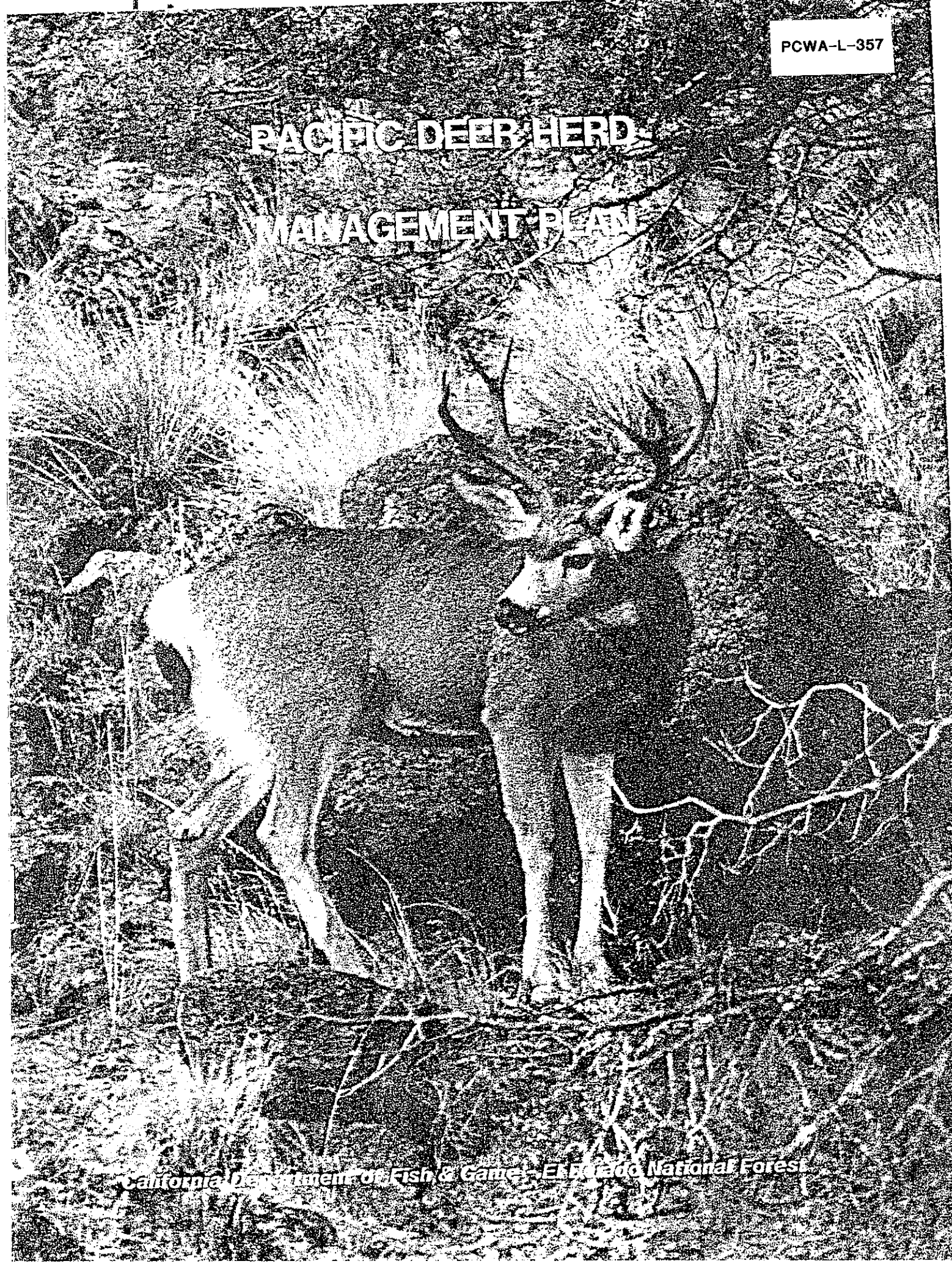
PCWA-L-357

PACIFIC DEER HERD MANAGEMENT PLAN



California Department of Fish & Game - El Dorado National Forest

THE PACIFIC DEER HERD

MANAGEMENT PLAN

Prepared July 1981

by

Daniel Hinz
Wildlife Biologist

Under the Supervision

of

D. E. Beauchamp
Associate Wildlife Biologist

and

W. H. Griffith
Wildlife Management Supervisor

California Department of Fish and Game
in Cooperation with the
Eldorado National Forest

Approved

Forest Supervisor
Eldorado National Forest

10-13-82
Date

3 Nov 1982

TABLE OF CONTENTS

TABLES

FIGURES

I. INTRODUCTION

Deer herds in most of California exhibited serious long-term declines during the late 1960's and early 1970's (Longhurst, et al. 1978). The Department of Fish and Game developed a statewide plan in 1976 designed to address the problem. In 1977 emphasis was added to the program by legislative mandate (AB 1521). A new Deer Management Policy was subsequently adopted by the Department and the Fish and Game Commission. It specified: 1) planning for deer management on a herd basis, 2) specific program elements be included in each plan, and 3) herd plans generally conform to the goals of the statewide plan.

This document complies with the legislative mandate and policy commitment. The plan includes: 1) a description of the deer population and the physical environment which constitutes its range and habitat; 2) management unit goals; 3) problems and potential solutions; 4) management programs, objectives, and recommended prescriptions; 5) alternatives; 6) selected references, and 7) an appendix containing supporting information. The plan is dynamic and subject to change, as new information is gathered. Periodic review and updating are an integral part of the plan.

The Pacific deer herd encompasses all of the Pacific Ranger District of the Eldorado National Forest. Portions of the herd overlap onto the Georgetown and Placerville districts. Falling within the Eldorado National Forest are scattered private holdings owned primarily by Michigan-California Lumber Company. Trespassing has been forbidden since 1976 on all Michigan-California lands. These scattered private holdings within the National Forest complicate potential habitat improvement and have altered harvest patterns.

II. DESCRIPTION OF THE DEER HERD MANAGEMENT UNIT

A. Deer Herd Definition and History

1. Herd Description

The Pacific deer herd is located on the western slope of the Sierra Nevada Mountains in central California (Figure 1). Two subspecies of mule deer inhabit this range, Columbian blacktail (Odocoileus hemionus columbianus) and California mule deer (O. h. californicus). The California mule deer is the subspecies found primarily within the Pacific deer herd.

The Pacific deer herd occupies a range of approximately 353 square miles of public and private lands within El Dorado County and that portion of Placer County lying south of the Rubicon River. Public land lies within the boundaries of the Eldorado National Forest. The majority of the deer herd are migratory and inhabit an area west of the Sierra Nevada crest. It is bordered by the Rubicon River on the north and the South Fork of the American River on the south. Longhurst et al. (1952) felt the herd extended south of the South Fork of the American River above the Silver Fork. Recent telemetry studies (Fary and Beauchamp, 1976) indicate that while some deer may interchange along the South Fork of the American River, the Pacific deer herd basically inhabits the area north of the South Fork of the American River. The western boundary is generally along a north-south line above 2,500 feet in elevation between Placerville and Georgetown. They share parts of their winter range with resident deer from the Placerville deer herd.

2. Herd Condition

The physical condition of individual deer in the herd appears to be fair to poor. The only information available is from a small collection of five animals made ten years ago from one location and, therefore, cannot be used to rate the whole herd ten years later. Recent observations at check stations reveal deer to be in fair condition. However, in March 1971 five deer, three does and two bucks, were collected from Peavine Ridge. The collection was an initial effort to assess the

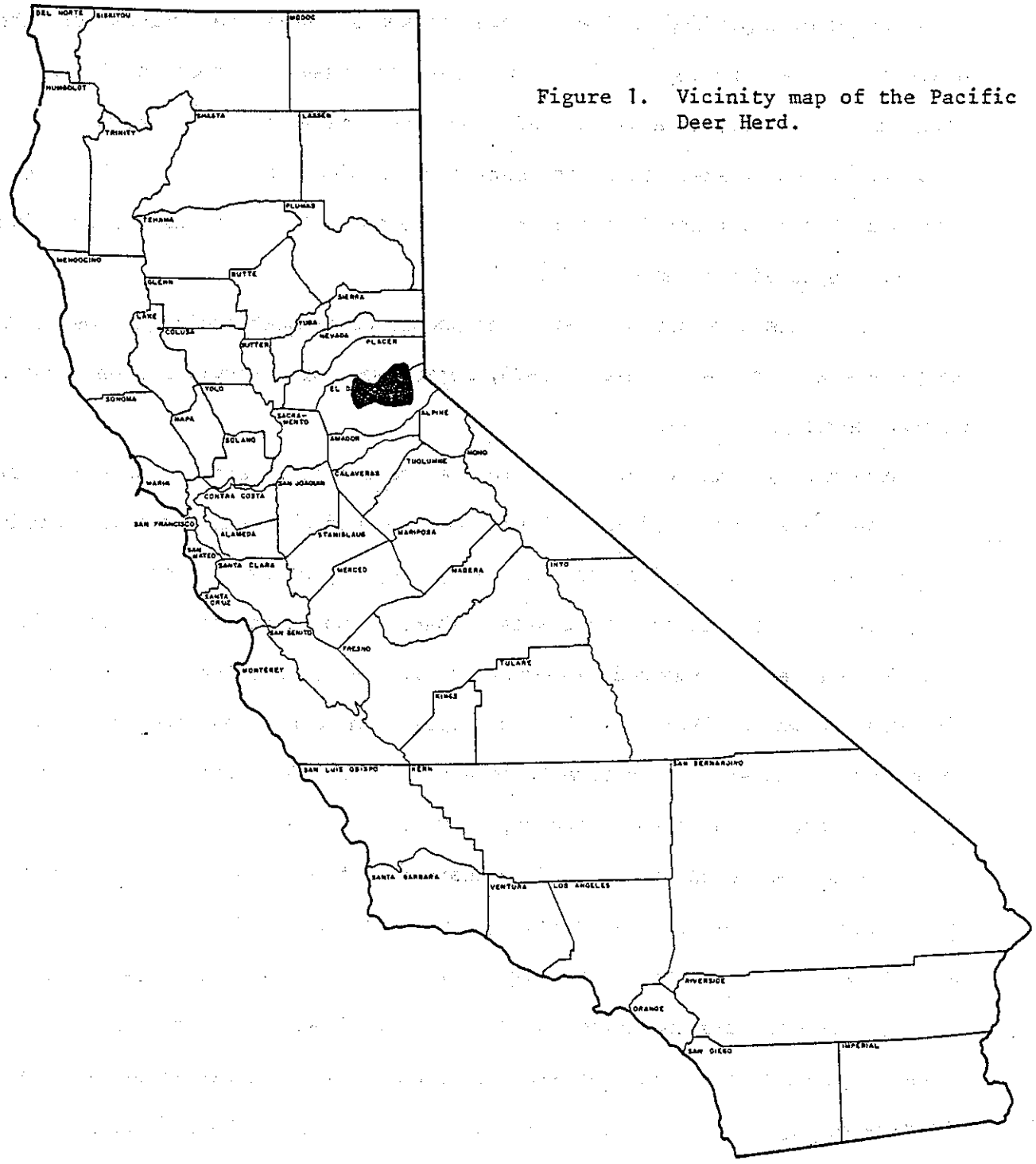


Figure 1. Vicinity map of the Pacific Deer Herd.

herd's general health, food habits, and reproductive condition (Table 1). Such a small sample could not be expected to produce statistically valid results.

The amount of fat was visually estimated by categories; heavy, medium, light or none, depending on the average thickness. Numerical values were then assigned for each rating ranging from three for "heavy" to zero for "none". The total of the numerical values of each body area (mesenteries, kidneys, heart, rump, ribs, and brisket) is an indication of physical condition: 18 being excellent; 12, good: 9, fair; 6, poor; and 0, very poor. The ratings for the five animals collected are shown in Table 1.

Field dressed weights averaged ten pounds below what could be expected on adequate winter range (Brunetti, 1976, pers. comm. with Fary), another indication of poor physical condition.

High fawn mortality exists within the Pacific deer herd. A question arises as to when this occurs and why. Adult does in good physical condition should produce twin fawns. If does are stressed, they may carry only one fetus to full term; although it will be normal size. There is no recent reliable reproductive data on this herd. Expected reproduction rates vary from 144 to 176 fawns per 100 does (Browning, 1973). Fall herd composition counts resulted in 40-50 fawns per 100 does. A significant decrease in six months following fawn drop. If major losses occur before fawn drop (as found by Salwasser (1974) on the North Kings deer herd), this would indicate nutritional deficiencies of the doe; but if the major loss occurs following fawn drop, an additional set of circumstances could be responsible for fawn mortality. This should be established.

The five animals collected in 1971 were examined for the presence of disease and parasites. No diseases were found. External parasites included ticks (Dermacentor sp.). Four animals had larval nose bots (Cephenemia sp.); two had hydatid cysts (Echinococcus granulosus), and four had cysts of the canine tapeworm (Taenia hydatigena). No physical detriment was observed.

TABLE 1

BIOLOGICAL DATA FROM DEER COLLECTED
FROM THE PACIFIC DEER HERD

Sex	Age	Weight (Dressed)*	Condition**	Embryo
F	Yearling	57	3.5	M
F	3+	52	1.5	MM
M	4+	62	0	-
F	7+	63	.5	M
M	8 Months	35	0	-

*Stomach and intestines removed.
**Condition Index
0 Very Poor
6 Poor
9 Fair
12 Good
18 Excellent

Data collected on March 9, 1971.

3. Population Size

Population size of the Pacific deer herd was estimated using a method developed by Sellick-Hart based on change-in-ratio using herd composition counts and harvest data. Adequate sample sizes of herd composition counts were not available in all years. To allow for this, a rolling three-year average of herd composition counts was used. Correction for unreported kill and crippling loss is built into the population estimates. Population estimates are shown in Appendix 4.

During the last 20 years, the early seventies showed a decline with the lows in 1973 and 1974. A significant increase was shown in 1975-77 but was offset by a decrease in 1978 and 1979, apparently in response to the drought during 1976 and 1977.

4. Deer Harvest

The reported legal buck harvest (Table 2) shows a large flucuation from 1956 to present. The harvest peaked from 1960 through 1966, then gradually declined to the low years of 1973 through 1976 and has increased during the last four years.

The average buck kill during the sixties was 340, while the average during the seventies was 200. Years of highest buck harvest generally had high population estimates and were generally preceeded by a year with high fawn survival.

In 1956, 252 antlerless deer were taken (Table 2) during the last three days of the regular buck season. Spring fawn-doe ratios were the highest ever recorded in 1957 through 1959. In 1960 through 1972, except for 1968, regulated antlerless hunts were conducted within the Pacific deer herd. Peak harvest occurred in 1966 (248) and a low in 1972 (83), with an average of 131. The spring fawn-doe ratios continued to remain in the 50's and 60's, except for a 48F/100D in 1968.

5. Herd Composition Data

Since 1956, composition surveys have been conducted each fall and spring

TABLE 2

PACIFIC DEER HERD
DEER HARVEST
1956-80

Year	Bucks	Antlerless
1956	224	252
1957	199	---
1958	158	---
1959	272	---
1960	537	96
1961	426	144
1962	275	131
1963	240	106
1964	379	152
1965	238	103
1966	419	248
1967	154	111
1968	210	---
1969	284	109
1970	285	90
1971	260	104
1972	256	83
1973	173	---
1974	167	---
1975	183	---
1976	204	---
1977	318	---
1978	239	---
1979	279	---
1980	234	---

(Table 3). The buck carryover has averaged 32 per 100 does with a high of 48 in 1960-61 and a low of 9 in 1964-65. The nine was probably not representative of the true ratio since both the previous year and following year were both much higher. The count may have been made following the rut when bucks leave the does (Geist, 1981).

The fawn/doe ratio measured in December herd composition surveys indicate 60-70% loss of fawns during the first six months; assuming a potential birth rate of 170 fawns/100 does (Bischoff, 1958). This loss is similar to other western Sierra herds (Salwasser, 1974), including the North Kings (Salwasser, 1978 and Rail Road Flat (Wernette, 1980). Another 20% are lost during the winter between December and March.

To maintain a high buck harvest, it is necessary to maintain high fawn survival. In general, there is a lag time of two years between the time a male fawn is born and when it attains legal antler status for harvest (forked-horn). The years of high buck harvest have generally been preceeded by high spring fawn/doe ratios. For example, 1960 had the highest buck kill recorded at 537 animals, and the 1959 spring fawn/doe ratio; fawns born during the summer of 1958, was the highest ever recorded. The average spring fawn/doe ratio from 1957 through 1966 was 72, and the average from 1967 through 1980 was 51. The last four years, the spring ratio has averaged 35 fawns per 100 does.

6. Herd Migration

A trapping and tagging program was initiated in February 1976 and continued through January 1977. Trapped deer were ear tagged, and eight does were equipped with radio collars. Does were monitored for approximately one year. Migration corridors, holding areas, and summer ranges of deer wintering at Mosquito, Poho Ridge, and Telephone Ridge were identified (Fary, 1976) (Figure 2).

a. Mosquito Area

Three deer wintering in the Mosquito area were trapped and collared (Ap-

TABLE 3

PACIFIC DEER HERD COMPOSITION DATA
1956-1981

Year	Fall Bucks/100 Does/Fawns		Spring Fawns/100 Does	Number Classified Fall	Spring
1956-57	33	66	66	66	66
1957-58	33	77	108	144	183
1958-59	36	92	148	483	159
1959-60	36	97	56	286	266
1960-61	48	56	43	314	369
1961-62	28	53	45	190	344
1962-63	41	35	42	167	251
1963-64	27	76	94	134	300
1964-65	9*	47	57	332	186
1965-66	43	59	64	154	165
1966-67	25	50	59	347	125
1967-68	46	37	38	179	115
1968-69	28	78	48	124	370
1969-70	24	90	66	90	244
1970-71	35	67	66	111	238
1971-72	33	59	43	185	150
1972-73	31	43	48	191	438
1973-74	26	55	50	174	188
1974-75	30	61	60	252	186
1975-76	37	85	70	133	183
1976-77	35	53	57	224	201
1977-78	19	47	42	155	102
1978-79	37	35	37	102	179
1979-80	21	53	28	101	208
1980-81	29	45	34	168	319

*Late count, not reliable

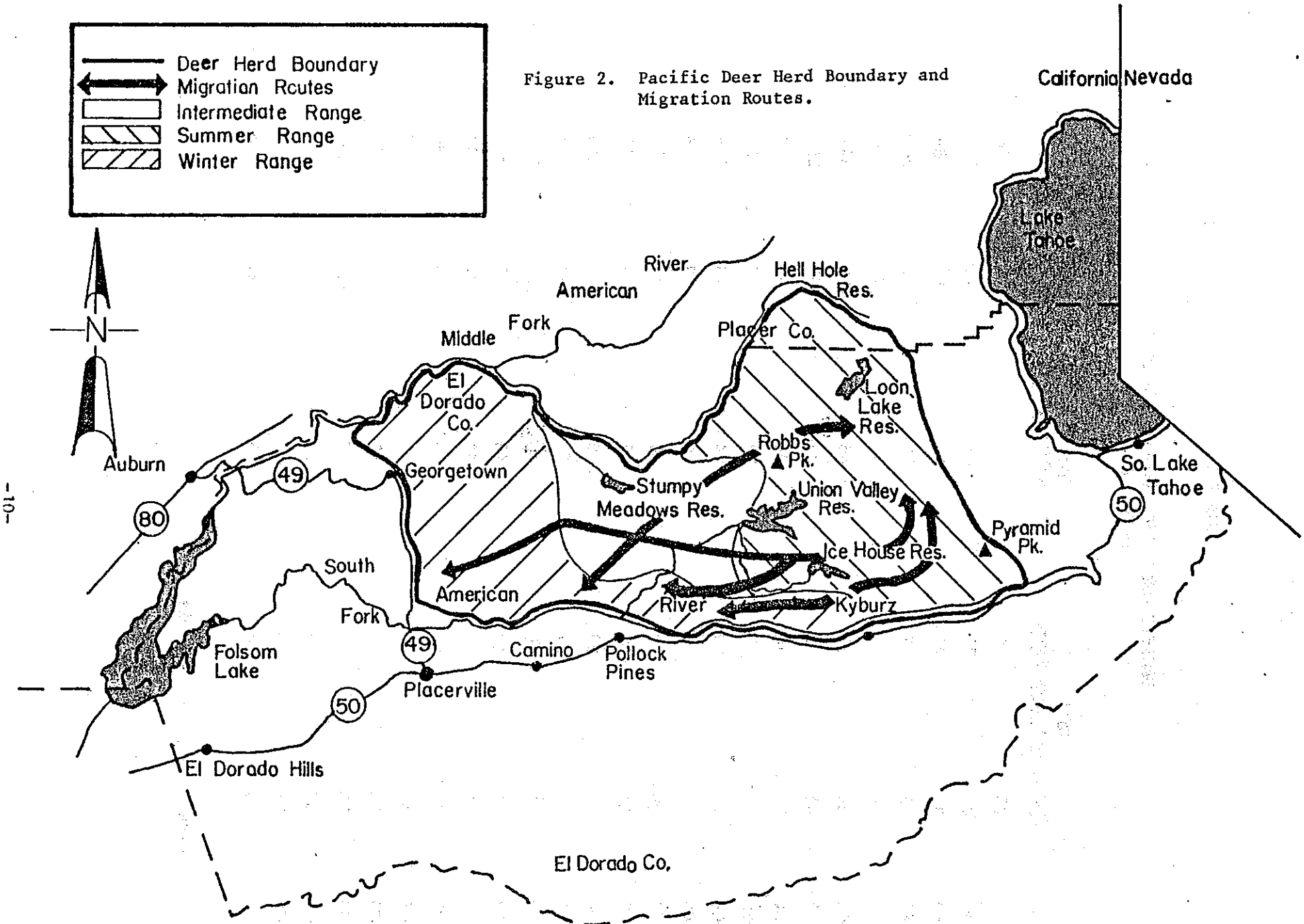


Figure 2. Pacific Deer Herd Boundary and Migration Routes.

pendix 12). They began their spring migration the first week of May and traveled northeast towards Pino Grande then easterly to Big Hill, south of Union Valley Reservoir. They summered in the vicinity of Pearl Lake and Slick Rock arriving the middle of June. Fall migration started the last week of October and the first week of November. Deer returned to the winter range by just reversing their spring migration route.

b. Telephone Ridge Area

Five deer were trapped and collared on Telephone Ridge (Appendix 12). Two radio collars ceased to function before spring migration was completed. Three collared deer were followed to the summer range and back to the winter range. Spring migration began about May 10. These deer used a spring holding area in the vicinity of Wilson Ranch, southeast of Wrights Lake. They arrived on the summer range in the vicinity of Pearl Lake between June 20 and July 1. They began fall migration approximately October 20 and began arriving on the winter range the second week of November and continued through December following the same route as the spring migration.

c. Poho Ridge Area

Two deer were trapped in the winter (February) of 1977 and fitted with radio collars on the winter range of Poho Ridge (Appendix 12). One deer was apparently a resident and did not move from the vicinity of the trap site.

The second deer began the spring migration May 13 traveling through Silver Hill towards Robb Peak. The deer stayed in Robbs Valley through June 20 then summered in the vicinity of the Van Vleck Ranch and left on the fall migration October 15 and arrived back at Poho Ridge the middle of November.

B. Herd Range and History

1. Landownership

Seventy-two percent of the summer range is within the Eldorado National Forest. The remaining 28% is privately owned. Ownership of the intermediate range is mixed with 51% managed by USFS and 49% by private land holders. The two major

private landowners in the summer and intermediate range are Michigan-California Lumber Company and Southern Pacific Land Company. Sixty-four percent of the winter range is on National Forest lands with the balance privately owned (Table 4). Two subdivisions within the winter range have reduced total winter deer range and has had a direct impact on deer numbers. The Swansboro County Subdivision in the Mosquito area and the Blairs Mill Development on Telephone Ridge altered approximately 2,800 acres (4.5 sq. miles) of prime winter deer range. Buildings, roads, human intrusion, and dogs have directly reduced the value of these two areas for deer.

East of Georgetown an 11,000 acre agricultural preserve under the Williamson Act expired in 1980. Of this 11,000 acres, 2,300 acres owned by Southern Pacific Land Company is a Timber Production Zone; the remaining land has been zoned for 5 to 160 acre parcels. General residential development on private lands is occurring on historical winter range at the 1500-3000 foot elevation resulting in a reduction of viable winter range. Deer are forced to winter on less area and at higher elevations which becomes significant in winters with "heavy snows" and are subject to harassment from human activity and by dogs during the winter stress period.

2. General Climate

The Sierra Nevada Mountains form a barrier that uplifts moist air from the Pacific Ocean and causes most of the average annual precipitation to fall on the western slopes above 4,000 feet. It is common to have a 20-30 foot snow pack at the summit. Average precipitation varies from 30 inches in the low elevation winter range to over 55 inches in the high elevation summer range (Appendix 5). Dry summers are characteristic of the entire area. There is little rainfall from June through October. Thundershowers, however, provide occasional moisture at elevations above 6,000 feet.

TABLE 4

LANDOWNERSHIP WITHIN THE PACIFIC DEER HERD

	USFS		Private		
	Square Miles	Percent	Square Miles	Percent	Total
Summer Range	111	72	43	28	154
Winter Range	48	64	27	36	75
Intermediate Range	63	51	61	49	124
TOTAL	222	63	131	37	353

3. Early History

Early records indicate that California Indians of the Washoe and Maidu groups used the Pacific deer herd range. Deer were used by these people for food and skins. This limited harvest probably had little effect on deer populations. However, fires set by the Indians helped influence the range by setting back vegetation from a climax to successional stages, thus favoring the deer herd (Leopold, et al. 1951). The burning by Indians was primarily at low elevations on winter ranges and very little, if any on summer ranges.

Historical evidence on the relative abundance of migratory deer in the high country is limited. Leopold et al. (1951), in a review of pioneer journals, speculated that deer were less numerous in mountains than in the foothills. Today the migratory deer are relatively numerous, while the resident foothill deer are less abundant.

In 1849, deer were fairly common in the mother lode country. However, the gold rush brought about drastic long-term changes in the deer ranges and deer herd of the central Sierra. Deer numbers were reduced by extensive hunting to supply the mining camps with meat (Longhurst et al. 1952).

4. Seasonal Ranges

a. Winter Range

The winter range lies mainly on south facing slopes between 2,000 and 4,500 feet. The major browse species is deer brush (Ceanothus intergerimus). The Ice House fire of 1959 resulted in abundant and dense stands on the upper winter range, much of which is now overgrown and unavailable. Other important but less abundant browse species include: buckbrush (Ceanothus cuneatus), California black oak (Quercus kellogii), and the mast of California black oak and canyon oak (Q. chrysolepis). Dense stands of mountain misery (Chamaebatia foliolosa) dominate the understory on south slopes. Ridge tops, north facing slopes, and protected areas support conifers such as ponderosa pine (Pinus ponderosa) and Douglas fir

(Pseudotsuga menziesii). Incense cedar (Libocedrus decurrens) and canyon oak represent the dominant vegetative overstory. Annual grasses, such as members of the genus Hordeum, Festuca, Avenea, and Bromus are abundant on open south slopes. Common forbs include: Filaree (Erodium) and clovers (Trifolium). Shrub species representative of the chaparral type are found in the lower elevations around Mosquito include: chamise (Adenostoma fasciculatum), yerba santa (Eriodictyon californicum), coffeeberry (Rhamnus californicus), toyon (Photinia arbutifolia), and interior live oak (Q. wislizenii).

b. Intermediate Range

The intermediate range is characterized by a pine-fir forest. The overstory is dominated by ponderosa pine and Douglas fir mixed with white fir (Aibes concolor), incense cedar and sugar pine (P. lambertiana). The shrub understory in areas opened by logging or fire is dominated by deer bursh, green leaf manzanita (Arctostaphylos patula, bittercherry (Prunus emarginata), and mountain whitethorn (Ceanothus cordulatus). Some broad leafed trees, such as alder (Alnus sp.), dogwood (Cornus sp.), big leafed maple (Acer macrophylum), and willows (Salix sp.) are found along water courses and protected slopes. Black oak is the most common oak within the pine-fir forest. On recently logged areas, forbs and grasses invade the sites in the first few years following logging but are eventually crowded out by shrubs and young trees.

The intermediate range generally extends from 4,000 to 6,000 feet in elevation and is used primarily during periods of spring and fall migration. Terrain consists of a series of east-west parallel ridges used as migration routes. The most notable of these are Peavine, Poho, and Telephone ridges. Most of the forest within this zone has been logged and is in various stages of succession.

c. Summer Range

The summer range lies generally above 5,000 feet. At higher elevations, the sedimentary soils give way to granitic and lava-capped soils resulting in differences in vegetative composition. The pine-fir forest gradually changes to the red fir forest made up of red fir (Abies magnifica), lodge-pole pine (P. contorta), and white bark pine (P. albicaulis). The canopy thins out at higher elevations and changes to a sub-alpine vegetative composition above 8,000 feet.

The principal shrubs and forage species are mountain whitethorn and bittercherry on the lower margins and huckleberry oak (Q. vaccinifolia), snowberry (Symphoricarpus albus), creambush (Holodiscus discolor), sage-brush (Artemesia tridentata), and chinquipin (Castanopsis sempervirens) found in the upper elevations. In the deeper moisture soils of meadows, grasses and forbs are abundant and are important as forage and fawning habitat.

5. Livestock Grazing

During the gold rush era, livestock were introduced to provide food for the miners. At first, sheep and cattle were grazed in the foothills and valleys. Drought conditions in the late 1870's caused a shortage of feed and water in the Sacramento and San Joaquin valleys and adjoining foothills. These conditions forced stockmen to take their herds into the higher mountains in large numbers. Dairying was the major purpose of cattle on the Pacific Ranger District around the gold rush era.

Grazing restrictions and range management were unheard of until the establishment of the National Forests around the turn of the century. Even then grazing records were incomplete until 1915. The implementation of controls on range use reversed the trend of blatent over-utilization of the available forage. Recovery of the forage resources was a slow process, with

some critical areas, such as meadows and riparian areas, still in poor condition. Past activities and continued grazing have prevented full recovery.

Presently, there are five grazing allotments within the range of the Pacific deer herd (Appendix 10). All grazing is done by cattle. Forage utilization is controlled by regulating the number of AUM's and the length of use each season. No deferred or rest rotational grazing systems are used. On/off dates vary each year based on forage condition and range readiness. Drift fences are used in a few selected areas to further control movement of animals.

6. Logging Practices

Logging in the Pacific deer herd range started shortly after the discovery of gold in the mother lode area. Large quantities of lumber were used in construction. Wood was the main fuel used for domestic heating, cooking, and fueling the engines used in the gold separation process. As a result, forests were essentially cleared out near settlements for fuel. Trees for lumber and shingles were cut very selectively, taking only the best trees and often using only the unbranched portion of the trunk. These logs were hauled as far as twenty miles to the mills. This type of cutting probably did not significantly change the successional stage of the forest.

With the advent of railroad logging in the early 1900's, logs were more easily hauled from the forest. The amount of timber harvested increased, and vegetation changed. As a result, available forage and habitat capacity for deer on the winter and intermediate range were substantially increased.

During the period of 1940-70, increased mechanization led to increased selective cutting of large trees and salvaging dying trees. This method of harvest created few new foraging areas for deer because conifer canopy cover was retained, not allowing invasion of grasses and browse species.

Current management practices call for even-age management that are essentially clear cuts of 5-40 acres. This has a potential of being beneficial for deer, if these clear cuts are rotated so that as young conifers crowd out

browse species in one area, another area is cut. This has to be coordinated so that a short-term gain is not offsetting by a long-term loss if a monotype of 30-100 years conifer stands occur. In clear cuts, reforestation will include planting and spot spraying to reduce competition with browse species. Spot spraying can be beneficial if spraying is confined to 3-4 feet around the seedling with browse species in between left unsprayed.

7. Fire History

Fire is part of the natural process of vegetative succession in the lower portions of the herds range and, on certain aspects, at the higher elevations as well. Natural fires provided favorable deer habitat by reducing fuel loading, regenerating browse in brushland and timber areas, germinating preferred browse species, and creating openings in mature forests. Evidence indicates that fires occurred frequently at lower elevations but were limited in extent and intensity by available fuels and weather conditions.

After the area was settled, many more fires were purposely started by loggers and stockmen to clear land and encourage the growth of forage plants. These fires resulted in increased areas of nutritional early successional vegetation which were beneficial to deer.

Around 1900, an active attempt was begun to reduce the number and size of wild fires on forest lands. The prevention and supression programs have been very successful, and since 1970, few fires burn more than one acre before being controlled. This has resulted, however, in fuel accumulations which are much greater than in the period prior to 1900. When a fire is not controlled early, the wildfire is usually very intense and burns a large area. These generally start during dry hot weather in areas with high fuel loads. Large, intense wildfires are much less beneficial to deer than small, less intense wildfires or prescribed fires. Major fires within the Pacific deer herd range occurred in 1916, 1923, 1944, 1959, 1979, and 1981 (Appendix 11).

8. Range Improvements

Activities, such as logging, prescribed burns, fencing, meadow and spring improve-

ments, have resulted in improved range carrying capacity for deer; although their primary objective may not have been to benefit deer habitat. Projects, such as brush manipulation to create browse ways, prescribed burning, plantings of browse plants, grass seeding, water development, and meadow improvement, have been carried out and have been beneficial to deer. (Appendix 9).

9. Food Habits

The limited food habits information for this herd is from five animals collected on the winter range in March 1971. Rumen contents revealed that 62% by volume of food consumed consisted of mountain misery and 35% grasses. These findings correspond closely with samples collected from the Rail Road Flat deer herd (Browning et al. 1973) in March 1971 indicating volumes of 69% mountain misery and 27% for grasses. The high incidence of mountain misery in the diet, which has low nutritive value, suggests low availability of more desirable browse species. But mountain misery becomes a staple food source during the winter because of its availability and abundance. This small sample from one site has built-in biases. To determine specific herd food habits on other portions of the range and during other seasons requires a special food habits study.

C. Major Factors Regulating the Population

1. Human Factors

Man and his activities have had the major impact on the Pacific deer herd. The following activities influencing the deer herd during recent times are: a) direct loss of habitat by construction of homesites, reservoirs, roads, etc.; b) grazing practices; c) logging practices; d) fire suppression; e) recreation; f) deer kill, both legal and illegal; g) predation; and h) diseases and parasites.

a. Construction

Direct loss of habitat from construction of homesites has occurred primarily within the winter range, with the largest being Swansboro Country Subdivision

in the Mosquito area. Swansboro covers approximately 3.9 square miles (2,500 acres) that can account for approximately 5% decrease in the deer herd size.

At higher elevations in the summer range, construction associated with Union Valley, Wrights Lake, Loon Lake, Ice House, and Gerle Creek reservoirs have directly eliminated 8.1 square miles of fawning habitat. The acerage lost to reservoirs is proportionately more important than other portions of the summer range on a per-acre basis since they are associated with meadow lands that provide high quality habitat and used as key fawning grounds. In addition, migration routes and holding areas have been disrupted. A heavily used paved road from Highway 50 at Riverton to Loon Lake has increased human activity due to improved access which has contributed to road killed deer and increased potential for illegal kill.

g. Grazing Practices

Grazing allotments are administered by the Eldorado National Forest on National Forest land and Michigan-California Lumber Company land. There were five permittees on the Pacific Ranger District and one on the Georgetown Ranger District in 1980 (Appendix 10).

A meadow evaluation survey within the Pacific Ranger District of Eldorado National Forest was initiated in 1980, and it was found damage to meadows associated with overuse by livestock contributed to conifer encroachment, loss of grass vegetative cover, and bank destruction. Meadow areas are important as fawning areas for deer by providing escape cover in association with a nutritious food supply in the form of grasses, sedges, and forbs. Conifer invasion reduces the amount of forage available and bank erosion promotes stream erosion that results in a drier meadow which changes the vegetative composition. Damage to meadows by livestock may be caused from time of use, usually too early, as well as too many animals. Cattle also concentrate on fragile areas, such as willow stands, causing overuse.

On Poho Ridge, the USFS has opened dense stands of deer brush and manzanita by mechanical means. Concentrated use by livestock has been used as a management tool to maintain these stands for the benefit of deer.

c. Logging Practices

Newly logged areas provide conditions suitable for invasion of successional species browsed by deer. Presently, the management direction is for the USFS to manage for even-aged timber stands. Blocks of 5-40 acres of even-aged timber are clear cut, slash is piled and burned, then conifer seedlings are planted. During the 80-120 year rotation cycle before the stand is mature enough to clear cut again, there will be several thinning operations.

Conifer seedling planting rates in the mixed conifer forest are planted on 8 to 12-foot centers as required by the State Forest Practice Act (Hubbell, pers. comm.). This rate is based on 30% survival, but it is common with todays superior seedling stock to obtain 80-90% survival, thus requiring sooner thinning, and reducing the number of browse species that will be available. To reduce conifer-brush competition, chemical spraying is done either broadcast by air or spot spraying around individual seedlings. Spot spraying around each conifer seedling is much more beneficial in providing browse for deer.

Current direction for timber management on the Eldorado National Forest was established through 1987 by the timber management plan. This document sets harvest goals and provides that even-aged management will be the management system used on commercial forest lands. Top priority for harvest will be to clear cut under stocked stands and replant with nursery stock. U. S. Forest Service policy dictates that all timber sales activities will be covered by an environmental assessment document which is open to public review. This document must consider the affect of the proposed project on all resources, including wildlife. Deer are routinely considered in this assessment and modification in harvest activities may be made to benefit deer.

in critical areas, such as winter range, fawning areas, or holding areas. In many cases, the timber sale offers an opportunity to accomplish needed habitat improvement work for deer.

Michigan-California Lumber Company is the largest private timber producer within the range of the Pacific deer herd. Currently they selectively cut at a fairly high rate. About 80% of their holdings have been selectively cut and 20% clear cut. They are eventually going to manage all their lands for even-aged stands because of increased economic return (Alden, pers. comm.). After clear cutting in approximately 40-acre blocks, slash is piled and burned then the area is replanted with conifer seedlings with a spacing of approximately 12 feet by 12 feet. Invading brush is chemically treated to reduce competition. The chemical treatment is not 100% effective, browse species survive but at a reduced density (Alden, pers. comm.). Michigan-California owns approximately 100 square miles of land which makes up 36% of the seasonal/summer range.

Small, private commercial timber land, of 640 acres or less, practice a selective cutting program.

During the preparation of the 1980 meadow inventory, alteration of normal water runoff, causing siltation and erosion at meadows, was noted from poor logging practices.

d. Fire Suppression

The general trend has been downward in total acres burned and the average size of each fire (Longhurst, 1976). Fire fighting techniques have greatly improved with the use of new equipment, highly trained crews, and the application of research on the dynamics of fire behavior. The suppression of wildfires has been greatly beneficial for the production of timber, but fires resulted in increased deer food supplies on the west slope of the Sierras. Since many important browse species used by deer usually either reseed or sprout following a fire, periodic burning is a beneficial dis-

urbance. Without fire, a higher percentage of the browse species becomes old and decadent, some brush stands become dominated with conifers, and browse becomes less available and less nutritious, thus supporting fewer deer.

The reduction in wildfires has been offset to some degree in the Pacific and Georgetown Ranger Districts by prescribed burns and mechanical mulching. Prescribed burning has been practiced on the key winter ranges of Peavine, Telephone, Poho, and Darling ridges. An ongoing prescribed burn program is being conducted at present and will continue. In the spring of 1981, a target of approximately 2,000 acres was proposed for prescribed burning and mulching. This comprises approximately 4% of the winter range.

e. Recreation

Recreational activities, such as campgrounds and off-road vehicle use, have displaced and disturbed deer. Use of off-road vehicles has increased dramatically in recent years. Erosion is caused from ruts and trails through fragile soils during wet periods. Vehicles disturb fawning areas by their activities. An example of this is the meadow at Wentworth Springs. The Eldorado National Forest has developed an Off-Road Vehicle Plan to address these problems. Vehicles have been restricted to existing roads, and road closures have been imposed during certain times of the year.

f. Deer Hunting

The taking of bucks, forked horn or better, under present management accounts for 6.5% of the population mortality each year and does not limit deer herd numbers at this low rate. It is impossible to take more than 10% of the deer herd with a bucks only, forked horn or better law (Dassman, 1952). There are more than adequate numbers of bucks to assure reproductive success as shown by post-season buck/doe ratios (Table 4). Deer kill by year for the Pacific deer herd is shown in Table 3.

g. Illegal Kill

During the season, the illegal kill would partly be dependent on hunter density and patrol effort. The amount is unknown. The out-of-season kill occurs primarily during the winter months when deer are concentrated and more visiable. The deer herd is close to a major population center (Sacramento) connected by a major highway (50) with good road access to the winter range areas. Local wardens feel between one and two illegal deer are taken for every legal deer harvested during the season. The illegal take would include all age classes and both sexes. The extent of illegal kill needs to be confirmed.

2. Economic Value of Deer

It is very difficult to place a dollar value on wildlife which reflects such things as aesthetics, contributing to one's quality of life, and providing hunting satisfaction. An alternative is to determine the economic benefits from hunting. Washington Game Department (Liver, Young, and Eldrad 1975) determined that a deer hunter spent $25.85 per day in 1974 for food, lodging, travel, and equipment.

The Pacific deer herd is within deer hunt zone D-5. This zone includes all of El Dorado, Amador, Calaveras, and the west half of Alpine counties. Zone D-5 had 28,116 hunters who bagged 1,275 deer in 1980. An annual hunter survey conducted by California Department of Fish and Game estimated the average deer hunter spent 5.0 days hunting in 1979 (Wildlife Management Handbook, CDFG, 1980). Using these figures, an average 140,580 man days were expended hunting in 1980. At $25 per day, they spent $3,514,500 which results in a value of $2,756 per buck harvested. The 1980 kill was low; using a 1979 figure, 133,540 man days were expended hunting with a harvest of 2,270 bucks which results in a value of $1,471 per buck. It can be safely said a deer is worth at least a value between these two estimates. With this type of formula in years of high buck kill, deer are not as valuable as in years of low kill if the number of man

days hunted does not vary greatly each year. This is probably unreasonable. Also an updated dollar spent per day should be used and an aesthetic index is needed. Therefore these values are unrealistically low.

3. Weather

Weather can influence the productivity of a deer herd. Precipitation during February through May can improve critical vegetative growth which is important for good fawn survival. Annual precipitation at Pacific House is reported in Appendix 5. Good vegetative growth resulting in improved fawn survival will result in more bucks available in subsequent years.

Fall weather during the hunting season can influence buck kill. It is common to have warm, if not hot, weather during the first half of the season. This affects deer activity and hunter effort. In general, after the third week of October, major storms can be expected, accompanied by a decrease in temperature. Cold, stormy weather causes deer migration and increases daytime activity. Deer become more concentrated in smaller areas at lower elevations and in some places become more vulnerable, resulting in increased hunter effort and success. In this herd with the closure of Michigan-California Lumber Company lands, portions of the herd in transition areas below Crystal Basin Road are not accessible due to the closure. Peavine Ridge, Telephone Ridge, and areas south of the Granite Springs Road are open and contribute to the hunting success.

4. Predators

Predators, aside from man, include mountain lions, coyotes, bobcats, black bears, feral and domestic dogs. All these take deer, but the role they play in reducing deer herds, whether they are additive or compensatory to natural mortality, is unclear (Connelly 1981). Importance of predation seems to vary between herds and the herds relationship with environmental factors.

a. Mountain Lions

Lions are found within the herd boundary. Lion studies have shown the lion is an efficient predator of deer but are not thought to limit deer numbers

on productive ranges (Browning et al. 1973). In Idaho, they were found to take a disproportionate number of adult males, contrary to the popular opinion that they take only old, feeble, or young animals (Hornocker 1970). Protection of lions over the last ten years no doubt has increased the deer mortality to lions. Lions are very opportunistic. Recent evidence on the North Kings deer herd indicates lions may be more important than previously thought. This needs to be substantiated.

b. Coyotes

Coyotes are common within the range of the Pacific deer herd. They are opportunistic predators and will, and do, take deer, especially fawns if the opportunity arises. Where the range produces good healthy fawns and good escape cover is available, depredation by coyotes will not suppress deer numbers significantly (Browning, et al. 1973). There has been several studies where fawn survival was compared between areas with and without coyote control (Connelly 1981). Results were mixed. In areas where there were measurable significant increases in fawn survival, a great deal of effort was required, and the total coyote population was reduced by more than 70% (Connelly 1981).

c. Black Bear

Bears are found in the Pacific deer herd and are known to take deer when available, but extent is unknown.

d. Feral and Domestic Dogs

As rural homesites encroach on traditional deer winter ranges, impact by dogs becomes more important. Reports of dogs pursuing deer on winter ranges increases each year. During periods of thermal stress associated with winter months, energy demand is increased as deer are concentrated on smaller areas. Food quantity and quality are reduced. The culminative impact of being pursued by dogs creates additional stress that results in direct and indirect losses.

5. Diseases and Parasites

Four of five deer collected in 1971 contained cysts of the canine tapeworm (Taenia hydatigera). While infestation was not heavy enough to cause death at that time, a potential exists during times of stress (late winter) or poor range conditions to reduce vigor and allow an animal to be more susceptible to diseases. This was a very small sample size, and it is unknown how this relates to the balance of the herd. Browning et al (1973) found a very heavy incidence of lung worms in the Rail Road Flat herd which is a herd that occupies similar habitat on the west slope of the Sierras. Disease is not thought to be a major source of mortality.

III. MANAGEMENT UNIT GOALS AND POTENTIALS FOR RESTORATION

The statewide goal for California deer herds is to restore and maintain deer herds in a healthy, vigorous condition and provide for a diversified use of deer resources. To meet this objective, several management decisions must be made: 1) At what population level can we reasonably expect to achieve and what methods do we use to achieve our population goals. 2) Determine the factors that would inhibit or conflict with potential population increases. 3) Determine possible harvest strategies and intensity of utilization. These will all require different levels of action and trade offs with other land uses.

A. Potentials for Deer Herd Restoration

Deer restoration can be divided into two categories: Those which affect habitat carrying capacity, and those which directly affect herd mortality. The factors influencing habitat and deer herd mortality are listed in Table 5.

1. Summer Range Capacity

If management practices are continued at present levels, habitat will remain essentially static. The improved carrying capacity resulting from future clear cuts will be offset by other areas in the process of phasing from low successional stages to higher stages not as valuable as deer habitat.

Potentials to increase carrying capacity include but are not limited to improving existing meadows. Many meadows have been degraded over the years resulting in gulleys that lower the water table which reduces the area and density

TABLE 5

POTENTIALS FOR RESTORATION
PACIFIC DEER HERD

SEASONAL HABITAT CAPACITY FACTORS

Summer and Intermediate Range		Winter Range	
Factor	Potential	Factor	Potential
Clear Cuts	10%*	Clear Cuts	10%
Increase Livestock Use (Cattle)	0**	Alteration of Decadent Brush	10%
Alteration of Decadent Brush	5%	Livestock Use	5%
Meadow Improvement	10%	Prescribed Burns	10%
Prescribed Burns	10%***	Oak Management	+5%

*Assuming new clear cuts replace old ones as they become overgrown.
**Will benefit maintaining clear cuts but is offset by use of meadows.
***Assuming located property on transition range.

Unit Wide Factors

Factor	Potential
Illegal Harvest	+5%
Predation	**See Text
Disease and Parasites	

of meadow forbs and grasses being replaced by encroachment of conifers. Prescribed burns can decrease decadent brush and encourage sprouting of preferred browse species and invasion of grasses and forbs. This is extremely important and has great potential in transition areas that deer use on their spring migration. Sites 40-80 acres placed in optimum locations that will receive heavy use during migration should be emphasized.

2. Winter Range Capacity

Several factors are working to change carrying capacity on the winter range. Deer are not evenly distributed on the winter range so there are many areas where habitat improvement projects can improve carrying capacities, specifically in brush control either by mechanical methods or prescribed burning. Burning on winter range on Telephone and Peavine ridges has occurred during the last several years. Mechanical thinning of brush on Phoho Ridge is a positive project by the Eldorado National Forest. Some negative factors acting on the winter range is the loss of mast producing oaks, either by illegal fuelwood harvest or timber harvest with replacement by conifers. Currently there is an Oak Management Plan being developed by the Eldorado National Forest that will address this problem and should improve the situation for deer. It is not realistic to figure on controlling oak loss on private lands. Michigan-California Lumber Company does not have an organized program to sell fuel wood (oaks) presently, but if it becomes economically feasible, it is a potential in the future.

Clear cutting on national forest lands can create short-term benefits by increasing available browse. If the clear cut pattern is worked out so that new areas are clear cut, as early clear cuts are lost due to closed canopy covers, it can be beneficial. Harvest patterns must be established for the length of the rotation for this to be beneficial.

3. Unit Wide Factors

Factors in this category tend to act directly on deer herd mortality. If it is possible to reduce the illegal kill 20-40% of present estimated levels, this

would add approximately 100 deer each year. The amount of deer lost from predation is unknown. Between fawn drop on the summer range to herd composition counts made on the winter range in December, approximately 65% of the fawns have been lost. Predation by coyotes has been documented in several mule deer herds (Connelly 1981). It is safe to assume a portion of the fawn loss can be attributed to coyote depredation. A coyote control program to reduce predation by any significant amount would require more than 50% of the coyote population be removed each year with no breaks, and the desired reduction would take 5-10 years. Under current harvest management (2 points or better, bucks only), a 20% increase in recruitment would only result in a maximum increase of hunter harvest of approximately 2%. It also assumes that there is habitat available to support the increased fawn production. At this time, a predator control program to control coyotes is not advocated since the logistics of trying to trap large numbers of coyotes each year, forever, is impractical and, balanced against the benefits gained by adding to the hunter harvest, is not justified. The impact of disease and parasites on the Pacific deer herd is unknown but generally is not considered limiting if the quantity and quality of the habitat is adequate.

B. Possible Levels of Herd Restoration

The estimated average current population between 1976 and 1980 averages 4,000 animals (Appendix 4). This figure results in 14 deer per square mile on the summer range and 53 deer per square mile on the winter range. It must be realized deer <u>are not evenly distributed</u> throughout either their summer or winter range. The peak population was estimated in 1960 at 8,200 animals. This represents approximately <u>29</u> deer per square mile on the summer range and <u>109</u> deer on the winter range. The possible levels of population increase by habitat improvement and reduction in direct mortality will fall somewhere between the current level and this historical high. Estimated potential population size changes are presented in Figure 3. The average

estimated population between 1960 and 1962 was approximately 6,000 deer, a 50% increase over present population. A population of 6,000 deer on a sustained level is a reasonable goal. If in fact it is not possible to improve the carrying capacity of the habitat to support 6,000 animals at a sustained level, the population goal will have to be adjusted to what the habitat will support. If a population of 6,000 deer is used as a herd goal, this would result in 21 deer per square mile on the summer range, and 80 deer per square mile on the winter range. To meet these increased densities, habitat improvement projects would have to be site specific on high use areas to maximize benefits for number of acres treated. The habitat improvement would have to balance between clear cuts, meadow improvement, prescribed burns, brush manipulation, and oak management. These population levels are winter estimates so that difference between the yearly pre-hunt summer populations would be considered the harvestable surplus. This assumes that the other mortality factors that operate on the population are proportional at all population levels, and to have a sustained population increase, the habitat capacity will have to be increased. The potential population level and feasible population level may be somewhat different.

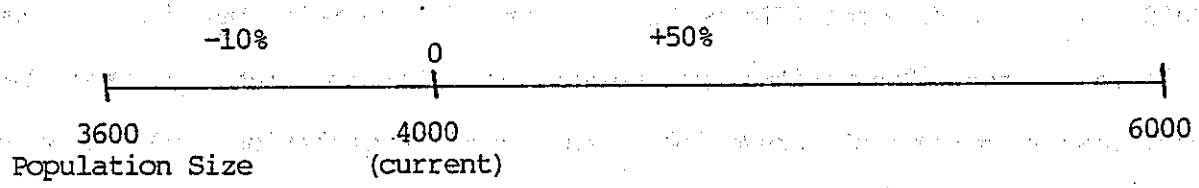
C. Utilization Levels and Alternate Strategies

Four potential harvest levels and strategies required to obtain them are proposed (Figure 4). Strategy #1 is the current harvest practice and results in approximate harvest of 6% of the deer herd. Strategy #2 would propose a post-season quota buck hunt of 3 points or better when buck-doe ratios the previous winter were a minimum of 30B/100D, and the spring fawn crop was at least 35F/100D. This would result in an increased harvest of only 1%. Strategies #3 and #4 propose taking a designated percent of the estimated doe population. Between 1977 and 1980, the average fawn-crop increased the Pacific deer herd population 38%

FIGURE 3

POTENTIAL LEVELS OF RESTORATION
PACIFIC DEER HERD

Winter Range Habitat Capacity



Summer/Intermediate Range Habitat Capacity

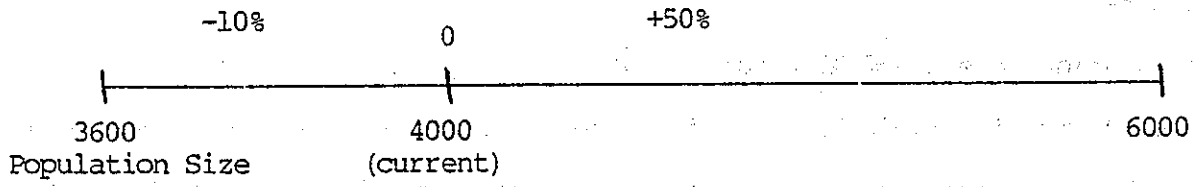
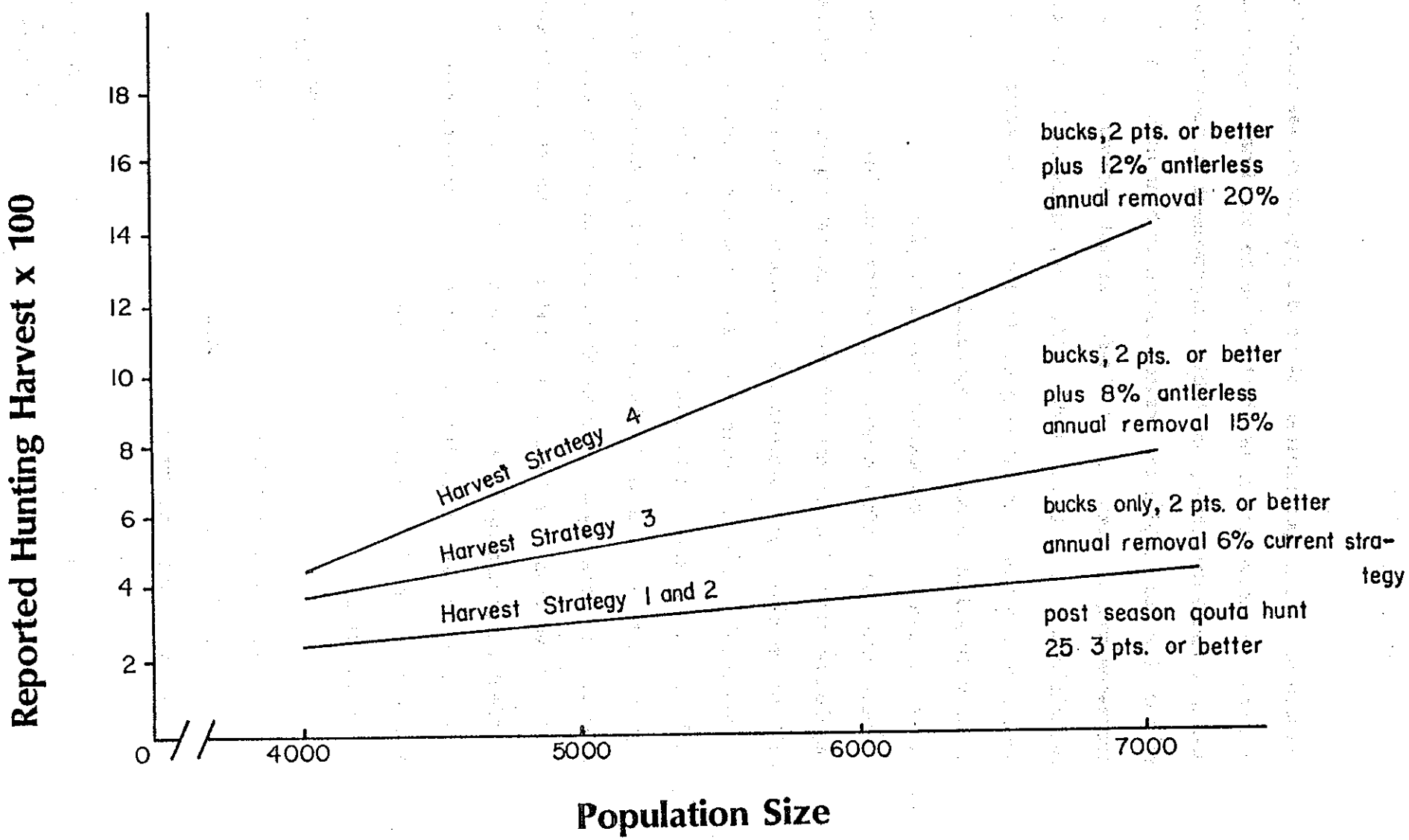


Figure 4 Potential Levels of Restoration and Harvest Strategies



(Figure 4), while approximately 6% of the population was being harvested by hunters. Proposed antlerless hunts would be coordinated with population size, seasonal range densities, and habitat improvement on seasonal ranges. Strategies #3 and #4 would yield a far greater return in hunting harvest from population increases than strategy #1. A liberal harvest strategy would be required to maintain population levels above 5,000 deer, since the habitat could not support excess deer for an extended period. Choice of a preferred harvest strategy is largely dependent on social acceptability.

D. Preferred Levels of Restoration and Utilization

To determine the preferred deer herd restoration level, it is necessary to balance population size with current and future habitat capacity. Future habitat capacity will be dependent on implementation of habitat improvement projects. Several factors in determining the herd goals that were considered are: 1) social acceptance of both population size and type of harvest strategy required to maintain the desired population size; 2) economic factors - improving carrying capacity will require some direct costs beyond just modifying present activities; 3) high deer populations will involve trade offs with other land uses, such as high timber production, residential development, and grazing practices; 4) herd recovery - liberalize harvest strategies when population increases result due to habitat enhancement; and 5) diverse uses of deer.

1. Herd Goals

	1990 Target	Current Level
a. Fall Population Size	6,000	3,900
b. Herd Composition (per 100 does)		
Post-Hunt Buck Ratio	30-35	25-30
Spring Fawn	50-60	30-40
c. Hunting Harvest	360-400 Bucks 400 Does 15% Harvest	250 None 6%

	1990 Target	Current Level
d. Estimated Natural Mortality		
Hunter Harvest Ratio (Calculated on current and projected hunter harvest and herd turnover rate of 30%).	NM:HH 2:1	NM:HH 5:1

The herd goal needs to be flexible enough so that it is more important to have a healthy herd in balance with the habitat, with fawn survival as a measurement of the health of the herd, than to have a large herd size in poor condition.

2. Range and Habitat Goals .

a. Summer Range (280 Square Miles)		
Average Deer Density	21	14
b. Winter Range (75 Square Miles)		
Average Deer Density	80	53

To improve deer densities by 50%, an increase of seven deer per square mile on the summer range is needed and 27 on the winter range. Because deer are not evenly distributed, habitat improvement should be directed to key high use areas to realize maximum benefits for dollars spent. Projects would include, but not be limited to, meadow restoration, rejuvenation of browse by burning or mechanical means, type conversion on selected sites from brush to grasses, and retention of mature brush and conifers for thermal and escape cover.

This assumes no new seasonal ranges are degraded or lost beyond current levels. If the amount of seasonal ranges is not improved at proposed rates, then deer herd size goals would be delayed by proportional amounts.

IV. PROBLEMS IN MANAGEMENT

1. The biggest, single problem is lack of sufficient fawn recruitment into the yearling age class to meet future herd goals (Table 2). It will be necessary to reverse the high fawn mortality during the first six months.

2. Winter fawn loss is important in some years. The last four years (1977-80), loss has averaged 20%.
3. Quality of meadows associated with fawning activities have decreased in size and numbers due to erosion and invasion by conifers and corn lilies which results in loss of meadow associated grasses and forbs.
4. Efficient wildfire prevention detection and suppression practices have resulted in long-term vegetative successional changes which are less productive for deer. Consequently, large scale, intense wildfires which occur due to increases in natural fuel beds do little to improve, and often harm, the long-term value for deer on any of the seasonal ranges.

   Present policies of suppression should continue while emphasising the use of prescribed fire to concurrently reduce fuel loading and improve browse and cover conditions on deer ranges.
5. Conflicts exist between certain timber management practices and habitat productivity for deer. Examples include brushland conversion into conifer plantations following logging, removal of oaks, and high density planting of conifer seedlings.
6. Residential development on winter range areas have resulted in habitat losses, i.e., Swansboro County.
7. Funds are lacking for single purpose deer habitat improvement projects.
8. Recent herd reproductive data are lacking.
9. A study to determine the most important factor causing the high loss of fawns and seasonality of fawn losses should be initiated, either on the Pacific deer herd or a similar herd.
10. Feral and domestic dogs harassing wintering deer on portions of the winter range.
11. Generally negative public attitudes have restricted the use of antlerless harvest as a management option and placed serious restraints on the ability of public agencies to manage deer herds.
12. A valid estimate of the illegal take of deer is lacking.

13. Large tracts of Michigan-California Timber Company lands have been closed, limiting public access to portions of the deer herd during hunting seasons. Reasons cited for closures include fire hazard, vandalism, and illegal wood cutting.

14. Additional knowledge of herd movement is needed to determine all the important winter and summer concentration areas. Radio telemetry offers the most effective approach to obtain needed information.

15. Where existing Forest Practice Act calls for replanting of conifers after harvesting, the replanting rates required are at a density resulting in competition between browse species and conifer seedlings. Lower stocking rates will allow for both.

V. MANAGEMENT PROGRAMS, OBJECTIVES, AND RECOMMENDED PRESCRIPTIONS

The following are herd plan management programs, desired objectives, and recommended prescriptions to achieve herd objectives.

A. Inventory and Investigative Objective

To collect and maintain a sufficient body of information to effectively manage the deer herd. Monitoring is necessary to evaluate management programs designed to improve herd and habitat condition.

Recommended Prescriptions:

1. Herd Performance Indicators

The following indicators are currently being monitored and should be continued.

a. Fall and spring herd composition counts with minimum sample size of 250 animals.

b. Opening weekend deer hunter check station at Riverton to obtain an age-class structure on the buck kill and a car count to monitor hunting pressure.

c. Continue to prepare a spot kill map with the returned deer tags at the end of each hunting season.

The following indicators are recommended for additional monitoring.

a. Collect deer every three to four years to determine physical condition, food habits, parasite loads, and reproductive data. Deer from road kills should be used initially. If samples prove to be inadequate, a collection would be recommended.

b. The herd performance data should be used to construct a computer simulation model of the Pacific deer herd. This model should be updated each year with new data, and results used to evaluate the success of present management.

c. Increase herd composition efforts to obtain adequate sample sizes.

2. Habitat Indicators

Currently the following indicators are being monitored and should be continued at current levels or increased.

a. An inventory of all meadows on National Forest lands within the Pacific deer herd was initiated in 1980 and will be completed in 1982. Information will identify location and amount of meadow improvement work that is needed.

b. An annual oak mast survey is completed each year on deer winter range to show mast production trends. This survey is conducted by California Department of Fish and Game.

The following indicator is recommended for additional or increased monitoring.

Annual inventories should be made to designate potential habitat improvement sites and be incorporated into future management programs. This can be accomplished through Sikes Act and other programs with emphasis placed on areas of high use such as migration corridors, holding areas, and fawning areas.

3. Research Needs

a. An intensive study should be designed and carried out to provide an accurate estimate of the illegal deer kill and its effect on the Pacific deer herd.

b. A study should be designed to provide detailed information on the causes of the low fawn survival within the Pacific deer herd.

c. A study to determine the degree of natural mortality within the female segment of the population.

d. Trap and collar deer on the winter range especially on the northern portion in the Darling Ridge, Volcanovile, Pilot Creek area. All previous trapping and radio telemetry monitoring was completed on the southern portion of the winter range (Figure 2). Location of migration corridors can be incorporated into habitat improvement plans.

e. The above cited (a, b, and c) may be combined with a comprehensive effort involving comparable west slope Sierra herds. These problems are not unique within the Pacific deer herd.

4. Monitoring Public Attitudes and Concerns

a. A brief hunter questionnaire should be given to hunters contacted at the opening weekend check station to determine attitudes on present policies and programs with information used to direct future programs.

b. A questionnaire could be sent out with the applicant's deer tags to determine attitudes of statewide management programs.

B. Herd Management and Mortality Control Objective

Reduce the current level on non-hunting mortality. Deer have a potential for high birth rates but also for high death rates. The following actions will help reduce the high rate of fawn mortality and minimize losses to the adult segment of the herd.

Recommended Prescriptions:

1. Reduce fawn mortality by improving key fawning areas with meadow restoration and other cover and forage enhancement projects.

2. Improve portions of the transition range located within migration corridors to improve forage for does during the last trimester of pregnancy.

3. Improve forage and cover conditions on key wintering areas to increase fawn survival. This can be accomplished by following the recommendations outlined in the Habitat Program Element.

4. Decrease adult and fawn deer losses from feral and domestic dogs. Dog losses have occurred in the Georgetown, Spanish Flat, and Swansboro areas. Generally, where rural homesites are situated within or adjacent to wintering areas, losses by dogs are experienced. The additional stress on pregnant does in the last trimester of pregnancy has an unknown effect on fawn losses. More stringent leash laws and public awareness is needed.

C. Habitat Objective

Improve the Pacific deer herd's winter, summer, and intermediate ranges. This can be accomplished by programs to manipulate brush patches in key winter and intermediate range areas and meadow restoration projects in fawning areas. Timber management practices, especially post-harvest management, should be coordinated with deer habitat requirements in mind.

Recommended Prescriptions:

1. Continue and expand coordinated program of prescribed burning within the deer winter and intermediate range on Poho, Telephone, and Peavine ridges with USFS.
2. Coordinate prescribed burning on private lands throughout the Pacific deer herd in cooperation with CDF (Chaparral Initiative, S. B. 1704, 1981).
3. Rejuvenate decadent stands of browse on the winter range by mechanical methods and burning. Areas considered to be improved should be Poho Ridge area, Crozier Loop, Darling Ridge, Telephone and Peavine ridges.
4. Rejuvenate stands of brush by burning or mechanical methods on key holding areas in migration corridors of the intermediate range. Such areas include Pino Grande, east and south of Ice House Reservoir, and Granite Springs vicinity. Some of this area is found on Michigan-California lands.
5. Coordinate with county planning department zoning to protect prime deer ranges Such zoning should include minimum parcel sizes of 40-80 acres. Minimum

parcel sizes of 40-80 acres have been incorporated into El Dorado County's Long Range Goals and Policies on winter ranges and key winter ranges. For example, restrict intensive agricultural and residential development. Compatable uses would include setting aside areas as open space or managed for timber with logging practices coordinated with deer habitat management needs.

6. Coordinate deer habitat needs with USFS, BLM, and Michigan-California Lumber Company harvest plans. Develop habitat models. A deer habitat committee composed of a DFG representative, public land managers (USFS, BLM, CDF), and private landowners (Michigan-California) may be formed to facilitate this coordination.
7. Work with CDF on private lands to incorporate habitat improvement projects during timber harvest planning. The CFIP program and 1704 Chaparral Management Program can be used to encourage participation.
8. Encourage the use of county fine money presently available to be used on deer habitat projects.
9. Acquire key deer areas now in private ownership and most likely to be lost to development in the future.
10. Encourage the USFS to use KV and Sikes Act funds for deer habitat improvement projects in key seasonal ranges.
11. Coordinate deer habitat improvement projects with the CDF's new CFIP program and 1704 Fuel Management Program.

D. Utilization Objective

Provide for any increase in the present utilization of the herd through both consumptive and non-consumptive programs. Improve hunting opportunity and success within the herd goals by increasing herd size and fawn survival.

Recommended Prescriptions:

1. Increase the number of deer available for harvest by increasing fawn survival through habitat improvement.

2. Increase the number of available bucks for harvest by increasing fawn survival by 50% over the last five-year average. This is to be accomplished through improvement of all seasonal ranges as specified in the habitat element. If it is found that ranges are at full capacity, antlerless hunting may be used to reduce intraspecific competition, making more room for fawns, thus increasing male fawn survival (McCullough, 1979). Higher fawn survival will improve hunting opportunity and success.
3. Restrict vehicle access in selected areas to discourage road hunting. This will discourage road hunting and also illegal kill from spotlighting.
4. Encourage hunters that do not want to experience hunting during peak use periods to hunt during the middle of the week, thus reducing pressure on opening and closing weekends.

E. Law Enforcement Objective

Reduce the rate of illegal kill on the Pacific deer herd. A high illegal kill may reduce the ability to evaluate results of habitat management programs designed to increase herd size and fawn survival. Public cooperation is essential in reducing illegal hunting.

Recommended Prescriptions:

1. Encourage the public use of the Department's new CALTIP Program, a secret witness program with a reward incentive for valid information on Fish and Game violations.
2. Develop cooperation with judicial districts to levy maximum fines for convicted violators.
3. Improve and maximize coordination with other enforcement agencies (CHP, Sheriff, USFS, CDF, etc.) in placing more emphasis on deer regulation enforcement. Nonenforcement personnel would be encouraged to report observed violations and not take direct action.
4. Following the hunting season, institute road closures in areas of deer con-

centrations to reduce access to deer during times they are concentrated. (In several areas this was done on USFS land this year.)

5. Require mandatory tag return to obtain a better kill estimate.

F. Review and Update Objective

Provide an annual herd plan review and update. Add additional data and modify the plan as new information becomes available.

Recommended Prescriptions:

1. An annual report should be completed containing: herd composition counts, deer kill, habitat improvement projects, and results of any research conducted during the year.
2. Establish a deer plan review committee that will meet annually to discuss the plans progress.
3. An annual in-house review should also take place before the deer plan review committee meeting. Department's Big Game staff should assist in this review to evaluate progress of the plan and coordinate this herd with other adjacent herds and herds with similar problems.

VI. ALTERNATIVES

A. Preferred Levels of Restoration and Utilization

To determine the preferred deer herd restoration level, it is necessary to balance population size with current and future habitat capacity. Future habitat capacity will be dependent on implementation of habitat improvement projects. Several factors in determining the herd goals that were considered are: 1) social acceptance of both population size and type of harvest strategy required to maintain the desired population size; 2) economic factors - improving carrying capacity will require some direct costs beyond just modifying present activities; 3) high deer populations will involve trade offs with other land uses, such as high timber production, residential development, and grazing practices; 4) herd recovery - when or do we liberablize harvest strategies when population increases result due to habitat enhancement; and 5) diverse uses of deer.

1. Herd Goals

		1990 Target	Current Level
a.	Fall Population Size	6,000	3,900
b.	Herd Composition (per 100 does)		
	Post-Hunt Buck Ratio	30-35	25-30
	Spring Fawn Ratio	50-60	30-40
c.	Hunting Harvest	360-400 Bucks 400 Does 15% Harvest	250 None 6%
d.	Estimated Natural Mortality		
	Hunter Harvest Ratio (Calculated on current and projected hunter harvest and herd turnover rate of 30%).	NM:HH 2:1	NM:HH 5:1

The herd goal needs to be flexible enough so that it is more important to have a healthy herd in balance with the habitat with fawn survival as a measurement than to have a large herd size in poor condition.

B. Maintain Deer Management As It Currently Exists

This would result in the status quo for management of the Pacific deer herd. Current inventory and data collection would continue. No new programs to provide updated or additional data would be initiated. Fawn losses would remain unchanged with yearly flucuations dependent mainly on variations of weather.

Fewer new habitat projects would be initiated; and without improved quantity or quality of food supplies on the seasonal ranges, herd size would fluctuate according to weather patterns that determine availability of forage, but with a downward trend.

Coordination with the USFS in post-timber harvest, projects to benefit deer habitat would continue but at levels less than possible. Few habitat improvement projects on private lands are designed specifically to improve deer habitat.

Hunter success would remain low at 5-8% while harvesting 5-7% of the deer population with the kill dependent on weather. Illegal kill would remain at the same level or increase with no additional effort to reduce the current level. No

new information on herd condition would be collected, and no additional effort to inform the public would be initiated.

This alternative was not selected for three major reasons:

1. An opportunity exists to improve the Pacific deer herd with current and accepted wildlife management techniques.
2. The Department's policy and legislative mandate (AB 1521, September 1977) makes a commitment to restore and maintain deer herds statewide. This policy cannot be carried out by maintaining the status quo.
3. Sportsmen support a program to improve the condition of the state's deer herds and specifically the Pacific deer herd.

C. Manage for Maximum Feasible Habitat Productivity and Maximum Sustained Yield of Deer

This alternative would require at least the level of management and study previously recommended. The habitat program would require land management decisions based on deer as the number one priority. Fawn mortality would have to be at the lowest possible level. Extensive prescribed burning programs on all ranges would be required. A substantial increase in herd size would result. A larger harvest rate would require a more intensive and liberal harvest program which would include all age classes of both sexes. The harvest of both sexes would match the annual increase of fawns into the yearling age class each year which would amount to removing at least 35% of the total population each year.

Wildlife Protection personnel would also have to shift most of their emphasis to enforce deer regulations and decrease the illegal kill to the lowest extent possible.

This alternative was not selected for the following reasons:

1. The alternative would conflict with USFS management policies to manage their lands on a balanced multiple-use program.
2. Local support for an intensive maximum sustained yield harvest program is not present in El Dorado County. Without this level of harvest, deer numbers

would, to an extent, soon damage their range resulting in lowered deer numbers which would not fulfill the objectives of this alternative.

3. A more intensive habitat program would also be many times more expensive. Current funding is limited.

VII. REFERENCES

Alden, Henry. 1980. Personal Communication, Forester. Michigan-California Lumber Company.

Anderson, A. E. 1981. Morphilogical and Physiological Characterisitcs: Mule and Black-Tailed Deer of North America. O. C. Wallmo ed. University of Nebraska Press. Lincoln, Nebraska. 605 pp.

Browning, Bruce, et al. 1973. Rail Road Flat Deer Herd Study. California Fish and Game Administrative Report No. 73-1.

Connelly, G. E. 1981. Limiting Factors and Population Regulation: Mule and Black-Tailed Deer of North America. O. C. Wallmo ed. University of Nebraska Press. Lincoln, Nebraska. 605 pp.

Dasmann, Raymond F. 1952. Methods for Estimating Deer Populations From Kill Data. California Fish and Game 38(2):225-233.

Fary, Frank, et al. 1976. Pacific Deer herd Delineation, Trapping, and Tagging Program. California Department of Fish and Game. Regional Report.

Geist, Valerius. 1981. Behavior: Adaptive Strategies in Mule Deer: Mule and Black-Tailed Deer of North America. O. C. Wallmo ed. University of Nebraska Press, Lincoln, Nebraska. 605 pp.

Hornocker, M. C. 1970. An Analysis of Mountain Lion Predation Upon Mule Deer and Elk in the Idaho Primitive Area. Wildlife Monographs 21:1-39.

Hubbell, Robert. Personal Communication, Forester. California Department of Forestry.

Leopold, A. Starker, et al. 1957. The Jawbone Deer Herd. California Department of Fish and Game Bulletin #14. 139 pp.

Liver, Young, and Eldred. 1975. Washington Game Department Bulletin.

Longhurst, William M., et al. 1952. A Survey of California Deer Herds - Their Ranges and Management Problems. California Department of Fish and Game Bulletin #6.

Longhurst, William M., et al. 1976. The California Deer Decline and Possibilities for Restoration. Cal-Nev. Wildlife Society Proceedings. January 1976.

Munz, P. A. 1951. A California Flora. University of California Press.

Salwasser, Harold J. 1974. North Kings Deer Herd: Fawn Production and Survival Study. California Fish and Game PR-W-51R-17 Project Report. 72 pp.

Salwasser, H. J., et al. 1978. Fawn Production and Survival in the North Kings River Deer Herd. California Fish and Game. 61(1):38-52.

Wildlife Management Handbook. 1980. California Department of Fish and Game.

Wernette, R. 1980. The Rail Road Flat Deer Herd Management Plan. California Department of Fish and Game.

VIII. APPENDICES

APPENDIX 1

SHRUB AND BROWSE PLANTS FOUND ON THE SUMMER RANGE

Snowberry (Symphoricarpus sp.)

Creambush (Holodiscus discolor)

Gooseberry (Ribes sp.)

Big sagebrush (Artemisia tridentata)

Rabbit brush (Chrysothamus sp.)

Quaking aspen (Populus tremuloides)

Willow (Salix sp.)

Serviceberry (Amelanchier alnifolia)

Huckleberry oak (Quercus vaccinifolia)

Greenleaf manzanita (Arctostaphylos patala)

Mountain whitethorn (Ceanothus cordulatus)

Bittercherry (Prunus emarginata)

Elderberry (Sambucus sp.)

APPENDIX 2

COMMON PLANTS OF THE INTERMEDIATE RANGE

Shrubs and Trees

Deer brush (Ceanothus intergerimus)
Snowberry (Symphoricarpus sp.)
Sierra gooseberry (Ribes roezlii)
Chinquapin (Castanopsis chrysophylla)
Choke cherry (Prunus demissa)
Wild Rose (Rosa sp.)
Canyon live-oak (Quercus chrysolepsis)
Thimbleberry (Rubus parvifolius)
Serviceberry (Amelanchier alnifolis)
Mountain whitethorn (Ceanothus cordulatus)
Mountain misery (Chamaebatia foliolasa
Manzanita (Arctostaphylos sp.)
Ponderosa pine (Pinus ponderosa)
Sugar pine (P. lambertiana)
White fir (Abies concolor)
Incense cedar (Libocedrus decurrens)
Douglas fir (Pseudotsuga menziesii)
Buckwheat (Eriogonum sp.)
Bitter cherry (Prunus emarginata)
Black oak (Quercus Kelloggii)

Forbs and Grasses

Bedshaw (Galium sp.)
Lupines (Lupinus sp.)
Clovers (Trifolium sp.)
Buckwheats (Eriogonum sp.)
Thistles (Cirsium sp.)
Monkey flowers (Nimulus sp.)

APPENDIX 3

COMMON PLANTS FOUND ON THE WINTER RANGE

Spanish clover (Lotus sp.)
Lupines (Lupinus sp.)
Buckhorn (Amsinckia sp.)
Chickweed (Stellaria sp.)
Miners lettuce (Montia perfoliata)
Blue oak (Quercus douglasii)
Interior live oak (Q. Wislizenii)
Canyon live oak (Q. chrysolepsis)
Black oak (Q. Kelloggii)
Soft chess (Bromus mollis)
Rip-gut brome (B. rigidus)
Red brome (B. rubens)
Fescues (Festuca sp.)
Wild oats (Avena sativa)
Barley (Hordeum sp.)
Rye grasses (Lolium sp.)
Filarees (Erodium sp.)
White leaf manzanita (Arctostaphylos viscida)
Buck brush (Ceanothus cuneatus)
Chamise (Adenostoma fasciculatum)
Poison oak (Rhus diversiloba)
Yerba santa (Eriodictyon californicus)
Toyon (Photinia arbutifolia)

APPENDIX 4

Pacific Deer Herd Population Estimates*

Year	Number
1957	4,349
1958	2,566
1959	3,746
1960	8,287
1961	4,921
1962	4,645
1963	2,531
1964	3,390
1965	2,773
1966	3,725
1967	3,577
1968	3,042
1969	4,742
1970	3,504
1971	3,881
1972	3,750
1973	2,575
1974	2,486
1975	3,486
1976	4,165
1977	4,317
1978	3,487
1979	3,419
1980	4,845

*Using 3-year average of composition counts.

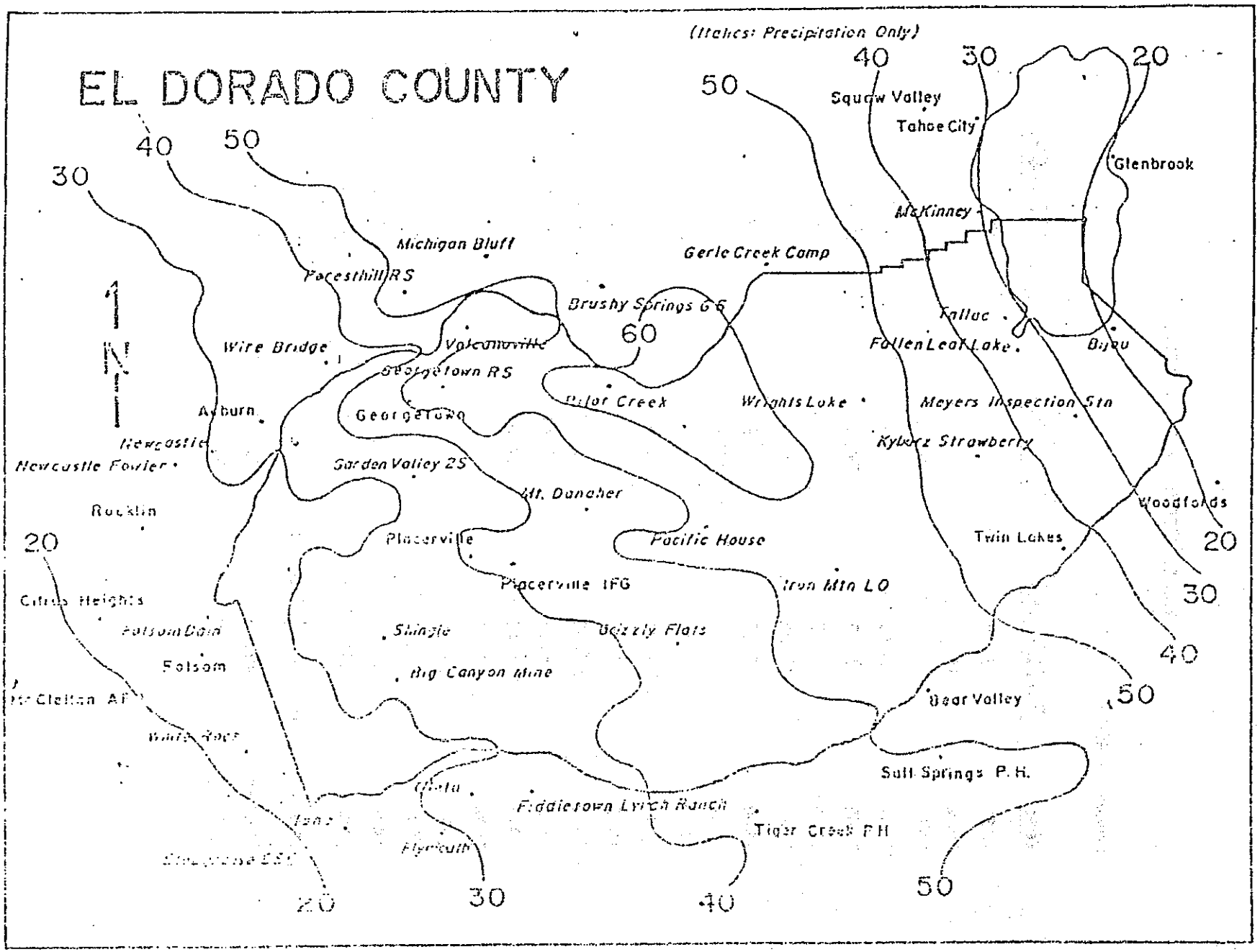
Years	Average
1960-64	4,755
1965-69	3,572
1970-74	3,239
1975-80	3,953

APPENDIX 5

PRECIPITATION DATA IN INCHES

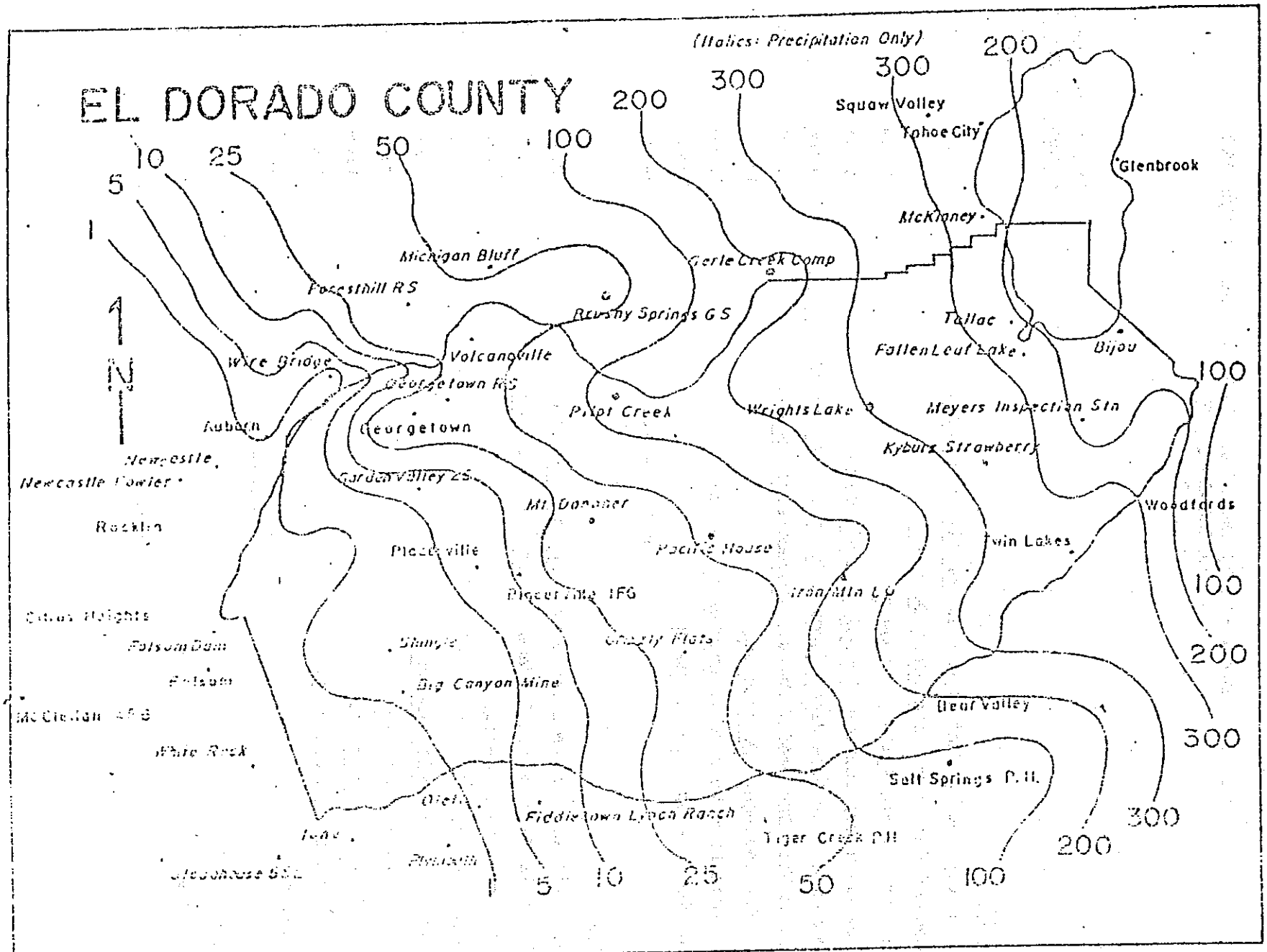
Season Total:

Year	Station		
	Pacific House	Robbs Peak	Sierra Ski Ranch
1961	33.05	34.2	40.5
1962	41.07	42.5	49.9
1963	60.49	63.9	75.9
1964	40.49	41.5	41.9
1965	71.37	74.0	85.0
1966	34.85	34.21	39.4
1967	62.83	69.50	74.5
1968	36.22	38.90	40.8
1969	63.76	70.16	87.3
1970	49.62	60.24	60.9
1971	55.53	56.46	53.8
1972	42.00	41.80	44.70
1973	52.56	49.22	46.29
1974	68.88	72.41	57.80
1975	54.45	52.02	38.61
1976	30.11	26.88	36.61
1977	18.32	20.61	25.29
1978	66.31	67.93	58.1
1979	42.30	45.80	45.54
1980	62.82	75.75	58.98
Average Annual Precipitation			
1961-80	49.35	51.90	53.09
1911-60	50.20	52.5	50.3



Average Seasonal Precipitation

Average Seasonal Precipitation



Average Seasonal Snowfall

APPENDIX 8

FOOD ITEMS EATEN BY FIVE DEER COLLECTED FROM THE PEAVINE AREA
EL DORADO COUNTY
March 9, 1971

	Volume Percent	Frequency of Occurrence
BROWSE		
Mt. Misery Leafage and Stem (Chamaebatia foliolasa)	62.2	5
Incense Cedar Stem (Libocedrus decurrens)	2.0	3
Pine (Dry Needle Fgmts.) (Pinus sp.)	Trace	4
Hairy Mistletoe Leafage (Phoradenron villosum)	Trace	1
Libocedrus Mistletoe (Phoradendron juniper inum var Libocedri)	Trace	1
Douglas Fir (Dry Needle Fgmts.) (Psuedotsuga menziesii)	Trace	1
Oak (Dry Leafage) (Quercus sp.)	Trace	1
Mt. Whitethorn Leafage (Ceanothus cordulatus)	Trace	1
Ceanothus Leafage (Ceanothus sp.)	Trace	1
Browse Subtotal	64.2	
FORBS		
Sierra Milkwort Leafage and Stem (Polygala cornuta)	0.4	2
California Yerba Santa Leafage (Eriodictyon californicum)	0.2	1
Unid, Green Forb Leafage	Trace	3
Mushroom Fgmts. (Fungi)	Trace	3
Clover Leafage (Trifolium sp.)	Trace	2
Sedge Leafage (Corex sp.)	Trace	2
Lotus Leafage (Lotus sp.)	Trace	1
Lupine Leafage (Lupinus sp.)	Trace	1
Lichen Fgmts.	Trace	1
Forb Subtotal		
GRASS		
Grass Leafage and Stem	35.2	5
TOTAL	100.0	

APPENDIX 9

HABITAT IMPROVEMENT PROJECTS IN
PACIFIC DEER HERD RANGE

Activity	Acres	Year
Prescribed Burning	150	1978
	695	1979
	831	1980
	1,199	1981
Brush Manipulation	29	1971
	101	1972
	84	1973
	94	1974
	327	1975
	83	1976
	205	1977
	380	1978
	698	1979
	1,293	1980

APPENDIX 10

GRAZING IN THE RANGE OF THE PACIFIC DEER HERD*

Allotment	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
Old Pino	520	520	400	378	384	283	174	---	159	354	450
Pearl Lake	192	174	---	208	226	155	226	176	--	182	202
Wrights Lake	686	655	937	1,015	579	626	706	533	761	693	794
Big Hill	1,436	1,167	1,394	1,508	1,894	2,107	2,246	2,521	2,383	2,130	2,733
Soldier Creek	612	556	457	603	657	591	433	468	607	482	676
TOTAL	3,526	3,072	3,188	3,712	3,680	3,762	3,785	3,638	3,910	3,841	4,855

*AUM's of cattle

APPENDIX 11

FIRE HISTORY
PACIFIC DEER HERD RANGE
1940-1981
(FIRES OVER 40 ACRES)

Area	Year	Name	Acres	Notes
Volcanoville	1943	Jess Canyon	60	20% of key area
	1944	Spanish Flat	3,520	
	1947	Allen Ranch	4,064	
	1950	Strawberry	170	
Mosquito	1951	School Flat	204	
	1954	Mosquito	295	
	1954	Brownell	300	Summer Range
	1959	Jones	60	
Peavine Ridge	1959	Ice House	18,531	90% of key area
Poho Ridge	1959	Camp Seven	9,818	
Mosquito	1960	Volcanoville	2,135	
	1979	Chili Bar	7,024	Winter Range
Wrights Lake	1981	Wrights Lake	3,600	Summer Range

APPENDIX 12

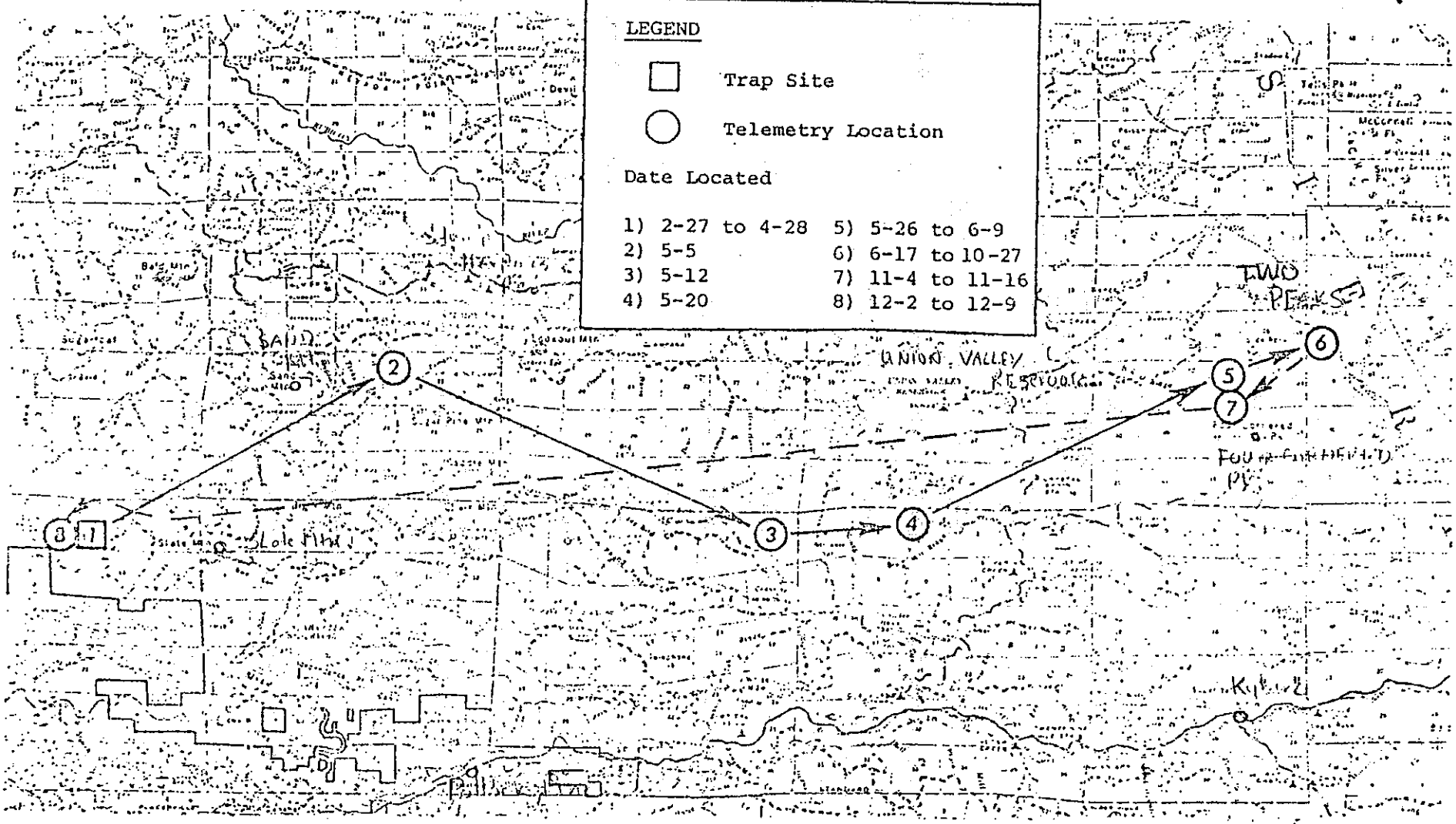
TELEMETRY DATA
INDIVIDUAL COLLARED DEER MIGRATION ROUTES

Map #1

One Eye Creek Trail - 1976

Ch 1

Frequency # 159.300



Map #2

One Eye Creek Trail

Ch 2

Frequency # 159.315

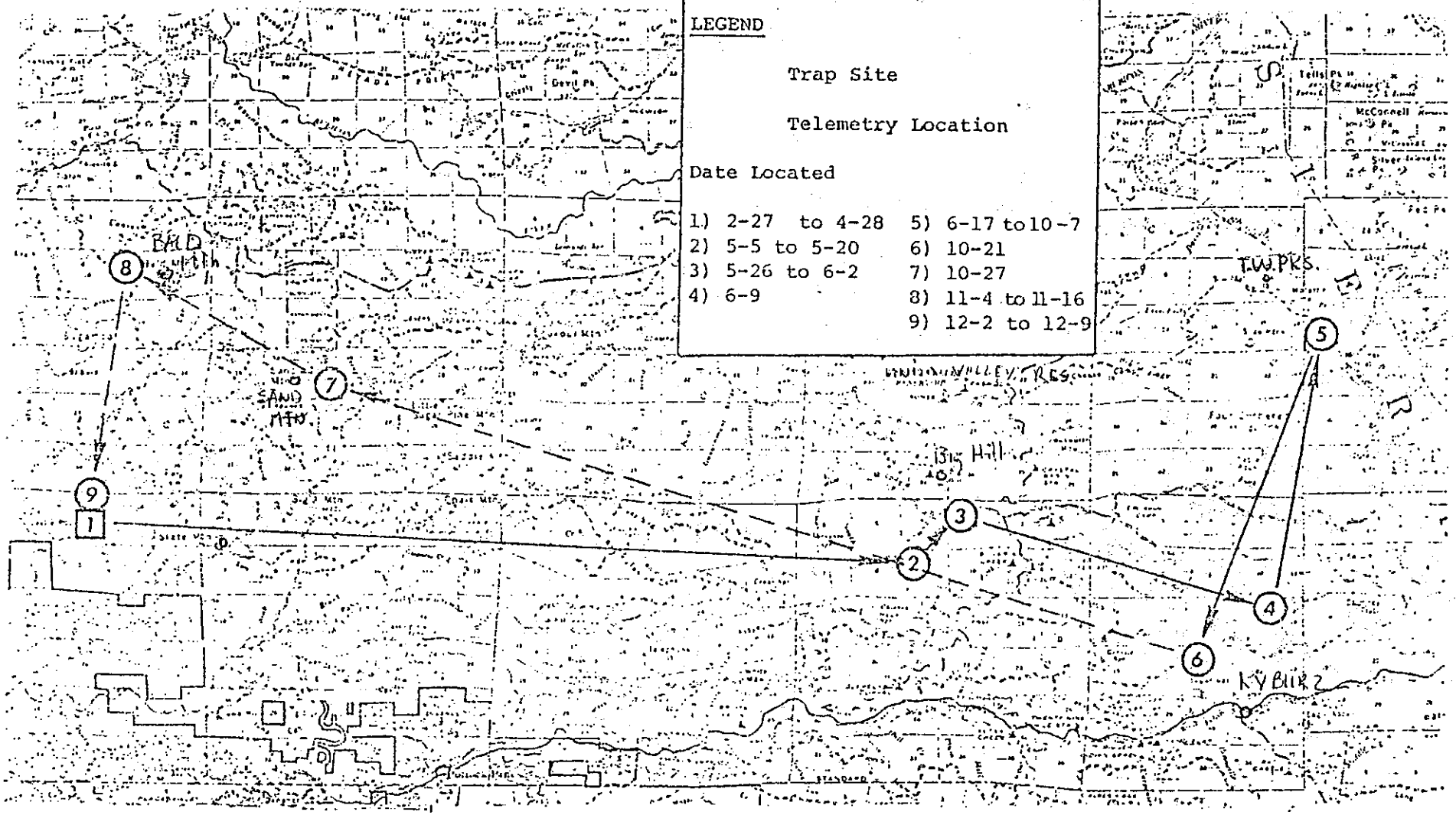
LEGEND

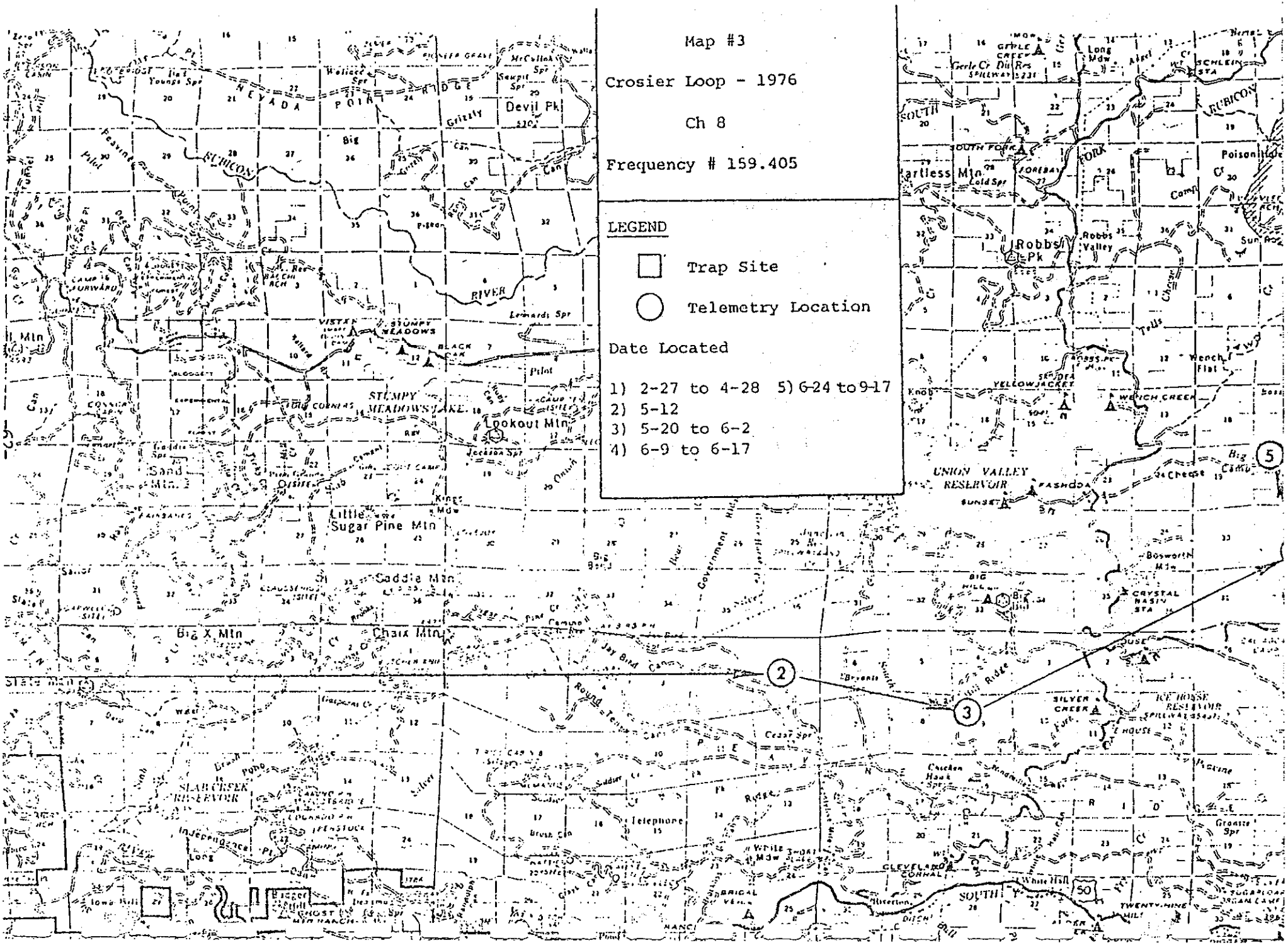
Trap Site

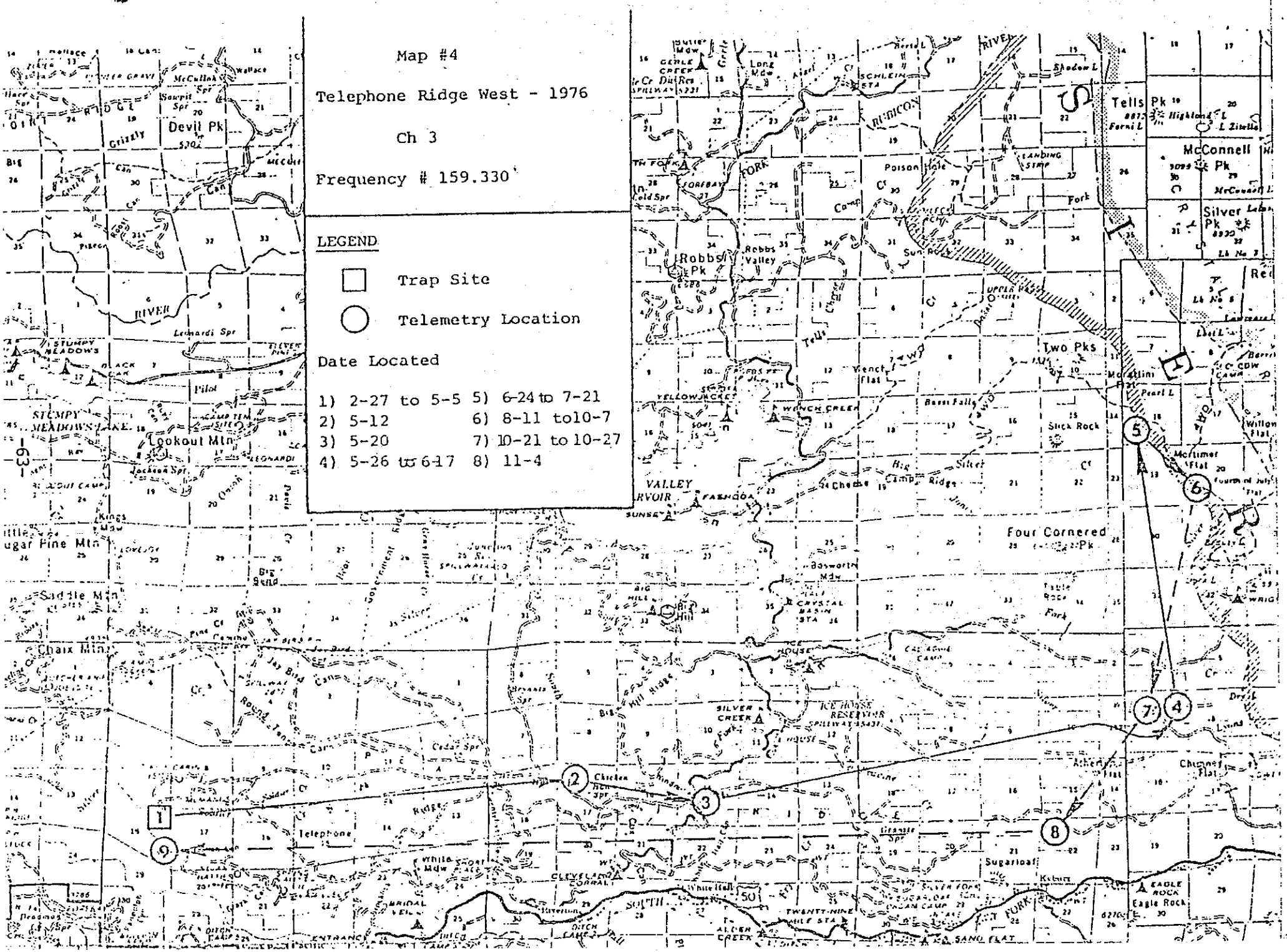
Telemetry Location

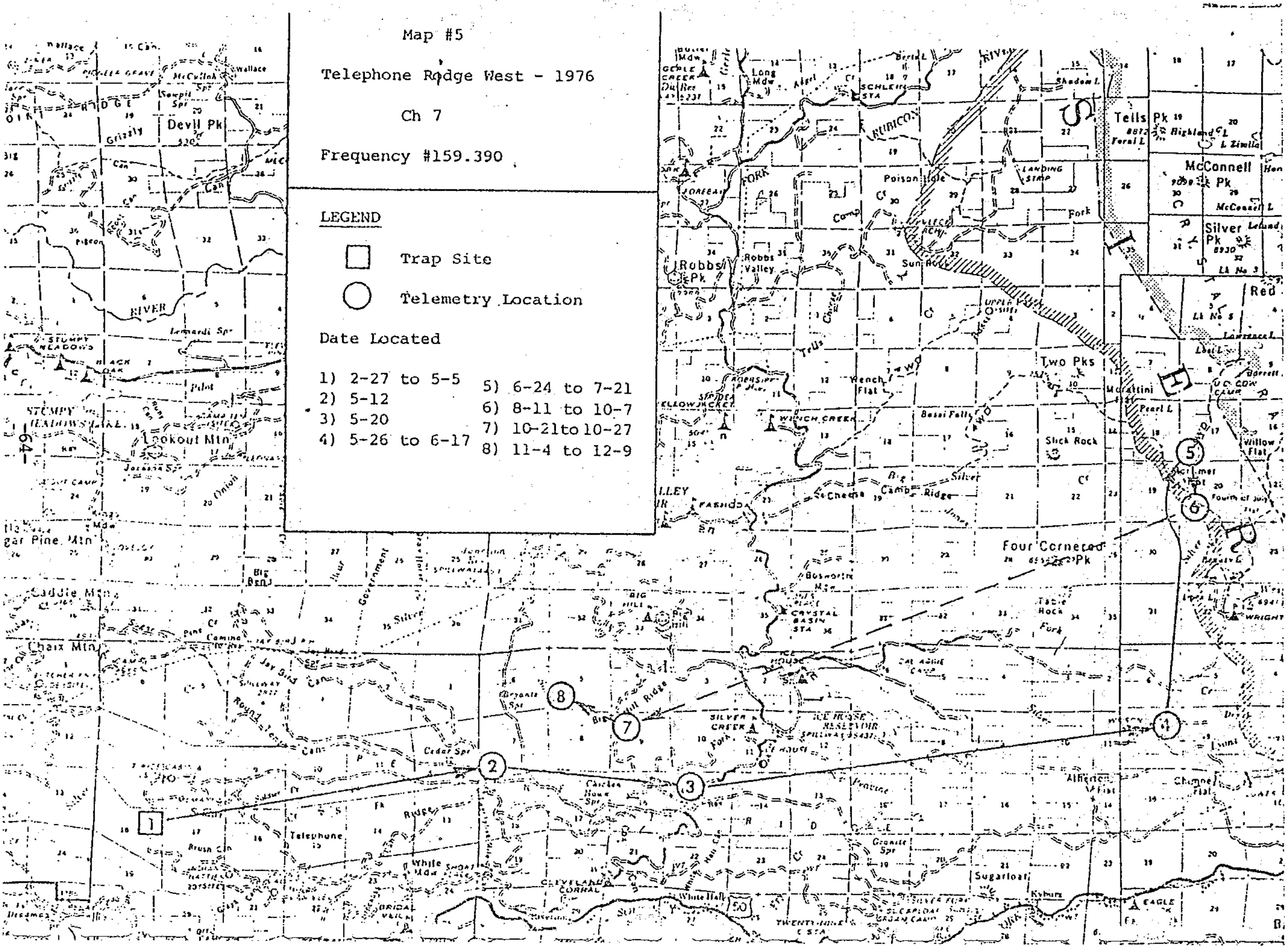
Date Located

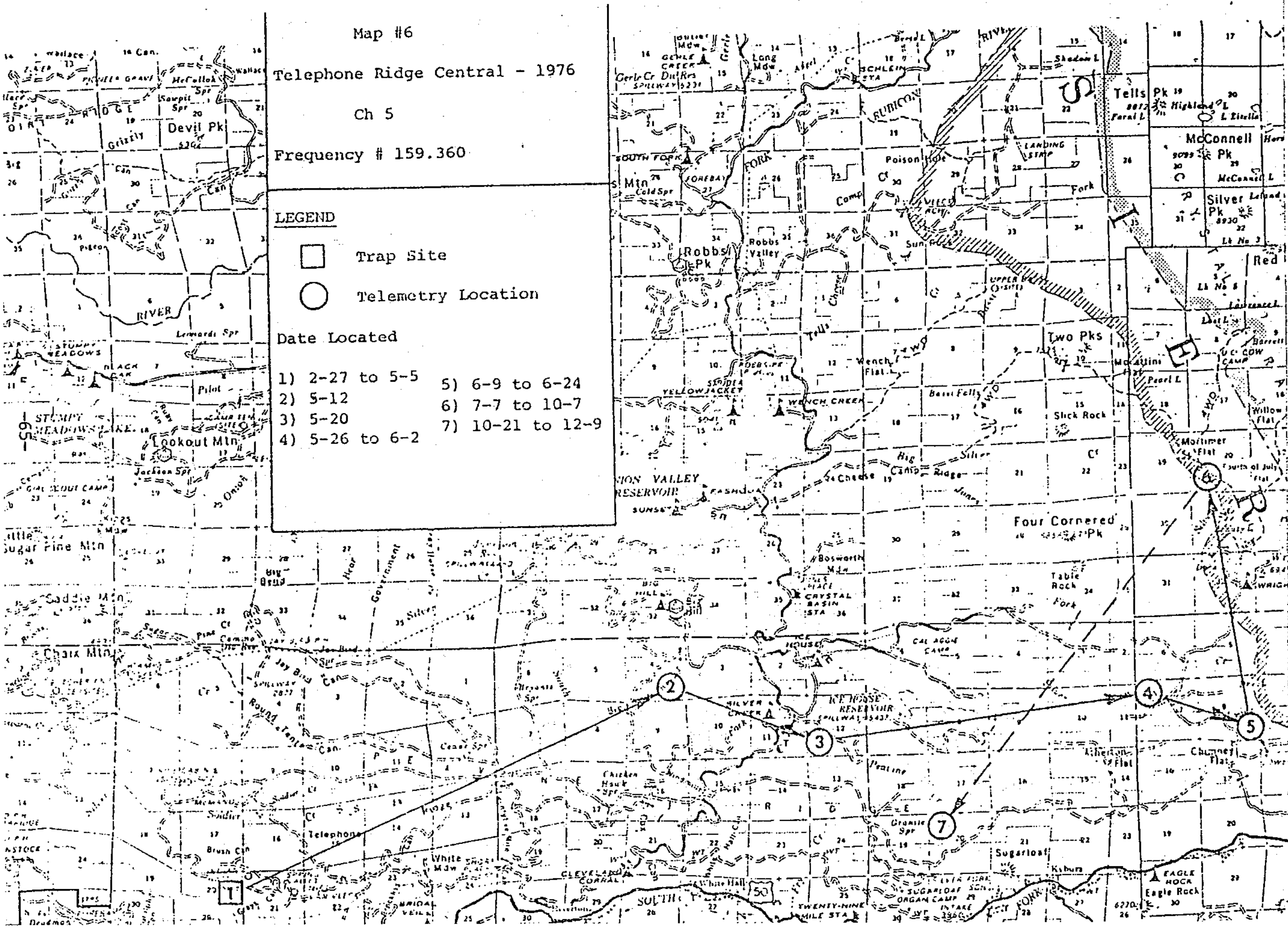
1) 2-27 to 4-28
2) 5-5 to 5-20
3) 5-26 to 6-2
4) 6-9
5) 6-17 to 10-7
6) 10-21
7) 10-27
8) 11-4 to 11-16
9) 12-2 to 12-9

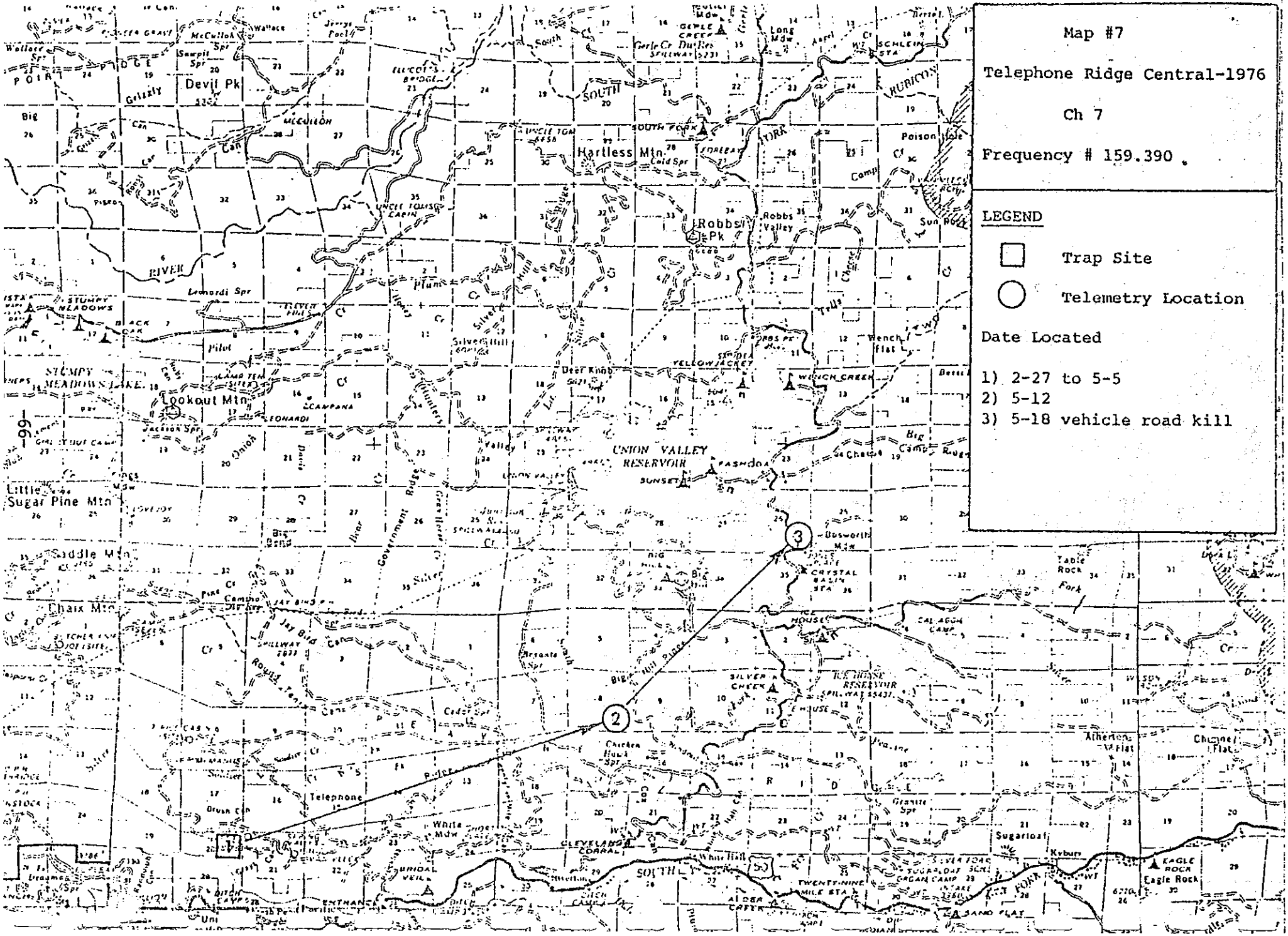


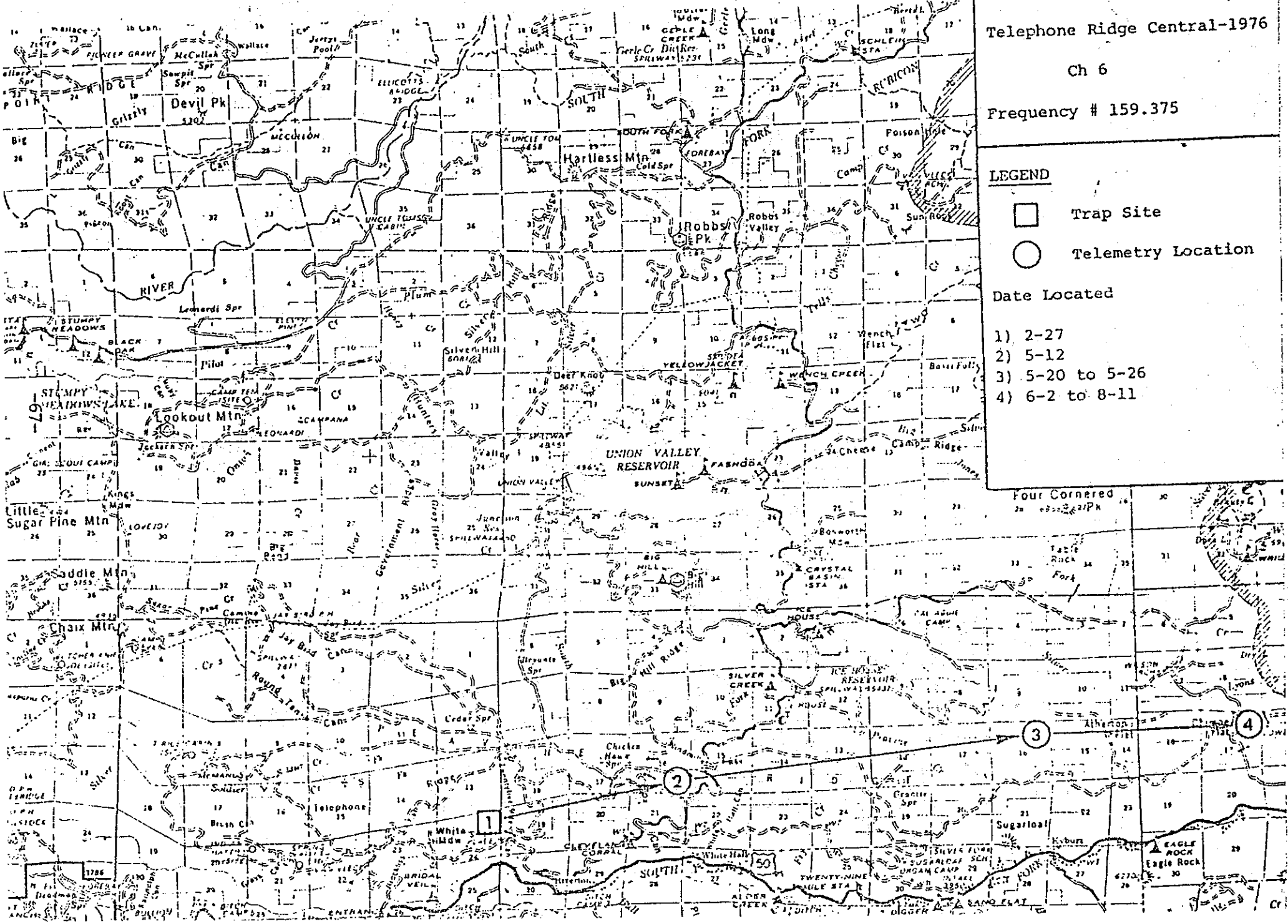

Map #3
Crosier Loop - 1976
Ch 8
Frequency # 159.405
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27 to 4-28
2) 5-12
3) 5-20 to 6-2
4) 6-9 to 6-17
5) 6-24 to 9-17
Devil Pk
Lookout Mtn
Little Sugar Pine Mtn
Saddle Mtn
Big X Mtn
Chair Mtn
Bartless Mtn
Robbs Pk
UNION VALLEY RESERVOIR
SLAB CREEK RESERVOIR
ICE HOUSE RESERVOIR
RUBICON
RIVER
NEVADA
POINT
SOUTH FORK
STUMPY MEADOWS LAKE
1
2
3
4
5

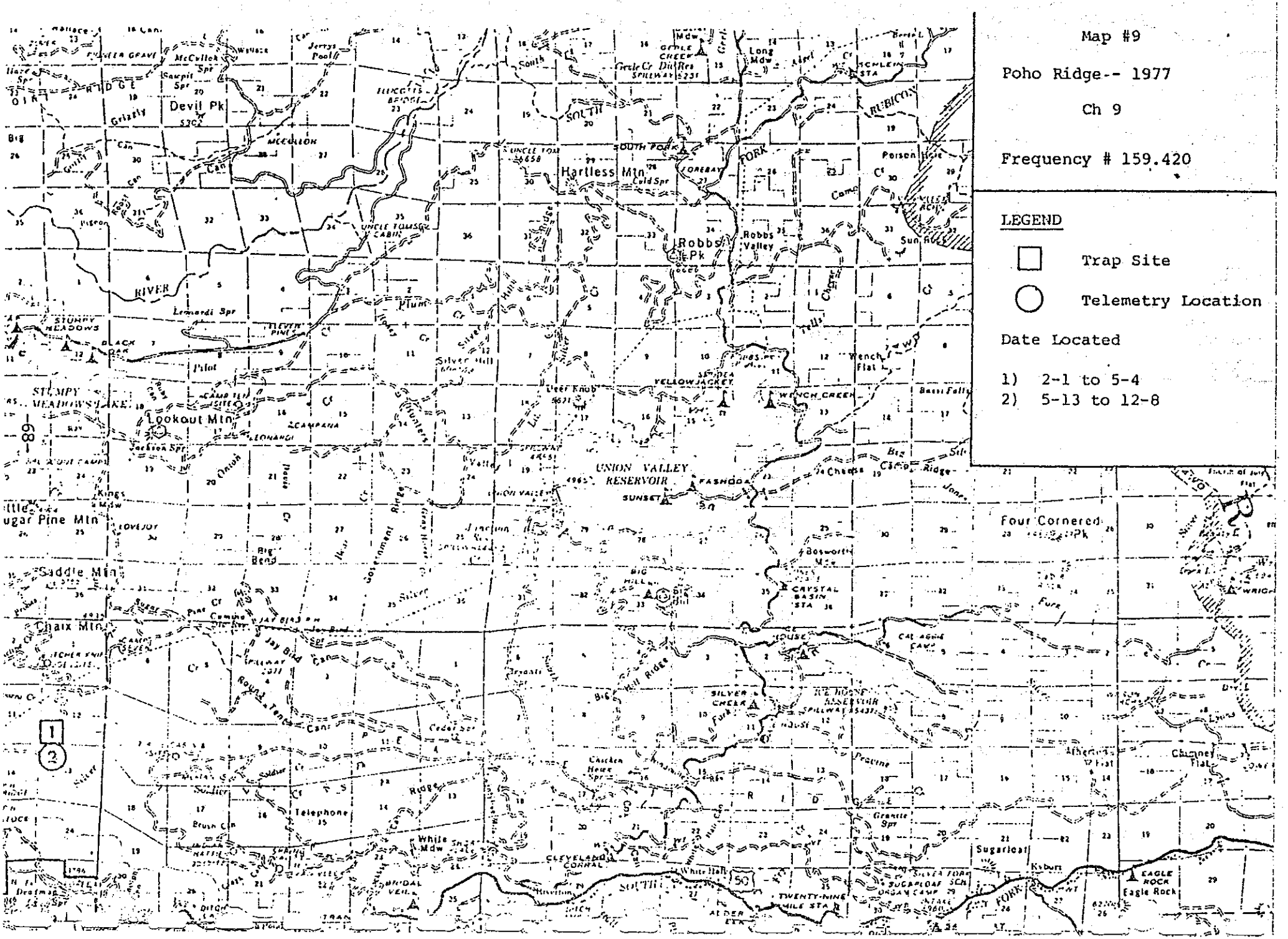

Map #4
Telephone Ridge West - 1976
Ch 3
Frequency # 159.330
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27 to 5-5
2) 5-12
3) 5-20
4) 5-26 to 6-17
5) 6-24 to 7-21
6) 8-11 to10-7
7) 10-21 to 10-27
8) 11-4
Devil Pk
Lookout Mtn
Saddle Mtn
Chaix Mtn
Robbs Pk
Tells Pk
McConnell Pk
Silver Lake Pk
Two Pks
Four Cornered Pk
Telephone
Sugarloaf
Eagle Rock
1
2
3
4
5
6
7
8
9
50

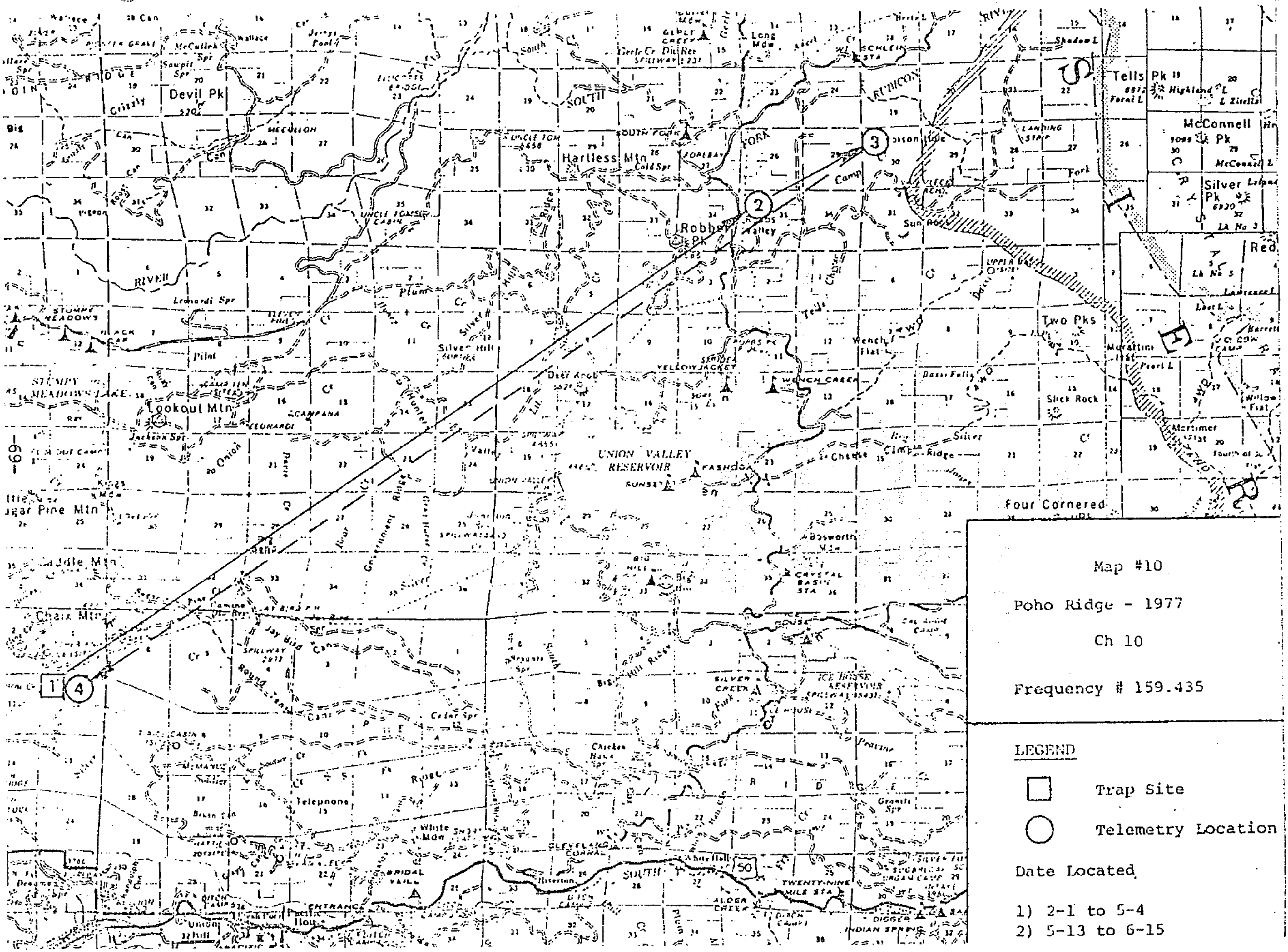

Map #5
Telephone Ridge West - 1976
Ch 7
Frequency #159.390
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27 to 5-5
2) 5-12
3) 5-20
4) 5-26 to 6-17
5) 6-24 to 7-21
6) 8-11 to 10-7
7) 10-21to 10-27
8) 11-4 to 12-9


Map #6
Telephone Ridge Central - 1976
Ch 5
Frequency # 159.360
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27 to 5-5
2) 5-12
3) 5-20
4) 5-26 to 6-2
5) 6-9 to 6-24
6) 7-7 to 10-7
7) 10-21 to 12-9
Devil Pk
Lookout Mtn
Robbs Pk
Tells Pk
McConnell Pk
Silver Pk
Two Pks
Four Cornered Pk
Saddle Mtn
Chaix Mtn
Sugarloaf
Eagle Rock
ICE HOUSE RESERVOIR
CRYSTAL BASIN STA
RUBICON
RIVER
Telephone


Map #7
Telephone Ridge Central-1976
Ch 7
Frequency # 159.390
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27 to 5-5
2) 5-12
3) 5-18 vehicle road kill
Devil Pk
Hartless Mtn.
Robbs Pk
Lookout Mtn.
Little Sugar Pine Mtn
Saddle Mtn
Chair Mtn
UNION VALLEY RESERVOIR
Telephone
1
2
3


Map #8
Telephone Ridge Central-1976
Ch 6
Frequency # 159.375
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-27
2) 5-12
3) 5-20 to 5-26
4) 6-2 to 8-11
1
2
3
4
Devil Pk
Harlless Mtn.
Robbs Pk
Lookout Mtn.
Little Sugar Pine Mtn
Saddle Mtn
Chaix Mtn
Four Cornered Pk
UNION VALLEY RESERVOIR
STUMPY MEADOWS LAKE
Telephone
Sugarloaf
Eagle Rock


Map #9
Poho Ridge-- 1977
Ch 9
Frequency # 159.420
LEGEND
Trap Site
Telemetry Location
Date Located
1) 2-1 to 5-4
2) 5-13 to 12-8
Devil Pk
Hartless Mtn
Robbs Pk
Lookout Mtn
Stumpy Meadows Lake
Union Valley Reservoir
Saddle Mtn
Chaix Mtn
Four Cornered Pk
Sugarloaf
Eagle Rock
1
2



Map #10

Poho Ridge - 1977

Ch 10

Frequency # 159.435

LEGEND

□ Trap Site

○ Telemetry Location

Date Located

1) 2-1 to 5-4
2) 5-13 to 6-15

APPENDIX 13

LIST OF AGENCIES REVIEWING DRAFT PLAN

1. U. S. Forest Service
   Eldorado National Forest
   Pacific Ranger District
   Placerville Ranger District
   Georgetown Ranger District

2. California Department of Forestry

3. Wildlife Protection
   Department of Fish and Game
   Region 2

Appendix 14

Pacific Deer Herd Harvest

1956-1981