————————

(14) General description of feature ————————

SECTION II – ANIMAL SPECIES BENEFITED			SECTION III – ANIMAL SPECIES ADVERSELY AFFECTED			SECTION IV – PLANT SPECIES AFFECTED	
SPECIES	USE ENCOURAGED BY FEATURE		SPECIES	USE DISCOURAGED BY FEATURE		SPECIES	EFFECT
	GENERAL	SPECIFIC		GENERAL	SPECIFIC		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
36							

Illustration 21.

Landsat images may be used in a general way but will not produce definitive enough cells to provide site specific analysis in many cases. Low altitude photography (1:2000 + or -) can be very site specific for special studies. Although one-half inch to the mile or 1/100,000 scale maps will give special relationships, their detail is not sufficient to use as a habitat inventory base map. Illustration 19 demonstrates how a]/24,000, 7 1/2' USGS topographic quadrangle is used to record habitat cells or sites from the vegetation inventory of field delineated cells or habitat sites.

The foregoing information is necessary so the biologist will know how much mule deer range there is by season and use, where it is, and what condition it is in. The successful habitat manager will not only obtain, record, and retrieve his inventory data, but will also know thoroughly the country with which he is dealing.

Limiting Factors

Having obtained inventory information as to where the habitat is and how much there is, the mule deer habitat manager normally proceeds to find limiting habitat factors in areas where deer production is not at the level planned or desired. This is in the areas where the lower production is controlled by habitat factors and not by disease, over-hunting, etc., which are not under control of the land manager.

One would normally look to the components of habitat to find the flaw in the long-term production scheme. Traditional among these components would be food, cover, and water; but in the present area of management, one more seems necessary and that is adequate space without critical disturbance.

    (1) Water - Water is most often a limiting factor in arid regions where yearlong flowing water is scarce. While Stanton (1974) gives emphasis that deer must have water for physiological needs, Swank (1958) cites lack of water as an indirect cause of death. Lack of water concentrates mule deer and livestock in the areas of permanent water during the dry season. Heavy demand on the forage in these areas soon causes forage depletion and inevitable die-offs.

Those regions where limiting water would be suspected are: the Upper Basin and Range; Lower Basin and Range, Colorado Plateau; and to a lesser extent the Wyoming Basin, Columbia Plateau, and perhaps some of the Rocky Mountain Piedmont.

In some of the hotter drier areas, habitats that appear to have all the ingredients and show no mule deer use at all may be found to be lacking in permanent usable water. Some biologists have had the personal experience of finding these unused areas usually about 2 miles from the

nearest water and installing various types of water tanks. Within a few month's time, perhaps, the mule deer have extended their range to the new water. 1/ Ultimately one could expect a population increase of a couple dozen or more animals, depending on the quality of the habitat. All waters must be low enough for fawns to drink. Illustration 22 pictorially describes this situation.

       A.   Water Quality - Although most naturally occurring water is usable, there are occasional times when an analysis by the State University, USGS, or other laboratory will be helpful in appraising the usefulness of water. This may well be true for well water which can originate from salty strata and at times be unusable by ungulates.

       B.   Water Quantity - The quantity of water consumed by mule deer varies with body size, age, sex, health, lactation, and physical activity of the animal, as well as with the humidity and temperature of the environment, and available succulent moisture. As a matter of practical management, much of the research on water needs has come from the more arid regions of mule deer habitat. The fact that water is more plentiful and available in cooler or winter habitat types should not mislead biologists to conclude that it cannot be a limiting factor or at least a variable control factor.

The use of water will decrease with lower temperature, snow cover, succulent vegetation, and dew or raindrops. Conversely, it will increase with drier atmosphere, lack of snow cover in winter, dry forage, and higher temperature.

It can be noted from reviewing the literature that experimentally held deer appear to drink about one-half the amount of water required by their counterparts in the wild. The amount and frequency of drinking will vary according to the aforementioned factors. One would expect a low daily water requirement of perhaps 2½ quarts (Taber and Dasmann, 1958). A high requirement might be 7.3 quarts for bucks in summer (Elder, 1954). Elder found that in the summertime the average amount of all water taken by individuals was 6.3 quarts per day. Clark found in Arizona studies that consumption varied from four to eleven quarts at one drinking. The mean in another study for 28 animals was 6.1 quarts (Clark, 1953). Perhaps Dasmann had a good view of the problem in southern Arizona when he observed that average daily consumption was between 1 and 1½ quarts per hundred weight in winter and 2 to 3 quarts per hundred weight in summer (Dasmann, 1971).

Illustrations 23 and 24 are examples of rain catching devices or water developments which removed the limiting factor of water on Lower Basin and Range areas.

1/ Author's personal experience in the Roswell, New Mexico, area.
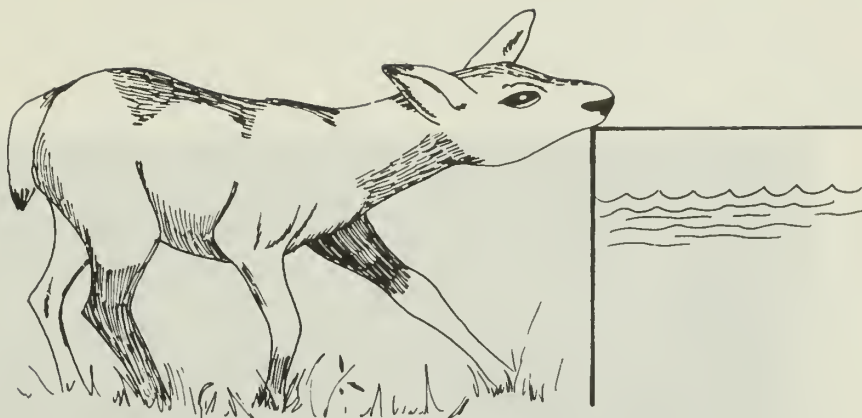
TROUGH HEIGHT ABOVE 20 IN WATER NOT AVAILABLE
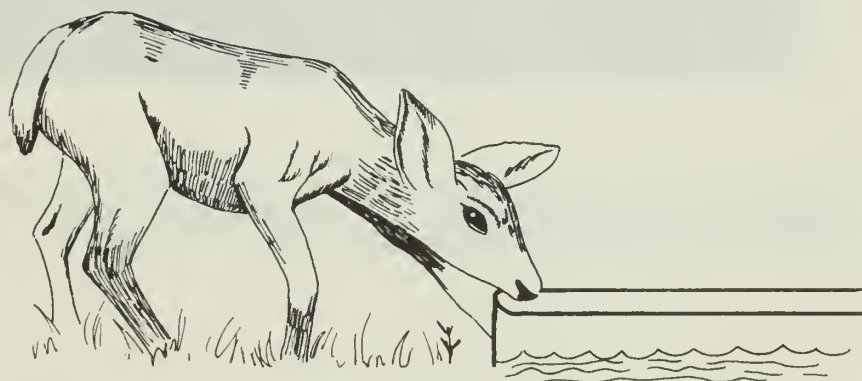
TROUGH HEIGHT 20 IN OR LESS WATER IS AVAILABLE

ILLUSTRATION 22 These two drawings illustrate the need for trough height
not to exceed 20 inches above ground level.

(Wilson, 1977.)

Illustration 23. An inverted umbrella type water catchment used in the Lower Basin and Range Region near Carlsbad, New Mexico. Biologist stands by drinking box with float valve.

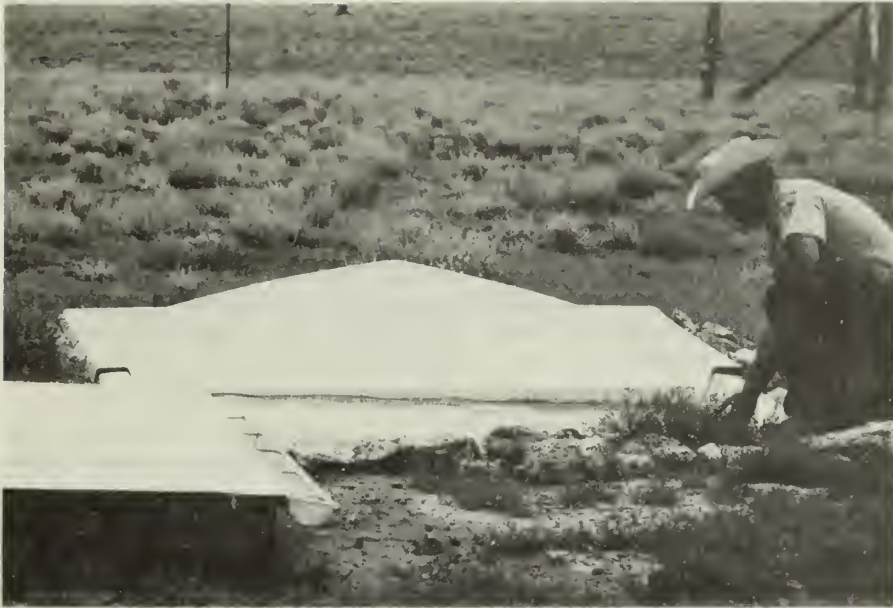Illustration 24. A fiberglass tank with half cover and corrugated roof catchment. Principally used for sage grouse and antelope but usable for deer also.

If the rain catching type of development is installed, the size of the catchment must be calculated on a year of lower precipitation and must allow enough rain catch to water the expected number of animals (based on local existing densities of mule deer on similar ranges). The use of wells and pipelines is also desirable where water is a limiting factor. In arid areas, springs and seeps must be protected from trampling by ungulates to provide optimum water. This can be done with collection boxes, pipes, and troughs.

C. Distance to Water - In arid or desert areas an observer can obtain a rather good estimate of the distance mule deer will venture from water by simply walking several radii from a water source. By pacing distances one can observe the decreasing number of mule deer tracks until a point is reached where no more tracks are seen. In the Fort Stanton area in New Mexico (Juniper-Pinyon Woodland), John Wood, et. al., concluded "the desirable distance between water sources at Fort Stanton should be 2½ to 3 miles;" further, "Since the fluctuations in deer densities occur almost simultaneously with the fluctuations in the number of water sources, it was concluded that the increased deer densities were a result of the increased amount of permanent water sources developed on the area." (Wood, et. al., 1970.)

(2) Cover - Perhaps the three main functions of cover, so far as mule deer are concerned, are for hiding, cold weather thermal insulation, and shade. It is significant that topography or land form may substitute for or supplement vegetal cover in providing the three functions above described (Loveless, 1974). Higher temperatures of south facing slopes congregate deer for feeding on winter ranges; further, bedding areas are found on the same slopes in conjunction with conifers which keep the absorbed heat from escaping into the atmosphere. Conversely, aspen offer shady areas in the hot summer, especially where they may be found in conjunction with cool, downhill air drainage routes. In South Dakota the juniper slope type was a valuable summer range and conversely, southern exposure was valuable for feeding because wind and increased solar radiation kept them relatively snow free (Severson and Carter, 1978).

In the rugged Rockies of British Columbia investigators found that "mule deer utilized more rugged country at higher elevations, where winds and insolation had cleared much area of snow." (Hudson, Hebert, and Brink, 1976.)

California investigators noted, "the irregular topography makes it easy for deer to escape a strong cold wind independently of the vegetation by moving to the lee side of the ridge." (Linsdale and Tomich, 1953.) The deer's inherent desire to remain concealed further works with these other factors to make suitable cover indispensable.

Attempting to measure all aspects of cover precisely may be futile, although one must realize that cover differs in its value. While relatively open stands may provide thermal cover for bedding, during particularly cold and windy days more dense cover, younger growth, tighter canopies, or areas with much conifer reproduction may be sought. Visual cover (hiding) will also require more dense foliage at lower levels. Experience of the author has demonstrated that where brush, woodland, or forest species reach about five feet in height, they become useful as hiding or escape cover.

Likewise, the value of hiding cover diminishes as the density of vegetation or litter diminishes in the ground to the five foot level (viewed horizontally).

(3) Food and Cover Relationships - The relationships between food and cover are extremely important in evaluating the condition of mule deer range. The information needed in the evaluation is normally collected in the soil vegetation inventory or a special inventory or study if gross vegetation inventory data is not available. See BLM 6630 for supplemental methods.

A. Cover to Open Area Relationships - Many times complete evaluation of the kinds of cover related to mule deer needs cannot be made on large areas. Systems that suggest this type of analysis may be impractical. The design of cover systems or their maintenance should be guided by the good judgement of a biologist or manager familiar with the local deer home range situations.

On the other hand, larger herd areas can be grossly evaluated as to their condition for deer. One of the criteria in forest and woodland cover types for habitat management, improvement of habitat, or evaluation of condition is the ratio of food (open) areas to cover areas (tree or brush canopy).

The home range of deer is small, perhaps less than ½ mile diameter on winter range and less than 3/4 mile on summer range in more productive range and 1 to 2½ miles in diameter in desert areas (Dasmann, 1971). All necessary seasonal vegetation (forage and cover) types, as well as water, must fall into the home range circle. Since mule deer home ranges are limited (as compared to elk), it is probably particularly important that the deer be within easy ranging distance of adequate forage. For this reason, deer range characterized as 60 percent forage area and 40 percent cover would approach optimum. This would be in line with Reynold's (1969) recommendation to leave islands of 10-30 acres in clearings. A wide ranging, more mobile cervid such as the Rocky Mountain elk (*Cervus canadensis*) could stand more cover, not only because of more need for connecting cover, but also because of its ability to move more

easily between smaller, more spread out patches of forage. It seems
logical, therefore, that as cover canopies close and feeding areas
become smaller and further apart, elk are benefited and deer adversely
affected.

B. Size of Openings - One should remember that the size of
open areas are general and in some areas should be adapted to local
conditions. It is, however, surprising that research conducted in
conifer forests at widely separated latitudes in the United States
revealed very similar results. Lyon (circa 1975), working in northern
conifer forests in Montana, demonstrates that 60 acres is preferred by
mule deer in that area of Montana. Hudson Reynold's work in ponderosa
pine cover in the Southwest reveals less than 46 acres to the opening is
proper. Exceptions must be made to general guidelines; for instance,
very little forest cover exists in the extreme southern portion of the
Big Horn Mountains in Wyoming. Where openings are not properly inter-
spersed in cover here, a biologist would want to reduce the size of the
openings to be cut, so they are consistent with limited existing cover.
A 40-60 acre clearing in this area would be too large. Blacktailed deer
in chaparral apparently need openings less than 600 feet across (Taber
and Dasmann, 1958).

Edgerton (1972) concluded that clearcuts, rather than thinning or partial
cuts, were more suited to deer use because of the better and larger
volume of forage produced. Also, the trees that were left provided poor
cover. Proper logging is beneficial to deer so long as enough protective
cover is left (Patton, 1976).

C. Shape of the Opening - Perhaps the shape of the opening is
as important as the size, particularly in large openings. Although
suggestions vary, it is probably reasonable to limit the width of clear
cuts for deer habitat to a maximum of approximately 1200-1600 feet
across (Reynolds, 1969) on winter range and 1050 feet across on summer
range (spruce-fir). If the edge is varied, the length of the opening
may be extended considerably. See Illustration 25.

D. Shape of the Cover - A mosaic or mottled pattern leaving
cover connected between feeding areas would be the best cover design
(see Illustration 26). This is somewhat reminiscent of the pattern left
by a cool, fast burning fire. Connecting cover should be from 600 to
1200 feet across. Reynold's work (1966) suggests, in addition to leaving
islands of cover, that an optimum cover width might be 900 feet. He
found heaviest use in spruce-fir forest to be between 400 and 450 feet
in from the edge. A series of openings of various widths connected by
corridors 900 feet wide or better would seem to offer optimum design.
Significantly larger areas could be left for bedding and escape from
cold winds, storms, and disturbance if these are locally necessary. In
needleleaf forests other than pinyon and juniper, down timber outside of
the opening may become a problem it if is over 18" high and should be
removed where it appears that it may block access to the opening.

Illustration 25

O.K.   BETTER   BEST

1600'   1200'   1600'
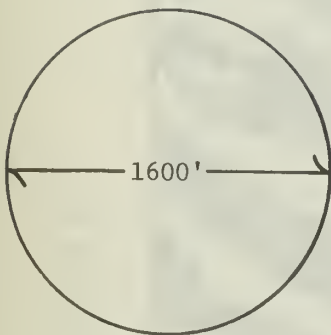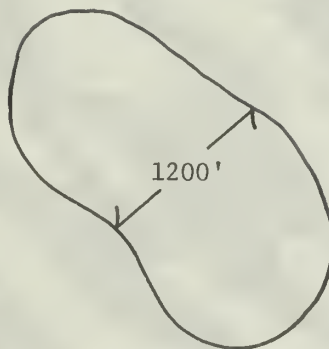
45 Acres Circular   45 Acres Asymmetrical   45 Acres Varied Edge

Scale 2" = 1 mile

Burned Area

Remaining Cover

Illustration 26

(4) Food – Although deer are somewhat opportunistic in their feeding habits, for broad practical understanding of their food needs the list below will give a basic concept of the seasonal major requirements. The construction of a desirable food table by local situation is suggested in Illustration 32. There is no substitute for local preference and use information based on field examination:
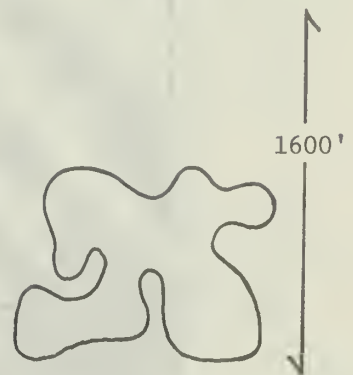
- Winter Season – browse species for winter body maintenance.

- Spring and Late Winter – browse species plus succulent species (usually forbs and cool season grasses) to build up body condition and for fetus production.

- Late Spring and Summer – succulent species especially forbs and grass for lactating females and general body condition.

- Fall – succulents and browse for body conditioning and fat storage prior to winter.' This season is especially important for quality forage if the winter range is small or poor in production. Local studies or information on food habits is essential. An elementary understanding of the physiological requirements of deer as related to forage availability is helpful. Further reading on this is recommended. Illustration 27 shows an exclosure used for studying local mule deer food preferences.

(5) Fences on Mule Deer Range – Fence should be constructed only where necessary for other important land uses. Woven wire fences are generally more damaging to deer herds than are barbed wire fences of the same height. This is because the small wire squares that compose the fence make efficient traps into which deer legs slide easily but from which extraction is seldom accomplished before death.

Fences on deer range should not exceed 42 inches to the top wire from the ground with at least a 12 inch space between the upper two wires to prevent leg twisting in the top two wires. Although mule deer can negotiate fence of 48 inches with considerable success, when fences of this height are placed on hillsides or in the paths of movement of weakened animals, they can cause difficulty in crossing. Illustration 28 depicts this problem.

(6) Other Limiting Factors – There may be many possible limiting factors other than those discussed which will vary from region to region. Such things as snowmobile disturbance, harassment by stray dogs, and dirt bikes are common problems. The problems being encountered in many mountainous areas today are increased snowmobile traffic (Illustration 29), widening of roads, and fencing of rights of way to attempt to drift deer to crossing areas. The traditional problems caused by overgrazing of domestic stock and wildlife are depicted in Illustrations 30 and 31.

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Illustration 27. A total 2 1/2 acre exclosure on the left and a 2 1/2
acre livestock exclosure on the right.

BARRIER HEIGHT INCREASE of 42" FENCE on CONTOUR
of DIFFERENT PERCENT SLOPES

42"

0%

62"

30%

48.6"

10%

68"

40%

55"

20%

75"

50%

108"

100%
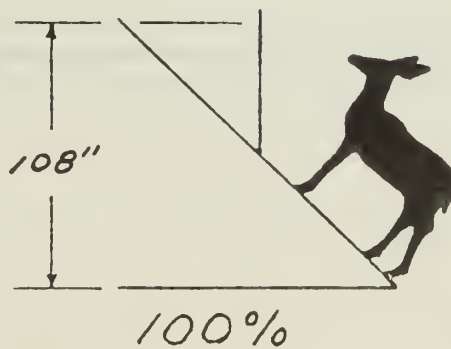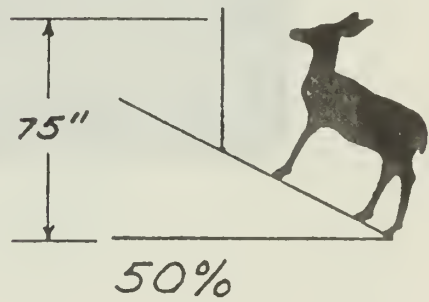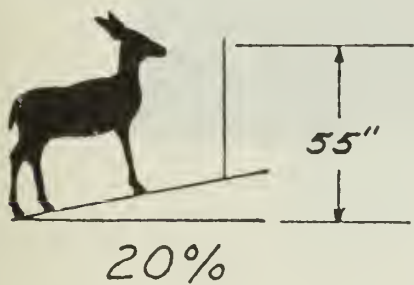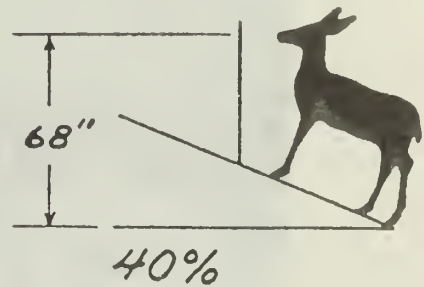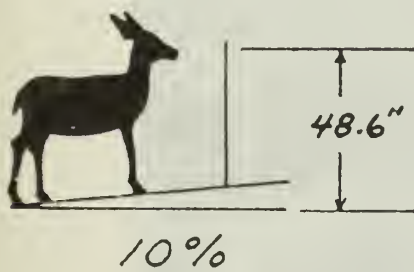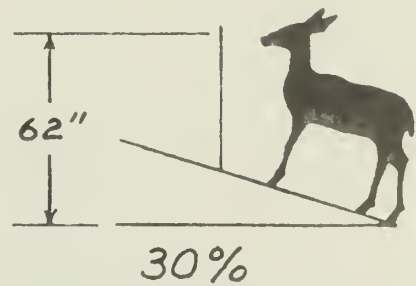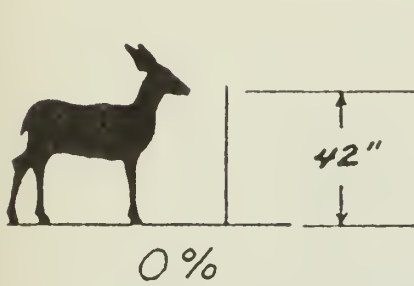
from
Loren D. Anderson &
William C. Bernt

Illustration 28

Illustration 29. Snowmobile traffic on winter ranges where deer are hard pressed by snow and cold can be extremely harmful and fatal.

Illustration 30.   Overgrazing by livestock can deplete quality mule deer
forage in otherwise desirable areas.
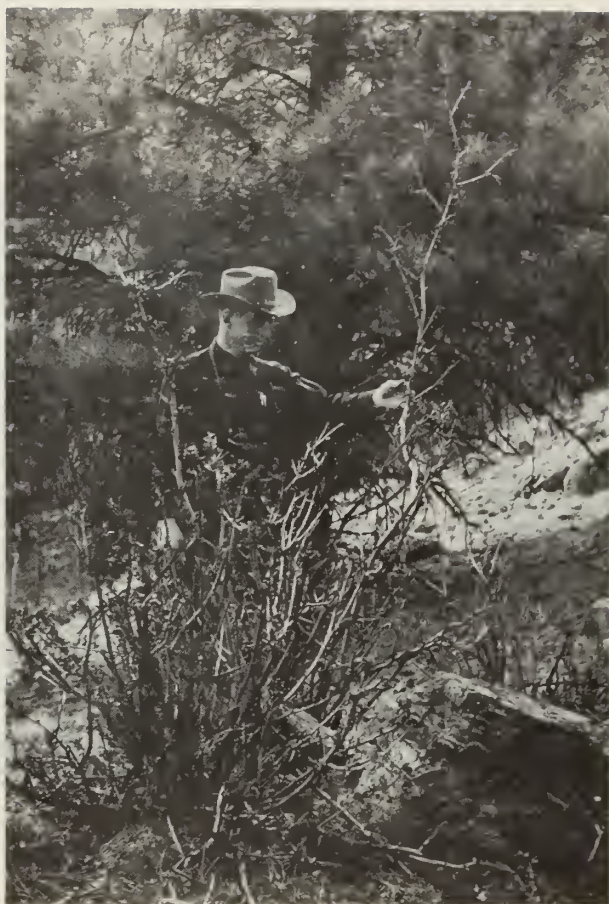
Illustration 31. Heavy mule deer grazing, along with closing tree canopies, can deplete mule deer foods.

Rating Mule Deer Range

Having inventoried and applied the inventory information against possible
limiting factors, a general assessment of the mule deer herd area or
seasonal range can now be produced. This is normally called the condition
rating. Several condition ratings for the same area on succeeding years
can be compared and a trend rating can be established. These rating factors
should be established on criteria using those habitat factors which are
important and which can be managed. It does little good, for instance,
to say that the area is too flat, for that cannot be changed materially
(with the exception of large open pit mining reclamation).

The general condition rating for the mule deer range or herd area can be
used for habitat management plans in reports to the Bureau Directorate,
reports to legislators or the Congress, for budgeting or legislation,
and in some cases as a major portion of environmental assessments in
conjunction with other programs carried out on these ranges. An
example of a condition rating system for mule deer ranges is given in
Illustration 32. (Deming, 1957; Hill and Brandborg, 1960; Reynolds,
1961 and 1966; and USFS, et al., 1970.)

Manipulation Practices

To create optimum opening cover ratios in forests or woodlands, various
methods may be used. For example, commercial timber cutting will probably
be the major manipulation factor or tool in the Cascade Mountains and
Northern Rocky Mountains, and perhaps in other regions where commercial
forest stands are being harvested. In other areas, especially the
juniper-pinyon woodland and juniper steppe woodlands, other practices
may be employed.

Chaining is a common practice used extensively on large areas to reduce
tree cover. It was widespread until the late 1960's. This practice
consisted of dragging an anchor chain weighing about ninety pounds per
link between two D-8 sized caterpillar tractors and knocking down and
uprooting mature and older trees (Kerr and Hofman, 1964). There were
various methods used, but chaining one way without burning might produce
good immediate results for deer. This practice has the disadvantage of
regrowing a canopy sooner than more intensive, cleaner methods. Various
applications of seed were broadcast prior to the chaining. For seeding
applications on various types of disturbed areas, the various writings
of Perry Plumber are unsurpassed. Restoring Big Game Range in Utah is
a particularly good reference (Plumber, Christensen, and Monsen, 1968).

Cutting areas for firewood can be laid out to benefit the opening
(forage) to cover ratio.

Some work has been done using 2,4-D sprays on types such as *Ceanothus-
Chamise* Range (Hoffer, 1972).

Some bulldozing of individual trees has been done, but it is not effective for large areas.

Maybe one of the most effective methods to manipulate vegetation for the forage cover ratio is by the use of fire. A naturally occurring phenomenon effective prior to man's encroachment, kept deer ranges in a mixture of successional stages, thereby providing a variety of cover and forage areas. It was in this situation that the mule deer evolved. The use of fire or the imitation of its occurrence and effects is probably the best and most practical way to manipulate large wild areas for mule deer habitat.

In order to plan for treatment of mule deer habitat, it is important to know the full and natural cycle of the plant association from establishment through climax.

Treatment should be spread out over a period of years to provide treated areas in a variety of successional stages if possible. If uniform treatments are given over broad areas (i.e., large denuding fires), we have a situation whereby deer boom when the sapling or post pole stage of the succession is reached and then decline drastically for the remainder of the succession until disturbances occur again. By periodically treating different small portions of a whole cover type, we create several important seral stages of a succession for a particular type and level out the boom and bust effect. In the past, man has not directly managed ranges in this manner. Rather, they have been indirectly managed by economics through homesteading, livestock grazing, timber harvest, cutting large forest areas for mine props, etc. A new example of economic control and management of habitat is rotating well irrigation on the high plains in areas never before cultivated. The regional habitat effect of this practice is yet to be observed.

Since these activities led by economic drives tend to be uniformly spread over large regional areas, they tend to produce successional ecosystems that are about at the same stage over whole areas. Unless they are managed, they tend to produce boom and bust populations. Our fire suppression activities have controlled or eliminated fire, which tended to vary successional stages within a region and therefore provided suitable habitat and deer numbers. We therefore need to overtly manage large cover types if we are to provide the complete variety of successional stages required by mule deer and other animals. There is little literature to objectively prove this, since no one has studied it over a 200 year successional period.

Illustration 32.

MULE DEER RANGE RATINGS 1/

I.   Vigor Rating (Information for Rating taken from Form 6630-3, Site
Inventory Forms).   Rate a key species 2/ of grass, forbs, or browse.   3/
     For Browse Ratings use 6630-3 or Site Inventory Forms.
     For Grass Ratings use Site Inventory Information.
     For Forbs use Site Inventory Information.

     A.   Age Class
          1.   If satisfactory enter 8 pts.
          2.   If unsatisfactory enter 4 pts.

     B.   Form Class
          1.   If satisfactory enter 8 pts.
          2.   If unsatisfactory enter 4 pts.

II. Forage Quality Rating (adjusted for quantity)

     A.   (Rate range that is least in supply or critical to the big game
species; if two or more seasonal ranges are critical, rate all that are
and divide by the seasonal ranges rated.)

     B.   Using a locally constructed table of desirable, intermediate,
and least desirable plants by species and use percent composition listing
for habitat site from the vegetation inventory or mean composition of a
group of sites determine if:

17   ☐   desirable species are present in quantities over 45%.
13   ☐   intermediate and desirable species make up at least 50% of
             the composition with desirables at least 15%.
 9   ☐   less than 50% but more than 25% of the composition is made
             up of desirable and intermediate species.
 5   ☐   undesirable species are 75% or more of the composition.

(Do not use these cores for final rating summation. Use the adjusted
figure described in C.)

     C.   The above score must be adjusted to reflect the amount of
forage available. From the vegetation inventory, take the total
cover density (by pace transect, usually) if the total cover density
is:

ADJUSTED SCORE FORAGE QUALITY

- ☐ more than 35%, subtract nothing from the above score and enter at left.
- ☐ 21% to 35%, subtract 2 points from the above score and enter at left.
- ☐ 11% to 20%, subtract 4 points from the above score and enter at left.
- ☐ 0% to 10%, subtract 6 points from the above score and enter at left.

III. Food Area to Cover Area Ratio

A. Using the vegetation map or aerial photos, list those habitat sites opposite their acreage which are considered food areas, and similarly, those which are considered cover (all types including fawning cover, escape cover, or thermal cover). Use areas known to be within the occupied herd area only.

17 ☐ herd area being rated is composed of 60% food patches and 40% cover (trees or shrubs in groups and over 20 ft high are mainly considered cover types).
13 ☐ cover or food area percentages vary 10% - 20% from above.
9   ☐ cover or food area percentages vary 20% - 30% from above.
5   ☐ cover or food area percentages vary 30% + from above.

IV. Forage Area Size

16 ☐ food patches 40-60 acres in size (20-40 acres in spruce-fir).
13 ☐ food patches more than 60 acres in size, less than]/5 mile across.
9   ☐ food patches 1/5 to 1/2 mile across.
5   ☐ food patches greater than 1/2 mile across.

V. Water Availability

16 ☐ average distance between permanent water sources of acceptable quality is 2-1/2 miles or less.
13 ☐ average distance between permanent waters of acceptable quality is 2-1/2 to 4 miles.
9   ☐ average distance between permanent waters more than 4 miles, or snow must be substituted for long period (1 month or more).
5   ☐ permanent acceptable waters are scarce.

56

VI. Disturbance or Interference Rating

    A. Taken from census or demographic trends, aerial photos, 6602-21.
These influences can be observed in a general way and are a subjective
judgement of the rater, but where major interference or disturbance is
indicated, it should be narratively explained.

18 ☐ Historic crucial, reproduction and/or migration areas are
         undisturbed by an influx of people and/or their facilities
         with little change in the last 10 years. Few if any conflicts
         or hazards are documented.
13 ☐ Historic crucial, reproduction and/or migration areas have been
         slightly disturbed in the last ten years; only a few new roads
         or facilities have been constructed; a small number of conflicts
         or hazards are obvious enough to be documented.
 9 ☐ Historic crucial, reproduction and/or migration areas have been
         noticeably disturbed in the last ten years. Conflicts and
         hazards could easily be identified and documented. 4/
 5 ☐ Historic crucial, reproduction and/or migration areas have been
         severely disturbed in the last ten years. Many conflicts and
         hazards could be identified and documented. 4/

RATINGS	SUM OF POINTS
Good	81 – 100
Fair	61 – 80
Poor	51 – 60
Bad	10 – 50

If the rater for purposes of evaluating range conflicts only desires to
rate big game range based on vegetation only, then ratings for Vigor
and Forage Quality only may be used and multiplied by a factor of 3.0
for the rating score.

For non-forest or non-tall bush types, do not use the Food Area to Cover
Area ratio or the Forage Area Size ratings. Multiply the total score of
the other ratings by 1.5 for the condition rating.

1/ Use on occupied or historically occupied ranges only can be applied
     to a single habitat site or a group of them if the mean data is
     used to rate the total group.
2/ A major forage species.
3/ Formulae shown below:

FORMULA FOR INVENTORY INFORMATION TO RATE
AGE AND FORM CLASS OF GRASSES AND FORBS

Age class is unsatisfactory for grasses if: class D "Decadent"
exceeds any of the other age classes of S "Seeding", Y "Young",
or M "Mature".

Form class is unsatisfactory if classes 2, 3, 4, and 5 totaled exceed No. 1.

FORMULA TO RATE BROWSE

Age class is unsatisfactory if decadent plants outnumber live seedlings and young plants combined.

Form class is unsatisfactory if severely hedged, unavailable, and dead plants outnumber other categories (6630-3); or classes 2, 3, 4, and 5 outnumber class 1 (vegetation inventory); or limited availability and unavailable classes outnumber available and partially available classes (vegetation inventory).

4/ Explain major distrubance in narrative.

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76	Blackland prairie (Andropogon-Stipa)	68	Wheatgrass-grama-buffalo grass (Agropyron-Bouteloua-Buchloe)
75	Nebraska Sandhills prairie (Andropogon-Calamovilfa)	67	Wheatgrass-bluestem-needlegrass (Agropyron-Andropogon-Stipa)
74	Bluestem prairie (Andropogon-Panicum-Sorghastrum)	66	Wheatgrass-needlegrass (Agropyron-Stipa)
		65	Grama-buffalo grass (Bouteloua-Buchloe)

AMERICAN GEOGRAPHICAL SOCIETY

POTENTIAL NATURAL VEGETATION
OF THE CONTERMINOUS
UNITED STATES
by
A. W. KÜCHLER

Scale 1:3,168,000

BUREAU OF LAND MANAGEMENT
PHYSIOGRAPHIC REGIONS

Northern Rocky Mountains

Upper Missouri Basin and Broken Lands

Middle Rocky Mountains

Columbia Plateau

Black Hills Uplift

Wyoming Basin

Upper Basin and Range

Southern Rocky Mountains

Great Plains

Colorado Plateau

Rocky Mountain Piedmont

Lower Basin and Range

WASHINGTON · IDAHO · WYOMING · SOUTH DAKOTA · NEBRASKA · COLORADO · KANSAS · NEW MEXICO · TEXAS · OKLAHOMA · MINNESOTA · MISSOURI · ARKANSAS

Northern Pacific Border · Cascade Mountains · Sierra Mountains · Southern Pacific Border

a Juniperus spp. (juniper, red cedar)
s Sequoia wellingtonia (giant sequoia)
t Yucca brevifolia (Joshua tree)

WESTERN FORESTS

NEEDLELEAF FORESTS

1 Spruce-cedar-hemlock forest (*Picea-Thuja-Tsuga*)
2 Cedar-hemlock-Douglas fir forest (*Thuja-Tsuga-Pseudotsuga*)
3 Silver fir-Douglas fir forest (*Abies-Pseudotsuga*)
4 Fir-hemlock forest (*Abies-Tsuga*)
5 Mixed conifer forest (*Abies-Pinus-Pseudotsuga*)
6 Redwood forest (*Sequoia-Pseudotsuga*)
7 Red fir forest (*Abies*)
8 Lodgepole pine-subalpine forest (*Pinus-Tsuga*)
9 Pine-cypress forest (*Pinus-Cupressus*)
10 Ponderosa shrub forest (*Pinus*)
11 Western ponderosa forest (*Pinus*)
12 Douglas fir forest (*Pseudotsuga*)
13 Cedar-hemlock-pine forest (*Thuja-Tsuga-Pinus*)
14 Grand fir-Douglas fir forest (*Abies-Pseudotsuga*)
15 Western spruce-fir forest (*Picea-Abies*)
16 Eastern ponderosa forest (*Pinus*)
17 Black Hills pine forest (*Pinus*)
18 Pine-Douglas fir forest (*Pinus-Pseudotsuga*)
19 Arizona pine forest (*Pinus*)
20 Spruce-fir-Douglas fir forest (*Picea-Abies-Pseudotsuga*)
21 Southwestern spruce-fir forest (*Picea-Abies*)
22 Great Basin pine forest (*Pinus*)
23 Juniper-pinyon woodland (*Juniperus-Pinus*)
24 Juniper steppe woodland (*Juniperus-Artemisia-Agropyron*)

BROADLEAF FORESTS

25 Alder-ash forest (*Alnus-Fraxinus*)
26 Oregon oakwoods (*Quercus*)
27 Mesquite bosques (*Prosopis*)

BROADLEAF AND NEEDLELEAF FORESTS

28 Mosaic of numbers 2 and 26
29 California mixed evergreen forest (*Quercus-Arbutus-Pseudotsuga*)
30 California oakwoods (*Quercus*)
31 Oak-juniper woodland (*Quercus-Juniperus*)
32 Transition between 31 and 37

WESTERN SHRUB AND GRASSLAND

SHRUB

33 Chaparral (*Adenostoma-Arctostaphylos-Ceanothus*)
34 Montane chaparral (*Arctostaphylos-Castanopsis-Ceanothus*)
35 Coastal sagebrush (*Salvia-Eriogonum*)
36 Mosaic of numbers 30 and 35
37 Mountain mahogany-oak scrub (*Cercocarpus-Quercus*)
38 Great Basin sagebrush (*Artemisia*)
39 Blackbrush (*Coleogyne*)
40 Saltbush-greasewood (*Atriplex-Sarcobatus*)
41 Creosote bush (*Larrea*)
42 Creosote bush-bur sage (*Larrea-Franseria*)
43 Palo verde-cactus shrub (*Cercidium-Opuntia*)
44 Creosote bush-tarbush (*Larrea-Flourensia*)
45 Ceniza shrub (*Leucophyllum-Larrea-Prosopis*)
46 Desert vegetation largely absent

GRASSLANDS

47 Fescue-oatgrass (*Festuca-Danthonia*)
48 California steppe (*Stipa*)
49 Tule marshes (*Scirpus-Typha*)
50 Fescue-wheatgrass (*Festuca-Agropyron*)
51 Wheatgrass-bluegrass (*Agropyron-Poa*)
52 Alpine meadows and barren (*Agrostis, Carex, Festuca, Poa*)
53 Grama-galleta steppe (*Bouteloua-Hilaria*)
54 Grama-tobosa prairie (*Bouteloua-Hilaria*)

SHRUB AND GRASSLANDS COMBINATIONS

55 Sagebrush steppe (*Artemisia-Agropyron*)
56 Wheatgrass-needlegrass shrubsteppe (*Agropyron-Stipa-Artemisia*)
57 Galleta-three awn shrubsteppe (*Hilaria-Aristida*)
58 Grama-tobosa shrubsteppe (*Bouteloua-Hilaria-Larrea*)
59 Trans-Pecos shrub savanna (*Flourensia-Larrea*)
60 Mesquite savanna (*Prosopis-Hilaria*)
61 Mesquite-acacia savanna (*Prosopis-Acacia-Andropogon-Setaria*)
62 Mesquite-live oak savanna (*Prosopis-Quercus-Andropogon*)

CENTRAL AND EASTERN GRASSLANDS

GRASSLANDS

63 Foothills prairie (*Agropyron-Festuca-Stipa*)
64 Grama-needlegrass-wheatgrass (*Bouteloua-Stipa-Agropyron*)
65 Grama-buffalo grass (*Bouteloua-Buchloe*)
66 Wheatgrass-needlegrass (*Agropyron-Stipa*)
67 Wheatgrass-bluestem-needlegrass (*Agropyron-Andropogon-Stipa*)
68 Wheatgrass-grama-buffalo grass (*Agropyron-Bouteloua-Buchloe*)
69 Bluestem-grama prairie (*Andropogon-Bouteloua*)
70 Sandsage-bluestem prairie (*Artemisia-Andropogon*)
71 Shinnery (*Quercus-Andropogon*)
72 Sea oats prairie (*Uniola-Andropogon*)
73 Northern cordgrass prairie (*Distichlis-Spartina*)
74 Bluestem prairie (*Andropogon-Panicum-Sorghastrum*)
75 Nebraska Sandhills prairie (*Andropogon-Calamovilfa*)
76 Blackland prairie (*Andropogon-Stipa*)

Illustration 1

APPROXIMATE DISTRIBUTION OF MULE DEER SUBSPECIES
IN RELATION TO PHYSIOGRAPHIC REGIONS 1978

LEGEND

ROCKY MOUNTAIN MULE DEER
Odocoileus hemionus hemionus

DESERT MULE DEER
O. h. crooki

BURRO DEER
O. h. eremicus

SOUTHERN MULE DEER
O. h. fuliginatus

INYO MULE DEER
O. h. inyoensis

CALIFORNIA MULE DEER
O. h. californicus

COLUMBIAN BLACK-TAILED DEER
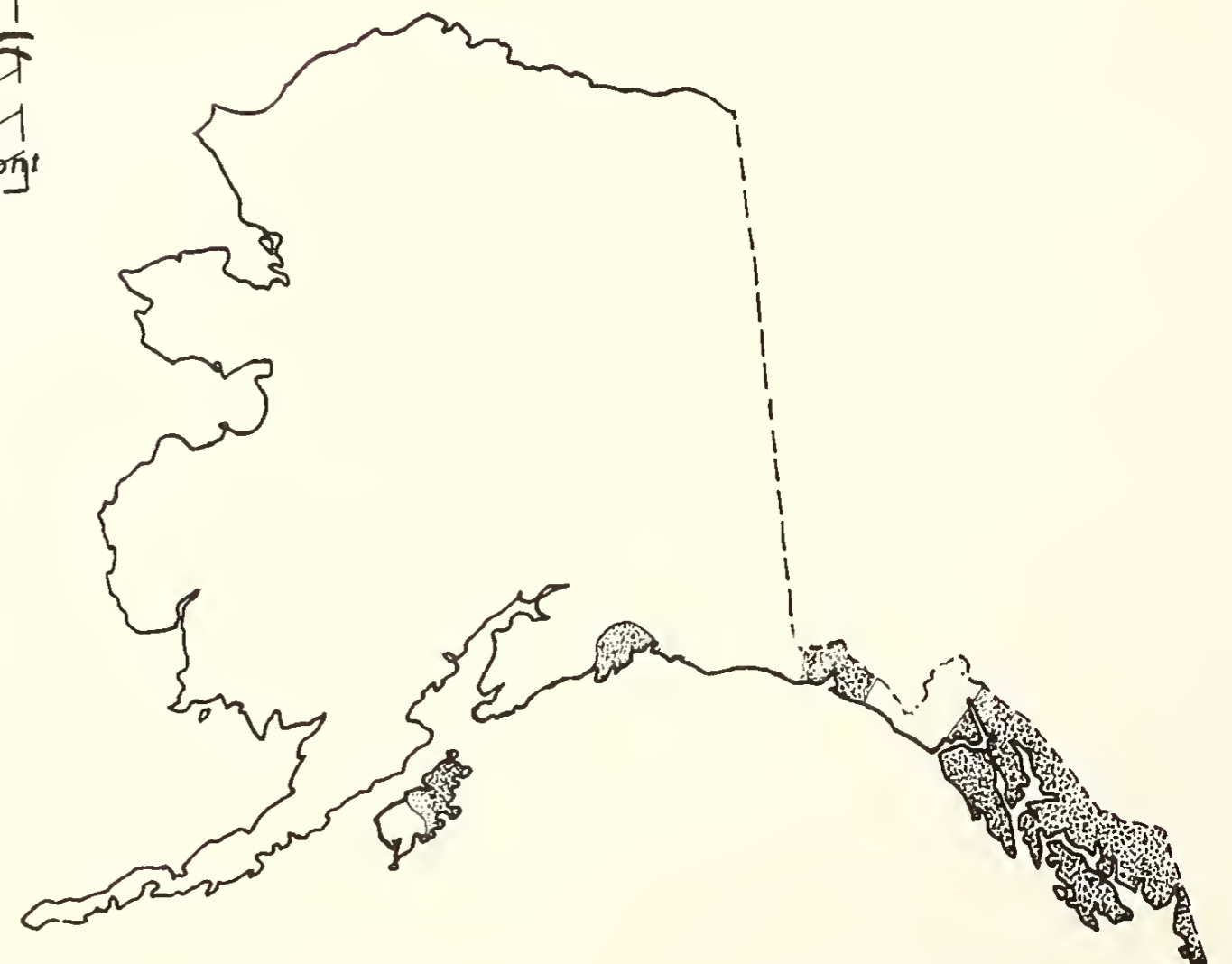O. h. columbianus
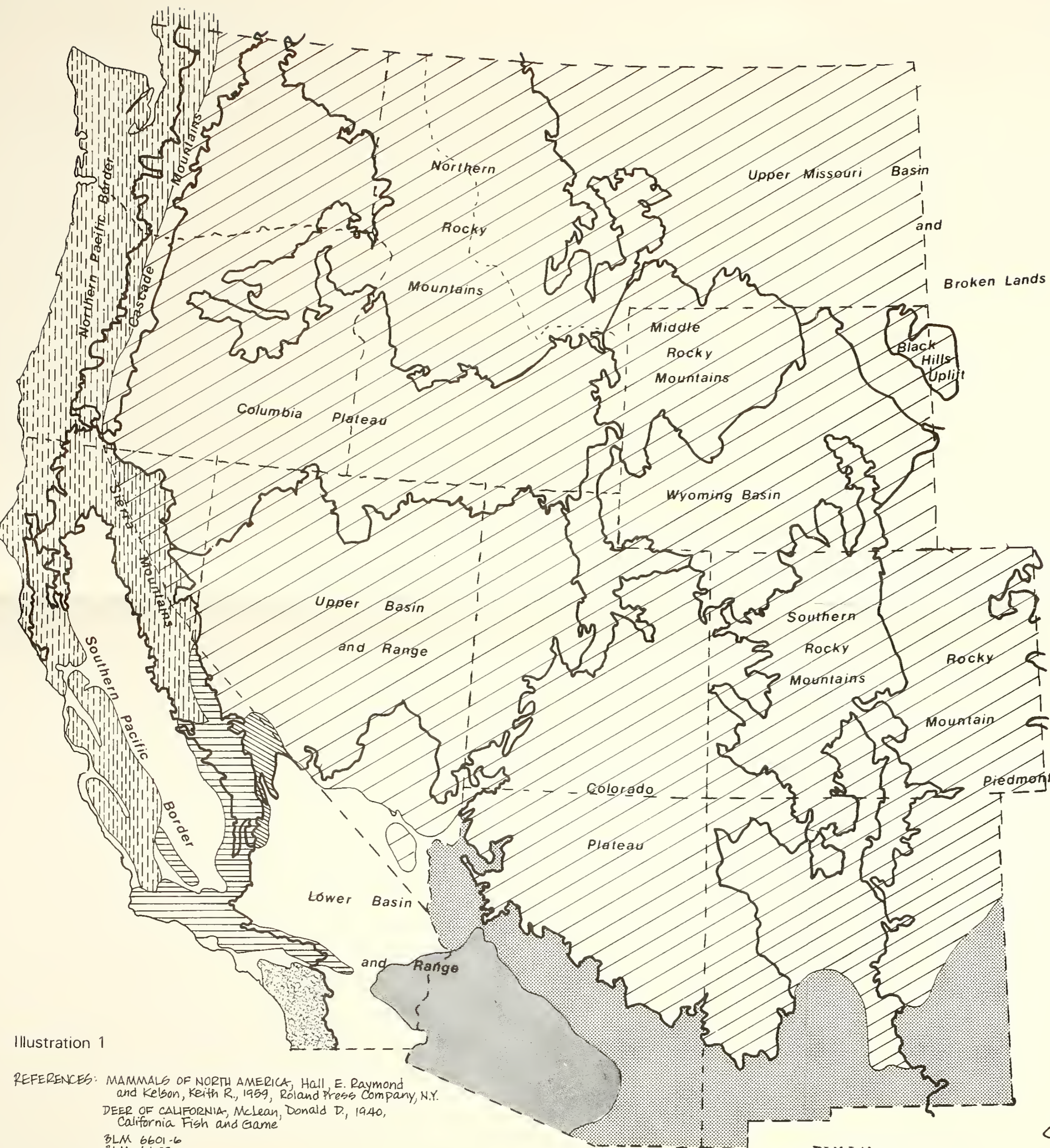
SITKA MULE DEER
O. h. sitkensis

Illustration 1

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