

BUTTERMILK DEER HERD MANAGEMENT PLAN

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INTRODUCTION

In response to a serious long-term decline in many California deer herds in the late 1960's and early 1970's, the Department of Fish and Game, with public input, developed a statewide plan for California deer. Consistent with Assembly Bill 1521 (Sept. 1977), the Department established the policy that 1) planning for deer be on a herd basis; 2) selected program elements be included in each herd plan; and 3) herd plan goals generally conform to the goals of the statewide plan.

This plan for the management of the Buttermilk deer herd includes a description of 1) the deer population and physical environment which constitutes its range and habitat; 2) management unit goals; 3) problems and potential solutions; 4) management programs, objectives, and recommended prescriptions; and 5) alternatives. Since herd plans are dynamic, periodic review and updating are integral parts of the planning process. As additional information is obtained, the plan will be revised appropriately.

The general goals of the statewide plan are to restore and maintain healthy deer herds at a desirable level and to provide for high quality and diversified use of the deer resources. This desirable level for the Buttermilk herd is characterized by a population with a buck ratio of about 20 per 100 does, a reasonably high buck harvest, and deer numbers in balance with the capacity on all seasonal ranges. Based on

recent helicopter surveys, the Buttermilk herd is presently estimated to contain 3,000 deer. Recent telemetry work has revealed greater mixing of deer from the Buttermilk and adjacent Sherwin Grade winter ranges than had been previously known. This combined population totals about 4,000 to 5,000 animals. As additional information becomes available, the two herds may be administratively combined into one.

DESCRIPTION OF DEER HERD MANAGEMENT UNIT

Deer Herd Definition and History

Herd Range and Population Estimates

The Buttermilk deer herd inhabits an area of roughly 1200 square miles within Inyo, Madera, and Fresno counties (Figure 1). The winter range (about 60 square miles in size) is bounded by Bishop Creek on the south and Sherwin Grade on the north. The summer range is approximately 20 times the size of the winter range; although deer habitat occurs only in scattered locations (Figure 2). Radio-telemetry information has shown that much of what was once recorded as Sherwin Grade herd range is also used by the Buttermilk herd.

Jones (1953) summarized the general history of deer populations in the Buttermilk herd and nearby areas. He noted that early explorers found very few deer on the east side of the Sierra Nevada in the 1830's and 1840's, except for limited populations in local areas. Even these local populations were severely reduced by extreme livestock use. Jones stated that unregulated livestock grazing from the 1850's to the early 1900's greatly affected vegetation, and reduced carrying capacity for deer. However, as explained in a following section, there is speculation that vegetation changes brought about by excessive livestock use, then controlled grazing, eventually were of some benefit to deer.

Inyo National Forest (USFS) reports, annual Department of Fish and Game (DFG) reports, and accounts of early residents indicate that deer were scarce up to the late 1920's in the Owens Valley. An increase occurred during the period from 1920 to 1950. Estimates for the Inyo National Forest increased steadily to 10,000 in 1930, 20,000 in 1942, 30,000 in 1944, and 38,000 in 1948 (Jones 1953).

From 1936 through 1944, E. L. Shellenbarger conducted surveys of all winter ranges from the south end of the Inyo National Forest north to Sherwin Summit (Jones 1953). Shellenbarger also made surveys in 1946, 1949, and 1950 (Table 1). Although survey methods for these counts are unknown, this information indicates a large increase in deer numbers in the Inyo National Forest during the 1940's.

The present population of the Buttermilk herd is conservatively estimated to be about 3,000 deer based on helicopter surveys conducted on the winter range in recent years. During January of 1986, 3,692 deer were counted. However, a count in January of 1987 yielded only 2,615 deer. It is unlikely that the population actually changed this much in a single year. Future census work is expected to produce a more accurate population estimate.

It should be emphasized that these census figures are only for that area traditionally considered the Buttermilk winter range (south of Pine Creek). Radio telemetry work has shown that it probably would be more realistic to combine the Sherwin Grade

Table 1. Deer count on the Inyo National Forest during the period 1936-1950 (from Jones 1953). Count method unknown.

Year	Area			Total
	North Fork Oat Crk.	Taboose	McMurray Mdws.	
1936	71	98	188	357
1937	48	69	487	604
1938	92	231	795	1118
1939	115	138	780	1033
1940	106	100	1004	1210
1941	126	275	1201	1602
1942	136	117	1050	1303
1943	126	261	1384	1771
1944	126	305	1007	1438
1945	---	---	----	----
1946	214	494	1324	2032
1947	---	---	----	----
1948	---	---	----	----
1949	65	311	798	1174
1950	19	509	1074	1602

and Buttermilk herds into a single unit. This may be done in the future.

Hunting Harvest

The reported buck harvest in the Buttermilk and Sherwin Grade herds is presented in Table 2. Data on buck take are available for 34 hunting seasons during this period.

The annual reported buck kill on the Buttermilk herd has averaged 84 ± 67 ($\bar{x} \pm SD$), and has varied from 24 in 1967 to 342 in 1981. Buck harvest on the Sherwin Grade herd has averaged 135 ± 82 and has ranged from 15 in 1969 to 446 in 1981.

The 1981 harvest was much larger than any recorded in the past because of an unusually early winter. Large fluctuations in numbers of deer taken in earlier years likely were due to variable timing of migrations in response to weather conditions. In general, if a major storm occurred before the close of the season in mid-November, deer were more available to hunters, and the kill was high. With the present season closure in mid-October, weather plays a smaller role in the deer harvest, except during an unusual year, since little migration normally occurs before this time.

From 1955 through 1967, 3,060 antlerless deer were harvested from the Buttermilk and Sherwin Grade herds. In 1984, a late season antlerless hunt was held on the Sherwin Grade winter range. Two-hundred hunters harvested 179 deer. Because the winter range is well defined and is sparsely vegetated, a

Table 2. Reported deer harvest in the Buttermilk area, 1952-1986. The numbers of deer harvested on the Sherwin Grade herd are given in parenthesis.

YEAR	BUCKS TAKEN	ANTLERLESS DEER TAKEN	
1952	107	---	---
1953	---	---	---
1954	201 (162)	---	---
1955	180 (126)	177	(164)
1956	45 (81)	214	(226)
1957	152 (216)	237	(202)
1958	37 (52)	202	(223)
1959	133 (155)	---	(207)
1960	76 (143)	135	(135)
1961	104 (153)	---	---
1962	43 (121)	58	---
1963	63 (182)	---	(145)
1964	101 (200)	143	(136)
1965	40 (92)	87	(155)
1966	106 (164)	---	(127)
1967	24 (36)	---	(87)
1968	88 (156)	---	---
1969	27 (15)	---	---
1970	55 (31)	---	---
1971	42 (35)	---	---
1972	84 (106)	---	---
1973	49 (107)	---	---
1974	37 (58)	---	---
1975	68 (147)	---	---
1976	42 (91)	---	---
1977	96 (136)	---	---
1978	35 (75)	---	---
1979	72 (121)	---	---
1980	46 (120)	---	---
1981	342 (446)	---	---
1982	27 (133)	---	---
1983	35 (171)	---	---
1984	30 (157)	---	179
1985	194 (311)	---	---
1986	60 (142)	---	---

unique opportunity exists to count virtually every deer by helicopter after sufficient snow has fallen. This allows close monitoring of population size and herd sex and age composition.

Herd Composition

Winter and spring herd composition count data for the past 24 years and for five years in the early 1950's are summarized in Table 3. In the years for which data are available, the number of fawns per 100 does arriving on the winter range have averaged 49 ± 14 , and those surviving the winter have averaged 41 ± 15 per 100 does.

Fall buck ratios have varied from 6 to 29, and have averaged 15 ± 7 per 100 does. The heavy harvest of 1981 dropped the buck ratio from 26 to 13, and the ratio apparently continued to drop following the 1982 season. It should be noted, however, that in 1982 the composition count was made by helicopter and many more deer (2,712) were classified than had been classified in any past year. Since bucks with small spike antlers are more difficult to distinguish from a helicopter than from the ground, it may be that the buck ratio of 8 per 100 does estimated in 1982 is slightly less accurate than previous ones, even though the sample size is larger.

A sample of bucks taken from the Sherwin Grade and Buttermilk herds have been aged for the past several years. With the exception of those years in which a migration occurred during

Table 3. Herd composition data for the Buttermilk deer herd, 1950-1986. Data are expressed as bucks per 100 does, fawns per 100 does, and sample size (N).

Year ^a	<u>Fall</u>			<u>Spring</u>	
	Bucks	Fawns	N	Fawns	N
1950-51	16	62	109	69	153
1951-52	16	89	463	31	446
1952-53	16	53	582	49	376
1953-54	18	75	439	56	471
1963-64	14	42	---	47	---
1964-65	7	58	---	41	---
1965-66	9	37	---	37	---
1966-67	9	51	---	51	567
1967-68	9	44	---	53	243
1968-69	10	42	---	16	318
1969-70	6	24	---	20	254
1970-71	11	57	---	62	288
1971-72	29	53	---	--	---
1972-73	21	51	---	--	---
1973-74	20	67	---	64	448
1974-75	7	59	---	56	516
1975-76	25	60	---	--	---
1976-77	21	50	526	46	230
1977-78	24	60	308	32	317
1978-79	16	41	531	28	338
1979-80	20	40	317	26	555
1980-81	26	39	331	37	354
1981-82	13	39	491	27	323
1982-83	8	35	2712	28	524
1983-84	15	38	892	37	629
1984-85	12	42	2231	38	584
1985-86	7	35	906	26	653
1986-87	7	25	767		

^aSpring is that of later year shown. Fall is that of earlier year shown. Information was not available for some years.

the hunting season, the majority of bucks were one or two years old. Less than five percent were four years or older.

Mortality

There is a large loss of fawns before arrival on the winter range. Longhurst et al. (1976) reported that approximately 150 fawns per 100 does are born in migratory deer herds in California. Since only 49 fawns per 100 does arrive on the winter range on the average, losses on the summer range are about 70 percent of the fawn crop.

In addition to the loss of fawns from unknown causes on summer ranges, deep snow can cause large losses on the winter range. Here again, fawns are probably the age class most affected, but adults sometimes die in large numbers. Heavy losses occurred on the Buttermilk winter range in 1951-52. During that year, Jones (1953) estimated that 64 percent of the fawns, 23 percent of the adults, and 41 percent of the herd as a whole died. During the winter of 1968-69, another large die-off occurred on the Buttermilk winter range. Although no records are available, DFG personnel estimated that several hundred deer died. Even years of normal snowfall, moderate fawn losses often occur (Table 3).

The relative importance of predation, disease and parasitism is unknown. Mountain lions occur within the Buttermilk herd range, and several lion kills have been found. Mountain lions are known to subsist primarily on deer (Connolly

1981). Coyotes are common in Inyo County, and in other locations it has been found that under some circumstances deer constitute a major portion of their diets (Connolly 1981). Predation is discussed in greater detail under a following section.

No widespread disease outbreaks have been noted. Although various species of parasites have been identified in this deer population, no cases of extreme parasitism have been observed.

Approximately 10 road kills occur each year along the Bishop Creek Road and 20 per year on the Pine Creek Road, which bisects the Buttermilk and Sherwin Grade winter ranges. In addition, approximately 5 deer per year are killed by vehicles on the south Round Valley Road, at the lower portion of the Buttermilk winter range. Also, many more are killed on Highways 395 and 203 as they migrate to and from the summer range.

Herd Range and History

Climate, Topography and Soils

Climatic conditions on the Buttermilk herd range vary from semi-arid on the winter range to relatively moist in the higher mountains. Precipitation comes chiefly between October and February as rain and snow in the valley, and as snow in the mountains. Summer thunderstorms are also common in the mountains.

The annual average precipitation is 5.64 inches at Bishop Airport. Precipitation generally increases with elevation and averages between 15 and 20 inches at 9,000 to 10,000 feet.

The Sierra Nevada escarpment rises abruptly from alluvial fans, at an elevation of 5,000-6,000 feet, to the jagged peaks of the crest at elevation within a horizontal distance of five miles is not uncommon.

Soils in the Sierra Nevada are shallow to moderately deep (10 to 40 inches deep) and are typically a loamy sand texture. On the steeper slopes, soils are shallower and have higher content of rock than those on surfaces of lower relief. Soil parent material is typically granitic.

Locations of Seasonal Ranges and Migration Routes

Locations of summer ranges, winter ranges, and migration routes have been identified by Kucera (1986a) (Figure 3). The key portion of the Buttermilk winter range, where most deer are confined once substantial snows occur, occupies alluvial fans at elevations of about 4,800 to 6,000 feet. This area is bounded on the north by Sherwin Grade and on the south by Horton Creek. In addition, a portion of the herd (normally several hundred animals) can be found between Horton and Bishop creeks except during times of extreme snow depth.

Intermediate or staging areas are those locations where migrating deer pause for a time when traveling from one seasonal range to another. Important staging areas have been delineated

by radio telemetry and other work. One is in the upper Buttermilk area and the other is southeast of Mammoth Lakes (Figure 3).

Summer ranges (including fawning sites) are smaller than winter ranges, but are more numerous and quite widespread. A relatively small percentage of fawning occurs on the east side of the Sierra crest. Two-thirds of radioed deer from the Buttermilk winter range were found to summer on the west slope of the Sierra Nevada. Important fawning habitat exists in the upper watershed of Le Conte Canyon on the middle fork of the Kings River. In addition, fawning occurs in the drainages of Mone Creek, Fish Creek, and the middle fork of the San Joaquin River (Kucera 1986a).

The major mountain passes are used extensively by deer as migration routes. Recent research has shown that, for those Buttermilk deer migrating southwest from the winter range, Piute Pass, Bishop Pass, and Lamarck Col are used as routes to reach summer ranges. For those deer that migrate north, (approximately half of the population), Solitude Canyon and Mammoth Pass are extremely important migration routes (Figure 3). A smaller number travel across San Joaquin Ridge north of Mammoth Pass. As they reach the west slope in the spring, deer disperse on the summer ranges. In the fall, they follow specific routes from the passes to their intermediate ranges (holding areas), and from there to winter ranges in response to weather changes.

Vegetation-Winter Range

The Buttermilk winter range supports Great Basin type vegetation, including the "Sagebrush-Scrub" and Pinyon-Juniper" plan communities described by Munz (1968). These are composed largely of big sagebrush (Artemisia tridentata), bitter brush (Purshia tridentata), rabbitbush (Chrysothamnus sp.), buckwheat (Eriogonum sp.). Black brush (Coleogyne ramosissima), and saltbrush (Atriplex sp.) are species commonly occurring at lower elevations. Pinyon pine (Pinus monophylla) occurs at the higher winter range elevations. Principal browse species on the Buttermilk winter range include bitterbrush, big sagebrush and buckwheat (Longhurst et al. 1952, Jones 1953).

Vegetation-Summer Range

Most of the Buttermilk deer herd summers west of the Sierra crest in Fresno and Madera Counties. Some deer summer east of the crest at elevations of 8,000 to 11,600 feet elevations in the upper drainages of Horton, McGee and Birsh creeks and in those drainages from Rock Creek to Mammoth. Occasional fawning doubtless occurs at lower elevations.

These higher summer ranges include high sub-alpine basin and lower timbered areas with associated small meadows. Meadows support a variety of herbaceous vegetation including sedges (Carex sp.), grasses (Poa sp., Deschampsia sp.) and forbs such as Senecio sp., Potentilla sp., and others.

Vegetation on the drier slopes includes Jeffery pine (Pinus jeffreyi) and aspen (Populus tremuloides) to about 10,000 feet, and foxtail pine (Pinus balfouriana), whitebark pine (Pinus albicaulis), and limber pine (Pinus flexilis) to timberline at about 11,000 feet. There is an understory of big sagebrush, bitterbrush, curl-leaf mountain mahogany (Cercocarpus ledifolius), cream bush (Holodiscus microphyllus), willow (Salix sp.), mountain whitethorn (Ceanothus cordulatus), manzanita (Arctostaphylos sp.), and chinquapin (Castanopsis sempervirens). Major plant communities on the summer range are "subalpine forest", alpine fellfields" and sagebrush scrub" (Munz 1968).

Water Distribution

Water is abundant on summer ranges. Rivulents from melting snow as well as larger streams are common and well-dispersed.

On winter ranges, streams and springs are less common although well dispersed, and snow is often available. Lack of water is not considered a limiting factor on either summer or winter ranges.

Land Ownership

The range of the Buttermilk herd is more than 98 percent public land. Approximately two-thirds of the key portion of the winter range is owned by the U.S. Bureau of Land Management. Most of the remainder is in the Inyo National Forest. In

addition, the Los Angeles Department of Water and Power (LADWP) owns about 10 percent of this key portion, as well as about 5 square miles of deer habitat in the upper part of the winter range. For the purposes of this plan, LADWP property can be considered public land, since little development is allowed and public access is not restricted.

Of the summer range, virtually all of that portion on the east side of the Sierra Nevada crest is in the Inyo National Forest, and most is within the John Muir Wilderness. Summer range west of the Sierra Crest is within Kings Canyon National Park and the Sierra National Forest.

Winter Range Forage Utilization and Trend Data

In the winter of 1951-52, Jones (1953) found that the most important forage species, by volume, for the Buttermilk deer herd were big sagebrush (averaging 59 percent over the winter use period), black brush (averaging 18 percent), and bitterbrush (averaging 12 percent). He found that forbs and grasses were only used in trace amounts from December through March, but were used substantially in April (Table 4).

Work involving range condition and trend plots, bitterbrush leader growth and utilization surveys, and pellet counts has been done on selected sites on the winter range in recent years. Table 5 indicates utilization of annual growth of bitterbrush "leaders" and deer days use/acre for the years 1949-56 and 1974-84. For the past five years, deer use on six

Table 4. Volume percent of food items in stomach samples of deer collected on the Buttermilk winter range during the winter of 1951-52. (from Jones 1953)

	Number of Specimens and Months Collected				
	Dec 20	Jan 36	Feb 27	Mar 24	Apr 20
<u>Browse</u>					
Big Sagebrush (<u>Artemisia tridentata</u>)	50	70	46	83	48
Black Brush (<u>Coleogyne ramossissima</u>)	9	17	46	13	4
Bitterbrush (<u>Purshia tridentata</u>)	40	6	T ^a	3	9
Rabbitbrush (<u>Chrysothamnus teretifolus</u>)	-	T	3	T	-
Willow (<u>Salix sp.</u>)	1	T	T	T	T
Buckwheat (<u>Eriogonum sp.</u>)	T	T	T	T	T
Lupine (<u>Lupinus sp.</u>)	-	-	-	-	-
Miscellaneous Browses	T	1	2	1	1
Total Browses	100	100	100	100	65
<u>Forbs</u>					
Hog Fennel (<u>Lomatium sp.</u>)	-	-	-	-	15
Miscellaneous Forbs	-	T	-	T	11
Total Forbs	-	T	-	T	26
<u>Rushes and Sedges</u>					
	-	T	-	-	-
<u>Grasses</u>					
Green grass	T	T	T	T	9
Dry grass	T	T	T	T	-
Total Grasses	T	T	T	T	9

^aTrace amount present.

Table 5. Utilization of bitterbrush leader growth and deer-days use/acre on transects on the Buttermilk winter range.

Winter Period	Utilization ^a	Deer-Days ^b (Use/Acre)
1949-50 (mean of 26 transects)	69	--
1950-51 (")	51	--
1951-52 (")	33	--
1952-53 (")	30	--
1953-54 (")	41	--
1954-55 (")	51	--
1955-56 (")	67	--
1974-75 (mean of 6 transects)	44	40
1975-76 (")	39	50
1976-77 (")	35	37
1977-78 (")	65	42
1978-79 (")	30	31
1979-80 (")	45	48
1980-81 (")	47	66
1981-82 (")	48	48
1982-83 (")	42	57
1983-84 (")	38	32
1984-84 (")	60	96

^aUtilization was defined as the percent of the previous summer's growth.

^bDeer-Days use per acre was estimated by dividing the estimated number of pellet groups per acre by 13.

plots on the key portion of the Buttermilk winter range has averaged 42 percent (range 30-48), and deer days use per acre has averaged 50 (range 31-66).

Bitterbrush plants on the Buttermilk winter range are obviously heavily used. Virtually every plant on the key portion of the winter range that extends above the height a deer can reach has a definite browse line by the middle of the winter season, following a poor growth year. In spite of this substantial utilization, it is somewhat below the 50 percent level suggested by Sheperd (1971) as the maximum acceptable.

To determine range trend, numbers of bitterbrush plants were counted on 10 plots in 1962, 1967, 1975, and 1982 (Table 6). Although it appeared up until 1975 that the bitterbrush stand was decreasing substantially (35 percent from 1962), 1982 data indicates that sufficient young plants have been recruited into the population to reverse this trend. Further study will be needed to confirm this.

Other important browse species are blackbrush and sagebrush. Although usually not so heavily cropped as bitterbrush, browsing pressure by deer is very heavy on these species also, particularly sagebrush.

Fire History

Records exist in USFS and BLM files of only three fires over 40 acres occurring during the past 30 years on the Buttermilk winter range. The largest (about 1,120 acres)

Table 6. Numbers of bitterbrush, sagebrush, and blackbrush plants on transects on the Buttermilk winter range, 1962-1982. (Numbers are averages for 10 transects)

<u>Species</u> ^a	<u>1962</u>	<u>1967</u>	<u>1975</u>	<u>1982</u>
Bitterbrush	23	20	15	24
Sagebrush	-	-	65	74
Blackbrush	-	-	10	30

^aData on sagebrush and blackbrush plants are available only for 1975 and 1982.

occurred approximately 30 years ago, just south of Rovana (Figure 4). Although much of the burned area is below the bitterbrush zone, that portion that contained bitterbrush has regenerated well, and the vegetation appears similar between the burned site and the surrounding area. Adjacent to this burn, a 40-acre fire occurred 10 years ago. This was also largely below the bitterbrush zone.

In 1972, a fire of approximately 800 acres occurred below upper Wells Meadow, north of McGee Creek. At some locations within this burn, bitterbrush has regenerated very well, particularly in the wetter areas.

Although long-term results of these small fires probably have not been detrimental, a fire that burned a large portion of the winter range could be expected to substantially lower its carrying capacity. The time needed for bitterbrush and sagebrush regrowth may be several years and possibly even decades.

Locations and times of substantial fires on the summer range of the buttermilk herd are unknown. More information on this may be forthcoming once summer ranges are better delineated.

Livestock Grazing

Historical information indicates that overuse by cattle and sheep in the 19th century had a devastating effect on the productivity of deer ranges in the Sierra Nevada (Longhurst et al. 1952). "By 1876 there were 6,000,000 head

of sheep in California and equally impressive numbers of cattle and horses. For a time the unexploited grassland and meadows supported these animals adequately, but as the ranges became overgrazed, the carrying capacity for both livestock and deer decreased rapidly."

According to Jones (1953), hundred of thousands of sheep made the circle from Bakersfield across the mountains to Owens Valley. Many of the sheep were taken into the Sierra in the summer (in some cases into the highest meadows), then along the east side of the Sierra to the area of Sonora Pass. They then crossed over the mountains and traveled through the San Joaquin Valley. By 1894 sheep had cleaned out the meadows in the high country of the Sierra Nevada (Muir 1894).

In the late 1800's, cattlemen forced most sheepmen from the Sierra. Thousands of cattle were grazed in some of the same areas previously overgrazed by sheep.

The USFS was established in 1905 and some degree of grazing control was initiated. As time went on, grazing allotments were reduced. Allotments now provide for only a fraction of the number of livestock that were grazed on the eastern side of the Sierra before controls became effective. Thus, past evidence strongly indicates that the effects of uncontrolled livestock grazing in the late 1800's were detrimental to deer populations. However, there is speculation that extensive livestock abuse caused ecological changes that eventually were beneficial for deer after livestock numbers were

reduced (Leopold 1950). Longhurst et al. (1952) supports this same theory as follows: "In bunchgrass areas such as Modoc County, the process of overgrazing by livestock makes possible the subsequent invasion of woody species, valuable as winter deer browse, into areas that had previously a low capacity for deer. Similar effects of overgrazing of grasslands are reported from other areas." Thus, carrying capacity on winter ranges likely was increased from that of pristine times as livestock use lessened, following livestock-induced vegetation changes.

It should be emphasized that this eventual, possibly beneficial, effect of past livestock abuse on winter ranges did not occur on summer ranges. It should also be emphasized that in some cases, even very limited use by livestock has been shown to be detrimental to deer populations (Mackie 1981).

Presently within the Buttermilk herd winter range, there are two cattle grazing allotments totaling 1,612 Animal Unit Months (AUMs) on the Inyo National Forest, BLM, and LADWP lands on that portion of the winter range south of Pine Creek (Table 7:Figure 5). On the winter range north of Pine Creek there are three allotments totaling 246 AUMs. The largest impact by grazing occurs on LADWP land at the upper portion of the winter range, where 350 cattle are grazed from June 1 through September 15. Most of this use occurs in the upper Wells Meadow area (Figure 5). Included in this lease is the USFS land surrounding the meadow.

Table 7. Livestock use on the Buttermilk deer herd range.

Allotment Name	Landowning Agency	Type of Stock	Number of AUMs	Dates Used
Buttermilk	USFS/LADWP	Cattle	1,225	06-01/09-15
Round Valley	BLM	Cattle	387	06-01/10-15
Hat Creek	USFS	Cattle	246	06-15/07-25
Convict	USFS	Cattle	463	06-20/08-15
Meadow	USFS	Cattle	91	08-15/08-25
Casa Diablo	USFS	Cattle	74	07-25/09-25
Whitmore Hill	USFS	Cattle	296	07-25/09-25
Laurel Creek	USFS	Cattle	25	08-25/09-25
Meadow	USFS	Cattle	228	08-25/09-25
Sherwin-Deadman	USFS	Sheep	---	07-01/09-20
Tobacco Flat	USFS	Cattle	200	06-15/07-15
Fish Crk.-Mammoth	USFS	Cattle	70	07-01/10-15
Minarets-Fish Crk.	USFS	Cattle	105	07-01/10-15
McGee	USFS	Sheep	960	06-07/09-07
Rock Crk.	USFS	Sheep	480	06-15/10-01
Wells Meadow (Admin. Pasture)	USFS	Horse	---	04-01/07-30 09-01/11-30

With the exception of the one allotment near Wells Meadow, the allotments on the Buttermilk winter range on BLM land are not currently grazed. Grazing is being postponed pending the results of a doctoral study being conducted by a student at the University of California at Berkeley. This will be discussed in detail under the section "Inventory and Investigative Element". There has been no use on this allotment since 1970.

Logging, Agriculture, Housing Developments, Mining, and Ski Areas

Several housing developments have doubtless affected this deer herd. These are the communities of Rovana, Starlight Estates, Aspendell, Paradise Estates Swall Meadows, Little Round Valley, Hilton Creek, and McGee Creek. Rovana, Starlight Estates, and Paradise Estates were built on winter range and the other developments were built on summer range or migration routes. Housing developments remove deer habitat at specific sites, but in addition often effectively eliminate a much larger amount of habitat through disturbance from people and free-roaming dogs (Reed 1981). Although the extent of deer population reduction caused by the construction of these housing developments is unknown, some reduction almost certainly did occur, and additional developments are be expected to reduce the population further.

In addition to housing developments, the planned Sherwin Bowl Ski Area may be detrimental to this herd, if the large

number of deer that migrate through solitude Canyon and Mammoth Pass are prevented from reaching their traditional summer range.

The only agriculture occurring within the range of the Buttermilk herd is the alfalfa operation north of Pine Creek, which is within

Agriculture within the Buttermilk and Sherwin Grade herd's winter range is primarily limited to an alfalfa field which is located north of Pine Creek. Until these fields were fenced several years ago, several hundred deer could be seen feeding there in the fall and spring. The effects of the elimination of this food source are unknown.

Areas of past mining activity are the Tungsten Hills and Mt. Tom. Currently, limited mining occurs in the Tungsten Hills, but not yet to the extent that it is of major importance to deer habitat. Certainly the potential exists to cause major reductions to this deer herd through extensive housing development and mining.

Major Factors Regulating the Population

Weather

Weather patterns have affected the Buttermilk deer herd. Heavy snowfall has been reported in a number of years, dating back to 1870. The winter of 1951-52 was exceptionally severe. Large numbers of deer carcasses were found by Jones (1953) in a survey of several east side winter ranges, including 104 on the south portion of the Buttermilk winter range. He estimated that

the Buttermilk herd lost 41 percent of its population during this harsh winter. The winter of 1968-69 also caused the death of a substantial portion of the Buttermilk herd, although information on numbers of deer that died is not available.

Competition

Effects of interspecific competition on the Buttermilk deer herd are not known precisely. Cattle use is substantial on and near upper Wells Meadow; within an important intermediate range for deer.

Although little cattle use occurs in areas used by deer as fawning habitat, the presence of cattle has been found to be detrimental to fawning habitat in other areas of California (Ashcraft 1977). Cattle have been shown to displace does with fawns from meadows and riparian areas by their presence alone. Also, after cattle have been in such locations for a period of time, depletion of forage and hiding cover makes it less likely that a fawn will escape predation. However, since only a small portion of the potential fawning habitat of the Buttermilk herd is grazed by cattle, destruction of fawning sites by cattle is not considered to be a major factor regulating this herd.

Although the problem of cattle use on fawning habitat does not appear to be excessive on the Buttermilk herd range at present, the potential exists for major deleterious effects of cattle grazing on the key portion of the winter range.

Some of this area is now within a BLM grazing allotment and, although no cattle have grazed here for a number of years, the potential to impact this important winter range by excessive cattle grazing does exist. It should be emphasized that this is in an area where BLM biologists have determined there are already more deer than can be supported over the long term.

Mackie (1981) does a thorough job of summarizing the effects of grazing on deer ranges. Basically he concludes that, on habitat already under heavy pressure from large numbers of deer, grazing by cattle or sheep will have detrimental effects and will reduce the carrying capacity for deer.

The BLM recognizes this potential damage to this important deer winter range, and has made a commitment to allow no grazing on this range until the previously mentioned study is completed.

Price effects of intraspecific competition (competition between deer for food and space) in the Buttermilk herd are unknown, but may be substantial.

Removal of some does could increase fawn survival in a deer herd at the carrying capacity of its range. This has been found to be true in many different habitat types, with both white-tail and mule deer (Leopold et al. 1951, Longhurst et al. 1952, Taber and Dasmann 1958, Connolly and Longhurst 1975, Connolly 1981). It should be emphasized that this increase in fawn survival can be expected to occur only in a deer herd at or exceeding the carrying capacity of its range.

One aspect of intraspecific competition that may be important in the Buttermilk herd is competition for fawning sites. Work by Ashcraft (1979) on the west slope of the Sierra indicates that does are territorial when they are about to fawn or when they have young fawns. In addition, they instinctively choose fawning sites where fawns will have the best chance of escaping predation. In the Buttermilk herd, these are often riparian areas, where sufficient food, water and cover exist for the doe, and appropriate hiding and escape cover exist for the fawn. Since there is a limited number of such prime fawning sites, and dominant does may exclude subordinate does, fawns born outside these areas may experience higher mortality.

Predation

Considering the fact that over the past five years the average number of fawns arriving on the Buttermilk winter range was 35 per 100 does, it is reasonable to assume that predation may play an important role in regulating the population. Longhurst et al. (1976) estimates that over 150 fawns are born per 100 does in migratory herds in California. The question is, of course, how many of the 100 plus fawns per 100 does which are eliminated before the herd reaches the winter range die of mortality factors other than predation. Sufficient information is not available to adequately answer this. It is likely that coyotes, mountain lions, and bobcats take a large number of deer each year from the Buttermilk herd, particularly

fawns. Numerous studies, both in California and elsewhere, have shown that predators take many apparently healthy fawns. In a study of fawn mortality in the North Kings deer herd, Neal (1981) found that, of 14 fawns monitored, 8 did not survive the summer period, and 4 of these were killed by mountain lions. Siperek (1982) found that lions killed 6 of 52 radio-collared deer in Tehama County.

There are cases where coyote control has substantially increased fawn survival. In a study at Fort Sill, Oklahoma, Stout (1982) showed that removal of coyotes from 3 study sites increased fawn survival an average of 154 percent.

Although it seems likely that predator control would, at least temporarily, increase fawn survival, it is not being considered for several reasons. It is probable that the Buttermilk herd is at the carrying capacity of its winter range. That is, no more deer can be supported by the vegetation that exists there. Until plans exist to harvest antlerless deer, there would be no point in controlling predators. In addition, predator control for increased deer numbers has not been practiced by the DFG for many years. Another reason predator control is not considered here is that most of the fawn loss is occurring on the summer range which is within the John Muir and Ansel Adams Wilderness Areas and Kings-Canyon National Park. Public opinion would preclude predator control in wilderness areas for increased deer

production and current National Park policy forbids predator control.

Habitat

Habitat limitations are almost certainly the most important factors regulating the population of the Buttermilk deer herd. This is true of most deer herds throughout the state (Longhurst et al. 1976). Range analysis work done by the BLM indicates that the winter range of the Buttermilk herd is presently overstocked with deer. "The trend of browse condition on 7,693 acres of this habitat occurring within the winter range of mule deer (Buttermilk and Sherwin Grade herds) is declining due to heavy deer use in excess of the range's carrying capacity" (USBLM 1980). DFG range data also indicate heavy use of bitterbrush. Winter utilization of previous summer's growth averaged 42 percent during the past 5 years. Although this is below the 50 percent level suggested by Sheperd (1971) as the maximum acceptable before death of the plants can be expected, utilization is still very high.

Some researchers believe that an overstocked winter range, where insufficient forage of high enough quality causes a stressed condition in pregnant does, will result in subsequent poor fawn survival (Longhurst et al. 1952, Verme 1962, Short 1981).

The high fawn loss that occurs on summer ranges each year (about 70 percent of the fawns die before reaching one year

of age) may result from habitat deficiencies. As described previously, this may well be a lack of sufficient fawning sites with appropriate concealing cover, so that a very high percentage of fawns are caught by predators.

An additional aspect of habitat quality that has the potential to affect this deer population is changing land use, particularly housing and recreational developments. Housing developments and new ski areas on migration routes and staging areas pose the greatest threat to the Buttermilk deer herd. Within Inyo County, relatively little private land exists on the winter range, migration routes, or staging areas. Most important deer areas have been recognized as vital for deer habitat in the Inyo County general plan. The Mono County Portion of the winter range, migration routes, and staging areas include several parcels of land under threat of development. Key deer areas should be protected if development of these parcels is allowed.

Both the Inyo and Mono County general plans will be reviewed and comments provided to respective planning departments for zoning changes that may be needed to preserve key deer habitat. This is consistent with Fish and Game Commission policy regarding land use planning.

Hunting

At the present level, hunting is not a major factor regulating this deer herd, although bucks-only hunting greatly alters the buck:doe ratio.

Illegal Take

The precise level of illegal take is unknown, but is not thought to be sufficiently high to be important in regulating the Buttermilk herd. The number of reports of illegally taken deer is small, compared to those from many other locations in California. Patrol efforts presently are sufficient to allow only a small amount of illegal take. One of the reasons for the relatively low level of poaching on this herd is the very open terrain of the winter range. People, vehicles, and lights are visible from a long distance.

MANAGEMENT UNIT GOALS

The statewide plan for the management of deer in California has general goals of maintaining healthy deer herds and providing for high quality, diversified use of deer. Goals for the Buttermilk herd will conform to these general goals, but are more specific, based on characteristics of this herd and its range.

Herd Goals

The most complete census of the Buttermilk herd to date was a helicopter count made on January 27, 1985, where 3,657 deer were observed. However, a count in January 1987 yielded only 2615 deer. Taking both censuses into account, the population is conservatively estimated at 3,000. This population is at least adequate for the habitat available, and it is not a goal of this plan to increase deer numbers.

The Buttermilk herd will be maintained to maximize recreational hunting opportunity, while maintaining a buck ratio at or near the goal of 20 bucks per 100 does. Since post-season ratios for the past two years have been only seven bucks per 100 does, and ratios are also in nearby herds, hunting zone boundaries were changed and hunter numbers were reduced. Once ratios increase to the goal, hunter numbers will be increased.

Range and Habitat Goals

With the exception of relatively small portions of winter range and key parcels on migration routes, the range of the Buttermilk herd is mostly within public ownership in the Inyo National Forest, Sierra National Forest, Bureau of Land Management, or LADWP. Although BLM is currently involved in an experimental blackbrush burning project, economically feasible habitat manipulation methods that would have major value to extensive areas of the winter range are presently unknown. Additional investigations and experimentation is necessary before major winter range improvement projects are undertaken.

Nearly all of the summer range is within USFS wilderness areas, RARE II study areas, or Kings-Canyon National Park where habitat improvement projects are not allowed.

The most important habitat goal for the Buttermilk herd is to maintain the current quality and quantity of all seasonal ranges and to prevent deleterious impacts from future land uses.

PROBLEMS AND CONSTRAINTS IN HERD MANAGEMENT

The section identifies major problems and limitations relating to management of the Buttermilk deer herd and its habitat.

1. Specific causes for low pre-fall fawn survival have not been documented.
2. Even if predation is determined to be the major cause of fawn loss on summer ranges, control of predators would not be permitted on USFS and National Park Service lands (which include essentially all of the summer range), and would not be recommended by the Department of Fish and Game.
3. Methods of maintaining and improving winter range forage stands (especially bitterbrush) are not yet known.
4. A segment of the public is opposed to the harvest of antlerless deer, which constrains management options for the herd.
5. Management policies for National Parks and USFS wilderness areas limit potential habitat management options on the summer range.
6. Current grazing policies of land management agencies may reduce deer carrying capacities on and near upper Wells Meadow,

and have the potential to seriously reduce the carrying capacity on the lower portion of the winter range.

MANAGEMENT PROGRAMS, OBJECTIVES AND RECOMMENDED PRESCRIPTIONS

Inventory and Investigation Element

Objective: Collect information that allows for effective management of the Buttermilk herd. This will include information on numbers and composition in the herd.

Recommended Prescriptions

1. To determine composition and population of this herd, at least four hours of helicopter time will be required each year. Flights should occur sufficiently late enough in the year so that all deer have migrated to lower elevations, but early enough so that antlers have not yet begun to drop. The first week of January is probably the optimal time.

Habitat Element

Objective: Preserve existing habitat against encroachment and improve habitat as methods become available.

Recommended Prescriptions

1. The values of habitat for deer will be given their full importance in all land management decisions having potentially adverse impacts on deer habitat. Specific land use elements of primary concern are described below:

- a. Increases in grazing use will not be allowed, where such increases are shown to be detrimental to deer habitat; and reduction in levels or changes in grazing schedules will be examined by land management agencies if conflicts with deer are identified. Elimination from grazing allotments of at least two areas where no grazing has occurred for several years will be pursued. One of these is upper Horton Creek Meadow, which is used as summer range by a small number of deer. The other area not now grazed, but still within an allotment, includes much of the key portion of the winter range.
- b. New roads or trails into important deer areas will be considered by federal agencies on a case-by-case basis and will be coordinated to reflect the unique nature of the Buttermilk deer population.
- c. Residential development or agriculture will not be permitted where these activities might substantially affect areas used significantly by deer.
- ←d. Mining activities will be coordinated to minimize impacts on deer habitat.
- e. Hydro-electric projects will be planned to avoid adverse impacts on deer habitat, and will not be allowed until their environmental effects have been determined.

2. An experimental habitat improvement project is planned, consisting of burning at the upper edge of the blackbrush belt on the lower portion of the winter range. The objective of this work, funded by BLM and Inyo County, is to convert blackbrush (which is considered to be very low in food value) to some other forage species, preferably bitterbrush. If this work is successful, it holds promise for increasing the carrying capacity of the winter range.

Utilization Element

Objectives: Provide an average annual buck harvest of at least 100 animals. Provide excellent opportunities on both the winter and summer ranges for viewing deer.

Recommended Prescriptions

1. Hunting seasons, zones, and quotas will be adjusted as necessary to allow maximum hunter opportunity, while providing reasonable hunter success and post-season buck ratios of 20 per 100 does.
2. Limited antlerless hunting may be recommended in the future as an attempt to increase fawn survival by reducing competition for forage. The Buttermilk herd offers an excellent opportunity for carefully controlled antlerless hunting, since virtually all deer on the winter range can be counted by helicopter. This allows effects of antlerless hunting on fawn survival and total

population to be accurately determined before additional hunts are allowed.

3. Individuals interested in viewing or photographing an easily accessible deer herd within a short distance of Bishop will be directed to specific sites within the Buttermilk winter range.

Law Enforcement Element

Most illegal kills on the Buttermilk herd range occur either on the winter range or on intermediate ranges where deer are easily accessible. Most deer in this herd are not accessible during the summer. During the hunting season, reports are received of approximately 10 illegally taken deer each year. Also, deer are poached on the winter range each year, but the number is unknown.

Objective: Prevent poaching to the extent possible.

Recommended Prescriptions

1. Patrol effort will be continued to assure as little poaching as possible. When routine patrol or citizen reports indicate illegal kill is occurring, patrol efforts will be increased in that location.

Mortality Control Element

As discussed previously in this herd plan, mortality control depends largely on providing appropriate habitat.

Although predators may take a large number of fawns, this may be a reflection of fawning habitat limitations. Unless the planned study or some future work discovers a method of increasing or improving fawning habitat in remote back country locations, fawning habitat limitations will remain unchanged. It should be emphasized that high fawn mortality is expected in a deer population that has reached the carrying capacity of its range (Longhurst et al. 1952). Also, control of predators on public land is not desirable or practical under present circumstances, and would not be politically possible on USFS areas, which constitute most of the fawning habitat of this herd.

Fall fawn counts indicate that the greatest mortality in this herd occurs with fawns on the summer range. The fall fawn count has averaged 49 fawns per 100 does, for the 28 years for which data are available. Work done by Jones (1953) and Longhurst (1952) indicates that there are about 150 fawns born per 100 does each year in the Buttermilk herd. Obviously, the majority of fawns born are dying before they reach the winter range. As described previously, some researchers feel that a winter range population that is too high for the available food supply may lead to the production of weak fawns, thus being the actual cause of mortality.

Objective: Reduce mortality when methods to accomplish this become available.

Recommended Prescriptions

1. If it can be demonstrated with nearby deer herds that fawn survival can be substantially increased by removal of some antlerless deer or if range conditions indicate a need, antlerless hunts will be held in the Buttermilk herd.

Public Information Element

Objective: Increase amount of information distributed to the public regarding the Buttermilk deer herd, so that they can gain an understanding of options available for management.

Recommended Prescriptions

1. Presentations on the Buttermilk deer herd will be given to local groups, in response to public interest.
2. Public seminars on management alternatives (including harvest strategies) and habitat requirements of deer will be held.
3. One or more articles about the Buttermilk and nearby deer herds is planned for a hunter newsletter (TRACKS).

Review and Update Element

Objective: The Buttermilk herd management plan should be reviewed and updated as necessary.

Recommended Prescriptions

1. Input from the Department of Fish and Game, Inyo National Forest, and Bureau of Land Management will be incorporated into the plan as additional information becomes available.
2. Input from the public will be sought continually. Attitudes toward antlerless hunts will be assessed.

ALTERNATIVE MANAGEMENT ACTIONS CONSIDERED

In any aspect of natural resource management, different values and opinions inevitably lead to different ideas about goals and programs for managing that resource. This section of the Buttermilk herd plan discusses three basic management alternatives to the recommended objectives and prescriptions presented here, and the reasons for not choosing these alternatives.

1. No Hunting

Under this alternative, hunting would be discontinued on all portions of the Buttermilk herd range. The total population would remain essentially the same. The buck ratio would increase, however. This alternative would cause the loss of an important recreational opportunity that is highly valued. The local economy would suffer a loss of money that is now brought in by hunters from out of the area. A "no hunting" alternative would not conform to current Department of Fish and Game policy, and would generate a considerable amount of local and statewide opposition.

2. Elimination of consideration of deer in management practices of land management agencies.

Under this alternative, the value of deer habitat would be given no consideration by the BLM and USFS. Other land uses would be given priority of maintenance of productive wildlife

Memorandum

Earl Lauppe
Region 5, Long Beach

Date : September 15, 1986

From : Department of Fish and Game - Tom Blankinship

Subject: Update of the Buttermilk Deer Herd Plan.

The following is a list of updated information for this herd plan. No major changes are included.

I. Update of Biological Data

Page 8 (Herd Range and Population Estimates), last paragraph. "This is based on a helicopter survey of January 27, 1984...." should be changed to "January 27, 1985..." Also, a sentence should be added after this one which reads "(A count in Jan. of 1986 totaled 3,692.)"

Table 2, Reported take. The reported take in 1985 was 194.

Page 12 (Herd Composition), second paragraph. This should read "...numbers of fawns per 100 does arriving on the winter range have averaged 50..." (rather than 47, as shown).

Page 13 (Mortality), first paragraph. Should read "Since only 50 fawns per 100 does..." (rather than 38, as shown).

Table 3. Herd Composition Data. Updated figures shown on the enclosed page should be included.

Page 24. (Winter range forage), third paragraph. Should read "other important browse species are black brush and bitterbrush. Although usually not so heavily cropped as bitterbrush, browsing pressure by deer is very heavy on these species also, particularly sagebrush."

Table 5. Utilization of bitterbrush. Updated figures shown on the enclosed page should be included.

II. Update of habitat improvement projects.

No change.

III. Other Changes

Page 42. (Herd Goals), first paragraph. Final three sentences in this paragraph should read "Based on recent radio telemetry information, recent years' buck ratios, and low buck kill on the Buttermilk herd area on the east slope, it appears that additional hunting restrictions on the west slope may be helpful in reaching the buck ratio goal of 20 per 100 does (see harvest data, Table 5). Should buck ratios remain substantially below the goal, an attempt will be made to raise them by getting the hunting season earlier, before any migration would be expected. If this is unsuccessful, additional measures will be taken."

Page 46 (Inventory and Investigation Element, Recommended Prescriptions, Number 5). This should read "To Determine response of fawn survival in the Buttermilk herd to antlerless hunting, antlerless hunting may be recommended on this herd or on the adjacent Sherwin Grade herd. Both herds will be carefully monitored with respect to fawn survival and total numbers."

Page 49 (Utilization Element, Recommended Prescriptions). A final sentence should be added as follows." In addition, it may be necessary to limit the number of permits."

Page 50 (Mortality Control Element, Recommended Prescriptions), first sentence. The phrase "or if range conditions indicate a need" appears twice. The first should be removed.

Tom Blankinship
Tom Blankinship
Wildlife Biologist

cc: file, Tom Blankinship

Table 3. Herd composition data for the Buttermilk deer herd, 1950-1985. Data expressed as bucks per 100 does, fawns per 100 does, and number of deer classified (N).

Year	Fall*			Spring*	
	Bucks	Fawns	N	Fawns	N
1950-51	16	62	109	69	153
1951-52	16	89	463	31	446
1952-53	16	53	582	49	376
1953-54	18	75	439	56	471
1963-64	14	42		47	
1964-65	7	58		41	
1965-66	9	37		37	
1966-67	9	51		53	567
1967-68	9	44		53	243
1968-69	10	42		16	318
1969-70	6	24		20	254
1970-71	11	57		62	288
1971-72	29	53			
1972-73	21	51			
1973-74	20	67		64	448
1974-75	7	59		56	516
1975-76	25	60			
1976-77	21	50	526	46	230
1977-78	24	60	308	32	317
1978-79	16	41	531	28	338
1979-80	20	40	317	26	555
1980-81	26	39	331	37	354
1981-82	13	39	491	27	323
1982-83	8	35	2,712	28	524
1983-84	15	38	893	37	629
1984-85	12	42	2,231	38	584
1985-86	7	35	906	26	653

*Spring is that of later year shown. Fall is that of earlier year shown. December and April counts were selected from several available during the years 1950-54 to be comparable with counts made in other years. Information not available for some years.

Table 5. Utilization of bitterbrush leadergrowth and deer-days use/acre on transects on the Buttermilk winter range.

<u>Winter Period*</u>	<u>Utilization (percent of previous summer's growth)</u>	<u>Deer-Days Use/Acre</u>
1949-50 (mean of 26 transects)	69	
1950-51 (")	51	
1951-52 (")	33	
1952-53 (")	30	
1953-54 (")	41	
1954-55 (")	51	
1955-56 (")	67	
1974-75 (mean of 6 ")	44	40
1975-76 (" ")	39	50
1976-77 (" ")	35	37
1977-78 (" ")	65	42
1978-79 (" ")	30	31
1979-80 (" ")	45	48
1980-81 (" ")	47	66
1981-82 (" ")	48	48
1982-83 (" ")	42	57
1983-84 (" ")	38	32
1984-85 (" ")	60	96

*Data from 1949-1956 from Jones, 1953.

Memorandum

To : Wildlife Mgt Supervisor
Region 5

Date : November 8, 1988

From : Department of Fish and Game - Inyo Unit Manager

Subject: Update of Buttermilk Deer Herd Plan.

The following is updated information for this herd plan:

I. Biological Data

A. Reported Buck Harvest

<u>Year</u>	<u>Bucks Taken</u>
1984	30
1985	194
1986	60
1987	14

B. Herd Composition Counts

A post-hunt herd composition count was conducted on January 7, 1988. A helicopter was used, for approximately 6 hours, funded with Hill Bill monies. The spring count was conducted on March 28, 1988. No helicopter time was available this year, so all counts were conducted on the ground. The buck ratio was assumed to be the same as the winter ratio. Due to the difficulty of classifying fawns and yearlings, we classified only those animals which we were absolutely certain were fawns, as fawns. Any questionable animals were classified as yearlings (adults).

Year	<u>Fall</u>			<u>Spring</u>	
	Bucks	Fawns	N	Fawns	N
1984-85	12	42	2231	38	584
1985-86	7	35	906	26	653
1986-87	7	25	767	19	*
1987-88	9	34	854	16	274

*Data not available

C. Utilization of Bitterbrush Leaders

Bitterbrush leader growth transects were conducted on 7 transects in the Buttermilk herd area in fall of 1987. Results are summarized below (in percent utilization)

<u>Winter Period</u>	<u>Utilization (Percent of previous summer's growth)</u>	<u>Deer Days use/acre</u>
1983-84	38	57
1984-85	60	96
1985-86	49	49
1986-87	*	*

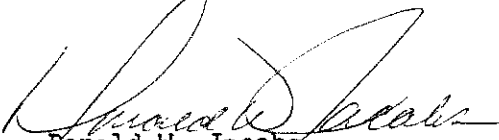
*Surveys were conducted for average leader growth only. The Buttermilk area was 0.12". This translates to, overall, no leader growth on the majority of bitterbrush plants (i.e. approximately 6 plants/100 had a very small amount of leader production).

II. Habitat Improvement Projects

No habitat improvement projects were completed.

III. Other changes to the Deer Herd Plan

A new hunting zone (X-9B) was initiated. This controlled the hunting pressure through the issuance of only 2,500 deer tags. This compares to 9,000 deer tags for zone X-9 before the split into two zones.


Donald W. Jacobs
Wildlife Biologist

cc: Davis
Bleich

ROUND VALLEY* DEER HERD PLAN ANNUAL UPDATE

1992-93

*Beginning in 1993, the Sherwin and Buttermilk herds are combined into one biological unit, termed the Round Valley Herd.

I. Update of biological data

A. Composition counts

<u>year</u>	<u>Post-season bucks/100dd</u>	<u>Post-season fawns/100dd</u>	<u>Spring fawns</u>	<u>Fall sample</u>	<u>Spring sample</u>
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	23	289	378
1992-93	15	36	25	462	1073

B. Buck kill

<u>Year:</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
	311	127	140	122	109	75	21	75

C. Winter range herd census

<u>Year</u>	<u>Buttermilk segment</u>	<u>Sherwin segment</u>	<u>total</u>
1985	3657	2321	5978
1986	3692	1555	5247
1987	2615	1161	3776
1988	1879	1080	2810
1989	1327	931	2407
1990	No count conducted due to inadequate snow to provide comparable condition.		
1991	515	424	939
1992	657	552	1209
1993	764	570	1334

D. Collections/necropsies

Adult female deer were again collected and necropsied in 1993. Summary graphics of collection data are attached.

E. Browse production on the Sherwin (North) portion of the Round Valley winter range (in inches of bitterbrush leader growth).

<u>Year</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
	1.2	5.8	<.05	.66	.65	.23	2.8	1.1

Additionally, visual estimates of living plant material were recorded for plants surveyed. Approximately 18% of the plants' total mass was observed to be live material, the balance being apparently dead wood as a result of persisting drought conditions when the survey was conducted in early November. Subsequent heavy precipitation occurred through the winter.

II. Update of habitat improvement projects for 1990 and 1991

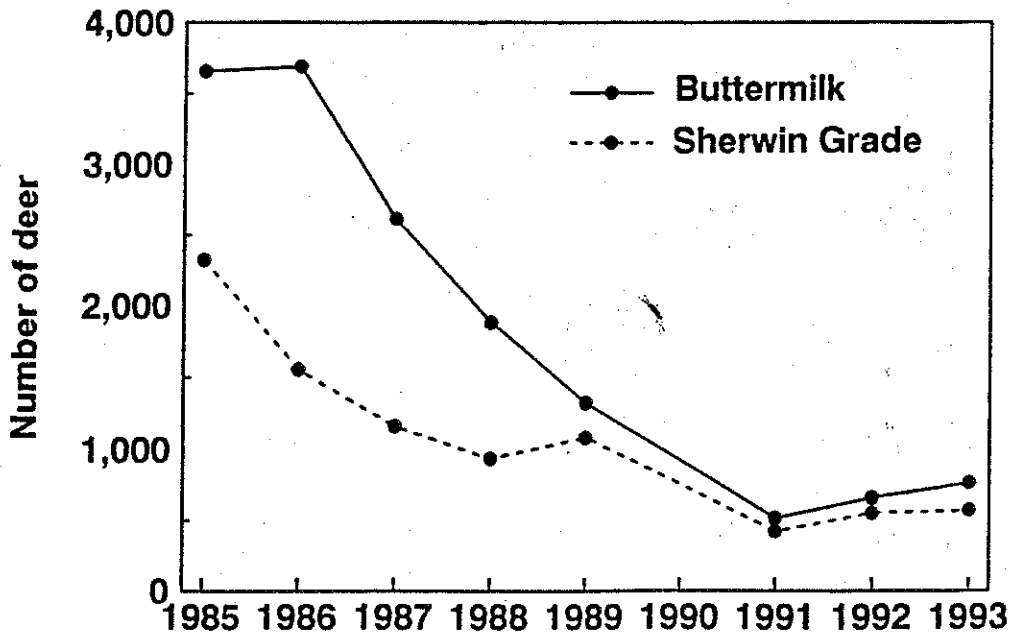
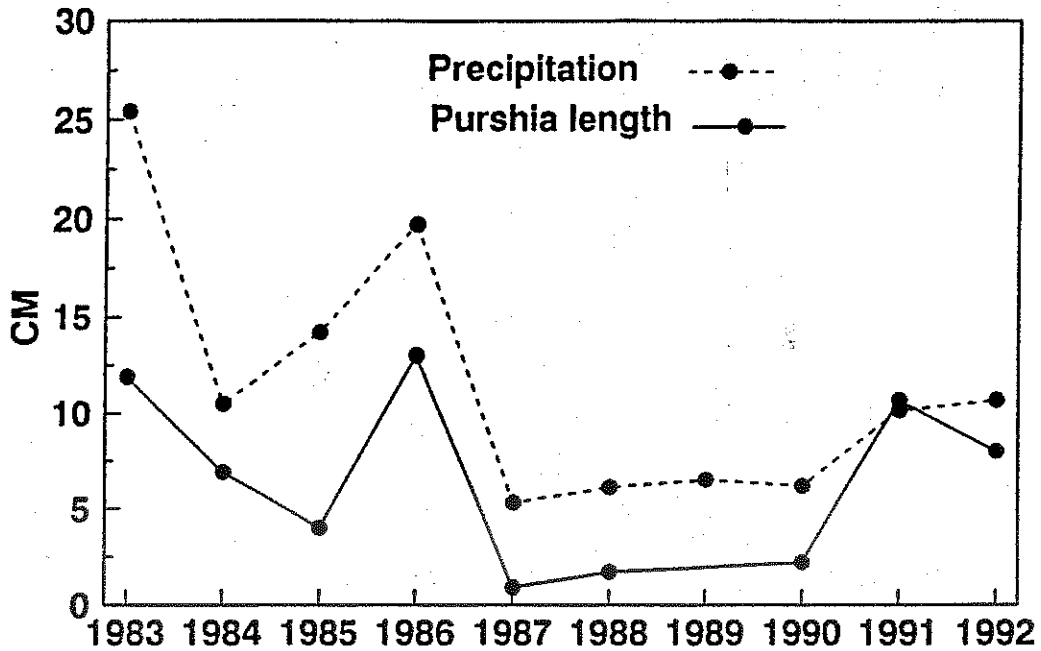
No habitat improvement projects have been undertaken during the report period.

III. Other changes to the herd plan

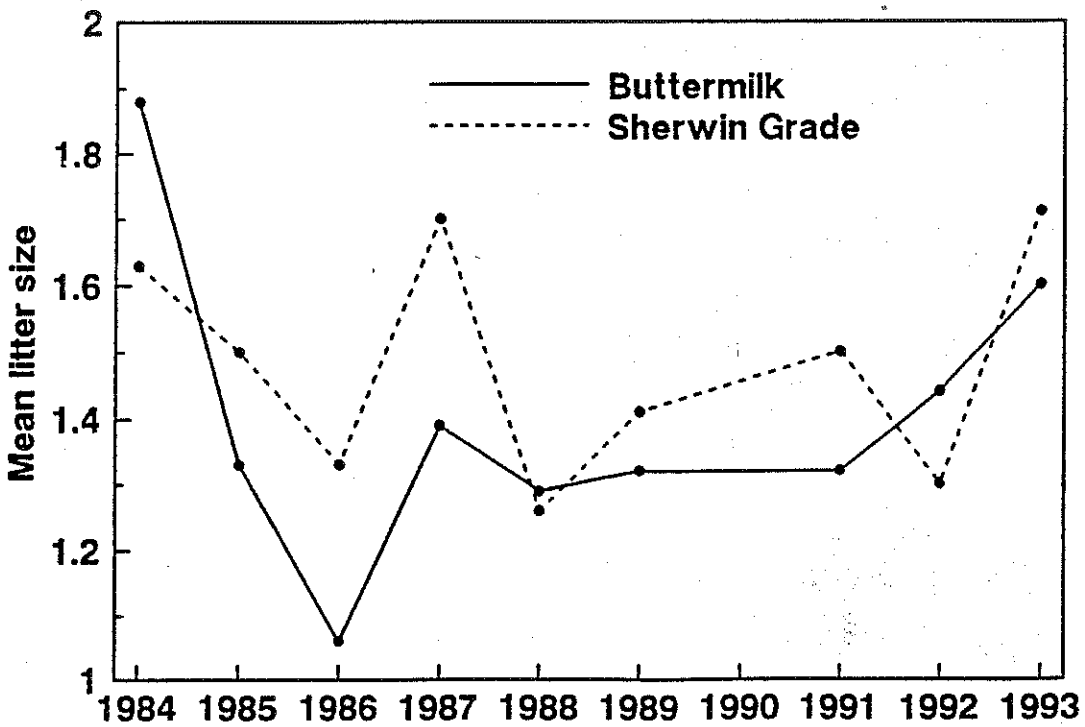
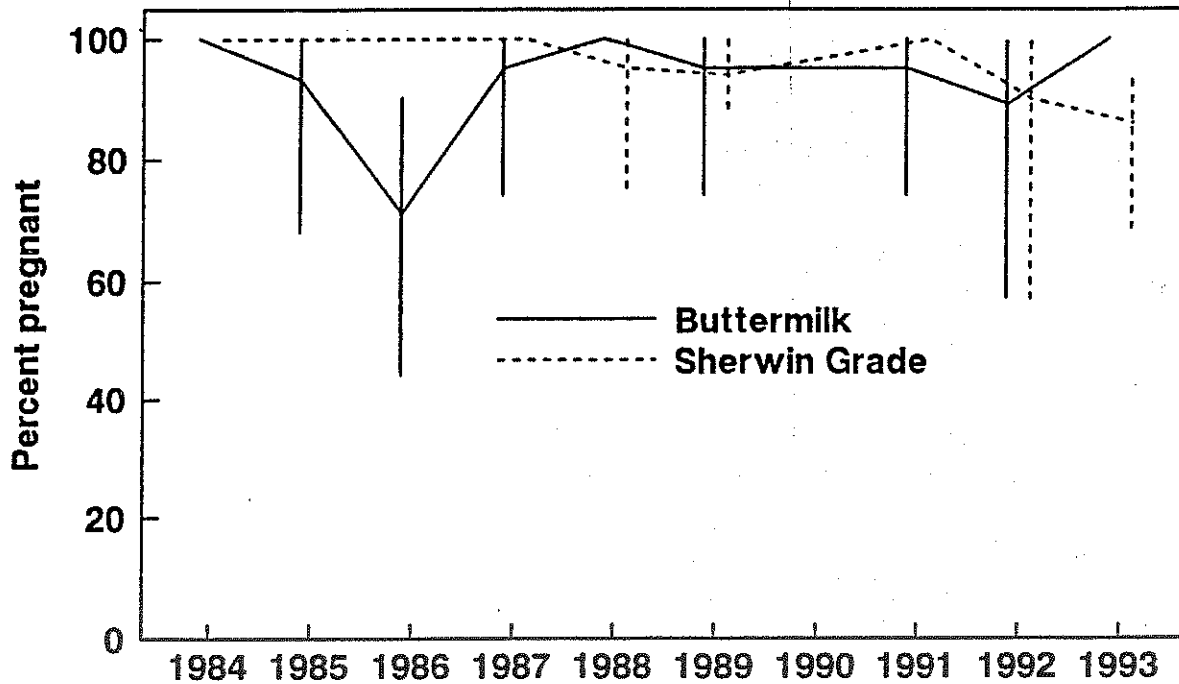
The need for winter range habitat improvement is increasing with each passing year. The effects of the drought, small lot development in the critical Swall area, and the threat of additional developments elsewhere (including the Sherwin Ski area) are cumulative and predictive of future serious declines in this population. Substantial investment in winter forage rejuvenation and acquisition of critical habitat at Swall Meadow are the highest priorities for the Sherwin herd. Because funding for land acquisition appears to be unavailable, winter habitat should receive priority attention through Hill Bill funding.

In 1993, WCB approved funding for habitat acquisition at Swall Meadow. Purchase is pending.

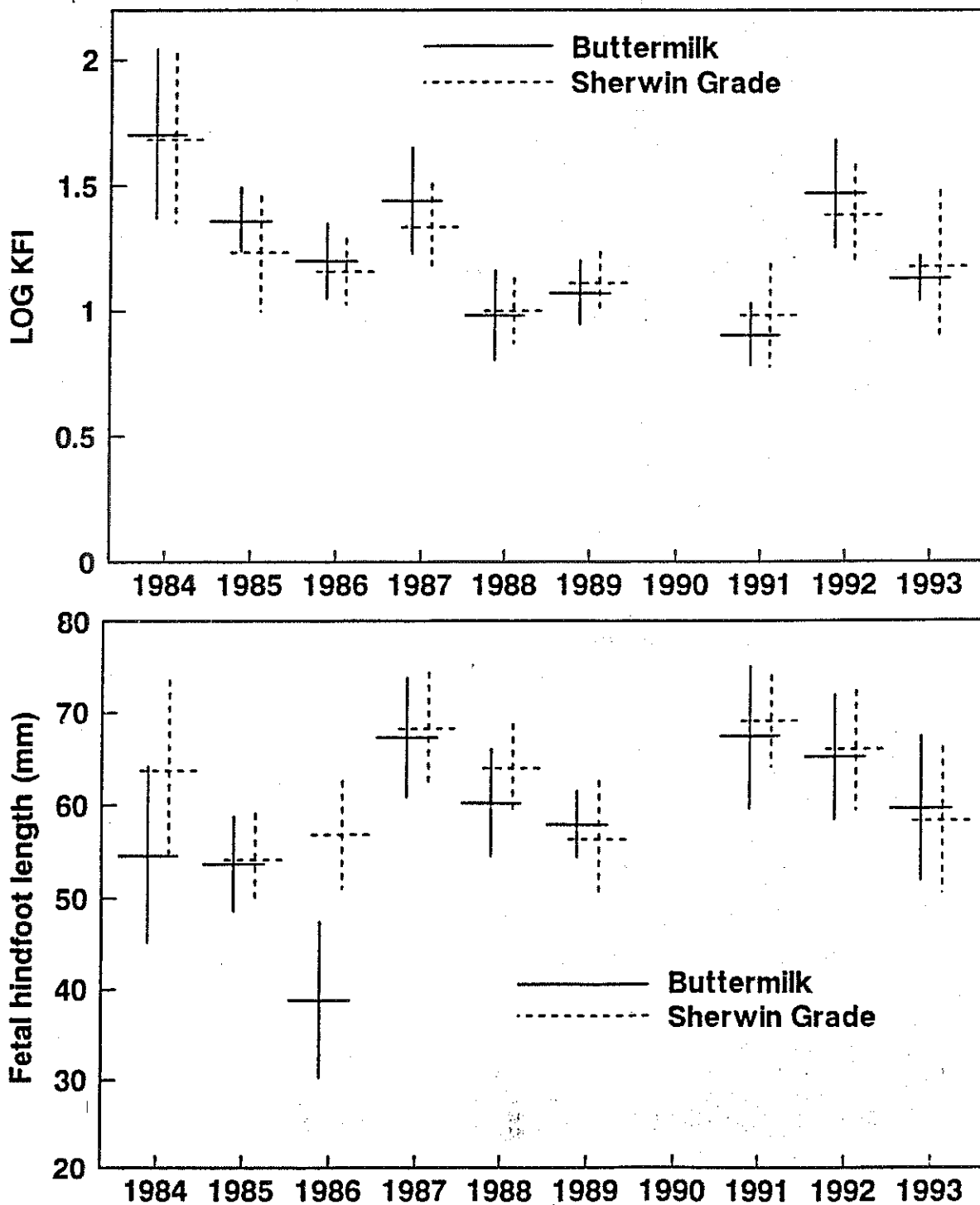
Annual precipitation and subsequent Purshia leader growth (top) and total number of deer counted annually (bottom), Buttermilk and Sherwin Grade, 1983-1993



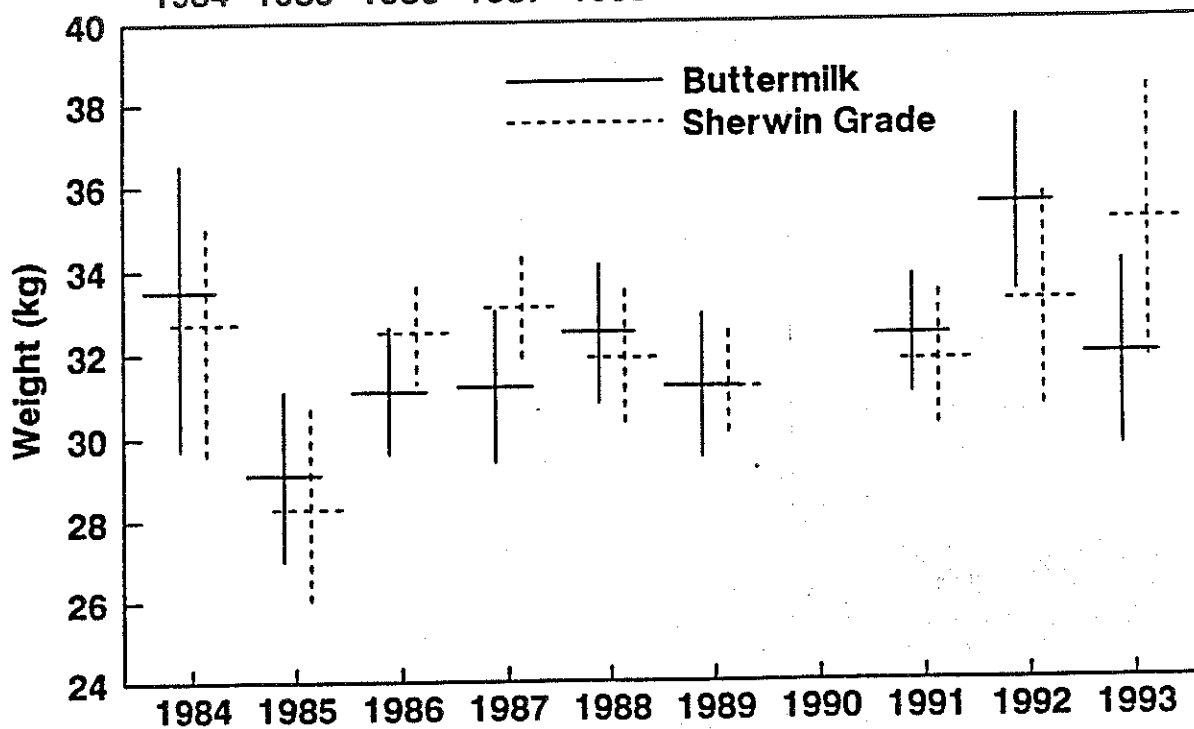
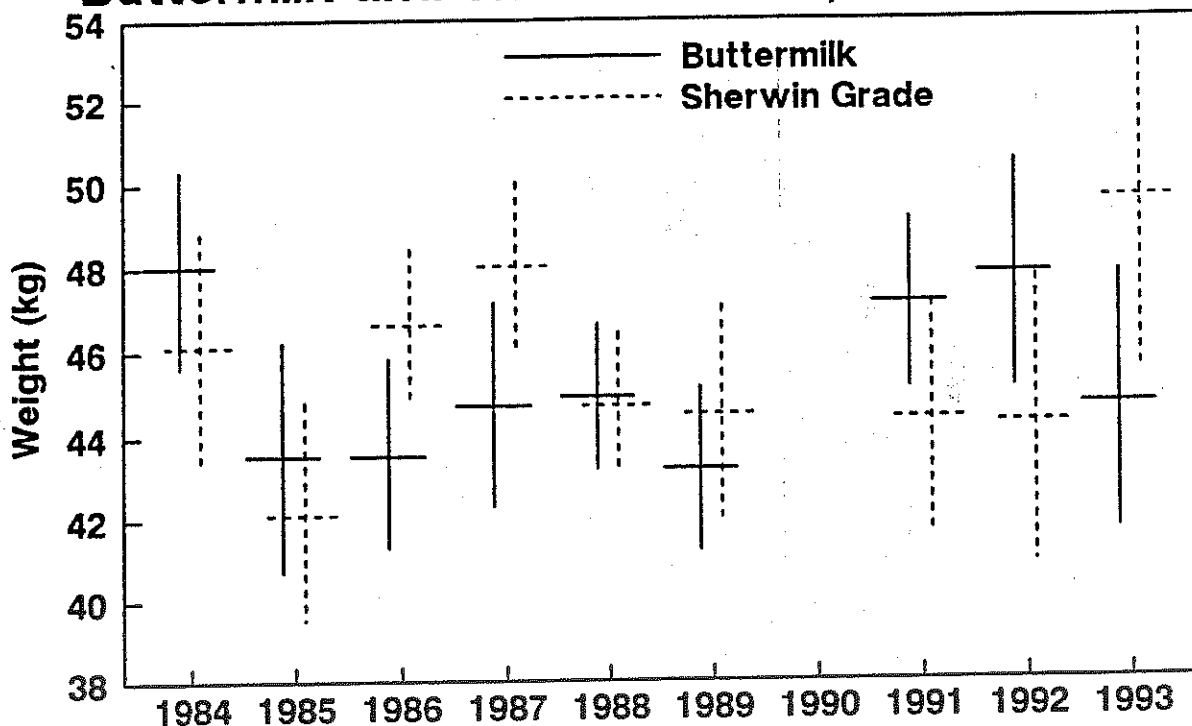
Pregnancy rates (top; mean and 95% CI) and mean litter size, Buttermilk and Sherwin Grade, 1984-1993



Log kidney-fat indexes (top) and fetal hindfoot lengths (bottom), means and 95% CI's, 1984-1993



**Freshly-killed (top) and eviscerated (bottom) carcass weights (mean and 95% CI),
Buttermilk and Sherwin Grade, 1984-1993**



ROUND VALLEY* DEER HERD PLAN ANNUAL UPDATE

1993-94

*Beginning in 1993, the Sherwin and Buttermilk herds are combined into one biological unit, termed the Round Valley Herd.

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	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	23	289	378
1992-93	15	36	25	462	1073
1993-94	21	35	41*	695	798

* A sampling error is indicated; however, it can also be inferred that very low winter mortality occurred this winter. This is consistent with improved forage conditions resulting from last winter's precipitation as well as low deer numbers on the range currently.

B. Buck kill

Year:	1985	1986	1987	1988	1989	1990	1991	1992
	311	127	140	122	109	75	21	75
	<u>1993</u>							

unknown; no data available

C. Winter range herd census

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 conducted due to inadequate snow to provide comparable condition.		
1991	515	424	939
1992	657	552	1209
1993	764	570	1334
1994	1127 total (Based on Lincoln-Peterson) (no count; inadequate snow cover)		

D. Collections/necropsies

Adult female deer were again collected and necropsied in 1993. Summary graphics of collection data are attached.

E. Browse production on the Sherwin (North) portion of the Round Valley winter range (in inches of bitterbrush leader growth).

<u>Year</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
	1.2	5.8	<.05	.66	.65	.23	2.8	1.1	7.1

Additionally, visual estimates of living plant material were recorded for plants surveyed. Approximately 18% of the plants' total mass was observed to be live material, the balance being apparently dead wood as a result of persisting drought conditions when the survey was conducted in early November. Subsequent heavy precipitation occurred through the winter, producing the marked increase in growth noted above.

II. Update of habitat improvement projects for 1990 and 1991

No habitat improvement projects have been undertaken during the report period.

III. Other changes to the herd plan

The need for winter range habitat improvement is increasing with each passing year. The effects of the drought, small lot development in the critical Swall area, and the threat of additional developments elsewhere (including the Sherwin Ski area) are cumulative and predictive of future serious declines in this population. Substantial investment in winter forage rejuvenation and acquisition of critical habitat at Swall Meadow are the highest priorities for the Sherwin herd. Because funding for land acquisition is limited, winter habitat should receive priority attention through Hill Bill funding.

In 1993, WCB approved funding for habitat acquisition at Swall Meadow. Purchase has been completed. Currently, other acquisitions are being reviewed, as well.

ROUND VALLEY DEER HERD PLAN ANNUAL UPDATE

1994-95

I. Update of biological data

A. Composition counts

year	Post-season bucks/1000d	Post-season fawns/1000d	Spring fawns	Fall sample	Spring sample
1985-86	7	35	19	691	794
1986-87	7	26	15	706	400
1987-88	10	34	12	718	307
1988-89	11	22	15	936	294
1989-90	12	21	16	572	622
1990-91	12	27	13	468	343
1991-92	12	22	23	289	378
1992-93	15	36	25	462	1073
1993-94	21	35	41	695	798
1994-95	24	34	39	735	671

B. Buck kill

Year	1985	1986	1987	1988	1989	1990	1991	1992
	311	127	140	122	109	75	21	75
	1993	1994						
	46	58						

C. Winter range herd census

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 conducted due to inadequate snow to provide comparable condition.		
1991	515	424	939
1992	657	552	1209
1993	764	570	1334
1994	1127 total (Based on Lincoln-Peterson) (no count, inadequate snow cover)		
1995	1127 <i>never taken</i>		

D. Collections/necropsies

Adult female deer were again collected and necropsied in 1993. Summary graphics of collection data are attached. (?) - will be provided

E. Browse production on the Sherwin (North) portion of the Round Valley winter range (in inches of bitterbrush leader growth).

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993
	1.2	5.8	4.05	.66	.65	.23	2.6	1.1	7.1

1994
? will be provided

II. Update of habitat improvement projects for 1990 and 1991

No habitat improvement projects have been undertaken during the report period.

III. Other changes to the herd plan

The need for winter range habitat improvement is increasing with each passing year. The effects of the drought, small lot development in the critical Swail area, and the threat of additional developments elsewhere (including the Sherwin Ski area) are cumulative and predictive of future serious declines in this population. Substantial investment in winter forage rejuvenation and acquisition of critical habitat at Swail Meadow are the highest priorities for the Sherwin herd. Because funding for land acquisition is limited, winter habitat should receive priority attention through Hill Bill funding.

The June 1993 wildfire burned substantial acreage of the Round Valley winter range. A draft rehabilitation plan has been prepared for consideration for Hill Bill funding. We believe that real benefits for wintering deer are possible and that much can be learned about future management of this key winter habitat.

In 1993, WCB approved funding for habitat acquisition at Swail Meadow. Purchase has been completed, assuring the preservation of an open space corridor for wintering and migrating Round Valley deer.

It is anticipated that the recent increases in spring fawn ratios could result in increased deer numbers in this herd. Abundant 1994-95 precipitation has created excellent feed, cover, and water conditions throughout the herd's range. Precipitation and weather patterns next winter will be crucial to future herd performance.

Conversely, the recent Inyo Forest Plan amendment to delete the State Deer Herd Plans from the Forest planning document, and the denial of all points of our DFG appeal of the Forest Plan can be expected to have substantial long term negative effects on the all deer herds on the Inyo Forest. These two events have resulted in a marked weakening of Forest Plan language concerning deer habitat management and we predict future deemphasis of deer habitat needs. For example, the removal of the Herd Plans now brings the Snowcreek Ski Area proposal into conformance with the Forest Plan, effectively facilitating the construction of that major development (and others) within the critical migration corridor of the Round Valley Deer Herd. Impacts cannot be quantified, but are

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COLLEGE OF NATURAL RESOURCES
DEPARTMENT OF FORESTRY AND RESOURCE MANAGEMENT

BERKELEY, CALIFORNIA 94720

February 4, 1985

RECEIVED
Department of Fish and Game

FEB 7 1985

Mr. Jack Parnell, Director
California Dept. Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Dear Mr. Parnell:

As you may know, one of my Ph.D. students, Tom Kucera, is doing a study of two mule deer herds that winter on the eastern slope of the Sierra Nevada near Bishop, California. The Department has been heavily involved in this study, part of which involves the movements of radio-collared deer in migration, and part an experimental reduction on one winter area by removal of 200 females. I am enclosing a copy of Tom's interim report to refresh your memory.

Since A. Starker Leopold's bulletin on the Jawbone deer herd was published by the Department of Fish and Game in 1951, the conventional view has been that deer in the Sierra migrate more or less up and down elevation between summer and winter areas. In a recent review of big game movements I came to question this assumption based on research elsewhere. Migratory movements are much more complex, as Tom's results are demonstrating for the herds he is following. Most deer from both winter ranges, in spring, move north up Sherwin Grade, up over the crest near Mammoth Lakes and scatter broadly over an enormous area of the west slope near the crest. Although each individual has a given home range on the summer and winter ranges, there is no sorting out of wintering herds into separate summering areas (see photo of locations). What this means is that if the population density limitation is not exclusively confined to the winter range, the experimental hunt is not likely to show any positive result, because summer range is shared with so many other winter populations. Deer from west side winter ranges migrating upward in the summer further complicate the picture. If the east side deer do not overlap in the summer with west side deer, then the combined east side winter populations can be managed as a unit as could the combined west side population. There is some reason to believe that the west side deer are summering at lower elevations in the heavier timber than the east side deer. However, if east and west side deer are summering together, then population management needs to be applied to all deer on both sides over long stretches of the Sierra.

The purpose of this letter is to point out the great need for data on the west side wintering populations on where they are summering. It is long overdue that we find out just what deer in the southern Sierra are doing based on reliable telemetry. If only radio-collars could be put on some west side herds on the winter range adjacent to the areas in the photo, we could determine where these deer are summering while we have crazy graduate students like Tom Kucera who are willing to do the rugged backpacking into this inhospitable terrain to see what habitat types the deer are using.

Mr. Jack Parnell
Feb. 4, 1985
Page 2

I bring this matter to your attention in hopes that the Department's equipment and manpower resources might be brought to bear on the trapping of west side deer for radio telemetry. I have 27 deer traps at Hopland Field Station that could be loaned for the effort; but, unfortunately, no radio collars or manpower, other than Tom's current effort on the east side herds. I know some work on deer is being done on the west side herds, but I'm afraid by the time I found out what, it may be too late for this year.

I would be glad to discuss this situation with you or your staff who might know the west side situation.

Sincerely,

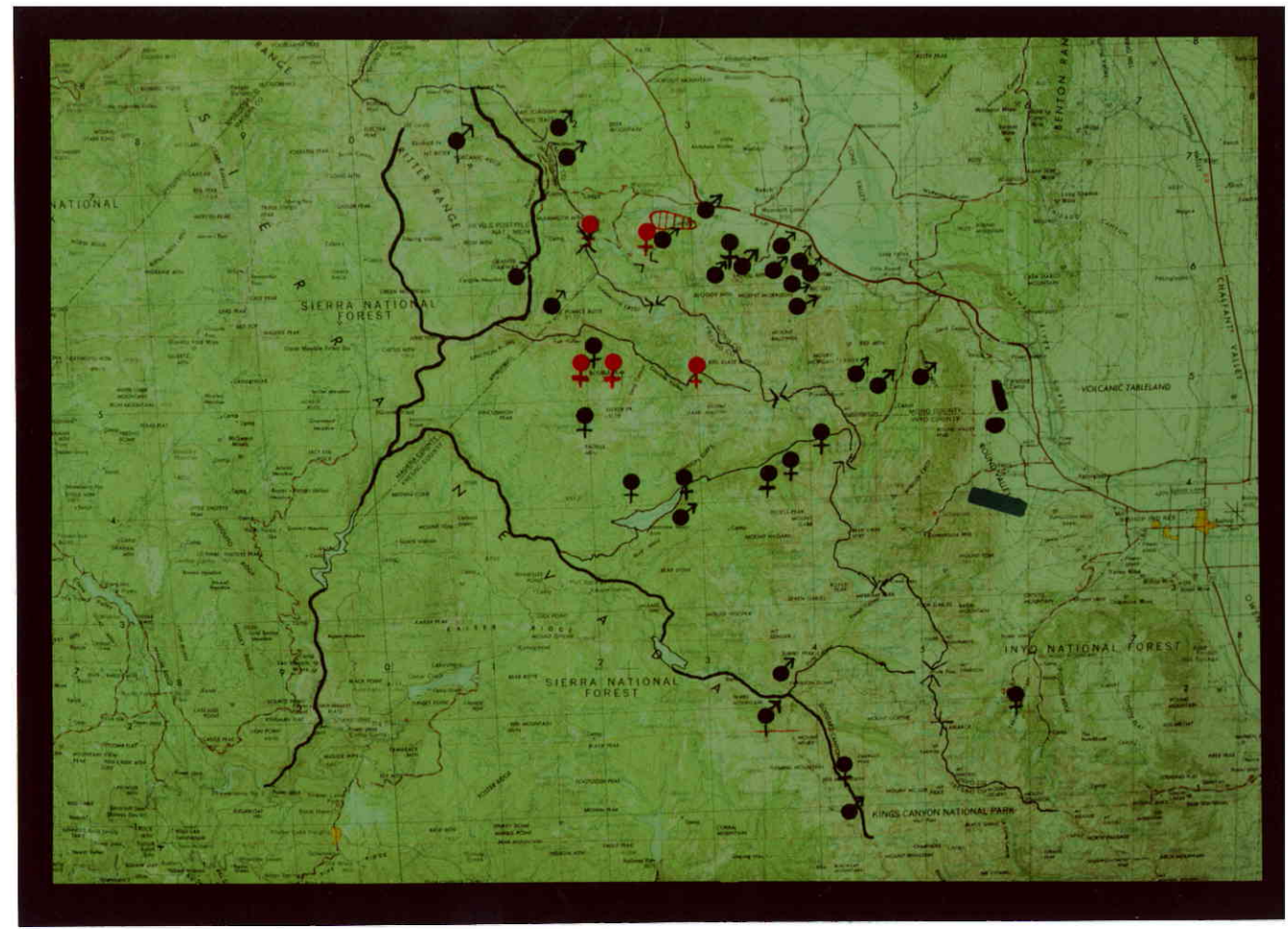


Dale R. McCullough
Professor of Wildlife
Biology and Management

415/642-8462

DRM:lm

Enclosure



BUTTERMILK/SHERWIN GRADE DEER STUDY, INTERIM SUMMARY

10 Oct 84

Thomas E. Kucera

On the winter and spring ranges in 1984, a total of 117 deer (66 females, 51 males) were captured, marked and released. This includes sixty-four on the Buttermilk range (28 males, including 11 fawns, and 36 females, including 9 fawns), 47 on the Sherwin Grade range (23 males, including 5 fawns, and 24 females, including 8 fawns), and 6 adult does captured during the spring migration near Mammoth Lakes, about 35 miles north. Twenty-five adults (8 males, 17 females) were fitted with radio-transmitter collars. In addition, all animals received individually numbered ear tags, and all other adult does received numbered marking collars.

Of the 25 radioed animals, the location of 23 on the summer range is known; transmitter failure is suspected in the other 2 cases. Eighteen have crossed the Sierran crest and are summering on the west side, throughout the upper San Joaquin drainage from the Minarets to Goddard Canyon in Sequoia-King's Canyon National Park. One male and 4 females have remained on the east side, and are distributed from Mammoth Mountain to Lake Sabrina. In addition, the locations of several marked animals are known from reports of sightings by members of the public.

Thirteen fixed-wing flights have been taken to date in order to find radioed deer on migration and on the summer range. The animals are subsequently found on foot, typically during backpack trips into the backcountry, and data on habitat, diet, fawning, etc., are collected. A total of 198 person-days were spent on such trips during the summer of 1984. Additional day-trips were taken to the more accessible areas on the east side where radioed deer summered.

Thirty does were collected on the winter range in early spring, and information on reproduction and diet was obtained. All does were pregnant. The average fetal rate of 19 Buttermilk does was 1.79 fetuses/doe; of the 9 Sherwin Grade does, the average fetal rate was 1.55 fetuses/doe.

Twelve marked bucks, including one radio-collared animal, were killed and reported during the 1984 deer season. Age and location data were collected from most of these.

Plans for work this fall and winter include monitoring fall migration to the winter range, continuing pellet collections to complete the yearly picture of changes in diet composition and quality, determining winter sex and age ratios, collecting reproductive and dietary data from animals killed in the Sherwin Grade antlerless hunt in December and January, and capturing and marking more animals in the winter.

POTENTIAL SKI FACILITY DEVELOPMENT IN MAMMOTH LAKES AREA

ZONE X-9

A resort development (Snow Creek Resort) is planned for the Mammoth Lakes locale on the east slope of the Sierra Nevada Mountains. The resident, resort and support buildings would be built on private lands. Skiing facilities would be on U.S. Forest Service administered public land. The buildings would occupy about 200 acres. Development facilities are in the path of migration of 2,000 deer from the Sherwin Grade/Buttermilk deer herd which totals about 6,000 deer.

Studies were recently started to answer questions about the effect of this development on the herd, and this herd's relationship with west slope Sierra Nevada deer who share a common summer range (attachment). The study was started cooperatively between the California Department of Fish and Game, University of California - Berkeley, U.S. Bureau of Land Management, U.S. Forest Service, County Fish and Game Commission, and the developer.

Current information indicates there are about 6,000 deer in the herd wintering in the vicinity of the development. The development would have a minor impact on deer winter habitat. This proposed resort would interfere dramatically with the migration of about 2,000 deer from this herd. The development would be on the migration route and the steep rugged nature of the adjacent land might prevent the deer from getting to the summer range. The study is ongoing and continues to provide deer management decision data.

The potential developer has attended many public meetings with his verbal proposal but he has not submitted formal plans for review. City, county and federal land managers report that they have given no official or tentative approval for this development. No environmental review has occurred.

BUTTERMILK/SHERWIN GRADE DEER STUDY, INTERIM SUMMARY

10 Oct 84

Thomas E. Kucera

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Of the 25 radioed animals, the location of 23 on the summer range is known; transmitter failure is suspected in the other 2 cases. Eighteen have crossed the Sierran crest and are summering on the west side, throughout the upper San Joaquin drainage from the Minarets to Goddard Canyon in Sequoia-King's Canyon National Park. One male and 4 females have remained on the east side, and are distributed from Mammoth Mountain to Lake Sabrina. In addition, the locations of several marked animals are known from reports of sightings by members of the public.

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Received
3/29/84

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Region 5

Submitted by Russell Carl Mohr/Consulting Wildlife Biologist

P.O. Box 764
BISHOP, CA 93514

Introduction

The proposal for development of a ski area on Sherwin Mountain (Rock Compartment), Mono County, California, has initiated concern over possible negative impacts on various wildlife species, especially mule deer (Odocoileus hemionus). Before such developments are approved, research directed towards species/habitat relationships and affected populations must be implemented. Wildlife surveys have been conducted within the Sherwin Mountain study area (Schneider, 1981), but more extensive information is required to better assess: 1) deer utilization within the area, 2) periods of habitat utilization, and 3) define possible critical deer habitats within the Sherwin Mountain study area.

Monitoring the movements, and documenting the habitats of occurrence of radio-equipped mule deer are required to better understand and evaluate habitat utilization within the Sherwin Mountain study area. Monitoring radio-equipped deer will also yield information on possible migratory corridors, fawning areas, staging areas, and periods of utilization of these habitats within the study area. Through year-round monitoring, information will be gained to define more precisely the wintering herds which may be affected by such development. Population census techniques will be employed to estimate migratory and summer utilization of the study area by deer.

Extensive information of this type is necessary for decisions

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Introduction (continued)

concerning public land management. Delineation of, and impact on possible key mule deer habitats must be a primary concern prior to approval of such developments.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Objectives

The following are objectives for the Sherwin Mountain deer study:

- 1) To capture and mark migrating and summer resident mule deer with radio-telemetry or marker collars within the proposed Sherwin Mountain ski area for studies on habitat utilization, periods of habitat utilization, and census analysis.
- 2) Utilize radio-telemetry observations, direct observations, and pellet group transects to define preferred or critical mule deer habitats within the Sherwin Mountain study area.
- 3) To estimate mule deer utilization (population size) within the study area during summer periods utilizing: a) pellet group transects, b) direct observations, and c) Lincoln index.
- 4) Determine seasonal migration corridors which may be present within the Sherwin Mountain study area.
- 5) Estimate numbers of mule deer migrating through the study area utilizing track count methods.
- 6) Determine fawning areas that may exist within the study area.
- 7) Determine periods of habitat utilization for migration, fawning, staging, and summering areas.
- 8) Through year-round monitoring of radio-equipped mule deer, determine wintering grounds (herds) of deer summering within the Sherwin Mountain study area.
- 9) By direct observation, determine species diversity, and habitat of occurrence within the study area, especially in

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Objectives (continued)

reference to U.S.F.S. recognized sensitive and indicator species; and State and Federal rare, threatened, or endangered species.

- 10) Make recommendations to decision making agencies detailing the possible impacts on wildlife species, especially mule deer within the Sherwin Mountain study area.
- 11) Lastly, make recommendations aimed at reducing any negative impacts on wildlife species within the Sherwin Mountain study area should the ski area be approved.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Study Area

The proposed Sherwin Mountain ski area is located in Sections 10,11,12,13,14,15,23, and 24 of T.4S., R.27E., in the Mammoth Ranger District, Inyo National Forest. The study area is comprised of steep mountainous terrain which lies between the Sherwin Creek drainage on the east and the Mammoth Lakes (Mary, Mamie, etc.) basin on the west. Elevations within the study area range from approximately 8000 to 11600 feet. Approximately 2000 acres are contained within the study area.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Methods and Materials

I. Capture

Several methods may be required to capture deer within the study area.

- A) Chemical immobilization by darting with projectile syringe from the ground using ketamine and rompun will probably be the primary capture technique.
- B) Alternative techniques if darting is unsuccessful consist of drive-netting or clover-trapping.

II. Marking

- A) Does only, will be marked with color coded radio-telemetry collars or numbered plastic (ABS) collars.
- B) Every deer handled will receive two ear tags for alternative identification.
- C) Should bucks or fawns be captured, they will only be marked with color coded/numbered ear tags.

III. Handling

- A) Deer will be physically restrained whenever possible. Chemical immobilization will be limited to darted deer or cases where physical restraint endangers animals or or personnel. Personnel will remain with immobilized deer until complete reversal of drug effects are evident.
- B) Blood samples will be obtained from deer and will be used for nutritional and disease investigations by the Wildlife Investigations Laboratory, California Department of Fish and Game.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Methods and Materials (continued Handling)

- C) Location and date of capture, age, sex, condition, identification #'s, estimated weight, body measurements, and other pertinent data will be collected for each animal.

IV. Monitoring Radio-Equipped Deer

- A) Attempts will be made to monitor each deer at least 5 times per week while deer remain within the study area. Once deer have dispersed to wintering areas monitoring at least 2 times per week should suffice until animals return to the study area.
- B) Intensive monitoring to and from wintering areas will be conducted to define migration corridors and migration periods.
- C) Periodic aerial telemetry may be required if deer are widely dispersed. Flights have been coordinated with the California Department of Fish and Game personnel and other studies being conducted within the area (Tom Kucera).
- D) Deer locations will be determined using standard methods of triangulation from at least two locations.
- E) Compass bearings of transmitter locations will be obtained from known landmarks. Each bearing will be placed on clear acetate, and overlaid on a U.S.G.S. 7½ minute quadrangle topographic map (scale 1:24000) and 1:500 aerial photographs supplied by O'Connor Associates.
- F) Deer identification, date, quadrangle name, reference points, and deer activity (if observed) will be placed

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Methods and Materials (continued Monitoring)

on each acetate overlay. One (1) overlay will be utilized for each deer location.

- G) Monitoring will be attempted equally during the following periods: 0900-1500, 1500-2100, 2100-0300, and 0300-0900.
- H) Attempts will be made not to disturb deer during monitoring.
- I) Visual sightings of any deer within the study area will be noted and mapped in the same manner as radio-telemetry locations. Activity, time, date, sex and age (if possible), and collar number or identification number (if marked) will be recorded.
- J) Emergence date and locations of fawns will be recorded in the same manner.

V. Censusing

A) Pellet group transects

- 1) Transects consisting of a minimum of 10 1/100 acre circular plots (11'9") every 66 feet will be utilized to estimate habitat utilization and estimate deer populations.
- 2) Transects will be established randomly within the proportions of habitat types present within the study area.
- 3) Pellet group transects will be counted once each month, as snow conditions allow.
- 4) Deer-day use will be calculated by multiplying the total number of pellet groups in ten plots by ten, then dividing by thirteen pellet groups per day.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Methods and Materials (continued Censusing)

- 5) Pellet groups will be destroyed after each sampling.
- B) Track counts
 - 1) Transects will be established in areas suspected as migratory corridors and along borders of the study area. During migration, tracks will be counted at least every third day or sooner until migration ceases.
- C) Lincoln index
 - 1) All observations of deer within the study area will be recorded. This will yield a ratio of marked deer to unmarked deer. Radio-telemetry marked deer will only be counted if they are observed prior to radio location.

VI. Mapping

- A) Each deer location will be described utilizing the Universal Transverse Mercator Grid (UTMG) system (Edwards, 1969). Error polygons will be determined, and the center of the error polygon will correspond to the UTMG coordinates.
- B) The following attributes will then be recorded for each deer location: 1) elevation, 2) slope, 3) aspect, 4) canopy closure, and 5) Wildlife Habitat Relationship type (WHR). Topographic, vegetation and aerial photographic maps will be utilized to determine characteristics. If more than one habitat type (WHR) occurs within the error polygon, the area of each habitat type will be visually estimated and assigned a value in tenths. The total of such values for that observation will equal 1.0.

SHERWIN MOUNTAIN DEER STUDY PROPOSAL

Methods and Materials (continued Mapping)

- C) Habitat selection or preference will be determined by comparison of the habitat utilization and the habitat availability. Preference indices (ranging from -1 to +1) and confidence limits will be calculated by methods described by Strauss (1979).
- D) Daily ambient temperature, rainfall (snowfall) and barometric pressure will be recorded, plotted against time, and correlated with deer movements and migration timing.
- E) Deer locations and critical (preferred) habitats will be plotted on topographic maps and compared with maps containing proposed ski runs and facilities.

Results

- I. Consultant agrees to furnish a progress report dated 31 December 1984 to all concerned agencies and private individuals (U.S. Forest Service, California Department of Fish and Game, Mono Board of Supervisors, Inyo/Mono Fish and Game Advisory Commission, and funding party, O'Connor Associates, etc.).
- II. Consultant agrees to furnish a final report dated 31 December 1985 to all concerned agencies and private individuals.

Note: The terms of this study proposal are from 1 January 1984 through 31 December 1985.

ECOLOGY AND PRODUCTIVITY OF TWO EASTERN SIERRA DEER HERDS

Rocky Mountain mule deer (Odocoileus hemionus hemionus) are a conspicuous component of the fauna of western North America, and are one of our most important game animals. In California, this subspecies occurs from the crest of the Sierra-Cascade axis eastward, from Oregon to the southern Sierra Nevada (Dasmann 1958, Wallmo 1981). Typically, these deer are migratory, spending summers at high elevations and moving down in winters. California hunting regulations pertaining to Rocky Mountain mule deer have almost exclusively restricted hunting to bucks only (Calif. Dept. Fish and Game 1956-77), primarily for reasons other than biological (Dasmann et al. 1957). Consequently, sex ratios of adults are heavily skewed toward females, with ratios of 5 to 20 bucks per 100 does commonly reported (Calif. Dept. Fish and Game 1956-77). Productivity of these herds typically is low, as shown in low spring fawn-doe ratios of 20-50 fawns per 100 does and low harvests.

Further, little is known of the summer ecology and migratory patterns of many of these deer herds. They are easily observed while concentrated on the winter range, but when they migrate to high altitudes in summer, they are much less observable. Management concern has focused on winter range quality, at least in part because of its ease of access and the belief that herd survival and productivity are mainly a function of the forage on the winter range.

Less attention has been paid to the importance of summer range to meet nutritional needs of does during late gestation and lactation, or to meet antler-growth and fat-depositional needs of bucks, although there are notable exceptions (Julander et al. 1961, Salwasser 1976). In Utah,

Julander et al. (1961) found that deer from a herd with poor summer range weighed 60 to 90 per cent less than deer with good summer range; also, ovulation rates were two-thirds lower, and yearling does rarely bred. In northeastern California, Salwasser (1976) attributed a sharp decline in productivity of the Devil's Garden deer herd to poor spring and summer nutrition. These investigations emphasize the fact that summer and fall range is at least as important as winter range in determining the performance of deer herds.

Another topic which is receiving increased attention in cervids is niche separation between the sexes (Clutton-Brock et al. 1982). With Rocky Mountain mule deer it is simply not known how the different "strategies" of the two sexes result in different patterns of habitat use, diets, migration timing, etc. Knowledge of this type is important scientifically, as well as for management in order to identify habitats, forages, or other components of the environment important to either of the sexes which may not usually be considered.

OBJECTIVES

The purpose of the proposed project is to study reproductive parameters, movements, habitat use and diets of two migratory herds of Rocky Mountain mule deer with the following objectives:

1. To describe the extent and quality of summer and winter ranges, patterns of habitat use within them, and migratory routes between them, emphasizing differences between the sexes.
2. To identify bottlenecks in productivity are by investigating reproductive status of females collected on the winter range and patterns of fawn survival based on composition counts throughout the year.

3. To determine herd size and composition in winter.
4. To establish baseline information in anticipation of an experimental density reduction in one herd via an antlerless hunt (assuming approval) in the winter of 1984-85.

STUDY AREA

The two herds to be studied are the Buttermilk and Sherwin Grade herds, which winter on adjacent ranges at the base of the eastern escarpment of the Sierra Nevada just west and northwest, respectively, of Bishop, California, in Inyo and Mono counties. Both have been of concern to wildlife managers because of low buck:doe and doe:fawn ratios and poor hunter success for more than a decade, and may be thought of as typical "stagnant" mule deer herds. Although popular with hunters, these herds are poorly known ecologically, and management has been based more upon intuition and tradition than solid knowledge.

METHODS

My first objective, to determine the extent and quality of summer and winter ranges, patterns of deer use within them and migratory routes between them, will be aided by the use of radio-telemetry equipment to be purchased by the U.S. Bureau of Land Management (BLM). These 20 radio collars, plus a number of marking collars to be supplied by the California Department of Fish and Game (DFG), will be placed on deer of both sexes in January, 1984, with the assistance of DFG personnel. By frequently locating the radioed animals as well as observing the marked animals, I can define their movements and the extent of the winter and summer ranges. Habitats in which these animals are found will be described physically and floristically. Deer will be located in the High Sierra summer range using fixed-wing aircraft provided by DFG, and subsequent collection of habitat and dietary information will be made on backpack trips to those locations.

Fecal pellets will be collected at least monthly for later microhistological and chemical analysis to determine diet composition and quality (crude protein) (Sparks and Malachuk 1968, Kie et al. 1980). Samples of rumen contents will be taken from deer collected on the winter range under permit from DFG and when possible from hunter killed deer to allow more accurate analysis of dietary composition and quality (McInnis et al. 1983, Klein 1962, Kie et al. 1980). Comparisons of diet composition and quality will be made between herds, sexes and seasons. Changes in condition of deer collected through the course of winter will be determined by the kidney fat index (Riney 1955). From these movement, habitat and nutrition data, management recommendations regarding habitat improvement projects, hunting regulations, and the impacts of housing developments, livestock grazing and proposed ski developments can be made to ensure the long term health of these herds.

The second objective, to establish how productivity is being limited, will be accomplished by examining reproductive tracts of up to 20 does to be collected monthly while the deer are on the winter range. Ovulation and embryo rates (Cheatum 1949, Kirkpatrick 1980) will be determined, and this information, combined with a complete census of the herds (see below), will give an estimate of the total number of fawns dropped. Monitoring of radioed does and their fawns will give an estimate of summer fawn mortality, as will a composition count soon after the animals return to the winter range. This will be compared to a late winter count to determine winter mortality, thus giving a complete account of annual fawn survival patterns and recruitment into the population.

The third and fourth objectives will be met with the help of DFG which has promised helicopter as well as fixed-wing aircraft time to conduct a

total census and composition count of these two herds. The concentration of the deer in a small area of the sagebrush-grassland winter range makes a total census possible; 2,962 deer were counted on the Buttermilk range in January 1983 by DFG. Over the past 17 years the buck:doe ratio in this herd has averaged 17:100, and the fawn:doe ratio has averaged 40:100 (DFG files). It can be hypothesized that both herds are at carrying capacity (McCullough 1979). The relatively few bucks removed annually by hunters do not reduce deer numbers sufficiently so that increased availability of food can be translated into increased recruitment (Caughley 1976, McCullough 1982). This hypothesis can be tested through an experimental reduction of deer density by an antlerless hunt in one of the herds. The prediction is that in the herd with lowered density, twinning rates, yearling breeding, fawn survival, etc., will increase, resulting in a higher rate of recruitment and a greater number of recruits joining the population. This greater addition to the herd is what both hunters and wildlife managers mean when they say they want increased productivity in a herd. These density-dependent effects have been speculated for years (Leopold et al. 1951, Longhurst et al. 1952), and have been demonstrated empirically in white-tailed deer (O. virginianus) (McCullough 1979). Evaluation of the results of this density reduction can be made by comparison to the pre-reduction condition in the same herd, and to the adjacent, unmanipulated herd.

The difficulties involved in getting approval for such a density manipulation make this aspect of the study uncertain, and therefore it is not the major focus of the work. However, this is the ideal situation, both biologically and physically, for a well controlled and monitored, precisely managed antlerless hunt. DFG biologists have identified these two herds as the most appropriate for such a hunt, and the results would have important

implications for the management of many of our deer populations.

This study is to be used as a Ph.D. Dissertation in Wildland Resource Science, University of California, Berkeley. Results will be published in scientific literature such as the Journal of Wildlife Management, Ecology, etc.

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TOTAL ESTIMATED BUDGET FOR THE STUDY

	<u>1984</u>	<u>1985</u>
<u>Salaries</u>		
Principal Investigator (12 mos. @ \$600/mo.)	7,200	7,200
Research Assistant (8 mos. @ 400/mo.)	3,200	3,200
<u>Travel</u>		
Pickup truck for field use	3,000	3,000
Two round-trips to Berkeley	320	320
<u>Equipment</u>		
Radio-telemetry equipment	7,500	—
Collections and misc.	500	500
<u>Services</u>		
Helicopter	3,600	3,600
Laboratory analyses	1,260	1,260
Computer	300	300
Misc. Office Services	200	200
	<hr/>	<hr/>
TOTAL	\$ 27,080	19,580
Amount already promised	14,100	6,600
Amount to be obtained	12,980	12,980

BUDGET JUSTIFICATION

1. Salary for the Principal Investigator is about equal to a half-time graduate research assistant at the University of California. Salary for the Research Assistant is for 8 months: help for 4 months in the winter will be needed with collecting and processing animals, locating radioed animals, etc., and help for 4 months in the summer will be needed to locate animals on the summer range, and to collect habitat and diet information.
2. The estimated cost of the truck is based on 10,000 miles @ \$0.30/mile; the truck is to be provided by BLM. Two round trips to Berkeley for the

Principal Investigator are estimated at 800 miles/trip @ \$0.20/mile.

3. Equipment includes the radio-telemetry equipment at a cost of \$7,500, which will be provided by BLM. An additional \$500/yr is needed for collection equipment (containers, formalin, etc.), notebooks, film, miscellaneous office equipment, etc.

4. Services include helicopter time for census work (12 hrs @ \$300/hr) to be provided by DFG. The amount of summer fixed-wing time is yet to be determined. Additional services needed are laboratory analyses of rumen and fecal material (60 diet composition samples (composited by sex, month and herd, with additional collected animals) @ \$15/sample, and 60 diet quality samples @ \$6/sample), computer time for data analysis, and miscellaneous office services such as typing and xeroxing.

AMOUNT REQUESTED FROM MZURI SAFARI FOUNDATION

A total of \$4,000 is requested from the Mzuri Safari Foundation to cover four months of Principal Investigator's salary @ \$600/mo. and four months of Research Assistant's salary @ \$400/mo.

OTHER RESOURCES AND FUNDING

The U.S. BLM is providing 20 radio collars, a receiver, antenna, etc., for use on the project, as well as the use of a pickup truck. DFG is providing personnel to trap and collar the deer, and helicopter and fixed-wing time to census and relocate them. The value of these services and equipment is \$14,100.

An application was made on 30 Oct. 1983 to the Boone and Crockett Club for a Grant-in-Aid in the amount of \$3300 for 4 months of the Principal Investigator's salary and part of the laboratory analysis of rumen and fecal material. Requests will be made to other organizations for additional support.

PRINCIPAL INVESTIGATOR

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Education

Ph.D. Student, 1981-present (Wildlife Biology), U.C. Berkeley
M.S. 1976 (Wildlife Management), The University of Michigan
B.A. 1969 (Psychology, Zoology), Western Michigan University

Employment

Professional:

Wildlife Biologist, July-Aug. 1981, E. Linwood Smith & Assoc., Tucson AZ.
Raptor Research Biologist, Feb. 1979-June 1981, U.S. BLM, Boise ID.
Consultant on the Conservation of the Camelidae in Bolivia, Jan.-Feb. 1981,
UNESCO, Paris.
Wildlife Biologist, May-Sept. 1978, U.S. Forest Service, Portland OR.

Academic:

Research Assistant, 1982-83, Black-tailed deer project, Hopland Field
Station, California.
Teaching Assistant, 1981-82, Wildlife Biology, and North American Game
Birds and Mammals, U.C. Berkeley.

Publications

Kucera, T.E. 1978. Social behavior and breeding system of the desert mule
deer. *J. Mammal.* 59:463-476.
Kucera, T.E. 1982. How mule deer mate in Texas. *Natural History* 91(6):50-
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Guenther, K. and T.E. Kucera. 1978. Wildlife of the Pacific Northwest:
Occurrence and Distribution by Habitat, BLM District and National
Forest. USFS Region 6 Special Publ. No. 6, Portland OR.
Kucera, T.E. (in prep.) Bolivia, Aymara, Vicuna.
Dennis, A. and T.E. Kucera. (in prep) Diets of sympatric vicunas and
alpacas in Bolivia.

Memberships

The Wildlife Society, The American Society of Mammalogists, The American
Association for the Advancement of Science, The National Wildlife
Federation, The American Museum of Natural History