MANAGEMENT PLAN FOR THE SHERWIN GRADE DEER HERD

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INTRODUCTION

A long-term decline in deer numbers has occurred throughout California during the past 20 years, prompting a decision by the Department of Fish and Game in 1975 to formulate a general plan to restore and maintain healthy deer herds at levels compatible with their habitat, to increase the quantity and quality of deer habitat, and to provide for diversified recreational use of deer. In 1977 the Legislature passed Assembly Bill 1520 (Perino) mandating that the Department develop deer herd unit management plans containing specified program elements, that a geographical unit of deer range be considered distinct from adjacent ranges and that a management plan for that unit be designed for that herd alone.

This document complies with the Department policy commitment and legislative mandate to describe the status and trend of the Sherwin Grade herd and to formulate a management program which will, if implemented, 1) maintain overall deer numbers, 2) improve the condition of the range, and 3) provide for high quality and diversified use of Sherwin Grade deer.

To achieve these goals, this plan incorporates ecologically sound management concepts which provide the basis for specific program elements relating to herd size, production and survival, research needs, habitat preservation and improvement, harvest strategies, and other facets of herd management. Because deer herds are continually changing, plans must be dynamic. Furthermore, since much information is lacking, provision will be made for plan

revision and updating as study results and other additional information becomes available.

The herd range is subject to high demands for multiple commercial, residential and recreational land uses, most of which tend to affect the deer herd adversely.

This plan was created with input from land management agencies and local governments and is intended to provide them guidance in making resource allocations which will dictate the future condition of Sherwin Grade deer. There are several major issues and concerns relating to management of Sherwin Grade deer including: 1) high demand for multiple resource use on the range especially recreation, grazing and housing, 2) increasing demands for water for power production and housing development, 3) demand for increased deer harvest and hunting opportunity, 4) long term deer habitat reduction and deterioration, and 5) opportunities for deer habitat preservation and enhancement in conjunction with other resource management programs.

These factors, in combination with appropriate laws, regulations, and policies, were used in evaluating goals for the Sherwin Grade herd. Since the attainment of these goals is a long-term process, this plan is intended to be effective for a period of 10 years, with a 1995 target date for attainment of goals.

II. DESCRIPTION OF THE HERD AND MANAGEMENT UNIT

A. Deer Herd Definition and History

1. Herd Definition

This herd has a population of about 2,000 Rocky Mountain mule deer that winter in southern Mono and northern Inyo counties and summer in southern Mono County, eastern Fresno,and Madera Counties. The herd occupies an area of approximately 360 miles. About 60 square miles are winter range and about 300 square miles are intermediate/summer ranges.(Figure 1.)

2. Herd History.

According to reports by early explorers, before settlement by European man, deer were scarce in the unit area. From the Gold Rush through the turn of the century they remained scarce due to heavy hunting, but increased slowly between 1910 and 1930.

Deer tags were first issued by California Division of Fish and Game in 1927; only 36 deer were reported taken in Mono County in that year. However, herds increased rapidly during the 1940's and 1950's, stimulating high hunter success (Britton, 1971). By the late 1950's deer had increased to the extent they clearly exceeded the carrying capacity of the winter range.

The first antlerless hunts were held in 1955 to reduce excessive deer numbers. Tag quotas were set using the three-year average buck kill. It was felt that too few deer were taken to relieve winter range abuse. In the mid-sixties, the number of antlerless tags was increased; the higher harvest rate reduced the pressure on the range to the desired level and antlerless hunting was

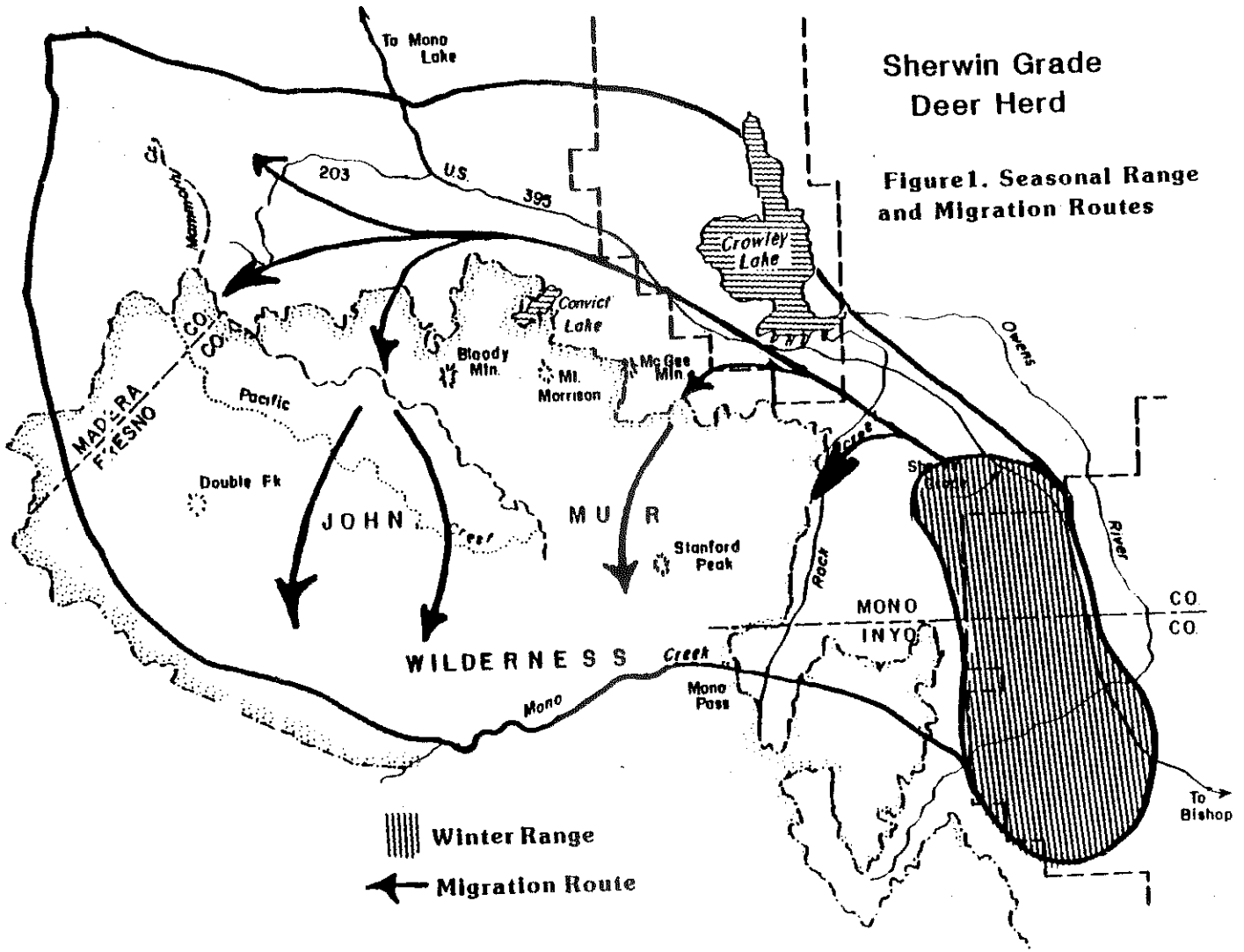

Figure 1. Seasonal Range and Migration Routes

curtailed after 1967. According to Anderson (1972) "in 1969 there was a 45% winter loss of fawns in the Sherwin Grade herd" (due to heavy, prolonged snow cover) and "carcass counts showed that about half of the total loss was fawns and half very old bucks and does." Population increases have been slow and the most recent data suggests a stable to slightly declining population at this time.

3. Seasonal Ranges and Migration

Winter range, summer range, and generalized migration corridors used by the herd are shown in Figure 1. A detailed herd study began during January, 1984, and will define more specifically the key intermediate, migration and summer habitats of the herd. Progress and final reports on this effort will be appended to this plan.

4. Harvest History

Harvest has been recorded since 1954. Total annual kill averaged 318 during the 1950's and fell to an average of 204 during the 1960's. These figures include a substantial antlerless harvest. The annual average fell to 90 during the 1970's largely due to a lack of doe harvest. Buck harvest has fluctuated widely over the years. Buck hunting seasons were set earlier and shorter during recent years, affecting the overall harvest (Table 1).

In 1981, a storm occurred during the month-long hunting season which caused an early migration, resulting in a record buck harvest. Subsequently, buck numbers and harvests have been consistent with the long-term average (Table 1). In spite of the low buck ratio, the 1983 harvest rose somewhat due to feed and

Table 1

SHERWIN GRADE DEER HERD

Year	Harvest: Buck	Harvest: Doe	Composition counts/100 Does: Bucks	Composition counts/100 Does: Fawns Fall	Composition counts/100 Does: Fawns Spring
1954	162	-	-	-	-
1955	126	164	-	-	-
1956	81	226	-	-	-
1957	216	202	-	-	-
1958	52	223	16	60	-
1959	155	207	10	58	40
1960	143	135	13	44	43
1961	153	-	11	34	41
1962	121	-	15	39	26
1963	182	145	18	64	37
1964	200	136	15	54	-
1965	92	155	17	34	29
1966	164	127	9	57	29
1967	36	97	13	-	41
1968	156	-	17	40	49
1969	15	-	10	27	22
1970	91	-	17	52	25
1971	35	-	31	58	51
1972	106	-	25	56	46
1973	107	-	33	65	45
1974	58	-	35	62	60
1975	147	-	25	56	57
1976	91	-	32	60	56
1977	130	-	33	37	56
1978	75	-	22	45	57
1979	121	-	21	51	22
1980	120	-	34	-	50
1981	446	-	11	36	19
1982	133	-	11	42	10
1983	171	-	10	50	26
1984	157	-	11	39	30

weather conditions.

5.Herd Composition Records

Sherwin Grade herd composition counts have been taken in late fall and spring since 1958. These data are presented in Table 1. Sample sizes have varied but have been ample in all years. Low summer fawn production or survival is indicated by fall counts. Winter losses also occur, as indicated by lower spring ratios, especially during the 1981 and 1982 winters. Buck ratios have fluctuated over the years but are currently low due to the high 1981 harvest, subsequent low recruitment rate, and continuing high level of hunting pressure.

6.Mortality Factors

a.Predation. Mountain lions and coyotes are the most common predators inhabiting the Sherwin Grade deer range. Lions are "deer specialists" and no doubt take deer from this herd. In addition, it seems likely that lion numbers have increased under recent no-take regulations, but no reliable estimates of lion numbers on the range are available; the overall effect on total deer numbers in the herd is unknown.

Coyotes are numerous on much of the range and are probably the major source of predation mortality on Sherwin Grade deer simply because of the far greater number of coyotes compared to other predators. Again, however, the overall effect on total deer numbers is unknown.

For an in-depth discussion of the varying effects of predation and predator control, see Connolly (1981).

An unknown number of deer are killed by domestic dogs each year

and many more are harrassed, especially around Paradise Estates and Swell Meadows housing developments on the winter range. Significant stress can impact wintering deer which are facing harsh nutritional and temperature conditions. On the summer range uncontrolled dogs accompanying backpackers can harrass deer which is particularly stressing to nursing does. Dogs associated with livestock operations probably disturb deer also, but to a lesser extent because they do not typically roam freely.

Although bears, eagles, and bobcats also occupy the herd's range, their effect on the population is believed to be minor since they aren't abundant and do not specifically prey on deer.

b.Winter Kill. Composition counts reveal heavy fawn losses during recent winters (1981: 47% loss, 1982: 76% loss). An unknown number of adults also die each winter.

Bitterbrush on the winter range is old and heavily used by deer; in most years browse becomes scarce by spring. During periods when snow covers the ground, little or no herbaceous forage is available either, causing severe nutritional stress. Many adults and fawns died on this range during the heavy snowfall winter of 1969 and similar losses may be expected to occur if similar conditions develop in the future.

c.Summer Fawn Loss.

An average of 43 fawns per 100 does has reached the winter range in each of the last five years compared to an average of 60 per 100 during the 1970's. Reasons for this decline are unknown, but the figures indicate an increasing loss of fawns prenately, at birth, or during the first months of life.

c. Disease and Parasites. No information on disease or parasites of Sherwin Grade deer has been collected so nothing is known about the incidence of these factors.

e. Nutrition. Nutritional deficiencies are probable on the winter range. No specific information is available relating to summer range forage quality although deer appear in good condition and bucks harvested are usually in excellent condition. Nutritional factors may be involved in early fawn losses, however.

f. Illegal Kill. An unknown number of deer are taken illegally each year. Much of the herd's range has road access, so deer are available to poachers. Out-of-season poaching is believed to be relatively light during recent years as evidenced by the few signs of kills found in the field. It is difficult to determine total illegal kill or the effect on the population.

g. Human Encroachment and Disturbance. Housing and recreational encroachment is a major factor impacting the Sherwin Grade herd. The City of Mammoth has acquired the use of key deer habitat and continues to expand further into important areas, forcing deer further into the periphery of historic range. The housing developments at Swall Meadow and Paradise Estates continue to grow to the serious detriment of deer winter range and the key migration corridor. Housing is expanding at Little Round Valley, Hilton Creek and McGee Creek into the herd's migration route along the base of the Sierra escarpment.

Sherwin Bowl, important deer habitat, is again being proposed for intensive ski development. If the project is constructed, preservation of the deer resource will be a substantial challenge to biologists and planners. Recreational use of the backcountry

is high and demand is increasing; many trails receive heavy and almost continuous traffic. Backpackers camp in key habitat and displace deer. When loosed, their dogs harass deer.

B. HERD RANGE DESCRIPTION AND HISTORY

1. Topography, Soils, Climate.

The range of the Sherwin Grade herd extends through elevations from about 4500 feet on the Round Valley winter range to well over 10,000 feet on the Sierra Crest. It is known that some east slope deer summer on the Sierra west slope down as far as 6,000 feet elevation. The range includes gently sloping brushlands at the low and intermediate elevations, sheer granite escarpments, and moderately sloping woodlands on the west slope of the Sierras. Much of the summer range topography is very steep and rocky and of low value as deer habitat.

The soils of the summer range are described as being shallow to moderately deep (10 to 40 inches) and generally having a sandy loam texture. Rock content varies from 0 to 35% and the steeper slopes are usually more rocky. Water retention capability tends to be low and inversely related to rock content. Much of the Sierra escarpment is a massive granite barrier.

Soils on the winter range are shallow, rocky and erodable decomposed granites with intermixing of sandy loam. The higher quality soils on the winter range are devoted to agriculture, but are moderately utilized by deer.

The climate of the unit is characterized by heavy snowfall and low temperatures during the December-April period. Average annual precipitation is approximately 60 inches at 10,000 feet and about

10 inches at 5,000 feet. Most of this precipitation is in the form of snow, but winter rains are common at the lower elevations and summer thunderstorms are common at higher elevations.

2. Range History.

Early reports by Walker, Fremont, Von Schmidt, and other explorers indicated sparse game populations (primarily bighorn and antelope) in the general region. The mining industry stimulated development in Mono County and during the 1860's a grazing economy was established. Large bands of domestic sheep were grazed beginning in the 1870's and by the turn of the century many thousands of sheep were grazing the range. During the same period heavy hunting pressure combined with excessive grazing of the bunchgrass to virtually eliminate the antelope and bighorn. Bunchgrass ranges were converted to browse, mainly bitterbrush and sagebrush, which provided good deer forage and prompted a gradual increase in deer numbers until the 1930's.

Grazing restrictions on National Forest lands and the passage of the Taylor Grazing Act in 1934, which regulated grazing use of the public domain (now BLM) lands, reduced grazing pressure significantly. Browse species continued to flourish and deer numbers increased dramatically during the 1940's and 1950's.

Due to lack of commercial timber stands, logging has not occurred on the herd's range.

3. Land Ownership.

Approximately 90% of the herd's range is public land administered by the U.S. Forest Service. The winter range is owned largely by Los Angeles Department of Water and Power, with some public domain

administered by the BLM. A small fraction of the range is privately owned; much of this private acreage is key winter and migration habitat. Private holdings extend into important summer and migration habitat at the growing city of Mammoth Lakes and along the base of the Sierra escarpment (Figure 8)

4. Current Grazing Use.

Table 2 presents current (1983) USFS range allotment data. Figures given are for cattle, except as noted.

Table 2

Allotments	Head		Dates	Months	AUM's
Hot Creek Unit	185		6/15-7/25	1.33	246
Convict Unit	253		6/20-8/15	1.83	463
Meadow Unit	253		8/15-8/25	.36	91
Casa Diablo Unit	37		7/25-9/25	2.00	74
Whitmore Hill Unit	148		7/25-9/25	2.00	296
Laurel Creek Unit	25		8/25-9/25	1.00	25
Meadow Unit	228		8/25-9/25	1.00	228
Sherwin-Deadman	3000	sheep	7/01-9/20		
Tobacco Flat	150		6/15-7/15	4.00	200
Rush Creek (horse&mule)	5		7/01-10/1	3.50	18
Fish Cr & Mammoth Cr	20		7/01-10/15	3.50	70
Minarets & Fish Creek	30		7/01-10/15	3.50	105
Convict Basin	4		7/01-10/15	3.50	15
McGee	1600	sheep	6/07-9/07	3.00	*4800
Rock Creek	2400	sheep	6/15-10/01	3.50	*8400
Wells Meadow	20		4/01-7/30 (Admin. pasture) and 9/01-11/30		-

* Sheep months. Use 0.2 AUM/sheep-month.

As on most public lands, the demand for grazing use on this unit is high. Except for the winter range, essentially all suitable land within the unit boundaries is used for cattle or sheep grazing and sheep trailing. Some remote, inaccessible summer range areas are ungrazed except for moderate pack stock use.

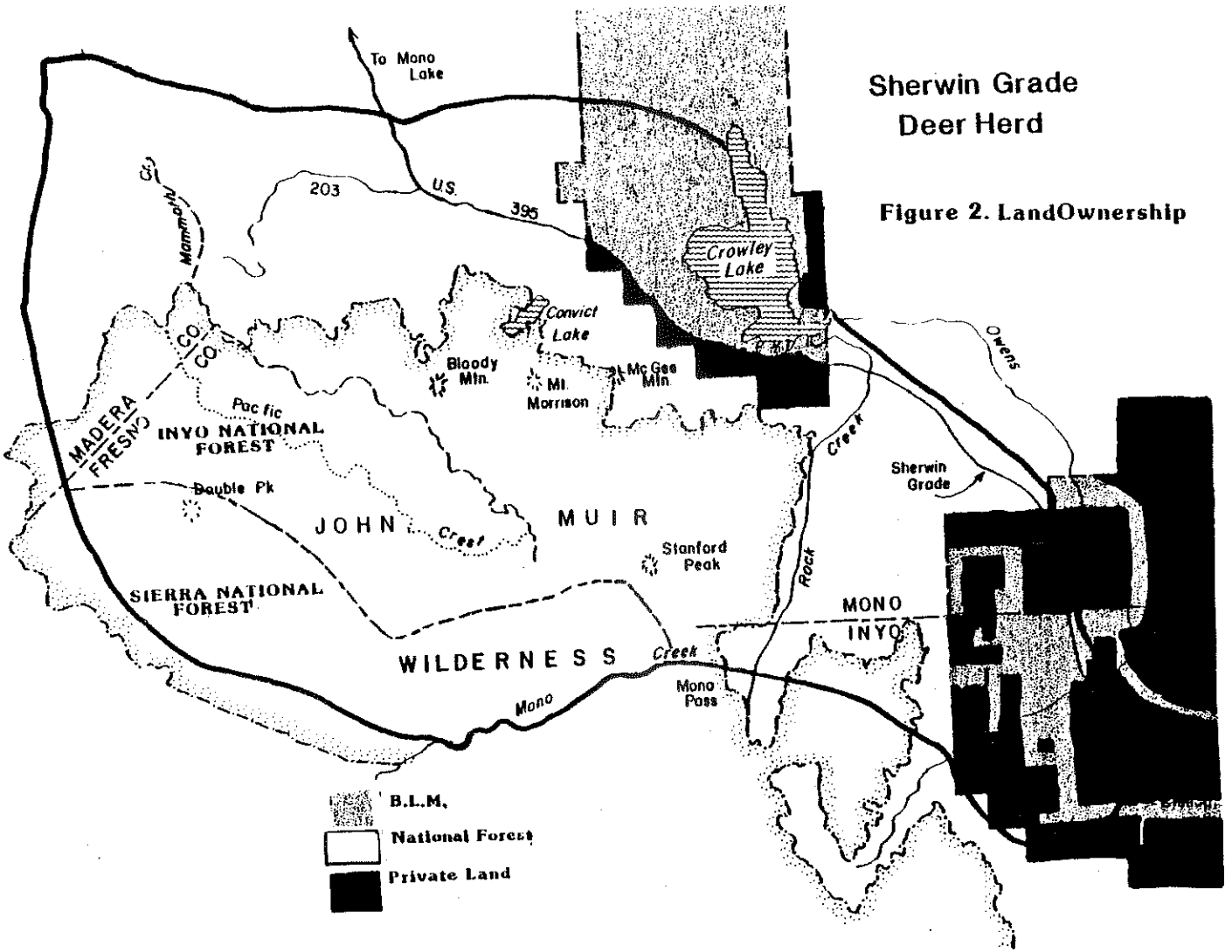

Figure 2. LandOwnership

5. Recent Fire History.

Sizable fires recorded in USFS records are:

Area	Date	Size
Swall	1972	500 acres
Sherwin Creek	1972 or 3	250 acres
McGee	1972 or 3	300 acres
Swall	1981	1900 acres

Of particular interest are the Sherwin Creek burn, where good regrowth of bitterbrush and Ribes sp. has occurred, and the 1981 Swall burn on the key deer winter/migratory range. Although little or no browse has regrown on the Swall burn, deer use of grasses and forbs was increasing as of 1988. Figure 3 shows the boundaries of the Swall burn.

6. Seasonal Ranges

a. Winter range. The herd's winter range is a compact, discrete area of about 30 square miles north of Pine Creek in Round Valley in northern Inyo and southern Mono counties (Figure 1). It is generally a rolling plain bisected by small abrupt drainages flowing eastward from Wheeler Ridge. The plant community is composed of bitterbrush (Purshia tridentata), sagebrush (Artemesia tridentata), and rabbitbrush (Chrysothamnus spp.) with some upper slopes dominated by blackbrush Coleogyne ramosissima). Various grasses and forbs including Poa species, Stipa species, filaree, etc. provide deer feed when snow does not cover the ground.

Upper elevations in the northern portion of the winter range are privately owned; housing is the primary land use there. The portion of the winter range administered by the BLM is key deer winter range; only limited livestock grazing is permitted.

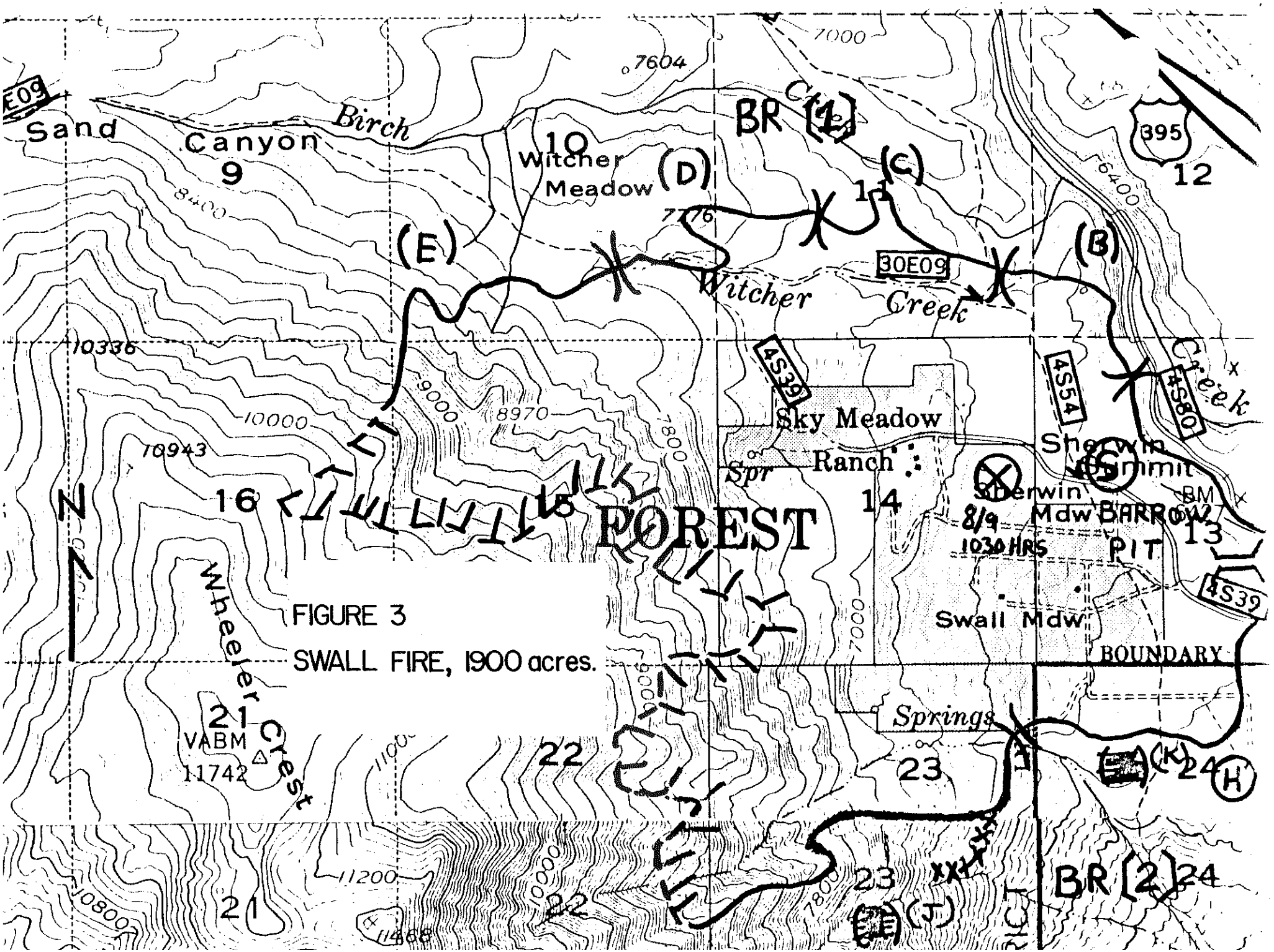

FIGURE 3

SWALL FIRE, 1900 acres.

Extensive holdings of the L.A. Department of Water and Power are also reserved for deer use. Some private holdings on the eastern periphery are in agriculture and some deer use occurs there.

b. Summer and Intermediate Range. The herd's summer range, about 250 square miles in size, includes the east slope of the Sierra Nevada, the Sierra crest and the Sierra west slope in the San Joaquin River headwaters and tributaries. Mixing of east and west side herds occurs on the latter portion of the summer range. The eastside summer range includes the major drainages of Rock Creek, Hilton Creek, McGee Creek, Convict Creek, Laurel Creek, Sherwin Creek and Mammoth Creek. Sherwin Grade deer are believed to summer in the following west slope drainages: Middle Fork of the San Joaquin River, Fish Creek, Deer Creek, Purple Creek, Crater Creek, and probably others. Current telemetry work will further define the extent of summer habitat.

Plant communities occurring on the intermediate/summer ranges include the following: (Munz, 1965).

1. Sagebrush Scrub; indicated by:
Sagebrush (Artemesia tridentata), Bitterbrush (Purshia tridentata), Rabbitbrush (Chrysothamnus sp.) Rubber weed (Haplopappus nanus)

2. Red Fir Forest; indicated by:
Red fir (Abies magnifica), Lodgepole pine (Pinus murrayana) Chinquapian (Chrysolepis sempervirens) Quaking Aspen (Populus tremuloides) Jeffrey Pine (Pinus jeffreyi)

3. Lodgepole Forest; indicated by:
Lodgepole pine, Mountain Hemlock (Tsuga mertensiana), Mountain Whitethorn (Ceanothus cordulatus) sagebrush (Artemisia rothrockii)

4. Yellow Pine Forest; indicated by:
Yellow Pine (Pinus ponderosa), White Fir (Abies concolor), Bitterbrush, Mountain Mahogony (Cercocarpus ledifolius)

In addition to those major plant communities recognized in the literature, the following ecotypes are important to this herd on its summer range:

1. Mountain chaparral, indicated by:
Greenleaf manzanita, (Arctostaphylos patula), Bitter cherry (Prunus emarginata) Mountain Whitethorn or buckbrush (Ceanothus cuneatus) Current(Ribes cerum)

2. Aspen Meadows dominated by:
Various grasses (such as Poa spp.); Forbs including clovers (Trifolium spp.), lupines (Lupinus spp.) and cinquefoil (Potentilla spp.); sedges (Carex spp.); and rushes (Juncus spp.).

7. Range Surveys.

In 1953, 20 permanent line-point forage transects were established on the winter range. Production by bitterbrush was determined using fall leader length measurements; utilization by deer is determined by measurement of leaders remaining in spring. Fall production measurements were taken during years 1953 through 1980. Spring measurements to provide percent utilization estimates were taken in fewer years. Plots were not read in 1980-82; measurements were begun again in 1983.

Leader growth is generally proportionate to precipitation in any given year. Percent utilization has varied widely over the years (Table 3).

In addition, ground cover composition on 1000 line points was evaluated in 1953 and 1973 (Table 4). Total cover increased about 7% by 1973, possibly as a result of the winter deer die-off in 1969. Living specimens of valuable deer browse species increased

Table 3
Sherwin Grade
Browse Survey Data

Year	Bitterbrush "L.L."	Percent Utilization
1953	2.5"	
1954	4.2	
1955	2.2	67
1956		69
1957		
1958	5.1	
1959		
1960	2.7	80
1961	1.6	
1962	3.7	
1963	4.9	
1964	2.3	
1965	2.0	
1966	3.2	
1967	4.0	
1968		
1969	4.5	
1970	3.3	
1971	2.5	
1972	1.9	
1973		
1974	2.9	7
1975	0.4	80
1976	0.5	88
1977	1.4	81
1978	6.6	87
1979		80
1980	2.4	52
1981		
1982		
1983	3.6	36
1984	3.0	35

TABLE 4
SHERWIN GRADE DEER WINTER RANGE
GROUND COVER COMPOSITION, 1900 LINE POINTS,
1958 AND 1978

Kind of Cover	No. of Points		Percent of Cover		Percent Living Vegetation	
	1958	1978	1958	1978	1958	1978
Bare Ground	722	192	38.0	10.0		
Erosion Pavement		310		16.3		
Rock	174	264	9.2	13.9		
Litter	201	269	10.6	14.1		
Bitterbrush (d)	93	32	4.9	1.7		
Blackbrush (d)	10	9	.5	.5		
Sagebrush (d)	151	93	7.9	4.9		
Desert Peach (d)	35	20	1.8	1.0		
Mexican Tea (d)	3	1	.2	.1		
Rubber Rabbitbrush (d)	73	75	3.9	3.9		
Horsebrush (d)	-	1	-	.1		
Total Non-Productive	1462	1266	76.9	66.5		
Annual Grasses	7	12	.4	.6	1.6	1.8
Annual Weeds	40	95	2.1	5.0	9.1	15.0
Total Annuals	47	107	2.5	5.6	10.7	16.8
Sitanion sp.	3	-	.2	-	.7	-
Stipa sp.	3	8	.2	.4	.7	1.2
Oryzopsis sp.	-	3	-	.2	-	.5
Total Perennials	6	11	.4	.6	1.4	1.7
Bitterbrush	65	110	3.4	5.8	14.8	17.3
Blackbrush	64	97	3.4	5.1	14.6	15.2
Desert Peach	25	14	1.3	.7	5.7	2.2
Horsebrush	-	7	-	.4	-	1.1
Mexican Tea	23	26	1.2	1.4	5.2	4.1
Sagebrush	95	170	5.0	9.0	21.7	26.7
Rabbitbrush	-	13	-	.7	-	2.5
Rubber Rabbitbrush	111	72	5.8	3.8	25.4	11.3
Sulphur Flower	-	2	-	.1	-	.3
Unknown	2	5	.1	.3	.5	.8
Total Browse Cover	385	516	20.2	27.3	87.9	81.5
Grand Total	1900	1900	100.0	100.0	100.0	100.0

also, although relative living vegetation declined due to a high percentage of dead rubber rabbitbrush, causes unknown. Age class and form of bitterbrush and sagebrush also improved (Table 5 and 6).

The Mammoth District (USFS) initiated pellet count surveys in 1982 on key migration habitat. Continuation of this data collection is recommended to monitor trends in deer use there.

C. Major Factors Regulating The Population

Individual factors which regulate a deer population are complex and interrelated, and the additive effects of several can combine to produce a markedly favorable or unfavorable set of circumstances for deer survival and production. It is useful to classify this complex set of factors into two general categories, human influences and environmental influences. Undoubtedly, human influences are by far the most profound.

1. Human Influences

This section will discuss separately the various human influences effecting the herd. However, it must be emphasized that the cumulative impacts of several human activities can create very harmful additive effects. Each individual project may have only limited impact, but the combined effects of several projects may be highly detrimental. For example, a ski area alone will create a certain level of impact to deer habitat, a level which may be possible to mitigate. In the same area, the accompanying residential development, roads, warming huts, lodges, parking areas, coffee shops, etc. will severely impact the habitat and the herd,

TABLE 5
FORM CLASS OF BITTERBRUSH AND SAGEBRUSH
1958 AND 1978

Bitterbrush	1	2	3	4	5	6	7	8
On Line 1958	8.3	41.7	29.2	-	-	8.3	12.5	-
On Line 1978	28.0	36.0	8.0	-	8.0	-	-	
Off Line 1958	6.1	31.9	52.6	-	4.7	4.2	.5	-
Off Line 1978	22.0	54.2	19.1	.4	4.3	-	-	-
Sagebrush								
On Line 1958	35.2	56.9	7.9	-	-	-	-	-
On Line 1978	65.3	33.4	1.3	-	-	-	-	-

TABLE 6
AGE CLASS OF BITTERBRUSH AND SAGEBRUSH
1958 AND 1978

	S	Y	M	O
Bitterbrush				
On Line 1958	-	-	54.2	45.8
On Line 1978	-	-	92.0	8.0
Off Line 1958	2.4	3.3	51.6	42.7
Sagebrush				
On Line 1958	-	-	49.0	51.0
On Line 1978	-	3.9	80.7	15.4

NUMBER OF PLANTS

Bitterbrush	
On Line 1958	24
On Line 1978	25
Off Line 1958	213
Off Line 1978	236
Sagebrush	
On Line 1958	51
On Line 1978	78

resulting in severe reduction or elimination of deer (and other wildlife) there. When dog harrassment, grazing disturbance, geothermal plants and pipelines, hydropower developments, campgrounds and trailer parks, and other factors are added, the prospects for the future of wildlife become bleak.

a. Encroachment on Habitat.

Residential Development. Continuing expansion of housing is impacting Sherwin Grade deer in several important areas. The most critical of these is the Swall Meadow complex on key deer winter range and migration corridor areas. Further building within and around the existing housing increases stress on migrating deer by reducing foraging area and increasing the difficulty of deer passage. The recent wildfire on adjacent slopes has contributed to the problem; forage and cover are now reduced there and the area is now poorer deer habitat. The net effect is drastic constriction of the historic deer use area, forcing deer to detour around important favored feeding areas and/or to move prematurely to the low elevation winter range in Round Valley where browse is old-age and limited.

Free-roaming dogs associated with this housing development and the one at Paradise Estates harass deer and compound the stress affecting the wintering animals.

This discussion provides a good example of the principle of several additive factors creating a markedly unfavorable set of circumstances for the deer resource. Housing development has reduced and continues to reduce available living space for deer; loss of habitat to the Swall fire has added to this problem. The browse on the lower portions of the winter range is in poor

condition, with a downward trend, forcing increased decendence on the Swall area. Homeowners' dogs harass deer which are already stressed by harsh weather, limited forage and shrinking habitat. These factors combine to depress the ability of the herd to maintain itself on the wintering grounds.

Housing in Little Round Valley, at Whiskey and Hilton Creeks, and on other privately owned lands along the Sierra escarpment is expanding and encroaching on deer habitat. Migrating deer are being forced out of their historic migration route, where forage is available, onto steep, rocky, snow-covered hillsides where forage is limited and environmental stress is much greater. Here again, domestic dogs compound the problem.

The city of Mammoth continues to expand on the intermediate and summer range, displacing traditional wildlife uses.

The Mono County planning process does not give adequate recognition to the values of key deer habitats when project proposals are reviewed. In many cases, finalized "Negative Declarations" (ie. findings of no significant impacts) are issued without prior consultation with resource managers regarding wildlife values on a project.

Numerous projects have been approved in this manner; irreversible inroads into key deer habitats are the result. The cumulative impacts of multiple projects is usually highly detrimental, but is not given appropriate consideration.

Residential development of such habitats is especially inappropriate in an area such as Mono county where recreation is of major economic value. Recent analysis has shown that developed residential property can produce more costs than revenue and that undeveloped land pays more in revenues than the corresponding costs to service that land. (Goldman, G., et al,1979)

In an effort to provide advance notice to planners, engineers, and landowners, current DFG efforts are concentrated on delineating specific key habitats throughout the county. As such delineations are completed (through telemetry studies or other means) they are provided to planners and will be appended to this plan. The County Planning Commission feels this to be the most positive means to reduce further impacts from development.

Recreational Development

The existing ski development on Mammoth Mountain occupies a large area of previously usable deer summer range. The proposed Sherwin Bowl ski area would utilize another large area of key deer summer range and migration corridor. The fate of a significant portion of the herd will depend upon whether this area is developed and, if so, how it will be constructed and operated. Some of the many existing campgrounds within the herd's range have encroached on important deer habitats. Campsites in meadows and along stream courses are favored by the public. Meadows and stream courses also provide key deer habitats.

Hydroelectric and Geothermal Projects

There are currently several applications on file for construction of small hydroelectric projects within the range of the Sherwin Grade herd. Geothermal energy projects are being proposed and constructed on the periphery of Sherwin Grade range. Potential impacts to the herd vary from nearly negligible to significant, depending on type, size, and location of the project. Coordination with land management agencies and local governments is ongoing to attempt to minimize adverse effects. Careful evaluation of each site will be necessary to protect wildlife resources.

Human Disturbance

Dispersed recreational use of the intermediate/summer range is high throughout the season. People, dogs, and packstock all contribute to disturbance of deer. This disturbance occurs in key fawning habitats where reproduction and survival of fawns may be affected.

b. Hunting. Hunting of bucks is presently the major consumptive utilization of Sherwin Grade Deer and is a major factor influencing buck numbers, ratio, and age structure in the population. Annual buck seasons have varied in the past from three to six weeks. The shorter three week seasons, ending before any significant storms, have tended to reduce the harvest somewhat. A storm occurred during the four week season in 1981. This caused an early migration, a dramatic increase in hunter take, and resultant decrease in buck ratio to the current level (10 bucks:100 does; 1983).

Under current harvest strategies, it is not believed that hunting

is responsible for reducing the total herd population. However, the high level of hunting pressure and take is the major cause of the low buck ratio and existing age distribution of the buck population. Bag checks and composition counts demonstrate that a low percentage of bucks is surviving past 2 or 3 years of age and yearlings make up a high percentage of surviving bucks and bucks in the bag in recent years.

c.Road Kill. Each year, an unkrown number of Sherwin Grade deer venture onto Highways 395 and 203 and are killed by vehicles. Other Mono County herds must routinely cross Highway 395 during spring and fall migrations; losses in these herds are higher. Most Sherwin Grade deer do not cross the highways and therefore losses are somewhat less.

Deer-vehicle collisions represent a public safety hazard and are an expense to motorists. Road kills are not believed to significantly alter the herd's population.

d.Livestock. Specific effects of grazing on deer are unknown due to lack of field survey effort. The locations and use periods of some allotments, particularly sheep allotments, suggest the possibility of conflict with deer use during spring migration. USFS field data denotes poor range conditions for some allotments, especially the McGee sheep allotment. Further investigation into deer-livestock interactions is sorely needed on this herd's range.

2.Environmental Influences

a.Weather. It is known that prolonged deep snow cover on the winter range creates a stressful situation and many deer are lost in such conditions. In Wyoming, crusted snow 0.3 meter (1.0 feet) deep caused deer to move to other areas with less snow (Strickland 1975). Late snow, persisting on intermediate and summer ranges, can delay spring migrations; such a delay also creates stress and can reduce fawning or recruitment that year. Other, more subtle effects of weather are less dramatic and not well understood. For example, early precipitation during the 1981 fall prompted the growth of grasses and forbs during October and November. Deer arrived early on the winter range, because of the early storm system, and found good herbaceous feed. This weather pattern appears to have created a temporary favorable feed situation which sent the deer into the winter in good condition. The influence of weather can affect timing of migration and possibly rutting. Migrations, in particular, generally held to be habitual, may be accelerated or delayed by unseasonable snowfall or cold (Geist, 1981). The effects of such a weather pattern were graphically illustrated during the 1981 X-3 zone deer hunting season. An early storm, coupled with a lack of feed at higher elevations, due to low precipitation the previous year, caused deer to migrate to such an extent that essentially the entire herd became accessible to hunters. An exceptional hunter take of mature bucks resulted.

Inclement weather prolonged into late spring can delay migration to summer ranges, preventing pregnant does from reaching

traditional fawning grounds. It is believed that reduced fawn production can result, as in 1982. Harsh late spring weather during 1983 also delayed migration but provided ample forage growth at lower elevations. As a result, many bucks failed to migrate to customary higher ranges. These bucks were unusually available to hunters during the 1983 hunting season. The excellent forage also stimulated antler growth; many yearlings grew forked antlers and were bagged in 1983 (65% of 170 deer aged in Mono County were yearlings).

Free water is abundant throughout most of the range of the Sherwin Grade herd, but prolonged drought can reduce availability of water. Another pronounced effect of drought conditions is reduction or absence of annual browse and forb production, which is likely to reduce fawning success.

Summer thunderstorms can be locally important to Sherwin Grade deer by providing for young herbaceous forage through the summer months and even into fall. Weather may also affect predation. It has been theorized that dry years reduce the prey base for coyotes, so fawns are subjected to heavier predation. Cover for fawns is reduced by dry years; this would increase their vulnerability.

b.Predation. The precise influence of predation on the Sherwin Grade herd is not known. It is known that predators kill substantial numbers of deer on many ranges (Connolly, 1981). Only careful study would define the true effect on the population. Conversely, predation by coyotes or mountain lions has never been documented as the principal cause of a mule deer decline (Connolly, 1981).

Since fall fawn ratios are low, it is assumed that predation has

some effect on fawn recruitment. However, predation losses can be caused or accentuated by poor fawning habitat, grazing practices, weather, poor nutrition, etc. Only through complete analysis of these factors can it be determined if predation causes deer to be less numerous than they would be in the absence of predation (Connolly, 1981).

III. POTENTIALS FOR RESTORATION AND MANAGEMENT UNIT GOALS

A. Potentials for Restoration

The statewide goal for California deer herds is to restore and maintain healthy deer populations and to provide for high quality, diversified use of the deer resource. However, before one can begin to state specific objectives and programs designed to achieve those objectives, several fundamental determinations must be made, including 1) possible mechanisms for restoration; 2) the factors which inhibit or conflict with restoration; 3) the overall potential levels for restoration; 4) potential harvest strategies and intensities of untilization and 5) considering the mix of all major issue and concerns, the preferred level of restoration and utilization.

Since the Sherwin Grade herd is believed to be at or near the carrying capacity of it's winter range, and since future housing encroachment is predicted to futher reduce the winter range, the reasonable goal for this herd is to maintain the current population level. Steps to restore the quality of the winter range may be required to achieve maintenance of the current population. Acquisition of key winter range acreage is needed. Improvements in sex and age ratios ir the herd will be required as well. With improvements in these factors and in the general health of the herd, the impacts of severe winters or other negative factors will be moderated.

Public sentiment supports habitat improvement for wildlife on public lands. Economic stability in Mono County depends to a large extent on viable fish and wildlife resources, and improving habitats is in the best interest of that stability. We cannot

realistically hope for improvement of habitats throughout southern Mono County, however. Priorities must be placed on maintenance and improvement of key habitats vital to the deer resource. As such areas are identified, information on their values, deficiencies, and needs are provided to the land managers on an on-going basis.

B. Attainable Levels of Restoration

The current population on the winter range north of Pine Creek is estimated to be approximately 2,300-2400; this estimate is based on a helicopter census conducted in January, 1985 which recorded 2321 deer. The goal for habitat management of the Sherwin deer herd range is to maintain habitat quantity and quality adequte to support the currently existing 2300-2400 deer.

Maintenance of this population level is realistic and achievable, when current and projected habitat conditions are considered.

C. Utilization Levels and Alternative Strategies

At present, forked horn or better bucks only are harvested with no restriction, other than the quota for zone X-9 (9,000 in 1985), of hunter pressure. Post season buck ratios during the past two years (10 or 11 per 100 does) reveal that a near maximum buck harvest is occurring. Such intensive harvest of bucks has certain drawbacks. The average age of animals killed is related inversely to the size of the harvest (Connolly 1981). Large, older animals are almost absent in the harvest, since nearly all bucks killed are less than four years of age. Field studies (Brownlee 1975) and computer modeling (Gross 1973,Anderson et al. 1974) have indicated this decline in higher quality animals with increasing harvest. Such an intensive rate of buck harvest also

tends to depress the buck to doe ratio in the herd. Again, field studies (Robinette 1956) and computer modeling (Anderson et al. 1974) attest to this fact. The low buck to doe ratio and low percentage of older bucks in the herd is cause for concern. Considering the low buck ratio, low fawn recruitment, and the fact that the population is near the carrying capacity of the winter range, good biological management should be directed toward increasing buck ratios and controlled antlerless hunting.

Current season recommendations call for a three week buck hunting season in zone X-3 with a quota of 3,000. Some feel that the three week season will stimulate increases in buck ratios. This has not occurred during 1982, 1983,or '84 probably a reflection of extremely low recruitment combined with heavy hunting pressure.

The alternative strategy of buck utilization is the quota permit system, so that hunter numbers could be adjusted annually. Hunter pressure would decrease initially, success rate would rise, buck ratios could be increased more rapidly. This strategy will be considered if shortened seasons do not result in an increase in buck ratios as determined post season 1985. Subsequent buck hunter quotas could be increased in response to any increases in buck ratios. To achieve realistic control of hunter pressure of the herd, division of the 8-herd zone X-3 will be required.

Limited antlerless hunting was approved for the 1984 season. The hunt was held during three hunt periods in December 1984, and January 1985, with a total of 200 tags issued by public drawing. Holding the hunt during this time period was designed

to insure that the entire herd is concentrated on the winter range, to achieve a random harvest before any major antler shedding. Hunters harvested 179 antlerless deer during the hunt which was generally well accepted by hunters and the general public.

The Inyo Board of Supervisors voted to veto the 1985 hunt proposal, so no antlerless hunts are planned for the near future It is planned to monitor the herd closely, through an intensive doctoral study to evaluate any effects of the antlerless harvest on ratios, population size, habitat, etc.

D. Preferred Levels of Restoration and Utilization

In formulating the preferred goals, a number of criteria were considered: 1) social acceptance and support; 2) economic factors including the costs and benefits of implementing restoration; 3) tradeoffs with other land uses; 4) current and projected demand for uses of deer.

1. Herd Goals

		Current	1995 Target
a.	Fall Population Size	2300-2400	2300-2400
b.	Herd Composition		
	Bucks/100 does	11	20
	Spring fawns/100 does	10-30	50
c.	Total Hunting Harvest		
	Bucks	75-150	200
	Antlerless	0	200+-

d. Flexibility in harvest to attain and maintain stated goals. Variability in buck and antlerless seasons' timing, length, and/or tag quotas to achieve such flexibility.

2. Habitat Goals.

a. Improve current habitat conditions and reduce competition and disturbance on key summer/intermediate habitats.

b. Improve current winter habitat conditions and maintain habitat for 2400 total animals. Reduce disturbance on the winter range. Acquire fee title or conservation easements on private lands if possible.

IV. Management Problems

1. Summer range herd composition counts are lacking.

2. Summer range forage quality and quantity is unknown.

3. Competition between deer and livestock on the intermediate and summer range is poorly understood.

4. Key habitats on intermediate and summer ranges are not identified.

5. High fawn mortality occurs during the summer, fall and winter.

6. Deer appear to be under nutritional stress during the winter.

7. Past harvest strategy and low herd recruitment has resulted in low buck ratios and diminished numbers of mature bucks in the herd.

8. Low buck ratios reduce hunting success and may affect breeding success.

9. Future residential developments will reduce intermediate and winter ranges, and funds for land acquisition are not available.

10. Uncontrolled domestic dogs harrass deer on winter ranges, migration corridors, and areas of summer range frequented by backpackers.

11. Backpacking and other summer recreational uses disturb deer.

12. Future hydro-power and Geothermal power projects may impact summer and intermediate habitats.

13. Demand for additional ski development threatens important summer and migration habitat.

14. Limited antlerless hunting is advisable as indicated by poor fawn survival and limited forage; political acceptance of continued antlerless harvest is questionable.

15. Funds are not assured to conduct annual aerial herd composition surveys.

16. Limited regeneration of bitterbrush is occurring on the winter range.

V. MANAGEMENT PROGRAMS, OBJECTIVES, AND PRESCRIPTIONS

A. Inventory and Investigative Element

1.Routine data collection and application.

Basic data indicating herd performance has been collected annually for many years. Due to the accessible nature of the winter range, fall and spring herd composition count samples have been of adequate size to determine age and sex ratios in the herd. Recently, excellent winter composition counts and herd censuses have been accomplished using helicopter flights funded jointly by DFG and the County Fine Fund. This census effort is especially valuable for assessing effects of antlerless hunts. Loss of such aerial surveys would seriously impair data quality. Intensive ground sampling of herd composition ratios augments aerial work.

Periodic surveys of summer ranges to investigate fawn production and survival, range quality, disturbance, competition and key habitat data are sorely needed. The lack of roads in rugged, inaccessible terrain inhibits such data collection.

Total reported kill is compiled by tag returns each year and is a good indicator of harvest trend. Reported kills are located on spot-kill maps each year. During recent years, a hunter check station has been operated on opening and closing weekends to evaluate hunting pressure and success, and to obtain buck age data. Continuation of this effort is needed to provide representative data.

Winter range browse surveys were initiated in 1953 and have been conducted sporadically since. Efforts to continue measuring

growth, utilization, condition and trend are recommended. When antlerless hunts are conducted, intensive routine data collection will be mandatory. Thorough necropsy of animals harvested to obtain age and condition data on all possible specimens will serve to monitor herd performance.

2.Research Needs

a.Key Habitats. The well being of a migratory deer herd depends on habitat quality on all seasonal ranges. Problems on any key habitat may affect the reproductive ability and health of the animals. The first step in preserving or improving habitat quality is identification of all habitats and their condition. The winter range and its condition are identified. Other seasonal habitats such as migration routes, holding areas, and fawning sites are not as well defined. Effective herd and habitat management will require more specific information or these habitats.

Radio telemetry offers the latest technology available to follow animal movements and to define key habitats. Deer are readily captured on winter ranges where terrain and cover are favorable and animals are concentrated.

With the use of traps, tranquilizing equipment, or set nets and helicopter, animals from different areas of a winter range can be captured, examined, and fitted with telemetry collars. By marking animals at various locations, researchers obtain a broad range of data on herd parameters and habitat locations. Habitat quality is then determined by on-the-ground surveys. Livestock use and any conflicts with deer can be evaluated.

b. Summer Fawn Losses. Over the years, data has indicated a significant loss of fawns before fall composition counts. The 10 year average fall fawn ratio has been 53 fawns per 100 does while approximately 150 fawns should be born. Intensive research is needed to identify specific causes of this early fawn mortality.

c. Nutrition. There are indications of nutritionally stressed deer on Sherwin Grade winter ranges from sightings, carcass examinations, and low fawn survival. Collection and necropsy of debilitated animals is needed.

Food habits analyses and range quality assessments in problem areas would be valuable. Identifying deficiencies or other causes of these problems would suggest measures to relieve stresses, and improve herd vigor and recruitment. DAPA (Diamino-phosphoric Acid) analysis of fecal pellets offers an experimental method of assessing digetible protein in the diet. Determination of levels of selenium, other vital trace elements, and disease entities through blood analyses is recommended whenever blood samples can be obtained.

3. Public Attitudes

It should be noted that concern by the hunting and local publics for the welfare of the deer herd reinforces the need for research on this valued resource.

4. Inventory and Investigative Programs

Objective: Gather and evaluate herd life history and trend data, and key habitat locations and trend information. To allow the making of ecologically sound, socially acceptable management recommendations and decisions.

older plants will reduce the carrying capacity for deer.

Research on bitterbrush (and other shrub) planting is being conducted by the USDA, Science and Education Administrtation and Plumas National Forest. Techniques to artificially establish bitterbrush or rejuvenation through controlled fire could relieve this threat to deer habitat. Unfortunately, livestock, deer and many other wildlife species must be excluded from planted sites or all seedlings will be eaten. This creates another major hurdle for researchers seeking means of establishing stands of forage plants on large acreages.

Experimentally fertilized plots have been suggested as a possible means of encouraging recruitment and rejuvenation on the winter range. Experimental blading or pruning of plants is another possibility.

Recent deer-proof fencing of the large alfalfa field on the winter range will significantly reduce vital herbaceous spring forage available to the herd. Plots of alfalfa or other herbaceous plants could be irrigated from springs or from Rock Creek to provide important spring forage to offset that loss.

2. Land Use Conversion

Demand for recreational and housing uses is nigh on this range. USFS land exchanges in the vicinity of the city of Mammoth continue to erode wildlife habitat. Continuing expansion of housing is occurring, as is expansion and intensification of development on Mammoth Mountain, probably once used as deer summer range.

Of particular concern at present is the renewed interest in ski area development of the Sherwin Bowl, a key holding area for deer

and other wildlife. This development has been the subject of intensive study during 1984 and 1985 and should not be developed if reduced deer habitat would result.

Geothermal energy development is occurring near portions of Sherwin Grade deer habitat. Expansion of this type of development, and any other resultant growth will impact habitats in the area.

Recent expansion of the Mammoth Airport will have a growth-inducing effect on the area, including impacts to wildlife habitats.

3.Private Lands

As more privately owned lands are developed into residences or small ranches, problems for deer ensue. Housing impacts to deer habitats on winter and intermediate ranges were discussed previously. In addition to direct loss of habitat for new housing, a primary concern is the pet dogs owned by most people living in rural areas. All too often these dogs are allowed to roam freely, harrassing deer which are already subject to winter stresses. The most obvious solution to these private land problems is to prevent further residential development. This usually is not possible, however the opportunity exists for BLM land exchange or DFG purchase of key winter range at Swall Meadow. Other measures can also provide at least partial solutions. Dog ordinances can be enforced in the county, and state laws regarding dog harrassment of deer can be publicized and enforced. Closure of key habitats to off-road vehicles by Federal Land agencies will be helpful. Strict federal enforcement of livestock trespass is very important. Any deer depredation

problems can be reduced by known methods such as fencing, repellents, contained dogs, and other methods.

4.Habitat Quality

Summer habitat quality could be heightened by reducing harrassment by people and dogs on fawning sites. Public education is recommended. Future hydro-electric projects may degrade or reduce deer habitat. Review of proposals, on-site surveys, and mitigation recommendations will be required on a site-specific basis to minimize or eliminate impacts to deer and other wildlife.

5.Conflicting Resource Management

Investigation of the effects of livestock on Sherwin Grade deer is needed to define any conflicts.

6.Habitat Management Programs

a.Objective: Attain and maintain habitat quality sufficient to achieve goals of herd size and composition.

b.Methods:

1) Identify key seasonal habitats and and deficiencies therein as recommended in the investigation section.

2) Pursue land acquisition, BLM land exchanges, conservation easement or other means of protecting key winter range near Swall Meadow.

3) Assess deer-livestock interactions and conflicts (see research).

4) Review grazing management and allotment plans. Provide planning recommenations to protect and enhance such key habitats as aspen grove, meadows, and riparian areas where grazing-wildlife conflicts are demonstrated. Evaluate timing of grazing and adjust to eliminate conflicts on key migration routes and holding areas. (Options include: changes in season-of-use, exclosures, herding, quota reduction, etc.)

5) Coordinate implementation of recommendations with land managing agencies.

6) Formulate other habitat improvement techniques such as forb and browse planting, browse and pinyon manipulation, grazing manipulation, tree falling and/or fencing as needed on a site-by-site basis.

7) Review all hydropower proposals, conduct surveys, and provide recommendations to safeguard wildlife resources.

8) Provide recommendations to preserve habitat in the County planning process.

9) Evaluate closely all effects of ski development and associated project developments to assess cumulative impacts to wildlife resources.

10) Through educational means, reduce disturbance to deer from backpackers and loose dogs on the summer range.

D. Utilization Element

1.Harvest Strategies and Public Attitudes

Currently, only bucks (forked horns or better) are harvested with a 9,000 tag quota in zone X-9. Since the record harvest in 1981, composition counts have indicated that a near-maximum buck take is being achieved(Table 1). Harvest strategies to increase the buck ratio and to maintain a balance in buck age class distribution are a major aim of this management plan. Strategies include antlerless harvest and reduction of buck harvest; a combination of both tactics should be effective in quickly increasing the buck ratio.

Recent winter fawn survival is evidence of heavy winter range use, declining winter range quality, and hard winters in 1981 and 1982. (Table 1). Antlerless hunting could reduce browsing pressure on the heavily-used winter range where deer have exclusive use of the majority of the range.

Recreational use of the resource would be increased and, possibly, the losses to a severe winter, like 1969, could be lessened. We cannot guarantee that such a hunt will produce more fawns or better habitat conditions. However, considering current high winter fawn losses and the prospect of a severe winter die-off, the situation could be described as "use 'em or lose 'em". If high winter mortality (as in 1969) were to occur during a certain winter, no antlerless harvest should be proposed until deer numbers again increase and conditions warrant doe hunting. In determining such conditions, a decided advantage of the proposed hunt is the opportunity to directly monitor the effects of the limited harvest. Because of the open and well-defined nature of the winter ranges, helicopter census of total deer numbers is possible and can directly monitor the effects of antlerless hunting, winter mortality, fawn survival etc.

Winter range harvest will allow a random take of does from various segments of the herd. (Past antlerless hunts began in September when deer were on summer ranges, rendering some herd segments especially vulnerable, others inaccessible.) Timing of a hunt on the winter range is critical since bucks will begin to lose antlers in mid-January.

In the opinion of the author, reduction of Sherwin Grade buck harvest should be intitated in 1986 if no increases in buck ratios result from the current three-week season. This could be achieved by substituting antlerless harvest for a portion of the buck harvest, a prescribed goal of this plan. The herd quota system provides the most immediate means of reducing buck take and rapidly increasing the buck ratio.

When management programs succeed in increasing Sherwin Grade buck ratios, future harvest strategy can allow increasing buck take while maintaining healthy buck ratios.

The public has expressed a variety of attitudes relative to harvest. Opinions range from a lack of concern to adamant approval of or opposition to changes in strategies. However, it is obvious that many people living in the county and many people who hunt here but live elsewhere are ready for a change in deer management. Many hunters contacted in the field have actually requested buck tag quotas and antlerless hunting, lamented low buck ratios and the harvest of mostly young bucks, and made comments such as "Why don't we harvest some of those many does?" On the other hand, some hunters (especially local residents) oppose any change by supporting the status quo.

2.Non-Consumptive Utilization

Casual viewing and photographing of deer at all seasons on all ranges constitues the major non-consumptive use of the herd. In addition, a DFG-organized tour of the winter range is a popular activity and provides an excellent opportunity to inform the public on issues of deer management. Total day-use figures or economic value of these uses are not known, but are substantial and increasing.

At present, no problems relating to such non-consumptive use are known to exist. The relatively open terrain and highly scenic qualities of the Sherwin Grade herd range provide accessible, natural benefits for casual users of the resource.

Public information and awareness relating to the herd could be

increased through a narrative display on Highway 395 showing deer photographs, browse plant identification and conditions, migration routes, and problems in management.

5. Utilization Program

a. Objectives

1) Provide for a maximum consumptive utilization of Sherwin Grade deer consistent with sustained yield and with achievement of stated herd goals. Maintain herd size in balance with existing habitat conditions and achieve equitable sex and age ratios. Increase and maintain prize bucks in the bag and provide increased resource utilization and improved sex ratio through antlerless harvest.

2) Continue to provide for a level of non-consumptive use which satisfies demand and increase information to the public.

b. Methods

1) Use annual variations in buck hunting season to respond to annual variations in herd performance. These include variations in season length, timing, tag quotas or other factors.

2) Increase deer available for harvest by increasing fawn survival through habitat improvement and/or antlerless harvest.

3) Strive for public acceptance of antlerless hunting when biologically advisable.

4) Institute limited, carefully monitored antlerless hunts based on measured herd performance.

5) Continue annual public tour(s) of the winter range.

6) Create a narrative display at the Sherwin Grade scenic overlook on Highway 395.

E. Law Enforcement Element

Enforcement personnel feel that illegal kill during hunting season is the major law enforcement problem in this herd. Out-of-season poaching is believed to be relatively minor at present. Increasing off-road enforcement activity in the field during the hunting season is recommended to put the warden at the scene of such illegal kills. As always, increased numbers of wardens throughout the season are desirable in such large areas of deer habitat.

Enforcement personnel encourage public education to improve hunter ethics, as in Hunter Safety Classes. Public meetings or news releases could increase public awareness of problems of illegal kill and general hunter ethics.

1. Law Enforcement Program

a. Objective: Improve the level of compliance with deer regulations.

b. Methods:

1) Continue the intensive opening weekend patrol effort using wardens from other districts.

2) Extend the intensive patrol effort to include other periods of peak hunting activity like the last weekend of the season.

3) Educate the public concerning hunting regulations through formal presentations and informal contacts.

4) Maintain and increase as needed coordination with other enforcement agencies (county sheriff, USFS, etc.)

5) Expand patrol efforts to include back country areas.

6) Advertise the CalTip program.

F. Communication of Information Element

Communication of information regarding the herd has been conducted through regional and statewide press releases describing general hunting conditions and herd trends. In addition, articles in outdoor publications prompted public response on herd management during 1977.

When this herd plan is finalized, copies will go to land management agencies and some key factions of the public. Announcement of the plan (and its availability) in local newspapers is recommended. Updated information (i.e., research results) could be announced as well. Other means of communication and soliciting public response can be developed as needed (e.g., leaflet form or summary of plan for wide-spread distribution). Increases in education of hunter ethics is recommended by enforcement personnel.

1. Communication of Information Program

a. Objective: Provide the public with as much information as practical.

b. Methods

1) Utilize local media and/or regional outdoor publications to publicize newsworthy information.

2) Develop a summary of the herd plan for publication.

3) Attend governmental meetings and conduct public briefings to convey information on the herd and plan.

4) Place copies of completed plan in local libraries.

5) Inform public of CalTip program.

G. Review and Update

1. Objective: Annually review and update the herd plan to maintain a current data base, evaluate progress, and prioritize future management steps.

2. Methods:

   a. Conduct deer management committee meetings to discuss progress, new information, and direction.

   b. Incorporate annual data in plan appendices.

   c. Use new information (research results, herd performance data, etc) to update plan text as needed.

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State of California

The Resources A

Memorandum

To : File

Date : July 14, 1985

From : Department of Fish and Game, Ron Thomas, Wildlife Biologist

Subject: Wildlife Habitat Survey of Mammoth Mountain Ski Area

Yesterday I hiked the circumference of Mammoth Mtn. at the 9500-10,000 foot elevation. The purpose was to examine habitat conditions on the ski area and to check on reports that deer are abundant in the developed areas.

In fact, the developed runs are nearly totally denuded of vegetation and many are seriously eroded. Scattered deer sign was found only in those areas not developed for skiing, and in one pocket of undisturbed habitat among ski runs on the east slope at about 8700 feet elevation. The most concentrated (but still sparce) deer sign was found on the south slope where no ski development has disturbed soils and vegetation. Here, ample cover is provided by conifer stands and the open forb-grass slopes provide forage. Two major deer migration trails were found in that area and one was located on the north-west slope, in undisturbed habitat among developed ski runs.

Water is very scarce or absent where I hiked, yet pipelines are conveying water to sprinkle new runs. However, no serious attempts at revegetation are apparent. The source of the piped water is unknown; the question is whether spring flows have been usurped for ski area development, to the detriment of wildlife habitat needs.

My conclusions are: 1) Due to poor soils and probable scarcity of water, it is likely that Mammoth Mountain was never very high quality wildlife habitat. 2) Any habitat values it once may have provided have been effectively wiped out in those major areas where ski development has occured. 3) Except for a few rodents, no wildlife or wildlife sign was seen in the areas fully developed for skiing. 4) Serious soil erosinn is occuring at many locations in existing ski runs and will increase with current management where expanded new disturbance is now occuring. Soils, plantlife, habitats, and stream quality will suffer further. 5) There is much to be learned on Mammoth Mountain about ski area development and its effects on natural resources.

(Photos available)

R.D. Thomas
Wildlife Biologist

Sherwin Grade Deer Herd Plan

Annual Update - 1985

I. Standard routine data collection was performed during 1985 including post-season and spring composition counts, harvest data, and buck age data, gathered on opening and closing weekends of the hunting season.

Composition Data

Year	Bucks	Fall Fawns	Spring Fawns
1985	7:100 dd	35:100 dd	19:100 dd

Substantial winter fawn loss occurred due to severe winter weather conditions and poor browse on the winter range.

1985 Harvest

314

1985 Buck Age Data

Yearling	2 Years	3 Years	4+ Years
7 (14%)	26 (52%)	6 (12%)	11 (22%)

II. No habitat improvement projects were undertaken in 1985. Significant research efforts were completed. (See enclosures for herd plan appendix.)

III. No major changes to the plan at this time.

Table 1

SHERWIN GRADE DEER HERD

Year	Harvest		Composition counts/100 Does		
	Buck	Doe	Bucks	Fawns	
				Fall	Spring
1954	162	–	–	–	–
1955	126	164	–	–	–
1956	81	226	–	–	–
1957	216	202	–	–	–
1958	52	223	16	60	–
1959	155	207	10	58	40
1960	143	135	13	44	43
1961	153	–	11	34	41
1962	121	–	15	39	26
1963	182	145	16	64	37
1964	200	136	15	54	–
1965	92	155	17	34	29
1966	164	127	9	57	23
1967	36	87	13	–	41
1968	156	–	17	40	49
1969	15	–	10	27	22
1970	31	–	17	52	26
1971	35	–	31	58	51
1972	106	–	25	56	46
1973	107	–	33	65	45
1974	58	–	35	62	60
1975	147	–	25	56	57
1976	91	–	32	60	56
1977	130	–	32	57	53
1978	75	–	22	45	37
1979	121	–	21	51	22
1980	120	–	34	–	50
1981	446	–	11	36	19
1982	133	–	11	42	10
1983	171	–	10	50	28
1984	157	–	11	39	30
1985	314	–	7	35	19

State of California The Resources Agency

Memorandum

To : Wildlife Management

Date : September 24, 1987

From : Department of Fish and Game
Ron Thomas

Subject : Sherwin Grade Deer Herd Plan Update - 1986

I. Routin data collection included composition counts, harvest data and buck age data.

Composition Counts

Year	Post Season bucks/100 does	Post Season fawns/100 does	Post Season Sample	Spring Fawns	Spring Sample
1985	7	35	691	19	794
1986	7	28	706	15	400

Harvest

Year	Buck
1985	314
1986	127

Buck Ages

Yr	.2yr	3yr	4+
2(6%)	25(75%)	5(15%)	1(3%)

II. No habitat improvement projects were undertaken in 1986.

III. Major Plan Changes:

A new hunting zone (X-9B) was proposed to better control hunter distribution and pressure and to stimulate increases in buck ratios. To be effective in 1987.

Ron Thomas
Ron Thomas
Wildlife Biologist

cc: V. Bleich
J. Davis

State of California

The Resources Agency

Memorandum

, : Wildlife Management, Region 5

Date : October 12, 1988

From : **Department of Fish and Game** --Ron Thomas

Subject: Sherwin Grade Deer Herd Plan Annual Update, 1987-88

I. Composition Counts

Year	Post Season Bucks/100dd	Post Season Fawns/100dd	Post Season Sample	Spring Fawns	Spring Sample
1986	7	28	706	15	400
1987	10	34	718	12	307

Harvest

1986: 127
1987: 135

II. No habitat improvement projects were undertaken in 1987.

III. Major Plan Changes: The new zone X-9B was created for the 1987 hunting season in an effort to better control hunter distribution, reduce harvest and increase the buck ratio.

Ron Thomas

Ron Thomas
Wildlife Biologist

RT:lp

1989 Deer Herd Management Plan Update

County: Mono/Inyo

A. Description of Deer Herd Management Unit

1. Herd Condition: Very Poor

a. Individual animal condition: The winter condition of animals in this two-herd unit is poor and is correlated with precipitation and forage growth. In March of 1989, when 40 adult males were sampled, mean KFI was 0.13, marrow fat was 57%, whole body weights averaged 97 lbs. Deer are dying on the winter range each year during the current drought.

Reference: Deer herd collection data compiled by Jessup and Kucera

b. Herd health: The herd is sharply declining, fawn survival is low (20f:100d) and the average age of does is 5+ years. Herd health is rated very poor. In the long-term, the herd decline is caused by the combined effects of poor quality winter range, human developments on all seasonal ranges, and livestock grazing impacts.

Reference: Collection data, annual composition count data.

2. Population Size - During each of the past five years, comparable helicopter census of this population has been conducted. The total figure has declined from 5,978 to 2,407 (60%) during that period. No hard data is available, but best guess estimates place the 1960 population as high as 15,000 animals.

3. Herd Statistics*

	Harvest		Fall		Spring
Year	Bucks	Antlerless	Bucks	Fawns	Fawns
1985	505	0	7	35	22
1986	187	0	7	26	15
1987	149	0	10	34	14
1988	133	0	13	30	20

* This data is a compilation of data from the Sherin Grade and Buttermilk Units.

4. Deer Hunting

a. Past and current hunting strategies effects on:

1. Deer numbers - Due to the small percentage of the population taken through buck-only hunting, regulated by flexible quota tag sales, it is not reasonable to believe that hunting strategies have affected overall herd numbers. Nutritional stress on wintering deer has taken many times more animals than hunters. In fact, each deer taken by a hunter means more forage on the winter range for remaining animals.

2. Herd composition - In 1981, the combined effects of hunting during the migration period and unlimited tag sales resulted in a high harvest, reducing buck ratios from 34 to 11 bucks per 100 does. The current season dates and quota tag system are directed toward increasing this ratio by limiting harvest. Drought conditions, poor winter range, and poor fawn survival have precluded increases to date.

3. Herd Health - Studies and collection data suggest that recent low buck ratios do not have a significant effect on breeding or overall herd health. Controlled doe hunting was shown to benefit herd productivity in the Sherwin Unit as compared to the unhunted Buttermilk Unit. (Kucera, 1988*) During times of high deer numbers and poor winter range conditions, doe hunting could improve herd health in the SG/BM population.

b. Future and proposed hunting strategies effects on:

1. Deer numbers - Continued bucks-only hunting cannot reasonable be expected to affect total deer numbers.

2. Herd composition - Proposed seasons, quota levels, and zone boundary realignment are designed to increase buck ratios through more carefully regulated harvest. Increased precipitation, improved forage (especially in the winter range) and increased fawn survival are essential to effect this increase, however.

3. Herd health - Continued bucks-only hunting, regulated by flexible quota tag sales, based on herd performance, will not affect overall herd health. Research has shown that the performance (health) of this herd is closely correlated with precipitation. (Kucera, 1988) *Doe hunting could improve herd health by reducing impacts to winter range.

5. Illegal Harvest

No known changes in the level of illegal kill have occurred since the herd plan was written.

6. Other - Road Kill

An estimated 50 - 75 deer are killed each year on Highway 395. This is not believed to effect total deer numbers, since winter range carrying capacity has now limited deer numbers.

*Kucera, T.E., 1988, Ecology and Population Dynamics of Mule Deer in the Eastern Sierra Nevada. Unpub. Ph.d. Dissertation. U.Calif., Berkeley.

B. Non-human Effects on Deer

1. Weather

a. Drought - Recent research (Kucera, 1988) indicates that this herd is highly dependent on annual precipitation due to poor winter range forage. The current drought is the primary proximate cause of the current population decline.

b. Early storms - Moderate early storms in September and October have improved fall forage and benefitted deer in 1988 and 1989.

c. Mild winters - Mild, dry winters have caused a lack of annual forage production on the winter range, depressing carrying capacity. However, mild winter weather has forstalled the large-scale deer dieoff which would likely result if deep snow and low temperatures occur and persist.

2. Predators

During telemetry study of other eastern Sierra deer herds, mountain lions have killed up to 20% of marked adult deer during a single year. This may or may not be generally representative, but does suggest a high level of predation which may be a significant factor affecting total deer numbers. Coyotes are very numerous and undoubtedly take a large number of deer also, especially fawns.

3. Disease and Parasitism

Extensive necropsy efforts and seriology testing have not revealed significant disease or parasite problems in this herd.

C. Effects of Current Deer Hunting and Proposed Hunting Strategies

1. Effects Upon Species of Special Concern

   a. Changes in local populations - Due to the lack of intensive disturbance, lack of habitat disruption or degradation, and the short duration of the hunting season, it is not reasonable to expect any significant effects to any species of special concern.

   b. Changes in regional and statewide populations - same as "a" above.

2. Effects Upon Other Wildlife Species

   a. Changes in local populations - Due to the lack of intensive disturbance, lack of habitat disruption or degradation and the short duration of the hunting season, it is not logical to expect any significant effects to other wildlife species.

   b. Change in regional and statewide populations - same as "a", above.

   c. Changes in health, condition and age class structure of populations - same as "a", above.

   d. Changes in mortality factors - same as "a", above.

3. Changes in Public Use/Recreation

   a. Hunting - The current and proposed hunting strategy provides substantial public recreational opportunity to hundreds of hunters each year. Loss of this opportunity would constitute a significant negative impact to public recreation in California.

   b. Nonconsumptive - Wintering deer numbers have declined dramatically; the popular annual public deer tour of the winter range has become a less rewarding experience and may be cancelled as a result. To the extent that hunting-funded management and habitat programs are effective, the deer population will benefit for the enjoyment of all users.

   c. Nonhunting - same as "b", above

4. Effects Upon Human Populations

   a. Housing - No effects on housing are known or anticipated.

b. Transportation - No effects on transportation are known or anticipated.

c. Public services - No effects on public services are known or anticipated.

d. Energy - No effects known or anticipated.

e. Human Health - No effects known or anticipated.

f. Aesthetics - To the extent that antihunting persons may be offended by the concept and activity of hunting, and if those persons are in deer hunting country during hunting season, their aesthetic sense may be offended to some unknown degree. The presence of hunting in the field could represent a minor effect to the aesthetic sense of other non-hunters.

g. Cultural resources - No effect known or anticipated.

D. Range Landownership - Range ownership as described in the herd plan is unchanged since that time. DFG has proposed acquisition of 300 acres of important winter range at Swall Meadow; purchase is anticipated as this parcel is rated #2 priority statewide.

E. Range Vegetation

1. Fire - In 1987, the Laurel fire burned about 1,900 acres of migration range holding area near Mammoth. This burn has been planted with bitterbrush and other beneficial species. Migrating deer will benefit unless cattle encroachment continues to degrade the habitat improvement effects.

State of California **The Resources Agency**

MEMORANDUM

Date: January 22, 1990

Disk:DEER
Filename:Compct90.mem

To: Files

From: Department of Fish and Game -- Denyse Racine, Inyo Unit

Subject: Deer Herd Composition Counts, January 1990

Composition counts were conducted on Inyo County deer herds January 3-5, 1990. The Goodale Herd was counted on January 3, the Inyo Mountains on January 4-5, and the Buttermilk herd was counted on January 5, 1990. A Bell Jet Ranger helicopter was used, piloted by Brian Novak of Landells Aviation. Observers included Jim Davis, Denyse Racine, Tom Lipp, Ron Thomas, Jim Landells, and Charlie Vandemoer (USFS). Approximately 4 hours of helicopter time was used to survey the Goodale herd, 3.5 hours for the Buttermilk herd, and 6 hours in the Inyo Mountains. The weather was clear with light breezes. Snow cover was sparse, and deer were generally scattered at primarily upper elevations. These conditions prevented a total count in Round Valley.

This year we began surveying the Inyo Mountains at New York Butte and worked north to Highway 168. The Piper Mountain/Soldier Pass area was not surveyed due to lack of time. Very few deer could be found. Some areas, such as Squaw Springs, Squaw Flat, and Seephole Spring, had a fair amount of fresh trailing in the snow, but despite intensive surveying, we found few or no deer.

We observed two groups of bighorn sheep on the east side of the Inyos. One lone ewe was observed in the vicinity of the Craig Canyon drainage, $36^{0}39.73$, $117^{o}53.75$, in light snow cover, SW slope. Two ewes were seen near Willow Springs. Very few chukar were seen. One group was seen above Sidehill Spring, and a few were located in the Saline Range NE of Waucoba Spring.

Results of the composition counts are as follows:

Goodale Herd South (Taboose Creek to Lone Pine Creek)
SPECIAL HUNT ZONE

	Numbers	1990 Ratios	Previous (1989) Seasons Ratios	1988 Ratios
Does	152	100	100	100
Fawns	28	18	28	27
Bucks	34	22	41	47
Sample Size	214			

Antler Class of Bucks

Spikes	2	(10%)
2 pt.	7	(35%)
3 pt.	9	(45%)
4 pt.	2	(10%)
Unclassified:	14	

Goodale Herd North (Bishop Creek to Taboose Creek)

	Numbers	1990 Ratios	Previous (1989) Seasons Ratios	1988 Ratios
Does	97	100	100	100
Fawns	28	29	37	26
Bucks	44	45	22	32
Sample Size	169			

Antler Class of Bucks

Spikes	6	(14%)
2 pt.	9	(20%)
3 pt.	21	(48%)
4 pt.	8	(18%)

Goodale Herd (Total)

	Numbers	1990 Ratios	Previous (1989) Seasons Ratios	1988 Ratios
Does	249	100	100	100
Fawns	56	22	31	27
Bucks	78	31	34	43
Sample Size	383			

Antler Class of Bucks

Spikes	: 8	(12%)
2 pt.	: 16	(25%)
3 pt.	: 30	(47%)
4 pt.	: 10	(16%)
Unclassified:	14	

Buttermilk Herd

	Numbers	1990 Ratios	Previous (1989) Seasons Ratios	1988 Ratios
Does	545	100	100	100
Fawns	121	22	38	34
Bucks	68	12	15	9
Sample Size	734			

Antler Class of Bucks

Spikes	: 11	(16%)
2 pt.	: 34	(50%)
3 pt.	: 16	(24%)
4 pt.	: 7	(10%)

Inyo Mountains Herd

	Numbers	1990 Ratios	Previous (1989) Seasons Ratios	1987* Ratios
Does	41	100	100	100
Fawns	11	27	21	74
Bucks	3	7	17	26
Sample Size	55			

* Herd Plan goals call for this herd to be surveyed only every other year. The herd was surveyed this year because we are concerned with the apparent drop in buck ratios and wish to collect as much information on this herd as possible.

Sincerely,

Denyse Racine

Denyse Racine
Wildlife Biologist

SHERWIN GRADE DEER HERD MANAGEMENT PLAN 1990 UPDATE

I. Update of biological data

A. Composition Counts

Year	Post-season bucks/100dd	Post season fawns/100dd	Spring fawns	Fall sample	Spring sample
1985-86	7	35	19	691	794
1986-87	7	28	15	706	400
1987-88	10	34	12	716	307
1988-89	11	22	15	936	294
1989-90	12	21	18	572	622

B. Buck kill

Year	1985	1986	1987	1988	1989
	311	127	140	122	109

C. Winter range total counts

Year	Buttermilk segment	Sherwin segment	Total
1985	3657	2321	5978
1986	3692	1555	5247
1987	2615	1161	3776
1988	1879	1080	2810
1989	1327	931	2407
1990	No count was conducted due to lack of snow cover which is needed to concentrate animals, allow adequate visibility of animals, and provide consistency.		

C. Collections/necropsies

Attached are graphs depicting measurements and changes in various biological parameters from data compiled through collections each year during the period 1984-1989.

D. Browse production (inches of bitterbrush leader growth)

Year	1985	1986	1987	1988	1989
	1.2"	5.8"	<.05"	.66"	.65"

II. Update of habitat improvement projects for 1988 and 1989

No habitat improvement projects have been undertaken during the report period, however, a major project has been proposed for Hill Bill funding to begin during the 1991-92 year. This project would initiate experimental rejuvination of the herd's Round Valley winter range through fencing, watering and plantings.

III. Other changes to the herd plan

The combined effects of the ongoing 4-year drought, decadent winter range conditions, suspected heavy predation, (especially by mountain lions), and development of key migration corridors are creating a situation of continuing decline in deer numbers as reflected in the total counts and very low fawn ratios.

Figure 1. Pregnancy rates (+/- 1 SE); sample sizes shown

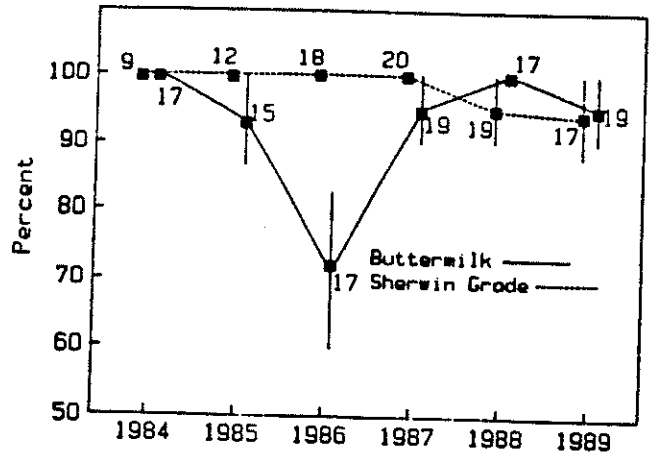


Figure 2. Fetal rates (mean and 95% CI) of adult does; sample sizes near means

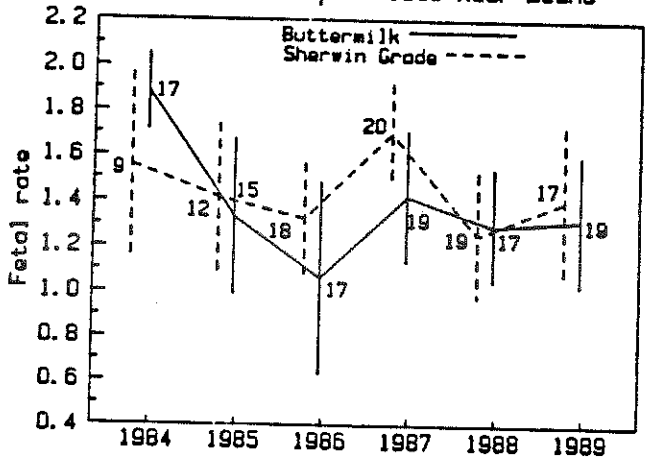


Figure 3. Fetal hindfoot length (mean and 95% CI); sample sizes near means

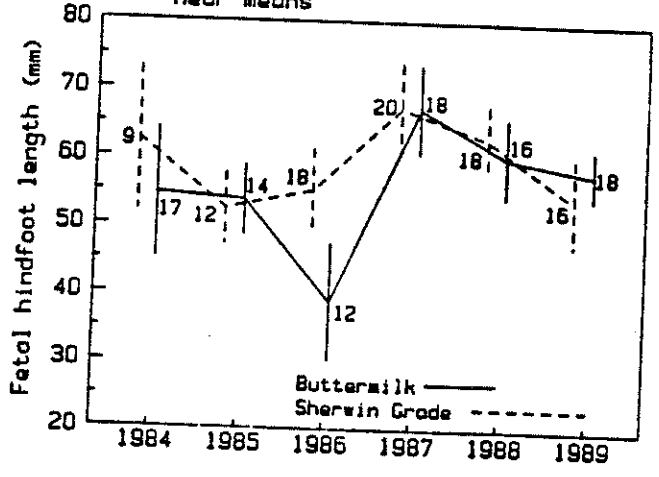


Figure 4. Fresh-killed weights (mean and 95% CI); sample sizes near means

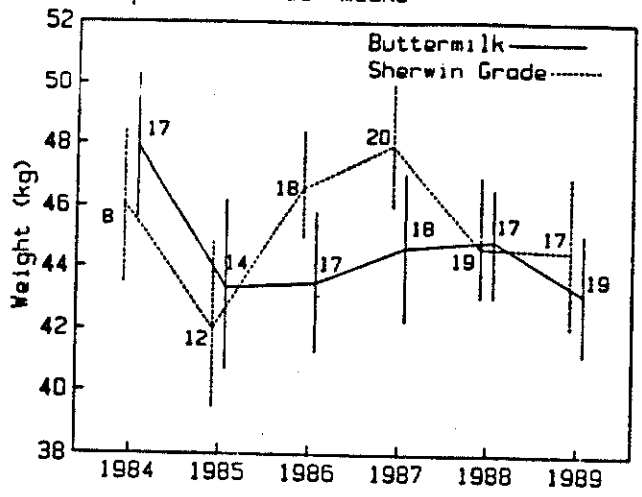


Figure 5. Kidney fat indexes (mean and 95% CI); sample sizes near means

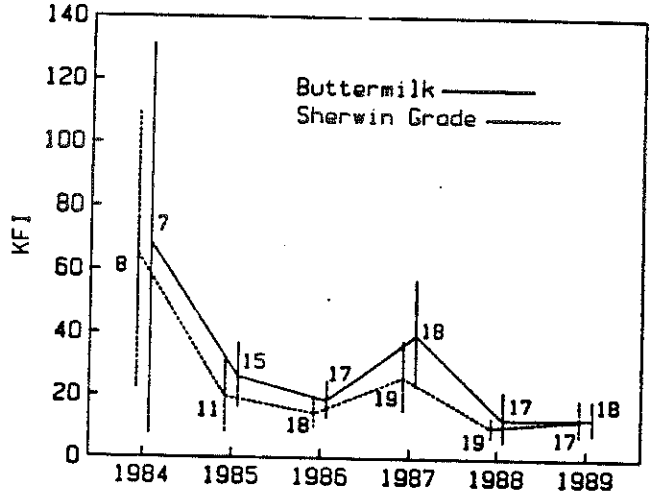


Figure 6. Purshia leader growth (mean and 95% CI) and precipitation

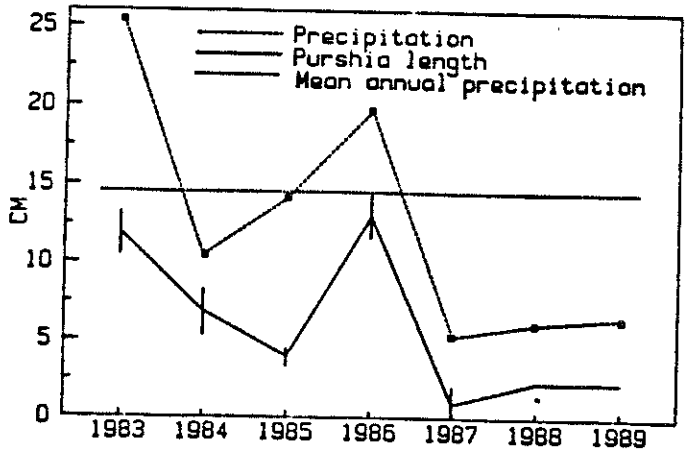
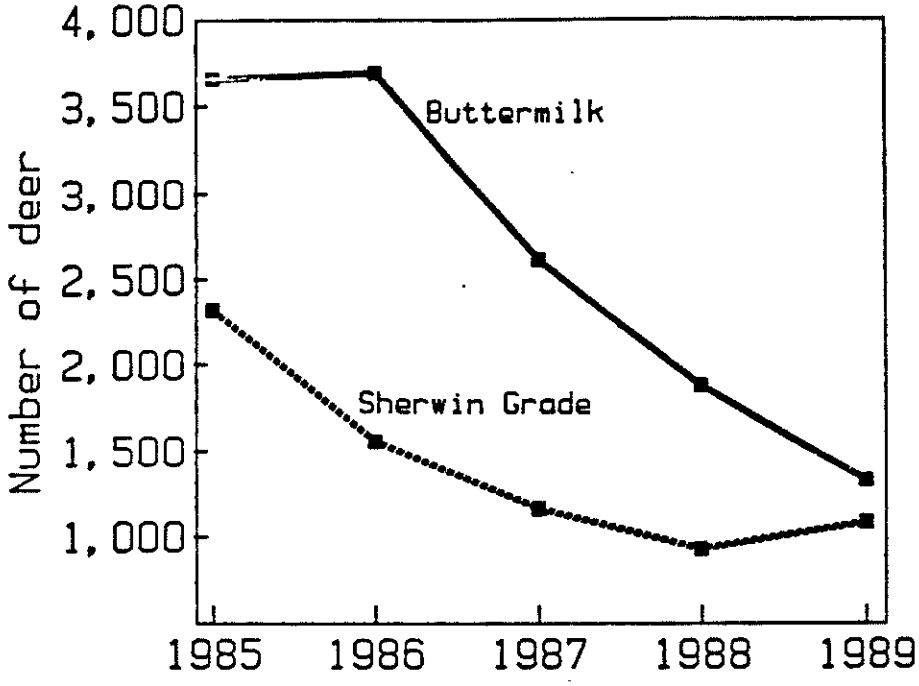


Figure 7. Total number of deer counted in the Buttermilk and Sherwin Grade deer herds



State of California — The Resources Agency

MEMORANDUM

To : File

Date : January 25, 1993

From : Department of Fish and Game, Mono Wildlife Unit

Subject : Deer herd Composition Data

Sherwin Grade Herd Composition

year	Post-season bucks/100dd	Post-season fawns/100dd	Spring fawns	Fall sample	Spring sample
1985-86	7	35	19	691	794
1986-87	7	28	15	706	400
1987-88	10	34	12	718	307
1988-89	11	22	15	936	294
1989-90	12	21	18	572	622
1990-91	12	27	13	468	343
1991-92	12	22	22	289	378

Round Valley Herd Composition

(Beginning in 1993, herd composition data of the Sherwin and Buttermilk herds will be combined and reported as the Round Valley herd, based on current knowledge of herd parameters.)

1992-93	15	36		462	

Casa Diablo Herd Composition

1985-86	15	61	21	444	153
1986-87	6	60	39	293	602
1987-88	6	36	18	940	406
1988-89	12	18	15	159	349
1989-90	9	22	26	172	628
1990-91	6	22	13	154	279
1991-92	17	38	29	206	507
1992-93	13	49		512	

Mono Lake Herd Composition

1985-86	6	52	20	257	272
1986-87	no sample obtained				
1987-88	17	41	35	317	285
1988-89	22	31	--	250	---
1989-90	12	26	16	388	350
1990-91	14	29	34*	238	239
1991-92	18	38	24	175	472
1992-93	no sample obtained				

East Walker Herd Composition

1985-86	15	44	28	456	469
1986-87	11	48	35	170	573
1987-88	22	37	21	239	234
1988-89	9	20	17	227	333
1989-90	19	19	15	231	340
1990-91	19	30	25*	263	265
1991-92	36	39	24	251	636
1992-93	18	46		266	

West Walker Herd Composition

1985-86	10	51	32	732	2173
1986-87	14	54	31	207	999
1987-88	18	40	21	457	1421
1988-89	9	23	17	715	1042
1989-90	13	21	17	606	1169
1990-91	10	26	22*	522	520
1991-92	18	37	25.5	643	1229
1992-93	10	33		657	

* These spring fawn ratios are believed to be unrealistically inflated since the "spring" counts were conducted on February 28, before the only severe storms of the '90-91 winter which occurred in March and persisted for about three weeks.

Composition Counts: Hunt Zone Totals

Zone X-12*

Year	Post Season bucks/100dd	Post-season fawns/100dd	Spring fawns	Fall sample	Spring sample
1989-90	16	20	16	1225	1859
1990-91	13	28	25	1023	1563
1991-92	22	38	25	1069	2131
1992-93	12	36		923	

Zone X-9A**

1989-90	12	22	20	1479	1711
1990-91	10	26	13	622	727
1991-92	15	24	24	909	1248
1992-93	14	42		974	

* Includes West Walker, East Walker, and Mono Lake Herds.

** Includes Casa Diablo, Sherwin Grade, and Buttermilk herds.

Appendix B

SHERWIN SKI AREA DEER and WILDLIFE STUDY

FINAL REPORT

December 1985.

Thomas E. Kucera

TABLE of CONTENTS

LIST of FIGURES

INTRODUCTION

The proposal to develop the Sherwin Ski Area in Mammoth Lakes, Mono County, California (Figs. 1 and 2), initiated concern over potential adverse impacts of such a development on local wildlife. Much of the land on which the ski area is to be located is managed by the U.S. Forest Service (USFS), which is legally mandated by the National Forest Management Act of 1976 to conserve diversity of plant and animal communities and monitor wildlife population trends when planning land management activities. Wildlife surveys have been conducted in the area (USDA, 1981a); however, more intensive and extensive information is required to determine:

1.) the timing, pattern and intensity of mule deer (Odocoileus hemionus) use in the area,

2.) the existence of critical deer areas (e.g., fawning and migration) within the proposed ski area,

3.) the presence, relative abundance, and habitats of those wildlife species defined by the USFS as Sensitive, Management Indicator, Special Interest, or Harvest species which are expected to occur in the proposed ski area (USDA, 1981a), and

4.) potential mitigating activities to be incorporated into the development plan, if the ski area is developed.

ACKNOWLEDGMENTS

This investigation was conducted under a contract from the O'Connor Design Group, Mammoth Lakes, California, with the cooperation of and a Special Use Permit from the USFS, Mammoth Ranger District, Inyo National Forest, and with the cooperation of the California Department of Fish and Game (DFG). The Principal Investigator took over the contract on 1 May 1984 from the original consultant and merged the present study into a larger investigation of Eastern Sierra deer supported by the Bishop Resource Area of the Bureau of Land Management (BLM), DFG, Inyo and Mono Counties, the University of California, Berkeley, and several private funding organizations. The design of the wildlife study is based on consultations with USFS biologists Clint McCarthy and Pat Stygar. Much of this investigation, both fieldwork and graphics, was done by Timothy Taylor.

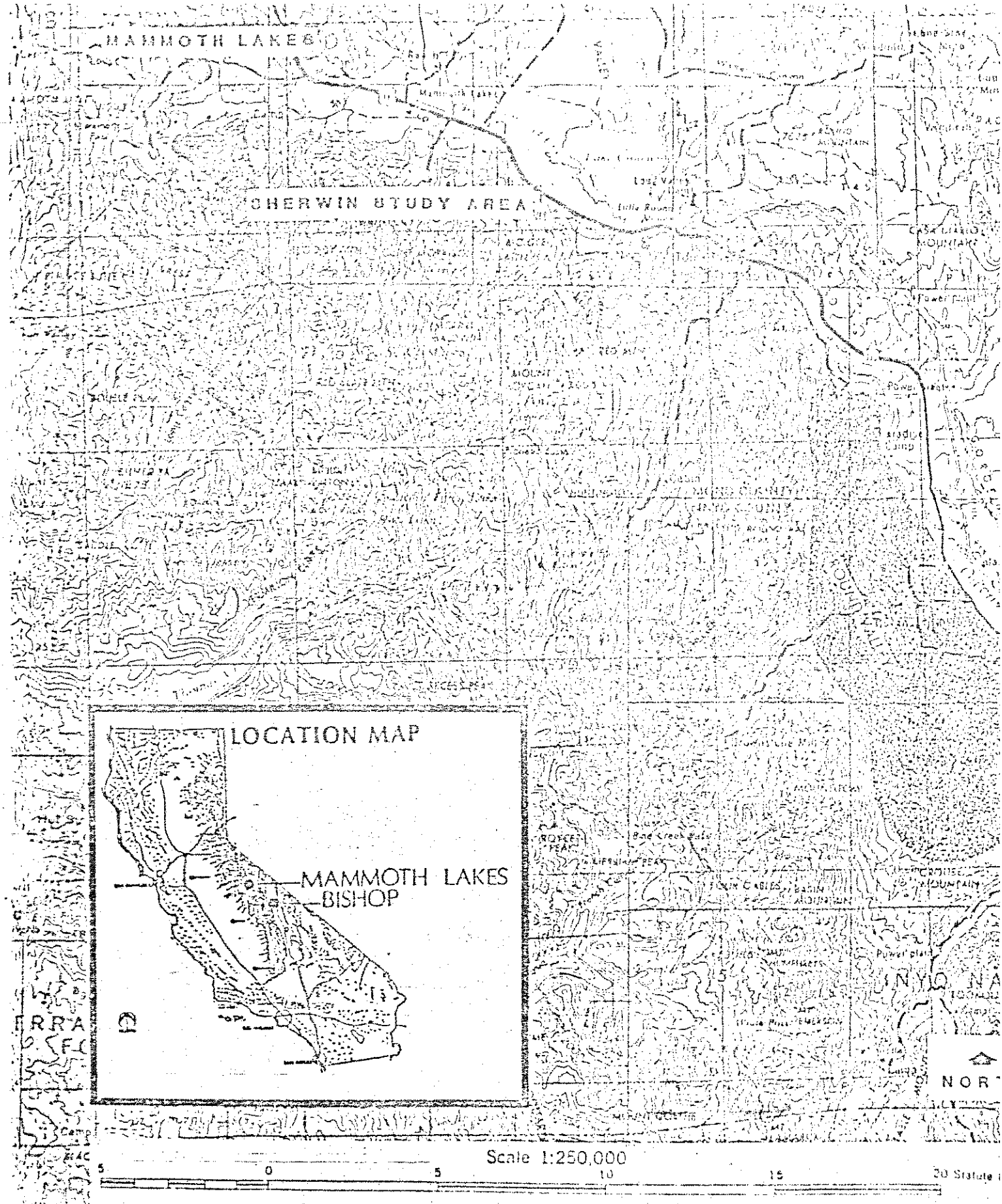


Figure 1. Location of the proposed Sherwin Ski Area in California.

Figure 2. Location of the present Study Area near the town of Mammoth Lakes, California.

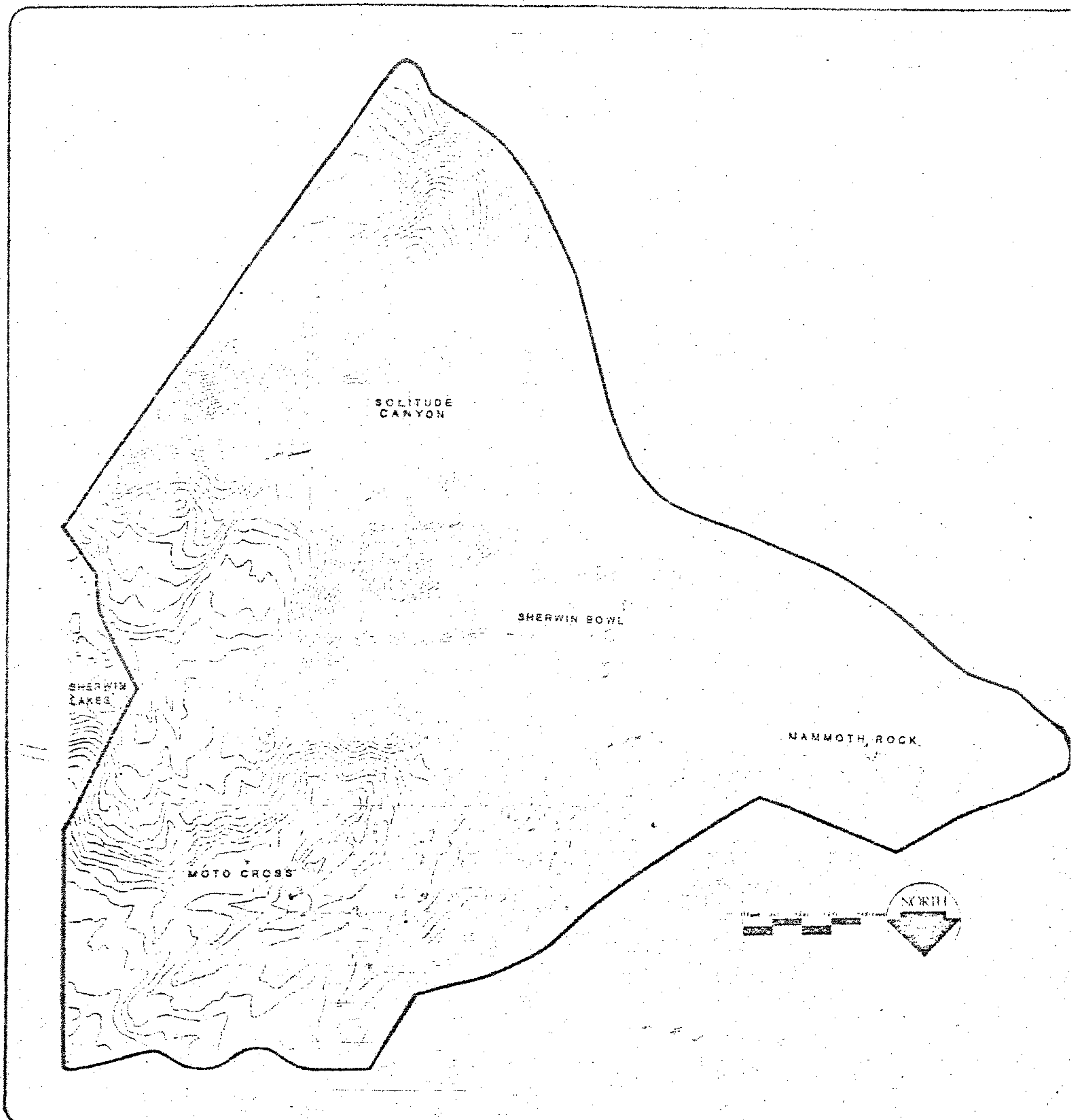
The proposed Sherwin Ski Area, hereafter designated the Study Area, is located in Sections 10-15, 23, and 24 of T.4S, R.27E, in the Mammoth Ranger District, Inyo National Forest (Fig. 3). The area comprises approximately 2,000 acres of steep, generally north-facing, mountainous terrain, varying in elevation from 8,000 to 11,600 feet, and lies between the Sherwin Creek drainage on the east and the Mammoth Lakes basin on the west. There is no commercial logging in the area. Limited grazing (70 AUM's) by horses and mules occurs in a meadow area in the northwest part of the Study Area (USDA, 1981a).

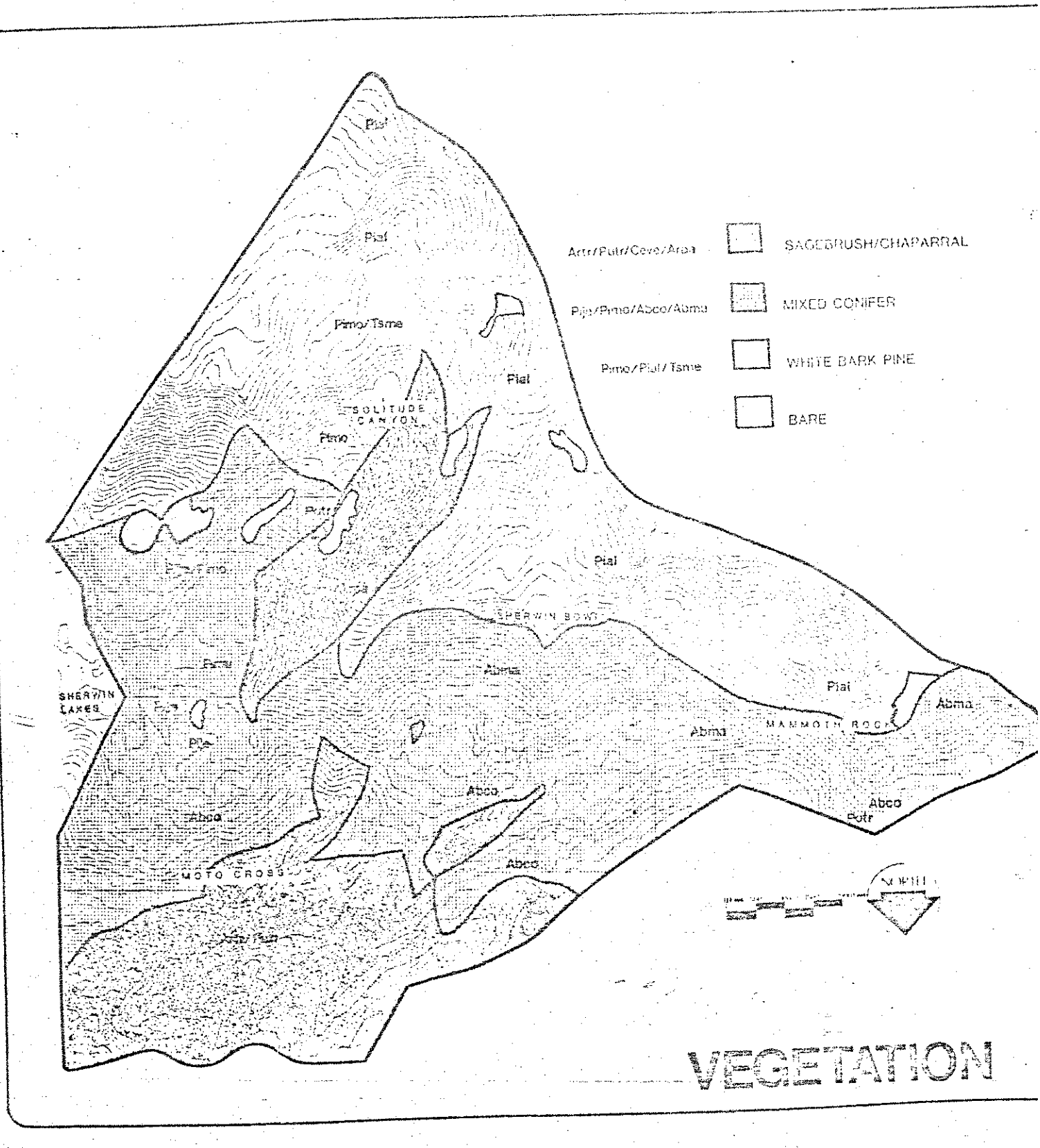
Present road access is limited to a four-wheel drive dirt road, approximately one mile in length, which enters the area from the east, climbs the steep slopes on the northwest flank of Solitude Canyon, and terminates at an abandoned mining prospect. Access is restricted by a locked gate at the start of this road (USDA, 1981a). An off-road motorcycle recreation area, the Moto Cross, also is present at the base of the eastern side of the Study Area.

Two main vegetation types were identified within the area by the USFS (USDA, 1981a) using the CALVEG (USDA, 1981b) classification system (Fig. 4). The first type of vegetation is Mixed Conifer (Jeffrey pine (Pinus jeffreyi), white fir (Abies concolor) and red fir (A. magnifica)). The second is Whitebark Pine (P. albicaulis). A third vegetation type, composed of a mixture of Chaparral (manzanita (Arctostaphylos patula) and tobaccobrush (Ceanothus velutinus)) and Sagebrush Scrub (bitterbrush (Purshia tridentata), and sagebrush (Artemesia tridentata)) is found on the rolling hills at the base of the mountains.

Figure 3. (Opposite) The Sherwin Study Area, showing major landmarks. Contour intervals are 50 ft.

Figure 4. (Overleaf) Vegetation types within the Sherwin Study Area. Abbreviations are as follows: Artr = Artemesia tridentata, Putr = Purshia tridentata, Ceve = Ceanothus velutinus, Arpa = Arctostaphylos patula, Pije = Pinus jeffreyi, Pimo = P. monticola, Abco = Abies concolor, Abma = A. magnifica, Pial = P. albicaulis, Tsme = Tsuga mertensiana.


SOLITUDE
CANYON
SHERWIN BOWL
SHERWIN
LAKES
MAMMOTH ROCK
MOTO CROSS
NORTH


Artr/Purr/Ceve/Arsp
SAGEBRUSH/CHAPARRAL
Pijo/Pimo/Abco/Abma
MIXED CONIFER
Pimo/Pial/Tsme
WHITE BARK PINE
BARE
Pial
Pimo/Tsme
SOLITUDE CANYON
Pimo
Artr
Pimo
Pial
SHERWIN BOWL
Abma
SHERWIN LAKES
Pial
Abma
MAMMOTH ROCK
Abma
Abco
Abco
Abco
Abco
Purr
MOTO CROSS
NORTH
VEGETATION

A. Deer

1.) Capture and Marking

In May 1984, 6 adult female mule deer were captured in and near the Study Area by use of tranquilizer darts; 3 more were captured in April and May 1985 (Fig. 5). These animals were fitted with radio-transmitter collars, provided by DFG, and released. In addition, during January - March 1984 and 1985, 212 deer were captured in Round Valley, approximately 15 miles northwest of Bishop, California, and 30 miles southeast of the Sherwin Study Area, in conjunction with a larger ecological study of Eastern Sierra deer (Kucera, unpublished) (Fig. 1). Thirty-two of these deer (13 males and 19 females) were fitted with radio collars; all received numbered ear tags, and 81 adult does which did not receive a radio collar received individually numbered "marking collars".

2.) Telemetry

Following capture, the locations of radioed deer were determined throughout the year, both from the ground and from a fixed-wing plane provided by DFG. A total of 37 telemetry flights were made between 16 April 1984 and 14 November 1985. Flights were taken throughout the year, but were concentrated during spring (April-June) and fall (September-October) migration periods. Numerous day hikes and backcountry trips were taken throughout the summer and fall to locate radioed animals on their summer range and during migration.

Within the Study Area, the original plan to monitor deer locations by triangulation was modified due to the large error in signal location induced by the very steep and rocky terrain. Only locations based on visual sightings of radioed animals are reliable in such terrain, and only these are included in this report. Due to safety considerations, night monitoring of radioed deer was not attempted.

Observations of marked but un-radioed deer in or near the Study Area were made throughout the course of daily field work, and locations of these were plotted on aerial photos. Because only one marked deer summered in the Study Area in 1984, the attempt to estimate deer population size in summer by use of the Lincoln Index (Connolly, 1981) was abandoned.

Figure 7. Location of the dawn road survey in and near the Sherwin Study Area.

aerial photo. Because of the large number of animals using the same narrow trails, using a track count method to estimate numbers was unworkable.

In order to quantify the number of deer moving through part of the Study Area, a battery-operated infra-red trail traffic counter (Scientific Dimensions, Inc., Albuquerque, NM) was placed a few hundred yards south of the top of Solitude Canyon in 1985. Previous work had shown this to be an important migration route. The infra-red beam was positioned to cross a narrow deer trail at about 30 inches above the ground. Deer walking the trail broke the beam, and were recorded on an automatic counter. There is essentially no human use of this trail.

B. Other Wildlife

1.) Introduction

This part of the study was designed to provide information on the presence, relative abundance, and habitats of those wildlife species defined by the USFS as Sensitive, Management Indicator, Special Interest, or Harvest species which are expected to occur in the Sherwin Study Area (USDA, 1981a; 1984). No federally listed threatened or endangered species are thought to be present (USDA, 1981a; 1984).

2.) Diurnal Raptors

The presence of goshawks (Accipiter gentilis), a Sensitive species, was investigated during the course of 4 field days spent in late June and early July, examining on foot those areas of potential goshawk habitat mapped by the Forest Service (USDA, 1981a). These potential habitats were examined as thoroughly as possible for adult goshawks or sign, e.g., plucking posts, nest trees, etc. In addition, during the course of other fieldwork in the Study Area, all observations of goshawks or sign were recorded. When adults were sighted attempts were made to locate nest sites.

The presence of prairie falcons (Falco mexicanus), another Sensitive species, was determined during 3 days of fieldwork in early June. Potential nesting cliffs were examined for the presence of breeding adults or for sign of breeding attempts, e.g., whitewash on cliffs, eggshell fragments, dead chicks, etc. Additionally, any prairie falcons observed during the course of other fieldwork in the Study Area were recorded.

Other raptors, e.g., golden eagles (Aquila chrysaetos), red-tailed hawks (Buteo jamaicensis), etc., were noted during the course of other fieldwork in the Study Area.

3.) Owls

The presence of spotted owls (Strix occidentalis), great gray owls (S. nebulosa), both Sensitive species, and flammulated owls (Otus flammeolus), a Special Interest species, was determined by the use of recorded calls played at night in areas of potential owl habitat as mapped by the Forest Service (USDA, 1981a). One night per week during May and June, beginning one-half hour after official sunset, these areas were visited. Recorded owl calls were played at approximately 100m intervals along the transect route, and any responses noted.

4.) Blue Grouse (Dendragopus obscurus)

Blue grouse, a Harvest species, did not require any surveys specifically directed toward them, but during the course of fieldwork in the Study Area, all sightings of blue grouse or sign, e.g., droppings, booming, etc., were noted and plotted on an aerial photo.

5.) Management Indicator Avian Species

Those Management Indicator species to be expected in the Study Area (USDA, 1981a), specifically yellow-bellied sapsuckers (Sphyrapicus varius), Williamson's sapsuckers (S. throideus), hairy woodpeckers (Picoides villosus), pygmy nuthatches (Sitta pygmea) and brown creepers (Certhia familiaris), were surveyed by using a variation of the plot technique outlined by Dedon and Barrett (1982) and Raphael (1983). During late May and June, when breeding birds are most conspicuous, an observer visited a plot as soon after dawn as possible, sat quietly, and tallied the number of each of the above species detected (visually and aurally) during 5 successive 10-minute intervals. Other bird and mammal species were noted as time allowed. Two plots per day were visited. When adults of the above species were observed, attempts were made to find nest locations. Plot locations were based on the vegetation types described and the deer pellet plots already established in the Study Area. Five plots each were selected randomly in the Whitebark Pine and Chaparral/Sagebrush Scrub vegetation types, and 10 randomly placed plots were used in the Mixed Conifer type. In addition, 1 extra plot was placed in Whitebark Pine, 2 extra in Mixed Conifer, and 3 extra in Chaparral in areas likely to be disturbed by the ski area, for a total of 26 plots in the Study Area.

6.) Carnivores

The presence of Sierra Nevada red fox (Vulpes vulpes necator), pine marten (Martes americana), and fisher (M. pennanti), all

Sensitive species, was investigated both in the summer and winter. In summer, the presence of these carnivore species was detected by their tracks left on the surface of a 1 x 1m alluminum sheet blackened with a kerosene flame, with a can of fish, its top punctured with small holes, in the middle (Barrett, 1983). During June and July 1985, a track station was placed on a plot, and read every other day for 6 days; 15 randomly placed plots, 5 per vegetation type, were sampled. In addition, 5 more plots were placed in the Mixed Conifer type in areas likely to be disturbed by a ski development. Thus, a total of 20 plots was used.

Eleven winter surveys were conducted on skis from February through April 1985. Different routes through the Study Area were travelled, and tracks or other sign of these species noted and plotted. The presence of other notable wildlife, e.g., blue grouse, coyote (Canis latrans), mountain lion (Felis concolor), etc., also was recorded when appropriate.

The habitat on each plot was described according to standard Forest Service procedures used in timber compartment exams, in coordination with Forest Service biologists.

RESULTS

A. Deer

1. Spring/Summer

Figure 8 shows the results of the road survey from 15 April to 23 August 1985. Many deer already were in the vicinity of the Study Area by mid-April, when some of the Sherwin Creek Road survey route was not yet passable due to snow. The first deer were seen in the Study Area on foot on 17 April 1985 when the road was still blocked by snow; the first deer were seen on the road survey within the Study Area proper on 29 April. The number of deer counted on the road survey varied between 300 and 600 through May, and then steadily declined as the animals migrated to their summer ranges. The number of deer counted on the road survey within the Study Area itself followed a generally similar trend, but was much lower, due in part to the poor road access. It should be remembered that this survey route was mainly in chaparral vegetation at lower elevations. Most of the deer had left this "staging area" (Fig. 9) by early June. The first deer sign in Solitude Canyon was observed on 16 May 1985, when deer began moving over Solitude Pass to the summer range.

Of the 32 deer radioed in Round Valley in both winters, 23 were known to migrate to the north. Seventeen (74%) of these (12 females) were observed in or near the Study Area during the

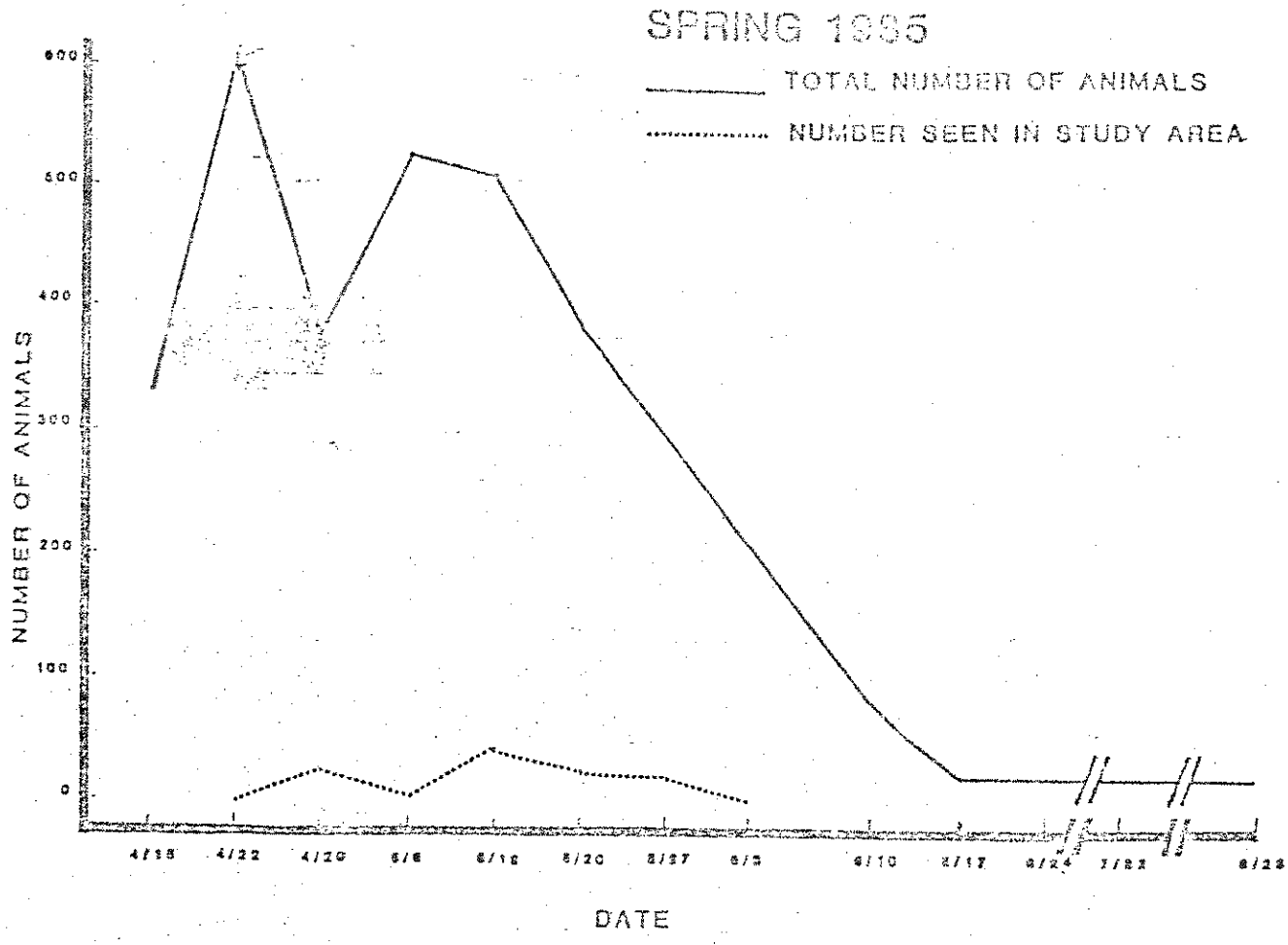


Figure 8. Deer counted on the dawn road survey, Spring 1995.

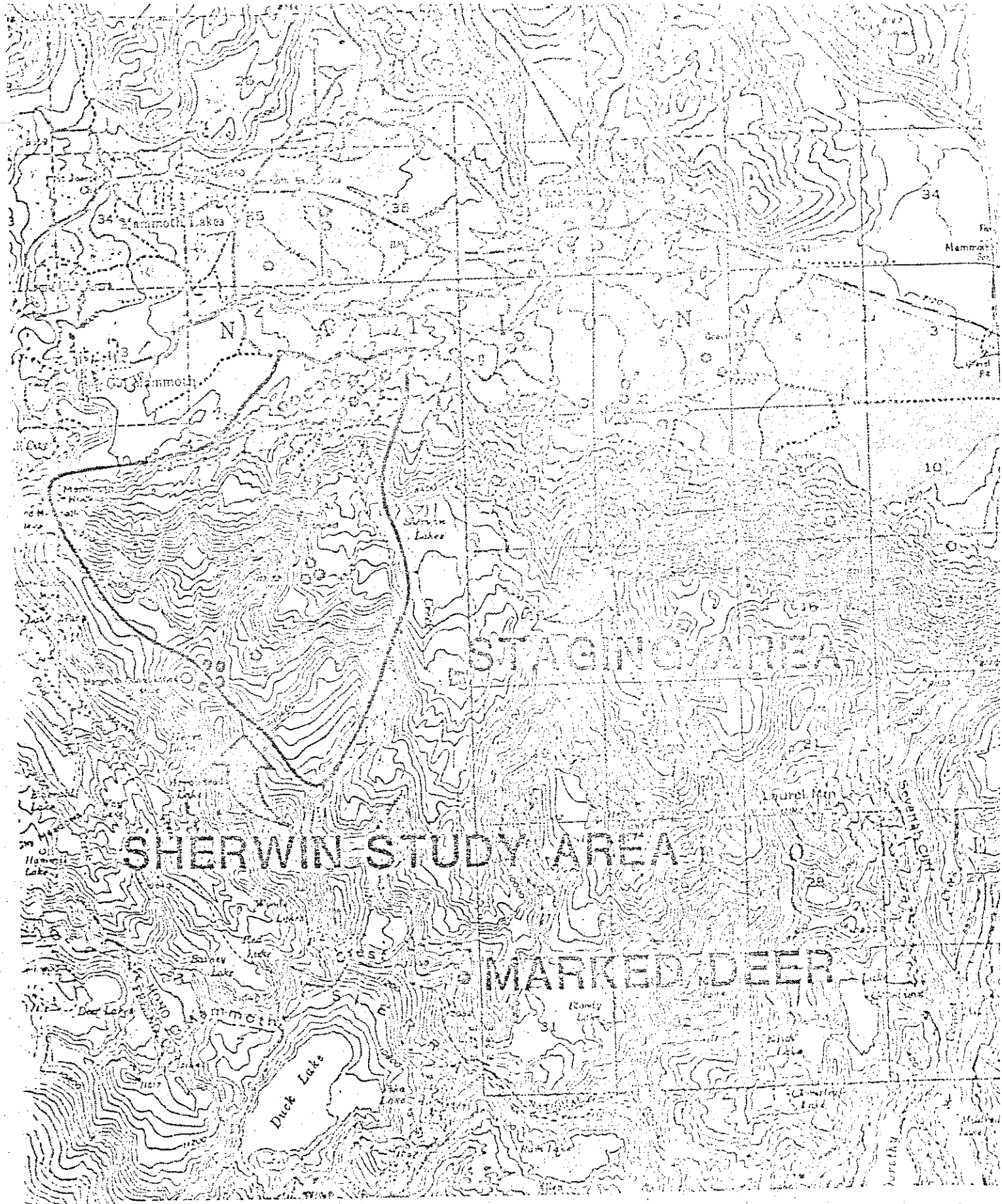


Figure 9. Location of the Staging Area, and locations of deer radioed or marked near Bishop, observed in or near the Sherwin Study Area.

spring (Fig. 9). An additional 36 marked, un-radioed deer (14 males, 19 females, 3 fawns) from Round Valley also were observed in the same area (Fig. 9).

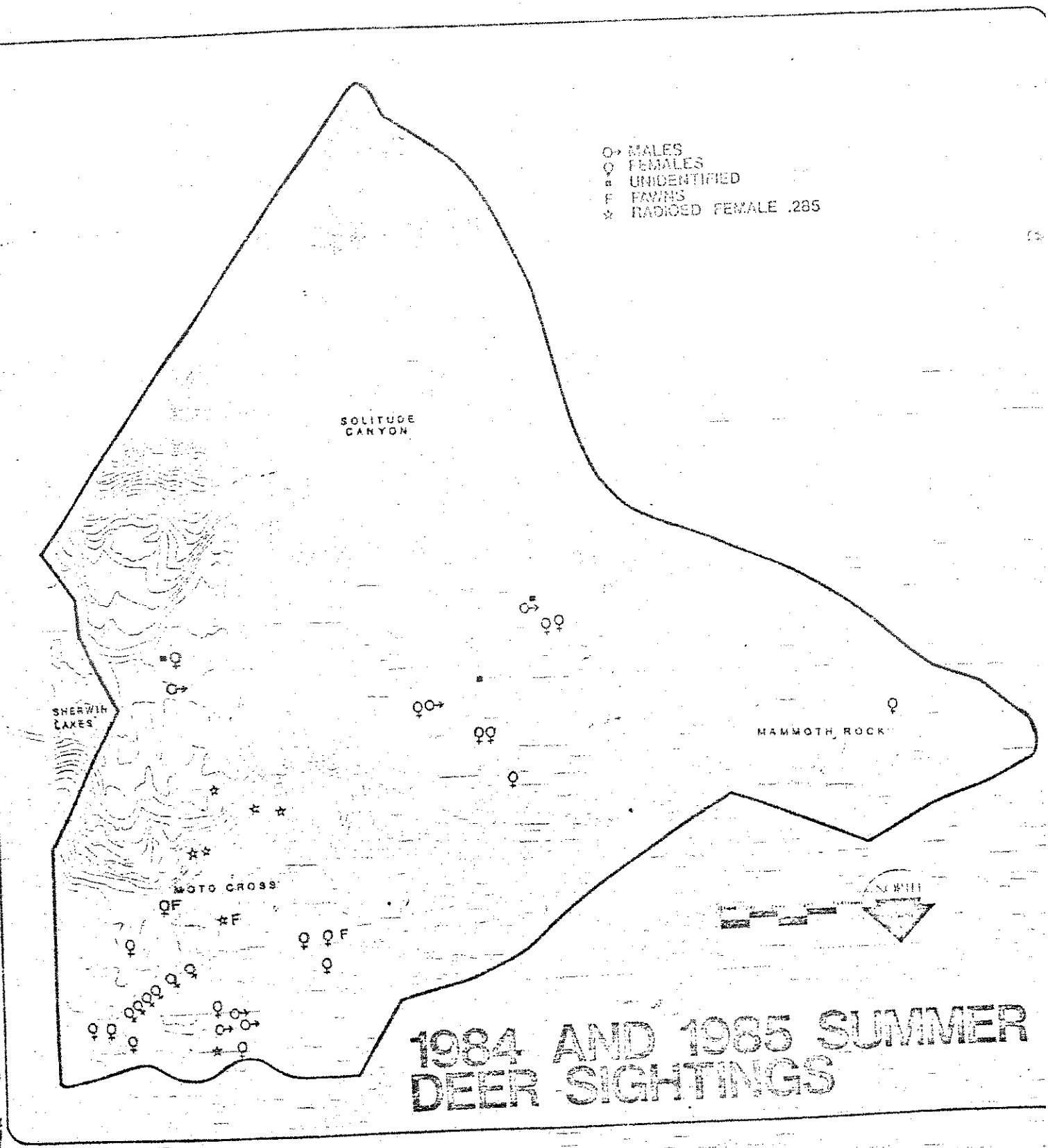
Of the 9 does radioed during spring migration in or near the Study Area, the summer locations of 8 were determined precisely, as were the summer locations of the 17 radioed deer and 4 of the marked but unradioed deer (2 males, 2 females) from Round Valley seen in or near the Study Area (Fig. 10). These animals summered from near Agnew Pass on the north to Florence Lake on the south, which represents an airline distance of some 33 miles, and comprises several hundred square miles of the Sierra Nevada.

Of the does radioed in or near the Study Area, 8 of 9 summered outside it: three went to the Fish Creek drainage, one went to the North Fork of Mono Creek, and another went as far as Florence Lake. One doe summered on Mammoth Pass, and one was located only generally in the summer, southwest of Lake Thomas A. Edison. One radioed doe remained in the Study Area during the summer of 1984 and was located and sighted frequently (Fig. 11). She remained in the Mixed Conifer/Chaparral/Sagebrush Shrub, and produced one fawn. In 1985, she shifted her summer range about 2 miles northeast, near Mammoth Creek. The final doe summered about 2 miles east of the Study Area.

During 141 days of summer fieldwork in the Study Area between 6 June and 15 October 1984 and 6 June and 7 September 1985, 32 un-marked deer (20 does, 6 bucks, 3 fawns and 3 unidentified) were seen. The locations of these sightings are shown in Fig. 11. None of the bucks was seen more than once, and although does are difficult to recognize individually, it is unlikely that many of these were seen repeatedly. The paucity of deer sign observed in the Study Area makes it unlikely that many of the deer remained throughout the summer.

The results of the pellet transects are presented in Table 1 (Pg. 23). Assuming a defecation rate of 13 pellet groups/day (Neff, 1968), summer deer use in the Study Area ranged from 0 deer days/acre/month in Mixed Conifer in June and Chaparral in July, to 7.1 deer days/acre/month in Chaparral in May and June. While probably not a precise measure of the amount of deer use of the various vegetation types, these data do provide an index of relative use of different vegetation types by month.

Figure 10. Summer locations of radioed and marked deer observed in or near the Sherwin Study Area during spring migration.



1984 AND 1985 SUMMER DEER SIGHTINGS

TABLE 1. Results of the deer pellet transects in the Study Area, 1984 and 1985 combined.

Month	MAY	JUNE	JULY	AUG.*	SEPT.*	OCT.
			CHAPARRAL			
# Pellet groups	23	23	0	6	12	7
Avg./transect	2.3	2.3	0	0.6	1.2	0.7
Avg./acre	92	92	0	24	48	28
Deer days/acre	7.1	7.1	0	0.9	1.9	2.1
			MIXED CONIFER			
# Pellet groups	1	0	1	3	3	0
Avg./transect	0.1	0	0.1	0.3	0.3	0
Avg./acre	4	0	4	12	12	0
Deer days/acre	0.3	0	0.3	0.4	0.4	0
			WHITEBARK PINE			
# Pellet groups	**	1	1	1	2	**
Avg./transect		0.1	0.1	0.1	0.2	
Avg./acre		4	4	4	8	
Deer days/acre		0.3	0.3	0.2	0.3	

* 1984 and 1985 combined
** Transects not read this month because of snow.

Figure 11. (Page 22) Summer locations of the one radioed doe and unmarked deer observed in the Sherwin Study Area.

2. Fall/Winter

Figure 12 shows the results of the dawn road survey from late August through October in both 1984 and 1985. A different pattern of migration is evident in the two years.

In 1984, with the first significant snow of the year on 16-17 October, a large wave of deer moved through the Study Area (Fig. 12a). More than 100 deer were counted on the October 18 dawn road survey. During surveys three days before and four days after this, 2 and 4 deer were counted, respectively. No deer were seen on 29 October 1984, after which the roads were closed by snow and the surveys discontinued.

No large peak of deer movement was evident on the Fall 1985 survey (Fig. 12b). The largest number counted, 38 on 12 September, followed an unusually early snowfall of about one foot at the base of the Study Area, and up to three feet at Solitude Pass. Subsequent storms, with the exception of one on 7 October, show little temporal relation to deer counted on the road surveys.

In order to get another picture of the temporal pattern of fall migration, the cumulative percent of radioed deer crossing the Sierra Crest and moving through or near the Study Area was plotted by date for 1984 and 1985 (Fig. 13). The 1984 data (Fig. 13a) mirror the pattern of the 1984 fall migration shown by the road survey data (Fig. 12a), with 73% (8 of 11) of the radioed deer crossing the crest in response to a storm on 16-17 October. In 1985 (Fig. 13b), it can be seen that a few (3 of 18, or 17%) crossed immediately subsequent to the storm on 11 September. Fully half (9 of 18) of the radioed deer crossed the crest on 8 and 9 October, following a storm on 7-8 October. The rest appeared gradually through 13 November, when the last radioed animal migrated through, in response to a major winter storm. No deer were known to pass through after mid-November, 1985.

For 1985, Fig. 13 probably presents a better picture of the timing and pattern of Fall migration than does the road survey (Fig. 12b), which did not detect major movement on 7-9 October. This may largely be due to the fact that deer hunting season was

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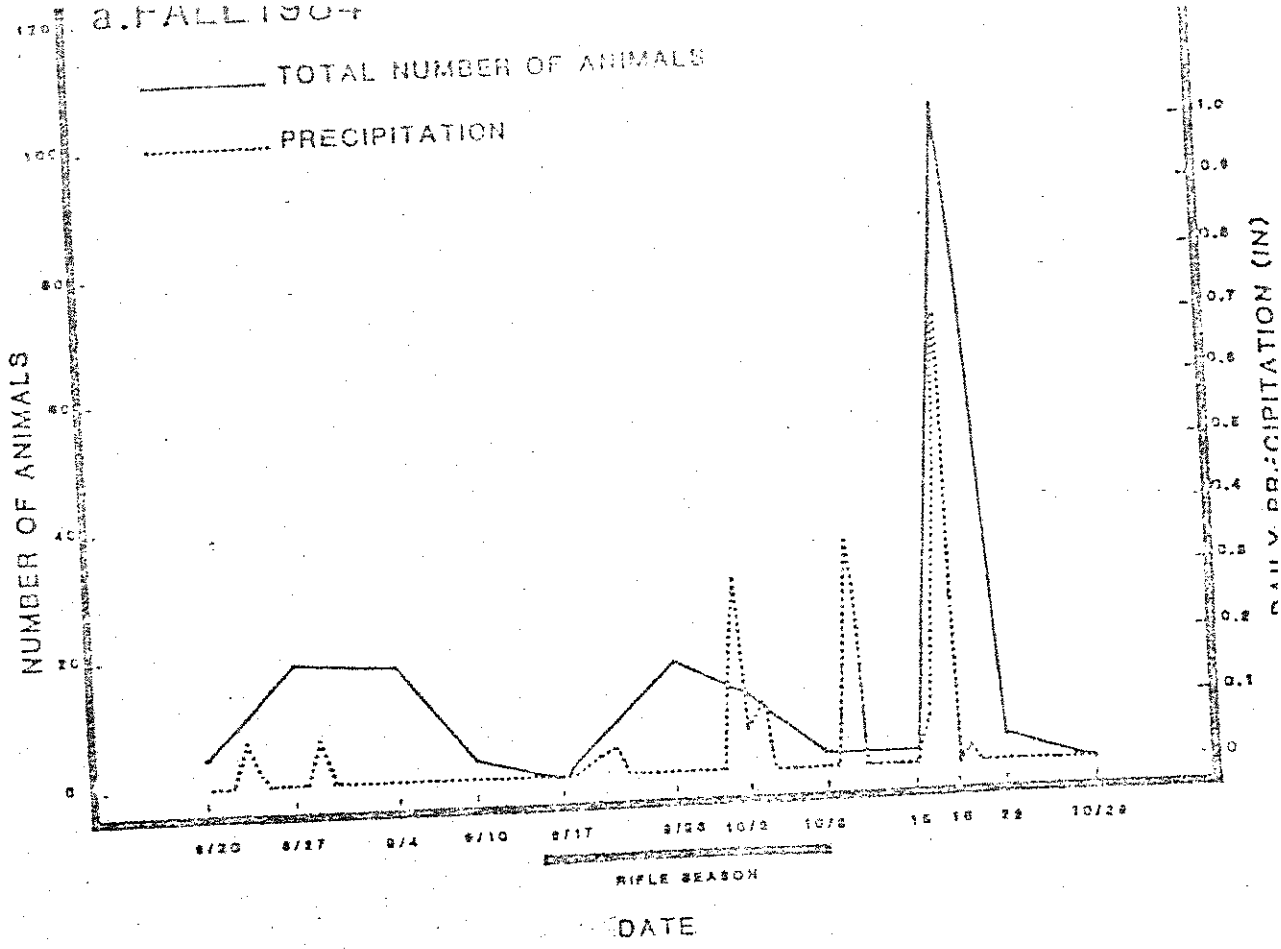
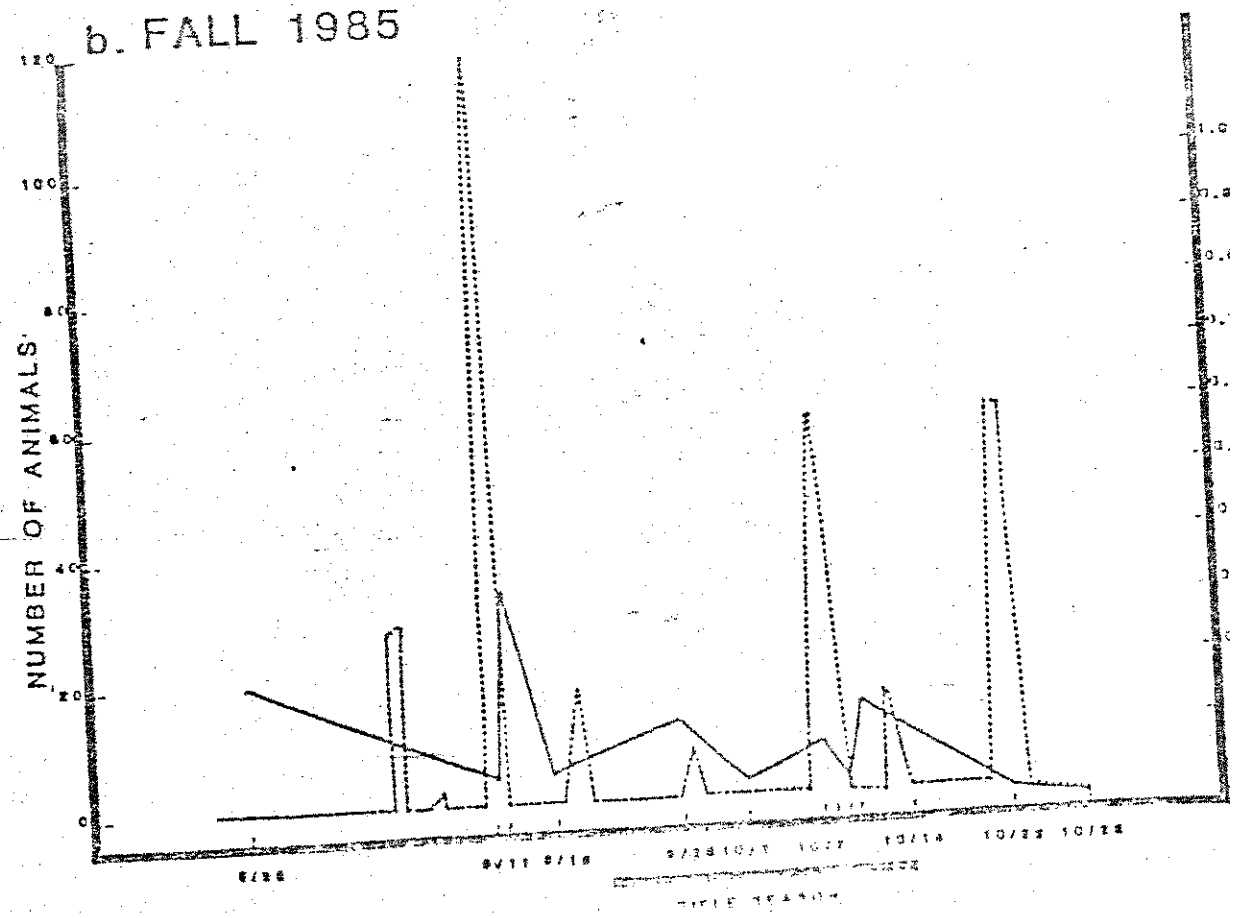
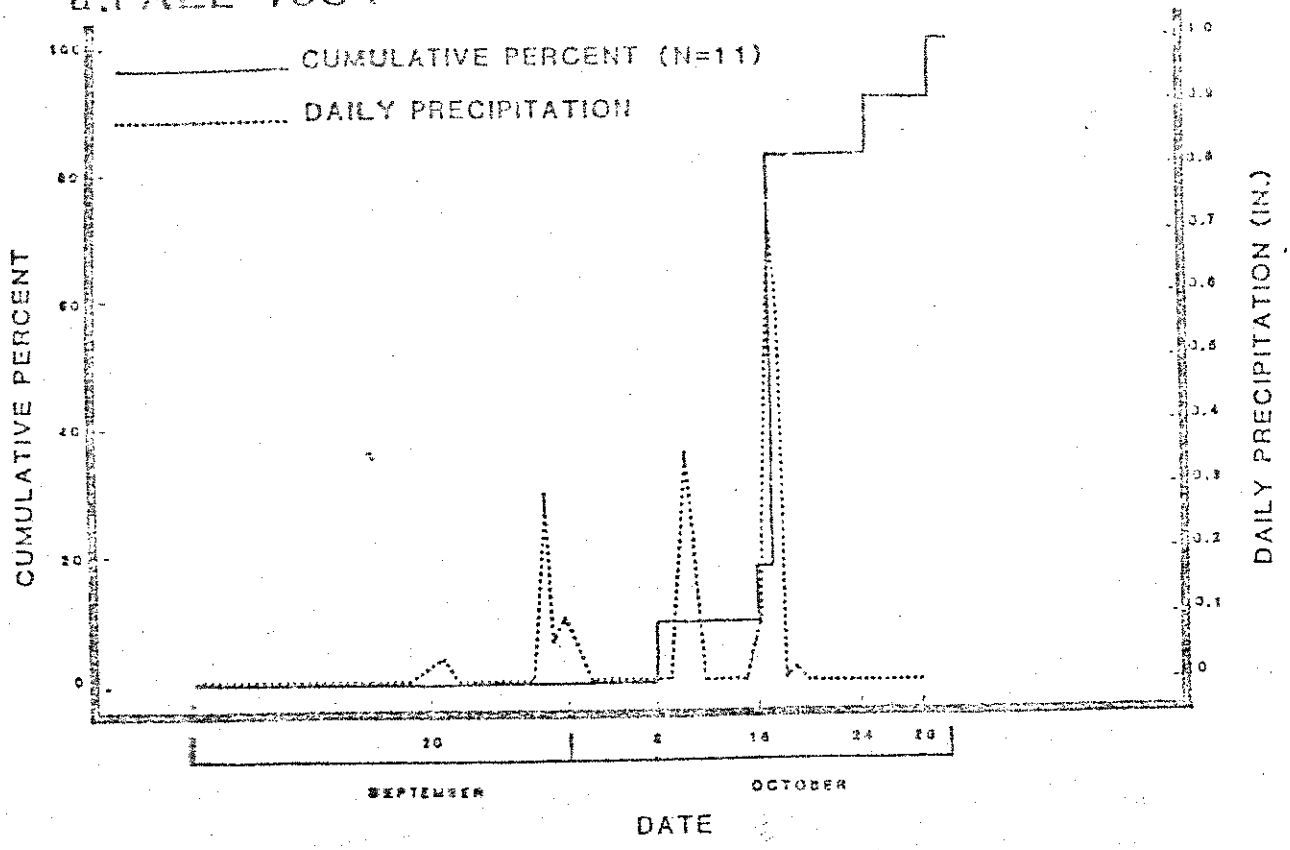
Figure 12. (Page 25) Deer counted during dawn road surveys, and daily precipitation; a. Fall 1984; b. Fall 1985.

Figure 13. (Page 26) Cumulative percent of radioed deer crossing the Crest and moving through or near the Study Area by date; a. Fall 1984; b. Fall 1985.

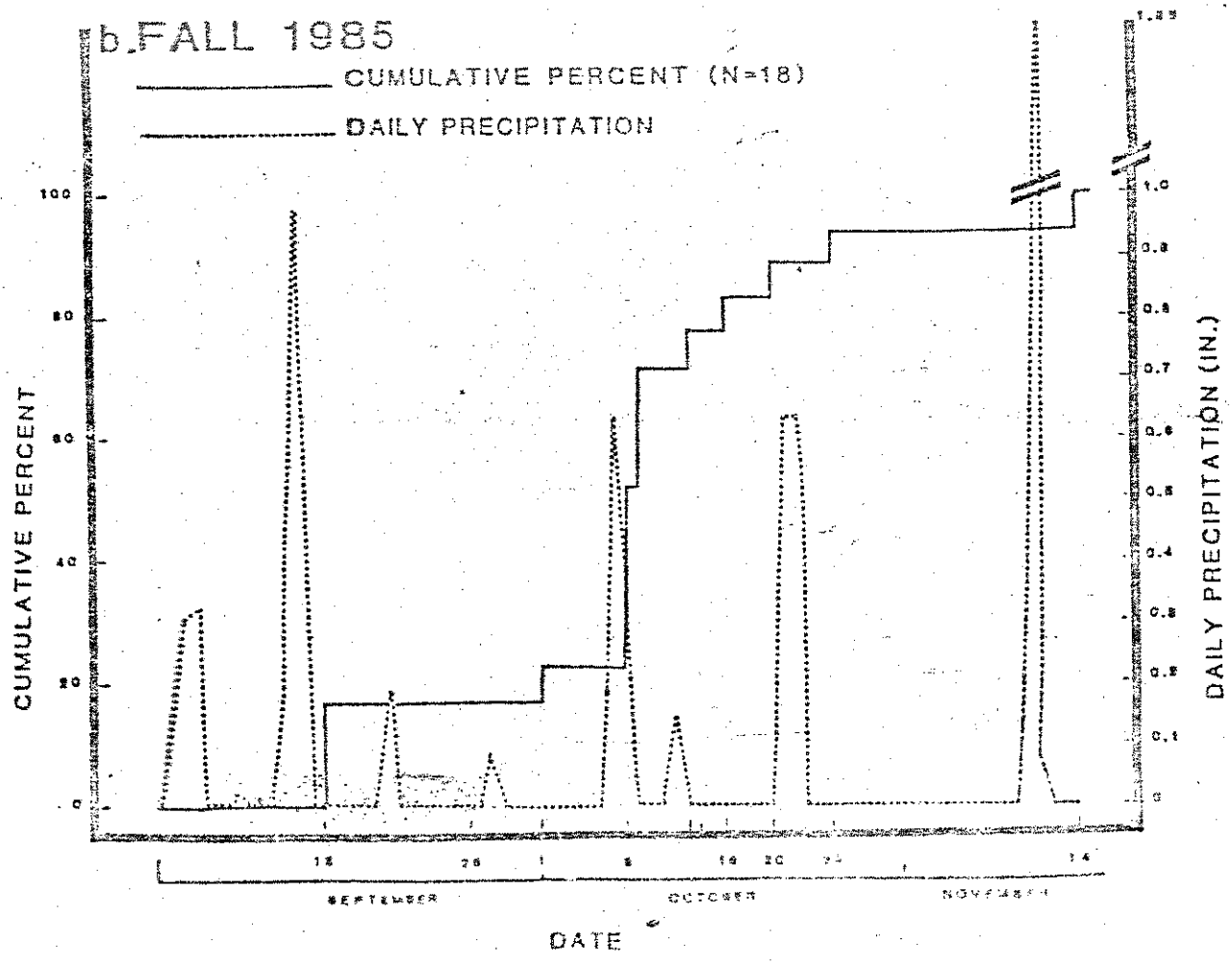

a. FALL 1984
TOTAL NUMBER OF ANIMALS
PRECIPITATION
NUMBER OF ANIMALS
RAINFALL/PRECIPITATION (IN)
8/20
8/27
9/4
9/10
9/17
9/23
10/2
10/8
15
16
22
10/29
RIFLE SEASON
DATE


b. FALL 1985
NUMBER OF ANIMALS
8/26
9/11
9/18
10/7
10/14
10/22
10/28

a. FALL 1984



b. FALL 1985



still on, and many hunters, knowing that the storm would trigger migration, were in the field. This human disturbance may have kept deer at higher elevations than the survey route, and may have kept them in heavier cover. Hunting season had ended by the time the Fall 1984 migration occurred.

3. Staging Areas and Migration Routes

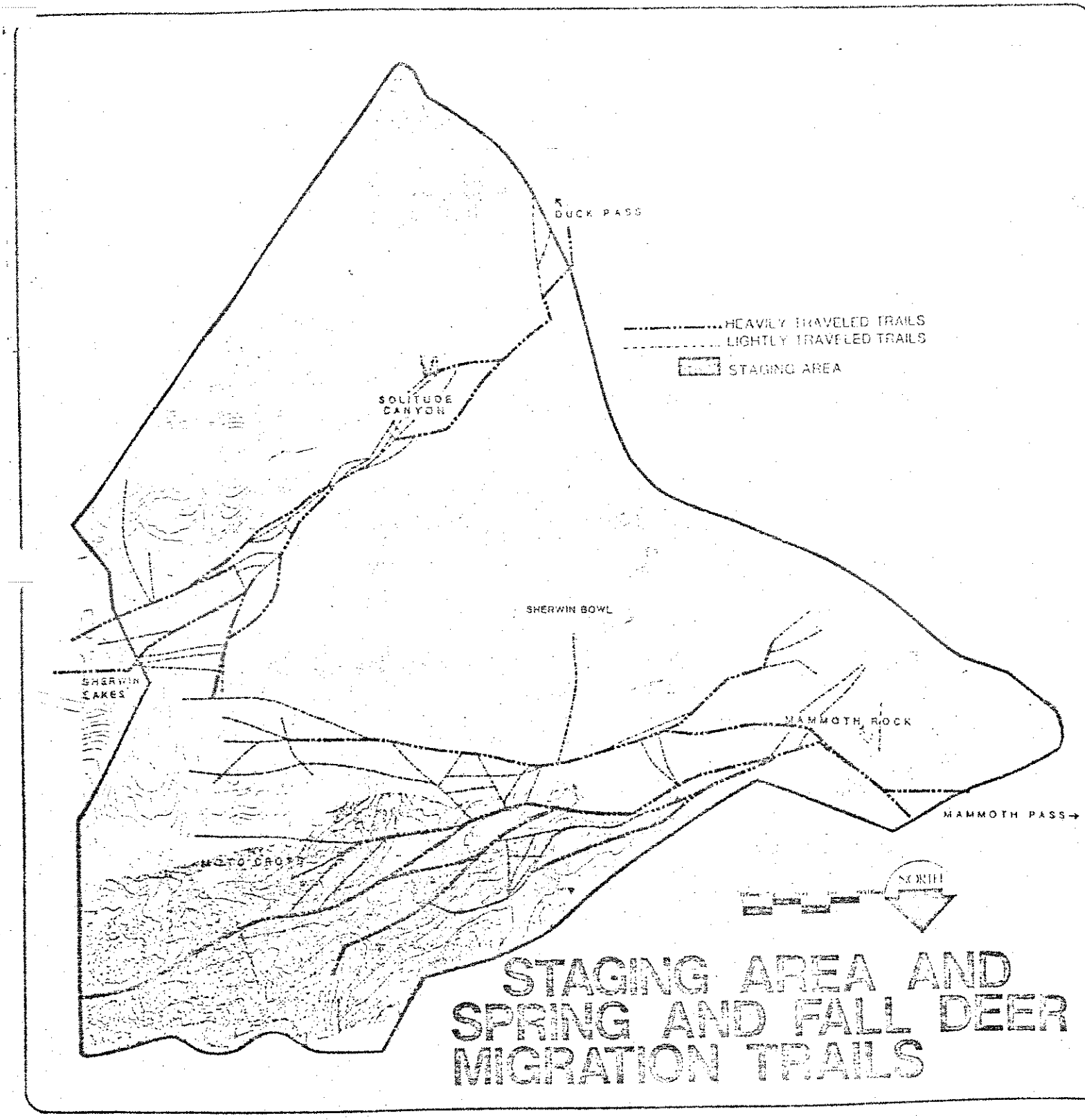
Figure 14 shows the major spring staging areas and migration trails in the Study Area. The staging area includes much of the lower and eastern parts of the Study Area, and consists primarily of Chaparral/Sagebrush Scrub vegetation with scattered white firs and Jeffery pines. This area is essentially a continuation of a staging area that goes east and south for several miles along the base of Laurel Mountain toward Convict Creek, and out in the flat to Highway 395 (Fig. 9).

The migration trails mapped on the ground in spring or in the fresh snow in fall also are shown in Fig. 14. Two general migration routes are evident: one comes east from Mammoth Pass, passes near Mammoth Rock, and traverses the base of the Study Area, splitting into several trails. The second comes from Duck Pass, enters the Study Area at the top of Solitude Canyon, descends the Canyon and, joining segments of the Mammoth Pass trail, turns east to go through Sherwin Lakes. The same trails were used in both years of the study, fall and spring. Additional less heavily used and more dispersed trails were seen above and to the east of the top of Solitude Canyon, and in the Sherwin Bowl area.

4. Total Numbers

There are several ways to estimate the total number of deer migrating through the Study Area. The first is from the infra-red counter on the deer trail near the top of Solitude Canyon. Between 16 May and 30 June 1985, the counter recorded 1282 hits. In order to assess the accuracy of the counter, direct observations of deer going over Solitude Pass were made on 7-8 June 1985. Forty-seven deer were observed apparently going through the counter and beam; 38 hits were recorded on the counter. During the same period, 49 deer were seen going over the pass but not by the counter. These observations both of migrating deer not going by the counter, and of the counter not recording animals apparently going through the beam, indicate that the counter likely underestimates the number of deer moving through Solitude Canyon. If deer which avoid the counter do so on the basis of visual cues, it would be expected that such avoidance would be less by animals moving at night rather than in the day.

Figure 14. (Opposite) Deer migration trails in the Sherwin Study Area.



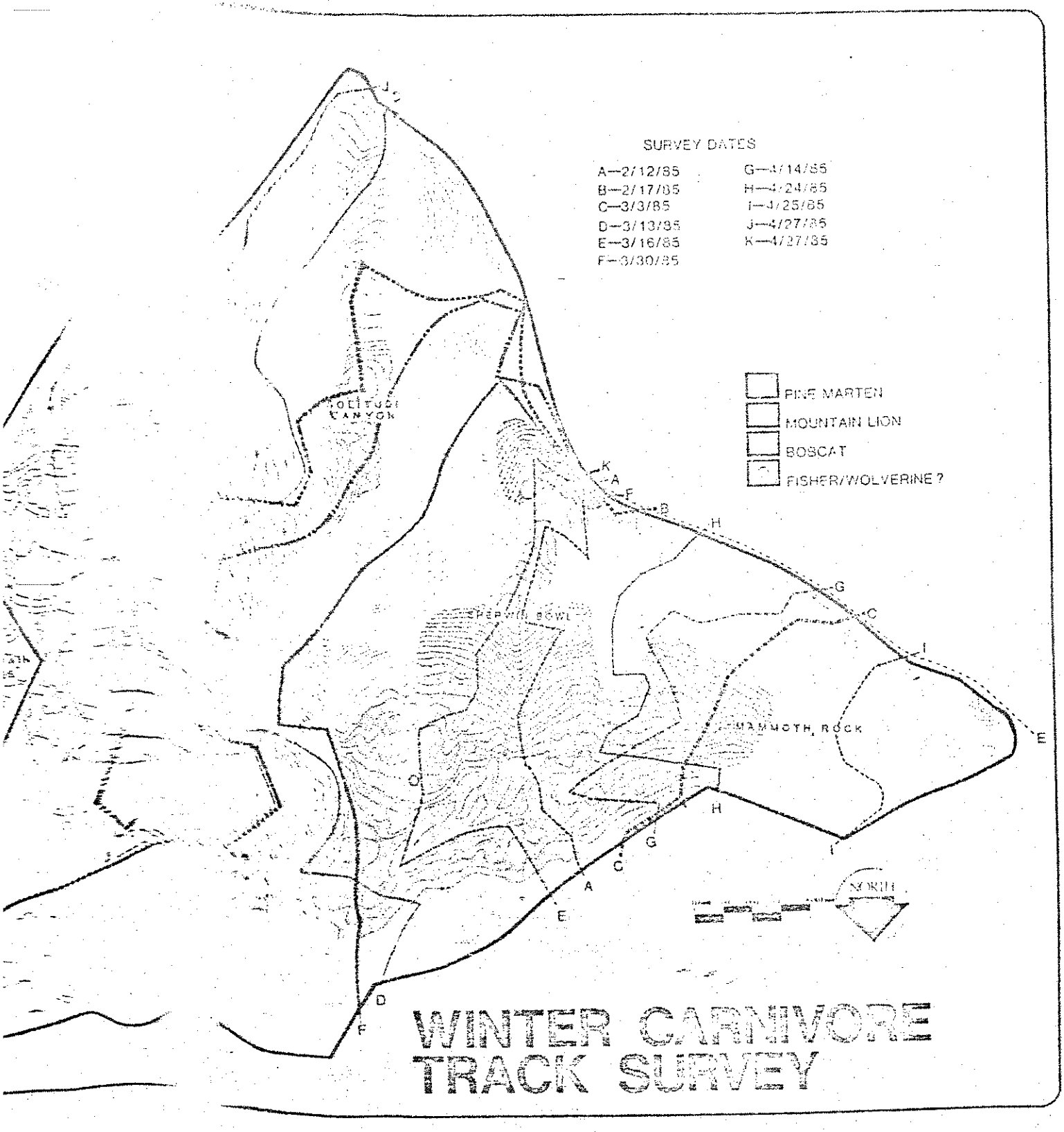
STAGING AREA AND SPRING AND FALL DEER MIGRATION TRAILS

Nevertheless, both the under-counting of deer moving past the counter and the movement of deer around the counter produce an error in the same direction, that of underestimating the actual number of deer migrating through Solitude Canyon. The real number is probably substantially greater than 1282. This number of course does not include any deer moving west through the lower part of the Study Area toward Mammoth Pass.

A second way to estimate the number of deer moving through the Study Area involves the proportion of animals radioed in Round Valley which passed through or near the Study Area in 1985. Thirteen out of 25 (52%) deer radioed on the winter range near Bishop came through the Study Area in 1985. This excludes animals captured during spring migration near the Study Area. Approximately 6,000 deer were counted in a DFG survey of Round Valley deer in January 1985 (DFG files, Bishop). Assuming that different age and sex classes of deer were radioed in proportion to their occurrence in the population, one could estimate that 3120 (6000 x 0.52) deer came through the Study Area. The assumption of proportional representation in the radioed sample is weak, however; no fawns or yearlings were radioed, and adult males were radioed in greater proportion than their existence in the population. These two sources of error, however, are in opposite directions, and should tend to balance each other. In fact, according to DFG age and sex composition counts of the Buttermilk and Sherwin Grade herds, adult males constituted only about 6% of the population in 1984-85 (DFG files, Bishop). There are many more fawns and yearlings, of both sexes, yet none were in the radioed sample, and thus do not enter the calculation. An estimate of some 3000 deer in Spring 1985, then, is not unreasonable and may be conservative. The fall migration should involve more animals, due to the presence of the summer's fawns.

Evidence consistent with an estimate of several thousand deer comes from the spring road surveys (Figure 8). Between mid-April and late May, from 250 to 600 deer were counted on every survey. These totals represent only those animals seen from the road; many animals present are not visible. Also, these totals surely involve a turnover of individuals as they move from the winter range, though the "staging area" in and near the Study Area, to the summer range, and are consistent with an estimate in the thousands. The fact that the known summer range of radioed deer passing through the Study Area encompasses hundreds of square miles is further evidence consistent with an estimate that several thousand deer pass through the Study Area on migration.

Further, it is suspected that animals from the Casa Diablo herd, some 20-30 miles east of the Study Area, also migrate through it to Western Sierra summer ranges. No animals have been marked or radioed from that herd, however, so no estimates of the number of those deer migrating through the Study Area can be made.



WINTER CARNIVORE TRACK SURVEY

Deer remain in these holding areas, primarily in the Chaparral/Sagebrush Scrub and lower conifer areas, for 3 - 6 weeks until ready to move to their western Sierra summer ranges.

During May and June, deer move through the Study Area on two main routes. One is through the Sherwin Lakes area and up Solitude Canyon to Solitude Pass, then through the upper Mammoth Lakes Basin and over Duck Pass into the Fish Creek drainage. Some of these deer ultimately move as far as Lake Thomas A. Edison and beyond. Deer sign was first noticed in Solitude Canyon on 16 May 1985; there is typically snow on the passes when the deer cross.

The other major migration route is along the base of the Study Area, below Mammoth Rock, and toward Mammoth Pass, giving access to the Middle Fork of the San Joaquin. Additionally, some deer passing through the Study Area move north and cross the Crest along San Joaquin Ridge north of Mammoth Mountain, summering in the Minarets and Agnew Pass area. Approximately 3000 deer participate in the migration from the Buttermilk and Sherwin Grade herds, which winter in Round Valley near Bishop. An unknown number of deer from the Casa Diablo herd also may be involved in this migration. These same routes are used during the fall migration.

The summer locations of individually marked or radioed deer known to pass through or near the Study Area (Fig. 10) demonstrate that this area serves as part of the migratory route of deer which summer over a large part of the Southern Sierra Nevada. The radioed deer which travelled farthest to the south summered just below Florence Lake, on the South Fork of the San Joaquin. The radioed deer summering farthest north was near Agnew Pass. Hundreds of square miles are included in the summer range of these deer. Given this large summering area, the large number of deer passing through the Study Area may not be surprising.

Only one radioed deer summered in the Study Area, and she stayed in the Mixed Conifer/Chaparral/Sagebrush Scrub vegetation at the base of the mountain in 1984 (Fig. 11). In 1985, she summered about 2 miles to the northeast. Other summer observations of deer in the Study Area (Fig. 11) indicated that summer use is relatively light, probably due to the absence of water and poor forage in much of the area. Most of the observations of deer were made in the Chaparral/Sagebrush Scrub vegetation, where browse conditions are more favorable. Even here, however, deer in summer are much more rare than in other nearby areas, such as above the spring at the northern face of Laurel Mountain, about 2 miles southeast of the Study Area. Heavy human presence in the area may be at least partly responsible for this difference in deer density.

Results from the pellet transects (Table 1) confirm the light summer deer presence. The greatest deer use was in the Chaparral in spring and fall, during migration. Thus, little fawning can be expected in the Study Area; its overwhelming importance to deer is as a migration corridor.

No nesting goshawks or prarire falcons were found in the Study Area, although on a few occasions individuals of each species were seen foraging. No spotted, great gray or flammulated owls were found on any of the surveys. Blue grouse were found throughout the Study Area, in all vegetation types.

With respect to the avian Management Indicator species, none were found in either Whitebark Pine or Chaparral vegetation types. One yellow-bellied sapsucker was found at one Mixed Conifer plot (BC-8). Williamson's sapsuckers were more common, and were found at plots BC-8, 10, 11, 17 and 21; all except BC-11 had more than 1 individual. These areas are all old-growth Mixed Conifer at the base of Solitude Canyon. Only one plot, BC-10, had hairy woodpeckers, and brown creepers were found at 6 plots (BC-8,11,12,13,15 and 21). No pygmy nuthatches were found.

The most common carnivore of particular management interest was the marten. Its tracks were found in the summer on plots SP-7 and 14 in Mixed Conifer and SP-13 in Whitebark Pine in Solitude Canyon (Fig. 15). In the winter, marten tracks were found commonly throughout the Mixed Conifer, and less so in the other vegetation types (Fig. 16). Evidence for the presence of fisher, wolverine, and Sierra Nevada red fox must remain tenuous. Possible tracks of the first two were seen in two locations in the winter (Fig. 16), but the soft and melting snow made positive identification impossible. Possible Sierra Nevada red fox tracks were found on one smoke plate, SP-16 (Fig. 15), but rain made the tracks somewhat blurry, again precluding positive indentification. If any of these 3 species do exist in the Study Area, they are quite rare, and possibly only temporary inhabitants or transients.

At least one mountain lion occurrs in what appears to be excellent lion habitat in Solitude Canyon, and bobcat tracks were observed at the base of Solitude Canyon (Fig. 16). Coyote tracks were found commonly at the top of the ridge, and black bear, racoon and badger sign occurred in the lower areas.

From these findings, it is obvious that the wildlife concern of overwhelming importance with respect to a ski development is the migratory deer. Wildlife mitigation is to be discussed in detail in another report, but some general comments are in order here. Summer resident deer are few, and indeed any habitat

alteration resulting in earlier successional vegetation would likely favor summering deer. There are no threatened or endangered species present, and only one sensitive species, pine marten, is present in any appreciable numbers. Sierra Nevada red fox, fisher, spotted and great gray owls, and goshawks and prairie falcons are absent or occur only rarely.

Thus, the approximately 3,000 deer which use the area for staging and migration are of greatest concern. Unfortunately, wildlife science is still at a stage where accurate and reliable predictions of impacts of projects upon wildlife are often difficult or impossible. This is particularly true regarding long-lived, vagile, intelligent species. The difficulty in the present case arises from the temporary, but absolutely critical, use that migratory deer make of the Study Area. Converting a certain number of acres of summer or winter habitat from one type of vegetation to another and predicting impacts on deer is relatively easy. Predicting the consequences of a major development in an important migration corridor is much more difficult. The area seems to work just fine now; the question is, how much worse will it be made by a ski development?

The timing and nature of deer use, and the timing of use by skiers, present both opportunities and constraints. The constraints are conceptually very simple: the less human disturbance, the less deleterious impact on migrating deer. The opportunities arise from the fact that most deer use occurs when there is little skiing to be done, i.e., spring and fall. Spring is the time with most potential for conflict; in years of heavy snowfall, deer could be present in the staging area, or attempting to move over Solitude Pass or by Mammoth Rock, while ski conditions were still favorable. In the fall, most deer will pass through the Study Area before the ski season is underway; pre-season activities (maintenance, preparation of facilities, etc.), however, could nevertheless pose some problems.

Deer use is concentrated through Solitude Canyon, and along the base of the Study Area, both major migration routes. In general terms, minimizing impacts to deer must involve planning to minimize human presence in Solitude Canyon and along the base of the ridge when deer are present, placing permanent stuctures as far as possible from migration routes, and screening those structures with vegetation or natural topographic features. The first can be achieved through a monitoring system to determine the presence of deer in the spring and a contingency plan to cease operations when migration occurs. The latter two can be achieved only through careful and thoughtful design. The ultimate success of such features, however, can only be determined empirically.

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APPENDIX 1

Terrestrial vertebrates potentially occurring in the Study Area.

1 = Sighted, or sign observed, in Study Area during this study.
2 = Reported in Study Area by U.S. Forest Service.
3 = Sensitive, special interest, or harvest species, as defined by U.S. Forest Service.

A. Birds

Northern goshawk	*Accipiter gentilis* 1,2,3
Sharp-shinned hawk	*A. striatus*
Cooper's hawk	*A. cooperi* 1
Red-tailed hawk	*Buteo jamaicencis* 1,2
Golden eagle	*Aquila chrysaetos* 1
Prairie falcon	*Falco mexicanus* 1,3
American kestrel	*F. sparvarius* 1
Blue grouse	*Dendragopus obscurus* 1,2,3
White-tailed ptarmigan	*Lagopus leucurus* 1
Sage grouse	*Centrocercus urophasianus* 2,3
Mountain quail	*Oreortyx pictus* 1,2,3
Band-tailed pigeon	*Columba fasciata* 2,3
Mourning dove	*Zenaida macroura* 1,3
Flammulated owl	*Otus flammeolus* 3
Great horned owl	*Bubo virginianus* 1,2
Northern pygmy owl	*Glaucidium gnoma* 3
Burrowing owl	*Athene cunicularia* 2
Spotted owl	*Strix occidentalis* 3
Great gray owl	*S. nebulosa* 3
Northern saw-whet owl	*Aegolius acadicus*
Common poor-will	*Phalaenoptilus nuttallii* 1
Vaux's swift	*Chaetura vauxi*
White-throated swift	*Aeronautes saxatalis* 1
Broad-tailed hummingbird	*Selasphorus platycercus*
Rufous hummingbird	*S. rufus* 2, 1
Calliope hummingbird	*Stellula calliope*
Yellow-bellied sapsucker	*Sphyrapicus varius* 1,2
Williamson's sapsucker	*S. thyroideus* 1
Hairy woodpecker	*Picoides villosus* 1,2
Downy woodpecker	*P. pubescens*
White-headed woodpecker	*P. albolarvatus* 1,2
Black-backed woodpecker	*P. arcticus*
Northern flicker	*Colaptes auratus* 1,2

Say's phoebe	Sayornis saya 1
Western kingbird	Tyrannis verticalis 1
Willow flycatcher	Empidonax traillii 1
Hammond flycatcher	E. hammondii 1,2
Dusky flycatcher	E. oberholseri 1,2
Western wood peewee	Contopus sordidulus 2,1
Olive-sided flycatcher	Nuttalornis borealis 1
Horned lark	Eremophila alpestris 2
Violet-green swallow	Tachycineta thalassina 1,2
Steller's jay	Cyanocitta stelleri 1,2
Clark's nutcracker	Nucifraga columbiana 1,2
Common raven	Corvus corax 1
Mountain chickadee	Parus gambeli 1,2
White-breasted nuthatch	Sitta carolinensis 1,2
Red-breasted nuthatch	S. canadensis 1,2
Pygmy nuthatch	S. pygmea
Brown creeper	Certhia americana 1,2
Rock wren	Salpinctes obsoletus
Canyon wren	Catharus guttatus 2
House wren	Troglodytes aedon 1,2
Sage thrasher	Oreoscoptes montanus
Hermit thrush	Catharus guttatus 2
American robin	Turdus migratorius 1,2
Mountain bluebird	Sialia currucoides 1,2
Townsend's solitaire	Myadestes townsendi 2
Golden-crowned kinglet	Regulus satrapa
Ruby-crowned kinglet	R. calendula 1
Northern shrike	Lanius excubitor
Loggerhead shrike	L. indovicianus 1
Starling	Sternus vulgaris 1,2
Warbling vireo	Vireo gilvus
Yellow warbler	Dendroica petechia 1
Yellow-rumped warbler	D. coronata 1
MacGillivray's warbler	Oporornis tolmiei
Wilson's warbler	Wilsonia pusilla 1
Western meadowlark	Sturnella neglecta 1
Brewer's blackbird	Euphagus cyanocephalus 1,2
Brown-headed cowbird	Molothrus ater 1
Western tanager	Piranga ludoviciana 1,2
Lazuli bunting	Passerina amoena
Evening grosbeak	Hesperiphona vespertina
Cassin's finch	Carpodacus cassinii 1,2
House finch	Carpodacus mexicanus 1
Pine grosbeak	Pinicola enucleator
Rosy finch	Leucosticte arctoa
Pine siskin	Carduelis pinus 1,2
Lesser goldfinch	C. psaltria

Red crossbill	Loxia curvirostra 1
Green-tailed towhee	Pipilo chlorurus 1
Vesper sparrow	Pooecetes gramineus
Dark-eyed junco	Junco hyemalis 1
Chipping sparrow	Spizella passerina
Brewer's sparrow	S. breweri 1
White-crowned sparrow	Zonotrichia leucophrys 1
Fox sparrow	Passerella iliaca 1
Song sparrow	Melospiza melodia 1

B. Mammals

Vagrant shrew	Sorex vagrans
Little brown myotis	Myotis lucifugus
Long-eared myotis	M. evotis
Long-legged myotis	M. volans
California myotis	M. californicus
Pika	Ochotona princeps 1,2
White-tailed jackrabbit	Lepus townsendii 1,2,3
Black-tailed jackrabbit	L. californicus 1,2,3
Mountain beaver	Aplodontia rufa
Eutamias spp.	1,2
Yellow-bellied marmot	Marmota flaviventris 2
Belding's ground squirrel	Spermophilus beldingi 1
Calif. ground squirrel	S. beecheyi 1
Golden-mantled ground squirrel	S. lateralis 1
Douglas' squirrel	Tamiasciurus douglassii 1,2
Northern flying squirrel	Glaucomys sabrina
Northern pocket gopher	Thomomys talpoides 1
Deer mouse	Peromyscus maniculatus
Bushy-tailed wood rat	Neotoma cinerea
Western jumping mouse	Zapus princeps
Microtus spp.	
Porcupine	Erethizon dorsatum 1
Raccoon	Procyon lotor 1
coyote	Canis latrans 1,2,3
Red fox	Vulpes vulpes 1 (?)
Black bear	Ursus americana 1,3
Marten	Martes americana 1
Fisher	M. pennanti 1 (?)
Ermine	Mustela erminea
Long-tailed weasel	M. frenata 1

Wolverine	Gulo gulo 1 (?)
Badger	Taxidea taxa 1
Striped Skunk	Mephitis mephitis
Mountain lion	Felis concolor 1
Bobcat	Felis rufus 1,3
Mule deer	Odocoileus hemionus 1,3

C. Amphibians

Western toad	Bufo boreas
Yosemite toad	B. canorus
Pacific treefrog	Hyla regilla
Mountain yellow-legged frog	Rana mucosa

D. Reptiles

Western fence lizard	Sceloporus occidentalis
Sagebrush lizard	S. graciosus 1
Northern alligator lizard	Gerrhonotus coeruleus
Rubber boa	Charina bottae
Gopher snake	Pituophis melanoleucus
Common kingsnake	Lampropeltis getulus
Western terrestrial gartersnake	Thamnophis elegans