



Ely
Miller Flat HMA

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Caliente Resource Area
P.O. Box 237
Caliente, NV 89008

11/3/82

IN REPLY REFER TO

4730
(N-057.8)

HMAP

(702) 726-3141

November 3, 1982

Wild Horse Organized Assistance
Atten: Dawn Y. Lappin, Director
P.O. Box 555
Reno, NV 89505

Dear Ms. Lappin:

The planning and preparation period for the Miller Flat Wild Horse Herd Management Area, identified to you in an April 29th correspondence, is complete. Extraordinary circumstances prolonged the oftentimes lengthy preparation and review of a preliminary draft. The extended time period, however, has resulted in optimistically a more satisfactory document. Review by the Coordinated Resource Management and Planning Committee and appropriate public interest groups marks the ultimate step in finalization of the Miller Flat Wild Horse Herd Management Area Plan.

Enclosed for your review and comment, is a copy of the management plan. Please forward all comments to the Caliente Bureau of Land Management Office by November 19, 1982, if possible. Questions concerning this correspondence should be directed to Phillip Seegmiller, Caliente Bureau of Land Management, Wild Horse and Burro Specialist.

Sincerely,

Richard A. Orr, acting

Darwin G. Anderson
Area Manager

MILLER FLAT WILD HORSE HERD MANAGEMENT AREA PLAN

CALIENTE RESOURCE AREA

LAS VEGAS DISTRICT

TABLE OF CONTENTS

I.	Introduction	1
II.	Background Information	1
	A. Location and Area	1
	B. Resource Data	2
	1. Vegetation	2
	2. Soil	2
	3. Watershed.	3
	4. Animals.	4
	a. Wildlife.	4
	b. Livestock	5
	c. Wildhorse	6
	1) Population History	6
	2) Present Situation.	6
	a) Numbers	6
	b) Color	7
	c) Condition	8
	d) Forage.	8
	e) Cover	9
	f) Water	10
	g) Seasonal Use and Home Range	10
	3) Population Demography.	10
	C. Existing Range Improvement Projects	11
	1. Water Projects	11

	2.	Vegetative Manipulation	11
	3.	Fencing	11
	D.	Coordination	11
	1.	Relationship to Other Resource Uses	11
	a.	Wild Horse - Wildlife.	11
	b.	Wild Horse - Livestock	12
	c.	Wild Horse - Recreation.	12
III.		Objectives.	13
	A.	Habitat.	13
	1.	Forage.	13
	2.	Cover	13
	3.	Water	13
	4.	Living Space.	14
	B.	Wild Free-Roaming Horses	14
	1.	Numbers	15
	2.	Animal Condition.	15
	3.	Sex Ratio	15
	4.	Wild Free-Roaming Behavior.	16
	5.	Home Range.	16
	6.	Color	16
	C.	Other Resources.	16
	1.	Wildlife.	16
	2.	Livestock	16
	3.	Recreation.	17
IV.		Management Methods.	17
	A.	Habitat Improvements	17
	1.	Forage.	17

	2.	Water	18
	3.	Fencing	18
	4.	Wildlife.	19
	5.	Living Space.	19
	6.	Recreation.	19
	B.	Population Viability	19
	C.	Population Manipulation.	20
	1.	Color	20
	D.	Population Adjustments	20
	E.	Public Information	21
V.		Studies and Assessment.	21
	A.	Habitat.	21
	1.	Trend	21
	2.	Utilization	21
	3.	Actual Use.	22
	4.	Climatic Data	22
	5.	Fecal Analysis.	22
	B.	Animal	23
	1.	Home Range and Seasonal Movement Pattern.	23
	2.	Productivity and Survival	23
	3.	Total Count Accuracy Rate	24
	4.	Sex Ratio Determination	24
	5.	Age Structure Evaluation.	25
VI.		Approval.	25
		Appendix 1 - Maps	26
		Appendix 2 - Fecal Analysis	27
		Appendix 3 - Population Demography.	28
		Literature Cited.	33
		Glossary.	i

I. Introduction

Wild horse (Equus caballus) habitation persisted in the Miller Flat region prior to 1971. Passage of the Wild Free-Roaming Horse and Burro Act of 1971 (P.L. 92-195) delegated responsibility for management and protection of these wild horses to the U.S. Department of Interior (i.e., Las Vegas Bureau of Land Management). Amendments to the Act by provisions contained in the Federal Land Policy and Management Act of 1976 (P.L. 94-579) and the Public Rangelands Improvement Act of 1978 (95-514) have significantly improved the management, protection and control capabilities of the Bureau of Land Management. Preparation of a Wild Horse Herd Management Area Plan designed to specifically manage the wild horses populating the Miller Flat region was recommended by the Caliente (Las Vegas Bureau of Land Management) Management Framework Plan. (U.S. Department of Interior, 1980)

The Miller Flat Wild Horse Herd Management Area Plan (WHMAP) is designed to effectively manage the wild horse population in accordance with the Bureau of Land Management Draft Manual 4730.6. and the Code of Federal Regulations 4700. Management of the wild horse population to effectuate compatibility with the existing environment is essential. Consequently, implementation of the Miller Flat WHMAP will result in a net benefit to the valuable resources (e.g., plant, wildlife, wild horses, livestock, etc.) which occupy the area.

II. Background Information

A. Location and Area

The Miller Flat Wild Horse Herd Management Area (WHMA) is located in Lincoln County, Nevada approximately 10 miles east of Caliente. Nevada State Highway 319 acts as the northern boundary with Clover Creek and the Kurt-Cannon-Wadsworth fence performing a similar function to the south. The WHMA is bounded on the east and west by the Panaca Division Fence and Union Pacific Railroad respectively. (Appendix #1).

Public lands constitute a majority of the land resources incorporated in the Miller Flat WHMA as reflected in the following table (Table 1):

TABLE 1

Land Status

<u>Land Status</u>	<u>Acres</u>	<u>Percent of Total</u>
Public Land	90,901	99.7%
Private	200	.2%
State	40	.1%

*Compiled from Caliente Unit Resource Analysis Table .44-9 and Master Title Plats (U.S. Department of Interior, 1978).

*Acreage portrayed in approximates.

B. Resource Data

1. Vegetation

Two major vegetative types blanket the WHMA; pinyon-juniper and sagebrush. The pinyon-juniper type extends over 95 percent of the management area with sagebrush existing in isolated areas. A more detailed description of the vegetation composition can be gleaned from the Caliente Planning Unit Range Survey accomplished in 1976-77 and contained in the Caliente Bureau of Land Management Office.

Presently, vegetative trend and utilization data for the WHMA is unavailable. However, forage resource monitoring techniques as defined by the Nevada Range Studies Task Force (1981) will be conducted thereby securing the necessary information within approximately three to five years.

2. Soil

The Miller Flat WHMA is composed predominantly of five soil associations; Decan-Uana-Shroe, Acana-Roval-Seval, Itca-Rock outcrop-Cedaran, Holtle-Fanu-Poorma and Tica-Rock outcrop-Hamtah (U.S. Departments of Interior and Agriculture, 1976).

The Acana-Roval-Seval and Decan-Uana-Shroe associations occur on upper terraces and alluvial fans composing approximately 50% of the WHMA. These soils are characteristically well-drained to excessively drained, shallow to very deep, and nearly level to steep. Elevation ranges from 4,800 to 7,800 feet, receiving an average eight to 16 inches of annual precipitation. The average annual air temperature is about 41° to 53° F experiencing an 80

to 130 day frost-free period. This association provides grazing habitat for wildlife, livestock, and wild horses. Suitability for irrigated crops or range seedings is minimal.

The Itca-Rock outcrop-Cedaran association are well-drained very shallow to moderately deep, gently sloping to steep soils on foothills and mountain faces. Approximately 40% of the WHMA contain these soils. The average annual precipitation is 10 to 16 inches at elevations ranging from 5,000 to 7,500 feet. Average annual air temperatures range from 42° to 53° F with a frost-free season of about 60 to 120 days. Grazing, wildlife, and wild horse habitat and watershed are provided by this association. It is not suitable for irrigated crops or range seedings.

Very shallow to very deep, well-drained to somewhat excessively drained, moderately steep to steep soils comprise the Tica-Rock outcrop-Hamtah association. These soils are located on the high mountains and foothills. Elevation ranges from 7,000 to 9,200 feet receiving an average annual precipitation of 14 to 22 inches. The average annual air temperature is 35° to 47° F. A frost-free season of about 40 to 80 days prevails.

A very small portion of the WHMA contains the Holtle-Fanu Poorma association. Very deep, well-drained, nearly level to moderately sloping soils on flood plains, low alluvial terraces and alluvial fans are characteristic. The average annual precipitation is 8 to 12 inches at elevations ranging from 5,800 to 7,800 feet. Average annual air temperatures are recorded at 42° to 45° F. The frost-free season is about 40 to 100 days. Grazing, wildlife, and wild horse habitat are provided in this association. Range seeding potential is good.

3. Watershed

The Caliente Unit Resource Analysis (U.S. Department of Interior, 1978) identified five watershed areas in the Miller Flat WHMA (Table 2). An erosion condition class designation of moderate to critical was accorded the five watershed areas. Deterioration of present watershed conditions over the next 15 years is anticipated by virtue of widespread pinyon-juniper cover (Table 2). Elevation differences, fragile soil conditions, and sparse vegetative cover account for problem areas where flood and sediment damage result from high intensity rains at infrequent intervals.

TABLE 2

Erosion Condition Classes

<u>Watershed Area</u>	<u>Present Condition</u>	<u>Future Condition</u>	<u>Trend</u>
Uvada	Moderate	Moderate	↔
Rabbit Spring	Moderate-Critical	Critical-Moderate	↕
Sheep Spring	Moderate-Critical	Critical-Moderate	↕
Clover Creek	Moderate	Moderate-Critical	↕
Oak Wells	Moderate-Critical	Critical-Moderate	↕

*Information obtained from Caliente Unit Resource Analysis Table .45-2 and .45-3 (U.S. Department of Interior, 1978).

4. Animals

a. Wildlife

Numerous wildlife species inhabit the WHMA. Mule deer (Odocoileus hemionus) utilize a majority of the management area as a yearlong range. A crucial winter area identified by the Nevada Department of Wildlife exists on the west slopes of the Cedar Mountain Range. The Caliente Management Framework Plan recognizes wildlife (mule deer) "reasonable numbers" (expressed in Animal Unit Months) at approximately 681 Animal Unit Months (AUMs) (U.S. Department of Interior, 1980).

Cottontail rabbits (Sylvilagus auduboni) exist in close proximity to drainages where the forage contains relatively higher water content and escape cover is more prevalent. Jackrabbits (Lepus californicus), found throughout the WHMA, are associated with more xeric sites.

Limited information pertaining to furbearers and nongame-predators prevents presentation of a detailed account. However, certain species i.e., coyote (Canis latrans), raccoon (Procyon lotor), badger (Taxidea taxus), and bobcat (Lynx rufus) predictably occur sparsely throughout the management area.

Gambel's quail (Lophortyx gambelli), the only native upland game bird populating the WHMA, generally require available free water at least during certain periods of the year. Consequently, these gallina-

ceous birds are encountered within approximately a quarter mile of springs, seeps, and other riparian areas (i.e., Clover Creek).

A more detailed account of wildlife species inhabiting the management area is presented in the Caliente Unit Resource Analysis, reserved in the Caliente Bureau of Land Management Office.

b. Livestock

Six livestock grazing allotments are incorporated in the Miller Flat WHMA. The Uvada (36%), Clover Creek (27%), Sheep Flat (6%), and Rabbit Spring (76%) Allotments each contribute only a portion of their acreage while Sheep Spring and Oak Wells are incorporated in their entirety (Appendix 1).

The Oak Wells and Sheep Flat Allotments are scheduled for incorporation into the Sheep Flat Allotment Management Plan (AMP). There are no immediate plans for AMP implementation on the other allotments.

Authorized livestock grazing consists of approximately 2,182 AUMs. Cattle use predominates with roughly 1,332 AUMs. Sheep use, occurring exclusively on the Rabbit Spring Allotment, accounts for the remaining 850 AUMs. Differentiation of the AUMs by allotment is displayed in Table 3.

TABLE 3

Livestock Grazing Privileges

<u>Allotment</u>	<u>% Within Management Area</u>	<u>Active Preference</u>	<u>Season-of-Use</u>	<u>Class of Livestock</u>
Oak Wells	100	511	Yearlong	Cattle
Clover Creek	27	166	11/1-4/30	Cattle
Rabbit Spring	76	850	10/16-4/15	Sheep
Sheep Spring	100	409	Yearlong	Cattle
Uvada	36	128	Yearlong	Cattle
Sheep Flat	6	118	5/16-9/15	Cattle

*Information acquired from operator case files reserved in the Caliente Bureau of Land Management Office.

Livestock grazing throughout the management area has been inconsistent. Rabbit Spring, Sheep Spring, and Clover Creek Allotments have experienced no livestock grazing for the past five years. Oak Wells received grazing pressure one of the last five years and only then during the summer months. The majority of livestock grazing on Sheep Flat exists south of Clover Creek outside the WHMA. Uvada Allotment alone has been grazed consistently.

c. Wild Horse

1). Population History

Horses have populated the WHMA at least since contemporary livestock use commenced. The source of these animals predominantly stems from domestic stock associated with mining and ranching activities (Thomas, 1979). As populations increased, local ranchers and governmental agencies attempted with reasonable success to control unwanted growth. Passage of the Wild Free-Roaming Horse and Burro Act of 1971 (P.L. 92-195) delegated the responsibility of management to the U.S. Departments of Interior and Agriculture.

Domestic horses were licensed in the WHMA until 1974. Licensed use was discontinued at that time because of conflicts associated with the management of wild and free-roaming horses inhabiting the area.

2). Present Situation

a) Numbers

Wild horse demographic information was essentially nonexistent prior to the passage of the Wild Free-Roaming Horse and Burro Act of 1971 (P.L. 92-195). The need for enlightened information is essential to effective wild horse population management. Consequently, four aerial inventories were conducted in the Caliente Planning Unit subsequent to passage of the Wild Free-Roaming Horse and Burro Act. The initial inventory was conducted in 1973 with succeeding inventories in 1974, 1977, and 1982. Inventories for the first three years were accomplished with a helicopter. A fixed wing aircraft provided the 1982 inventory travel mode. The inventory results are depicted in Table 4.

TABLE 4

Wild Horse Inventory

<u>Inventory Date</u>	<u>Inventory Count</u>
* 1973	32
* 1974	84
* 1977	-133
** 1982	42

* Caliente Unit Resource Analysis (Table .44-8) furnished the above inventory data (U.S. Department of Interior, 1978).

** Caliente Resource Area personnel secured the 1982 inventory data (includes young of year). This data reflects the 1980 wild horse gathering operation. A more detailed account of the inventory is reserved in the Caliente Bureau of Land Management Office.

Wild horse gathering operations were conducted in the Miller Flat WHMA during the summer of 1980 resulting in the removal of 93 wild horses. Hence, the discrepancy between the 1977 and 1982 inventory counts. Wild horse inventories conducted on terrain similar to that existing in the Miller Flat WHMA suggest only the remote possibility that every horse is counted. Preliminary research conducted by Siniff et. al., (1981), under Bureau of Land Management Contract (No. AA851-CTO-52) further demonstrates this situation. Siniff et. al., (1981) utilizing radio-collared wild horses determined total count accuracy to be between 45% and 93% depending on the particular terrain inventoried and type aircraft used. Accordingly, the total count data secured on the Miller Flat WHMA population is presumably below the actual population size. However, the use of population estimates for management purposes will be avoided until a site-specific total count accuracy rate determination is accomplished.

b) Color

Wild horse gathering operations conducted

in 1980 yielded 93 captured animals. The population capture sample demonstrated animal colors predominated by medium to dark hues (Table 5).

TABLE 5

Color

<u>Color</u>	<u>Number of Horses</u>
Bay	50
Sorrel	26
Black	5
Chestnut	4
Gray	3
Red Roan	1
Sevina	1
Pinto	1
Dun	1
Buckskin	1

93

c) Condition

Generally, the animals removed during capture operations were in fair to good condition. The population as a whole appeared healthy with isolated malady afflicting some of the older animals.

The average weight of the adult horses captured was approximately 600 pounds. These weights are considerably less than those attained by domestic horses. However, considering the harshness of the desert ecosystem, the demonstrated weights are predictable.

d) Forage

A fecal analysis was conducted over a four-month period during the summer of 1977. The study area was located in the central portion of the Miller Flat WHMA and typified the general vegetative conditions throughout. Pinyon-juniper-sagebrush was the plant community classification afforded the area containing the study.

Large herbivores inhabiting the study area include mule deer, wild horses, domestic sheep (not addressed in study), and cattle. Dietary overlap was determined greater between cattle and wild horses than mule deer and wild horses. Research conducted in Wyoming's Red Desert (Olsen and Hansen, 1977) and the Douglas Mountain Area of Colorado (Hansen et. al., 1977) demonstrated similar conclusions. Additionally, wild horses preferred grasses to forbs and shrubs. Similar findings are documented by Hansen et. al. (1977), Salter and Hudson (1979) in western Alberta, Canada and Olsen and Hansen (1977). The main grasses consumed by the horses inhabiting the Miller Flat WHMA include bromes (Bromus spp.), needle-and-thread (Stipa comata) three-awn (Aristida spp.) sand dropseed (Sporobolus cryptandrus), galleta (Hilaria jamesii), and wheatgrass (Agropyron spp.). For a more detailed account of the final analysis, refer to Appendix 2.

There are obvious limitations to the information gained from this fecal analysis. Fecal samples were collected only for four months and not on a yearlong basis. Fecal samples were not always fresh and moist. The study was restricted to a single area in the Miller Flat WHMA and extrapolation of information to the entire WHMA might not be appropriate. Sheep fecal samples were not collected.

Future studies should and will be pursued (when funding permits) to further supplement the information gained from the fecal analysis. These studies will include further fecal analysis in addition to trend and utilization evaluation.

e) Cover

Pinyon and juniper woodlands supply the cover for wild horses. These woodlands blanket the majority of the WHMA and constitute 95% of the vegetative resource. Forage availability in the pinyon-juniper community is meager.

f) Water

The management area is serviced mainly by developed and undeveloped springs. Wild horse use occurs on these water sources annually (Appendix 1). Water is not considered a limiting factor for the wild horse population.

Private ownership of several springs (i.e., Rabbit, Miller, Sheep and Oak Well) creates potential access problems for wild horses. Currently, access is provided at these springs, unfortunately, this situation could change depending on the private land status.

g) Seasonal Use and Home Range

A comprehensive study was never performed to determine the seasonal use patterns or home ranges of wild horse groups inhabiting the management area. Funding and manpower restrictions prevented the accomplishment of this goal. Identification of Major Use Areas, however, was accomplished (Appendix 1). Accurate knowledge pertaining to wild horse movement patterns is essential to effective management. Accordingly, a year-long study will be proposed for fiscal year 1983.

3) Population Demography

Effective management of wildlife populations is contingent on the acquisition and accurate interpretation of reliable sex and age data. Wild horse population management is no exception. Sex and age information secured through capture operations is a reliable technique utilized by the Bureau of Land Management to analyze population processes for management purposes. Analysis of the Miller Flat WHMA population considers four population parameters; sex ratio, age structure, productivity, and mortality or conversely survival (Appendix 3).

C. Existing Range Improvement Projects

1. Water Projects

Water projects are limited in the management area. Sheep Spring Pipeline and Wadsworth Well have use potential, however, repair is needed. A pipeline originating at Oak Well Spring and traversing the allotment to Oak Well Hollow is proposed for FY-1983 construction. Refer to the projects map included in this plan for project locations (Appendix 1).

2. Vegetative Manipulations

Two vegetative manipulations exist on the WHMA (Appendix 1). The Uvada Seeding was completed in 1957 and consists of 798 acres seeded to crested wheatgrass (Agropyron cristatum). Secondly, Uvada Juniper Eradication and Seeding, completed in 1958, provided a 493 acre crested wheatgrass seeding.

Increased forage availability was effectuated on both seedings with resulting benefits realized by the grazing herbivores inhabiting the area. Unfortunately, the forage production on these areas is decreasing due to encroachment of undesirable vegetation and maintenance is necessary.

3. Fencing

A majority of the Miller Flat WHMA boundary is fenced (Appendix 1). However, the fencing is in a state of disrepair in several areas allowing wild horse passage. The Uvada Juniper Eradication and Seeding Fence (Appendix 1), the sole interior fence, would preclude wild horse movement between Uvada and Sheep Spring Allotments if maintained.

D. Coordination

1. Relationship to Other Resource Uses

a. Wild Horse - Wildlife (Appendix 1)

Mule deer, the only big game species populating the WHMA, utilize the majority of the management area as a yearlong range. The Caliente Management Framework Plan recognizes wildlife "reasonable numbers" expressed in Animal Unit Months at approximately 681 (U.S. Department of Interior, 1980). Separation of mule deer AUMs by allotment is presented on the following page (Table 6).

TABLE 6

Mule Deer Vegetative Demand

<u>Allotment</u>	<u>Mule Deer</u>
Oak Wells	DY-247
Sheep Spring	DY-225
Rabbit Spring	DY- 58
Clover Creek	DY- 53
Uvada	DY- 37
Sheep Flat	DY- 5

Note: DY = Deer use on a yearlong basis.

The Caliente Management Framework Plan identified a mule deer crucial winter area located on the west slopes of the Cedar Mountain Range (U.S. Department of Interior, 1980). Intensive range monitoring of this area is essential to preservation.

Improve and maintain the aquatic habitat in Clover Creek as recommended by the Caliente Management Framework Plan (U.S. Department of Interior, 1980). Wild horse occupation of the area could impede accomplishment of this goal.

b. Wild Horse - Livestock

Oak Wells Allotment is scheduled for incorporation into the Sheep Flat Allotment Management Plan. Conflicts with wild horses could result where additional fencing is required to implement a successful grazing system.

The Coordinated Resource Management Planning process and range monitoring system are integral parts of the wild horse and livestock management programs. Genuine participation in these processes will diminish the potential of resource conflicts.

c. Wild Horse - Recreation

The Miller Flat WHMA incorporates many areas which provide a variety of recreational pursuits, including sightseeing, hiking, off-road vehicle (ORV), hunting, camping, etc. The Caliente Resource Area is in the process of ORV designation. Off-road vehicle competitive events are permitted on a case-by-case basis via Special Recreation Use Permits which could conceivably interrupt wild horse movement patterns and create undue harassment.

A reputed fishing resource exists in the Clover Creek. The continued existence of this resource is desired. Diligent coordination among the recreation, wildlife, and wild horse programs was advocated by the Caliente Management Framework Plan (U.S. Department of Interior, 1980).

The Big Hogback, located in the extreme northwestern segment of the WHMA, has identified visual resource management qualities. The Caliente Management Framework Plan recommended a Class II Visual Resource Management level for the area (U.S. Department of Interior, 1980). Wild horse habitation will likely have only minor consequences.

III. Objectives

A. Habitat

1. Forage

Maintenance of two vegetative manipulations and the development of one (Appendix 1 for location) are proposed for FY-1984 with a resulting increase in forage production. A grazing capacity of 10 acres/AUM is predicted. Wildlife, livestock, and wild horses will be mutual beneficiaries of these projects.

A green firewood cutting program has been initiated in the management area. Reduction in the pinyon-juniper overstory (2-3%) allowing establishment of native grass and browse species is the desired goal.

The realization of improved range condition (relative to climax) is a basic management goal. Judicious range management will effect movement toward the desired range condition (10% increase in desirable forage species) within a ten-year time span.

2. Cover

Any future vegetative manipulations will be designed so cover will be available for wild horses.

3. Water

Presently, there are sufficient water sources available to assure wild horses an adequate year-round supply. However, several of the water sources exist on private land. Coordination with the private land owners to maintain water availability for wild horses is essential to effective management. Maintenance of existing water projects (Sheep Spring Pipeline and Wadsworth Well) and further development of the springs located on public land (Dow, Chokecherry, Miser and Horse) will insure year-round water availability for wild horses. Future funding levels will dictate when these objectives can be accomplished.

Future water projects where all or part of project construction is on public land will be designed to provide water to wild horses, livestock, and wildlife (Code of Federal Regulations 4120.6 and 4730.2). However, water projects that would alter or disrupt the home ranges of wild horses will be avoided (Bureau of Land Management Manual 4730.2).

4. Living Space

The goal of this management plan is to maintain a viable population of healthy free-roaming wild horses in equilibrium with their habitat. Accomplishment of this objective depends to a great degree on the ecological density of the wild horse population. The ecological density of the population is not known. Casual observation reveals adequate space available over the majority of the management area. However, certain areas (i.e., Rabbit Spring) exhibit apparently high population densities. A study program designed to provide enlightenment into home range and seasonal movement patterns in conjunction with a range monitoring program will furnish ecological population density information.

B. Wild Free-Roaming Horses

The Caliente Management Framework Plan recommended designation of Miller Flat as a wild horse herd management area (U.S. Department of Interior, 1980). A management plan will be prepared for the accommodation of an estimated 50 horses utilizing 600 AUMs of forage. The management plan incorporates the basic foundations, specified in Bureau of Land Management Instruction Memorandum No. 81-145, necessary for effectual stewardship of the wild horses inhabiting the Miller Flat WHMA:

- To maintain in a thriving ecological condition the basic soil, water, and vegetation resources that comprise the rangeland ecosystem. Maintaining this condition will be the biological basis for the establishment of the desired number and mix of animals that utilize the public lands.
- To ensure viable populations of healthy free-roaming wild horses and burros in equilibrium with their habitat and other resource values under the principles of multiple use. The focus of the program is on preserving the intrinsic and primary value of these animals as wild free-roaming components of the rangeland ecosystem.
- To control wild horse and burro populations. Where a demand for excess animals exists, they are to be made available to the public for proper care and treatment through the adoption program. If no adoption demand exists, they are to be humanely destroyed.

- To provide for the humane care and proper treatment of wild horses and burros.

1. Numbers

The 1982 inventory conducted in the Caliente Planning Unit revealed 42 wild horses inhabiting the area. The Caliente Coordinated Resource Management Planning Committee recommended the management of 50 wild horses as a planning objective. Further differentiation of the population by allotment is displayed in Table 7.

TABLE 7

Allotment Wild Horse Population

<u>Allotment</u>	<u>1982 Population Estimate</u>	<u>Population Objectives</u>
Oak Wells	5	5
Sheep Spring	9	9
Rabbit Spring	17	17
Clover Creek	0	8
Uvada	6	6
Sheep Flat	5	5

2. Animal Condition

The horses removed during the 1980 capture operations were in fair to good condition. Improvement over present animal condition is desirable. Through effective management, a good-to-excellent overall animal condition rating can be achieved.

3. Sex Ratio

The Miller Flat population capture sample exhibits a sex ratio of 47 males to 46 females (approximately 1:1). A research study conducted by Wolfe (1980) suggest that a larger depression of the rate of population increase can be effected if removals are selective to females in comparison to an equal number of animals distributed over both sexes. Computer simulation techniques conducted by Wolfe (1980) indicates sex-specific female removals of 7 to 10% will effectuate an appreciable depression in the rate of increase. Application of this theory to the Miller Flat WHMA population could produce similar results.

4. Wild Free-Roaming Behavior

Management facilities and practices will be at minimum feasible levels and consistent, to the extent possible and practical, with the maintenance of free-roaming behavior (BLM Manual 4730.2 and Code of Federal Regulations 4730.2).

5. Home Range

The components and function of home ranges (seasonal-use areas, distribution and movement patterns, crucial area, etc.) must be thoroughly understood before undertaking actions which have the potential of altering home ranges (BLM Manual 4730.21A).

A comprehensive study will be conducted, when funding permits, to secure an understanding of home ranges and seasonal movements. Until this information is available, the aforementioned policy statement will be adhered to.

6. Color

Allow natural recurrence within the wild horse population of the dun coloration.

C. Other Resources

1. Wildlife

The management of wild horses within the Miller Flat WHMA shall be compatible with wildlife "reasonable numbers" defined by the Nevada Department of Wildlife. Wildlife "reasonable numbers" is the goal to strive for. However, wild horse and livestock populations will not necessarily be reduced in the accomplishment of this objective.

Improve and maintain the aquatic habitat in Clover Creek.

Preserve the mule deer crucial winter area located on the west slopes of the Cedar Mountain Range.

2. Livestock

Incorporate the Oak Wells and Sheep Flat Allotments into the Sheep Flat Allotment Management Plan. Administer the remaining allotments under a licensed use situation.

Construct a four mile pipeline from Oak Wells Spring to Oak Wells Hollow to facilitate livestock, wild horse and wildlife distribution.

A vegetative manipulation, consisting of approximately 1000 acres, is proposed for the eastern portion of the Oak Wells Allotment. Successful allotment management plan development depends on establishment of this manipulation.

Implementation of the Sheep Flat Allotment Management Plan depends on the construction of a fence across the the northern boundary of Oak Wells Allotment and completion of the eastern boundary fence.

Determine desirable livestock numbers through the range resource monitoring program and the Coordinated Resource Management Planning process.

3. Recreation

Regulate ORV events on a case-by-case basis via Special Recreation Use Permits.

Ensure the continued existence of Clover Creek's fishing resource through diligent management.

Visual quality of the Big Hogback should be maintained at a Class II Visual Resource Management level. Wild horse habitation will alter this insignificantly.

IV. Management Methods

A. Habitat Improvements

1. Forage

Maintain the Uvada Seeding and the Uvada Juniper Eradication and Seeding. Development of a 1,000 acre vegetative manipulation on the Oak Wells Allotment will be coordinated with implementation of the Sheep Flat Allotment Management Plan. Success of a vegetative manipulation hinges on a two-year rest period resulting in short-term, non-use of these areas. However, the movement patterns and home ranges of the wild horse bands inhabiting these particular areas will not be significantly altered.

Achievement of a 10% increase in desirable forage species is contingent on implementation of range monitoring procedures as described by the Range Studies Task Group (1981). These procedures will be employed on strategic locations called key management areas within the identified Major Use Areas (Appendix 1). The key management areas will reflect the overall acceptability of current grazing management on all or part of the Miller Flat WHMA (Range Studies Task Group, 1981). Attainment of proper forage utilization by the grazing herbivores is fundamental. Diligent evaluation of proper utilization levels as prescribed by the ensuing table (Table 8) will

result in accomplishment of the desired goal.

TABLE 8

ALLOWABLE USE FACTOR FOR PERENNIAL RANGE

PLANT CATEGORY	SPRING	SUMMER	FALL	WINTER	YEARLONG
Annual Grasses #	60	90	90	90	83
Perennial Grasses & Grasslike	50	50	60	60	55
Annual Forbs #	60	90	90	90	83
Perennial Forbs & Biennial Forbs	50	50	60	60	55
Shrubs, Half Shrubs & Trees	30	50	50	50	45

*Information secured from Nevada Range Monitoring Procedures Handbook, 1981.

A green firewood cutting area has been identified (Appendix 1) and will be opened to cutting in FY 1983.

2. Water

Management facilities (i.e., water projects etc.) will be designed and/or modified with the goal of maintaining the integrity of wild horse home ranges (Bureau of Land Management Manual 4730.21).

Reconstruct the Sheep Spring Pipeline and further develop Chokecherry, Miser and Dow Springs to insure year-round water availability for wild horses and wildlife.

Develop Horse Spring to reduce wild horse use of the Clover Creek Riparian Zone.

Maintain the Uvada and Old Highway Reservoirs.

3. Fencing

Intensive livestock grazing management practices which involve fenced allotments and/or pasture boundaries (i.e., Oak Wells northern boundary fence) must be designed to preserve the home ranges for a large majority of the animals (Bureau of Land Management Manual 4730.21).

The Caliente Coordinated Resource Management Planning Committee recommended construction of the Oak Wells northern boundary fence. Gaps will be maintained in the fence to allow free-roaming movement of wild horses.

The Uvada Seeding Fence if maintained properly and gates closed would preclude wild horse passage. The retention of gaps in one or two unobtrusive locations will provide adequate year-long wild horse passage.

4. Wildlife

Monitor wild horse, livestock, and wildlife grazing in the mule deer crucial winter area as described in Section IV A 1 above.

Maintain livestock and wild horse utilization at a level that ensures improvement of the Clover Creek aquatic habitat.

5. Living Space

Range monitoring studies, in conjunction with home range and seasonal movement pattern studies, will determine if an ecological density imbalance exists. If an imbalance is identified, a population adjustment will be employed to correct the situation. Livestock, wild horses, and wild life (i.e., mule deer) utilization will be considered simultaneously when population adjustments are obligatory.

6. Recreation

Guarantee the continued existence of Clover Creek's fishing resource by managing livestock and wild horse grazing at desirable utilization levels.

B. Population Viability

Viability of the Miller Flat WHMA population is threatened by excessive unnatural mortality. The source of this mortality is twofold; Union Pacific Railroad and unauthorized removals. The railroad right-of-way fence is in a state of disrepair thus allowing wild horse access to the railroad track. A wild horse carcass was discovered on February 25, 1982 adjacent to the railroad track. Further wild horse railroad mortality can be precluded through proper maintenance of the right-of-way fence. The Union Pacific Railroad will be requested to repair and maintain the right-of-way fence.

Suspicion of unauthorized wild horse removals stems from apparent traps existing at Chokecherry and Dow Springs. Removal of these traps plus periodic reconnaissance of the management area will reduce the likelihood of unauthorized removals.

C. Population Manipulation

1. Color

Dun coloration will be allowed to evolve naturally in the wild horse population. When population removals are warranted, horses possessing the dun coloration will be avoided where possible and practical. Desirable population, age structure and sex ratio will not be sacrificed to attain this goal.

D. Population Adjustments

Population adjustments will be conducted only when range monitoring studies demonstrate a need. Adjustment will be based on the utilization of key forage species (Range Studies Task Group, 1981). A basic utilization - population size formula will be employed for calculation of the necessary adjustment.

$$\frac{X \text{ (Desired Population Size)}}{\text{Desired Utilization}} = \frac{\text{Present Population Size}}{\text{Present Utilization}}$$

Utilization monitoring, as per BLM Manual 4412.22 B 7 c 5), and the Nevada Range Monitoring Procedures Handbook, 1981, will be executed in the key management areas. When the need for a population adjustment (at least two years hence) is evidenced, both wild horse and livestock populations will reflect change. Population adjustments for livestock will be made from active preference while wild horse adjustments will be contingent on the 1982 population estimate reflecting a 1.06 (6%) annual finite rate of increase (λ) (Appendix 3). If an upward adjustment is identified, livestock AUMs held in suspended-non-use will be returned before wild horse numbers are allowed to increase as recommended by the Caliente Coordinated Resource Management Planning Committee.

Maintenance of an overall wild horse population of 50 animals is the management objective. If, for example, one Major Use Area (Appendix 1) is identified as requiring a downward population adjustment and a second Major Use Area may need an upward population adjustment to meet the proper utilization goal, the necessary adjustments can be made while still maintaining the desired management population. However, this situation does not preclude the possibility that an overall population adjustment upward or downward might eventually be warranted.

All population reductions will be in accordance with guidelines established by the Caliente-Virgin Valley Wild Horse and Burro

Gathering Plan (retained in the Caliente Bureau of Land Management Office) and the Code of Federal Regulations 4740.

Depression of the rate of population increase can predictably be accomplished through female selective removals (Wolfe, 1980). Helicopter trapping is intuitively selective to females (Milton Frei, Bureau of Land Management, NSO, pers. comm.). Consequently, a population having a sex ratio of 1:1 would experience a depression in the rate of population increase prompted by helicopter gathering procedures. Considering the low finite rate of increase ($\lambda = 1.06$) identified by the Population Projection Table (Appendix 3) and apparent unnatural mortality, further female selective techniques other than those inherent to helicopter trapping will be avoided. If further studies indicate a change in the 1:1 sex ratio and cessation of excessive unnatural mortality increased female selection could be warranted.

E. Public Information

The Wild Free-Roaming Horse and Burro Act (PL 92-195) declared that wild free-roaming horses and burros " . . . are living symbols of the historic and pioneer spirit of the west; that they contribute to the diversity of life forms within the Nation and enrich the lives of American people . . . " The enrichment of American lives is manifested in two forms; knowledge that wild horses endure on public lands and visual encounters of the animals. The opportunity for this enrichment depends on notification of the public. Therefore, a sign should be posted on Nevada State Highway 319 to inform passing motorists of the WHMA.

V. Studies and Assessment

A. Habitat

1. Trend

Trend is defined as a change in vegetation and soil characteristics as a direct result of environmental factors, primarily climate and grazing. Trend studies will be used in combination with other studies to evaluate the effectiveness of this management plan. The frequency sampling procedure described by Tueller et. al., (1972) will be the methodology utilized. The data collected will be reserved in the allotment files located in the Caliente Bureau of Land Management Office. Refer to the range monitoring map (Appendix 1) for approximate locations of the trend plots.

2. Utilization

Utilization is defined as the degree of herbage removed from current annual production. Utilization studies help to evaluate management systems by determining patterns and

quantity of use. The Key Forage Plant Method is the technique adopted for this management plan. Section 4412.22B7C of the Bureau of Land Management Manual and the Range Studies Task Group (1981) describes this particular method adequately. Utilization data will be collected contiguous with movement of livestock from the key management areas, thus acquiring cattle and wild horse use. Utilization data will again be collected prior to cattle re-entry to obtain wild horse utilization only. Utilization transects will be conducted throughout the key management area. Data will be reserved with trend information.

3. Actual Use

Actual use grazing records will supply a log of animal numbers, date on and off, pastures used and rested and distribution of use. The livestock operator will bear the primary responsibility for livestock actual use, supervised and assisted by the Caliente Resource Area Range Conservationist. The Nevada Department of Wildlife will supply mule deer actual use estimates. Wild horse actual use estimates will be obtained from aerial census conducted by the Caliente Resource Area Wild Horse and Burro Specialist. Data will be reserved with trend and utilization information.

4. Climatic Data

Climatic data consists primarily of rain can studies measuring the amount of precipitation. The precipitation data is collected on a monthly basis and reserved with the trend and utilization information.

5. Fecal Analysis

A fecal analysis study will be conducted when funding permits. This study will supplement information gained from the fecal analysis conducted in 1977 and discussed in Section II B of this plan. Methodology adopted for the study follows:

- Data collection will span an entire year.
- Seasonal samples will be gathered through collection of monthly sub-samples (minimum of five sub-samples/collection area).
- Establishment of collection areas in close proximity to trend and utilization studies.
- Only fresh-moist sub-samples shall be selected.

B. Animal

1. Home Range and Seasonal Movement Pattern

A comprehensive study will be conducted when funding permits to secure an understanding of home ranges and seasonal movements. The succeeding outline briefly analyzes the methodology planned.

Phase 1 - October

Objective: Identify wild horse bands.

Method: Capture and attach radio-collars to at least 25% of the wild horse population. One radio-collared wild horse/band is preferable.

Phase 2 - October, January, April, July

Objective: Determine seasonal movement patterns and home range establishment.

Method: Super Cub (10 hours/season) aerial inventories and on the ground observation seasonally (fall, winter, spring, and summer). Sighting locations will be plotted on a map.

Phase 3 - Evaluation of information acquired through field work.

BUDGET NEEDS

<u>Item</u>	<u>Time Period</u>	<u>Cost</u>
Super Cub	40 hrs.	4,000
Horse Rental	20 days	450
Personnel	3 work months	7,500
Capture & Collaring		<u>3,000</u>
		\$14,950

2. Productivity and Survival

General productivity indices can be estimated from the relative age composition (percent foals) of the WHMA population (Wolfe, 1980). Information acquired will supplement the productivity estimates secured through analyzation of captured horses (Appendix 3). Aerial inventories will secure the desired data. Therefore, the aerial inventory designated to obtain wild horse home range and seasonal movement patterns can also supply relative age composition.

First year survival rates can be approximated through shrinkage of foal incidence between post-parturition composition surveys and pre-parturition surveys (Wolfe, 1980). The survey will be conducted in July and January in conjunction with seasonal movement and home range enlightenment.

3. Total Count Accuracy Rate

The mark - resight estimation method will be utilized to enhance the 1982 population inventory in addition to the establishment of an inventory accuracy rate. This method involves the initial marking flight (animals collared in home range and seasonal movement study) with a second flight conducted to count all animals and record the number of those with collars. The succeeding formulae can then be used to determine accuracy rate and population estimate.

$$A = \frac{m}{M} \qquad N = \frac{Mn}{m}$$

Where: A = accuracy rate
N = estimated number of horses
M = number of available collars
n = number of animals resighted
(both collared and uncollared)
m = number of collared animals resighted

Acquisition of the above information will be in conjunction with the home range and seasonal movement patterns study (Appendix 3).

4. Sex Ratio Determination

Further enhancement of the sex ratio assessment secured from the 93 horse removal sample (Appendix 3) is the objective of this study. Two methods will be utilized in the accomplishment of this endeavor.

Classification of captured animals - sex determination will be conducted on all horses captured during gathering operations.

Field observation - a spotting scope positioned at strategic locations (water sources, trails, natural salt licks, etc.) will be employed to obtain sex ratio information where possible. However, unless all animals in a band can be classified, the data will not be used.

5. Age Structure Evaluation

Relative age structure of the Miller Flat WHMA population will be periodically evaluated. The 93 animal capture sample obtained during the 1980 gathering operation supplied valuable

data. This information will be further supplemented with the following study techniques:

Classification of captured animals - animals captured during gathering operations will undergo age determination activities.

Photographic reconnaissance - time lapse photographic equipment will be positioned at water sources frequented by horses. Age classes will be obtained on a bi-annual basis: Once in late summer, following the peak foaling period and the second in late winter when foals are approaching one year of age.

VI. Approval

Prepared by: _____

Concurrence: _____

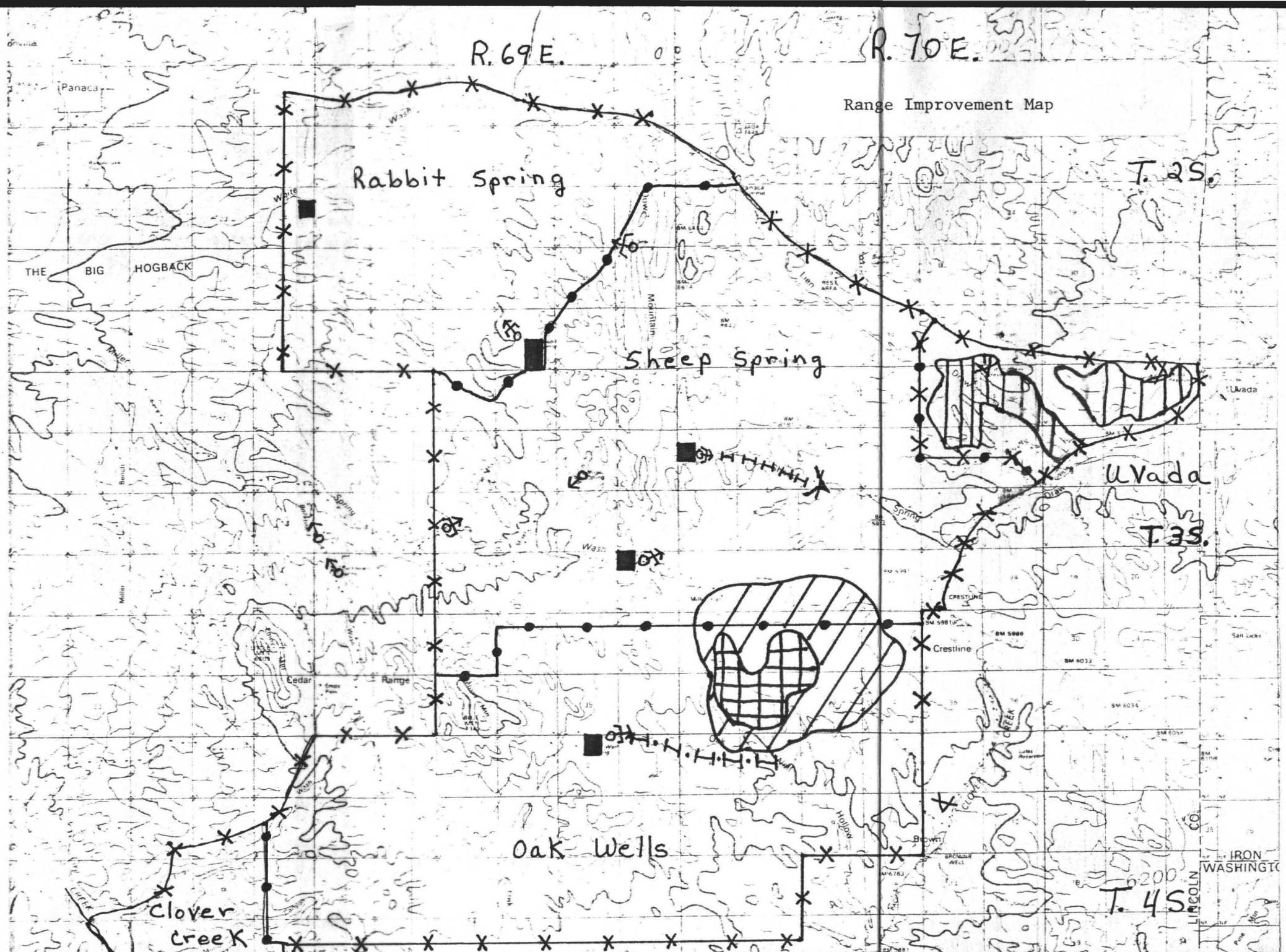
Approved by: _____

APPENDIX 1

MAPS

- Range Improvement Map - Depicts all range improvements existing on the Miller Flat WHMA.
- Wildlife Map - Mule deer use areas.
- Major Use Areas and Range Monitoring Map - Wild horse major use areas and the location of range monitoring plots are identified.

Range Improvement Map



Key

- Herd Management Area Boundary
- Allotment Boundary
- X Fence
- H-H Existing Pipeline
- H.H.H Proposed Pipeline

- ♂ Spring
- ♂♂ Developed Spring
- △ Reservoir
- ||| Vegetative Manipulation
- ▨ Proposed Vegetative Manipulation
- Private Land
- /// Green Firewood Cutting Area

R. 69 E.

R. 70 E.

Wildlife Map

THE BIG HOGBACK

T. 25.

T. 35.

T. 45.

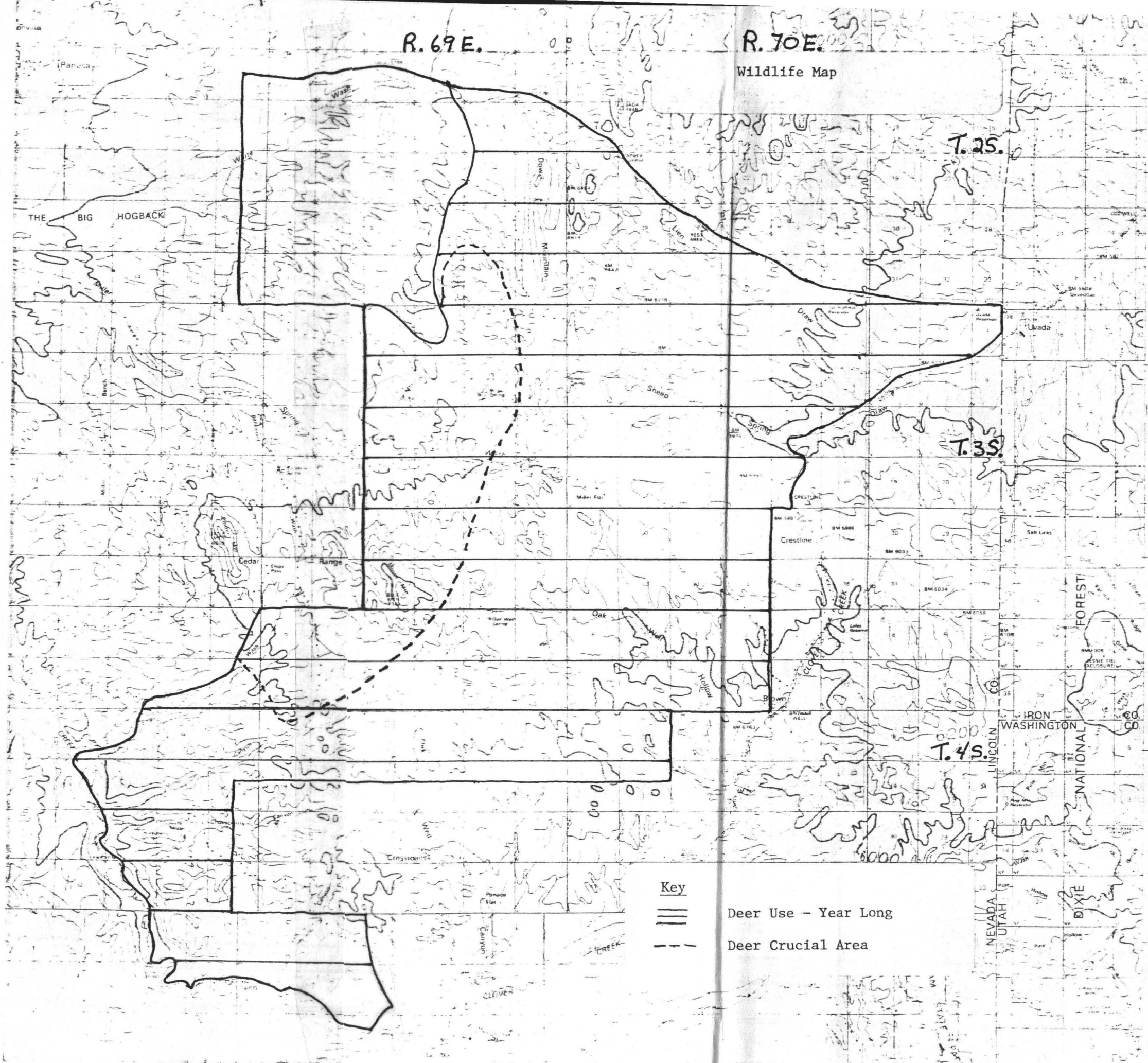
Key



Deer Use - Year Long



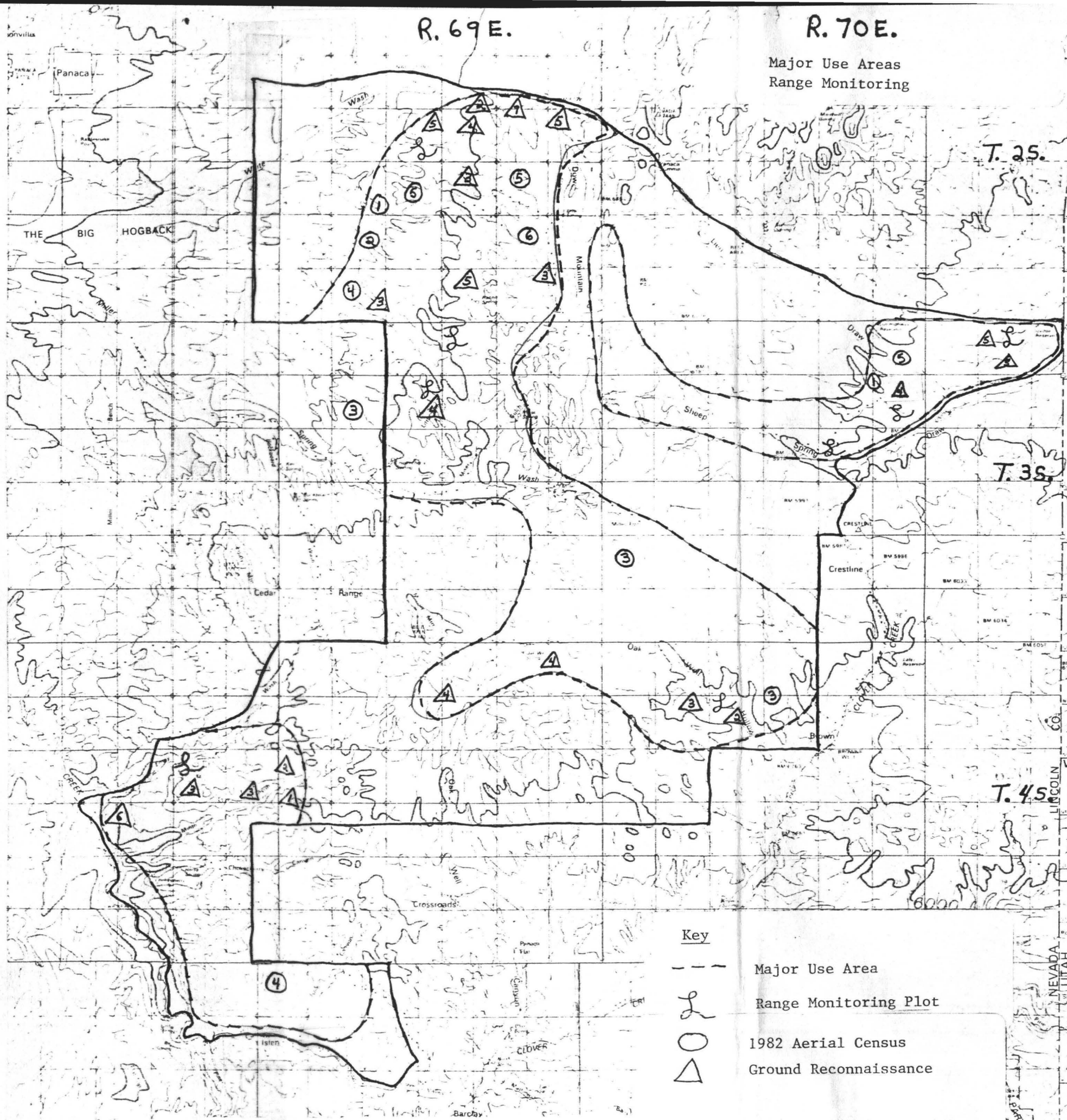
Deer Crucial Area



R. 69 E.

R. 70 E.

Major Use Areas
Range Monitoring



T. 35 S.

T. 36 S.

T. 45 S.

Key

- Major Use Area
- Range Monitoring Plot
- 1982 Aerial Census
- △ Ground Reconnaissance

NEVADA
UTAH
LINCOLN CO.

APPENDIX 2

FECAL ANALYSIS

A brief summary of the fecal analysis study conducted in the Miller Flat WHMA in 1977 is presented here. A more detailed account of the study is contained in the Caliente Unit Resource Analysis located in the Caliente Bureau of Land Management Office.

PLANT SPECIES COMPOSITION LIST

Key to Occurrence

i - infrequent

c - common

a - abundant

GRASSES

Agropyron desertorum - a
Agropyron smithii - i
Aristida spp. - c
Bouteloua gracilis - c
Bromus rubens - i
Bromus tectorum - i
Hilaria jamesii - c

Oryzopsis hymenoides - i
Poa nevadensis - c
Poa secunda - i
Sitanion hystrix - c
Sporobolus cryptandrus - i
Stipa comata - i

FORBS

Astragalus spp. - i
Antennaria spp. - i
Brassica nigra - i
Chenopodium album - i
Commandra pallida - i
Erigeron spp. - i
Eriogonum spp. - i
Euphorbia spp. - i

Iris spp. - i
Lotus spp. - c
Lupinus spp. - i
Lygodesmia spp. - i
Penstemon spp. - i
Phlox spp. - i
Salsola kali tenuifolia - i
Sphaeralcia spp. - i

TREES AND SHRUBS

Artemisia nova - a
Artemisia tridentata - a
Aster engalmanii - i
Atriplex canescens - i
Cercocarpus ledifolius - i
Chrysothamnus nauseosus - i
Chrysothamnus viscidiflorus - a
Cowania mexicana stansburiana - c
Ephedra nevadensis - a
Ephedra viridis - c
Eriogonum spp. - c
Gutierrezia spp. - c

Juniperus utahensis - a
Leptodactylon pungens - i
Opuntia spp. - i
Peraphyllum ramosissimum - i
Pinus monophylla - a
Purshia tridentata - c
Quercus gambellii - i
Quercus turbinella - i
Salvia carnosa - i
Tetradymia canescens - i
Yucca spp. - i

APPENDIX 3

POPULATION DEMOGRAPHY

Analysis of the Miller Flat WHMA population considers four population parameters; sex ratio, age structure, productivity and mortality or conversely, survival. A population sample of 93 wild horses captured from the Miller Flat and Little Mountain WHMAs (Little Mountain WHMA is adjacent to the Miller Flat WHMA) provides the source of information for the aforementioned population parameters.

1) Sex Ratio

The sample population exhibits a sex ratio of 47 males to 46 females (approximately 1:1). However, helicopter capture operations favor female selection by virtue of wild horse social organizations (Milton Fri, Bureau of Land Management, NSO, pers. comm.). Consequently, the Miller Flat population presumably has an unequal sex ratio favoring males. Predictability to the extent of inequality is at present unfeasible.

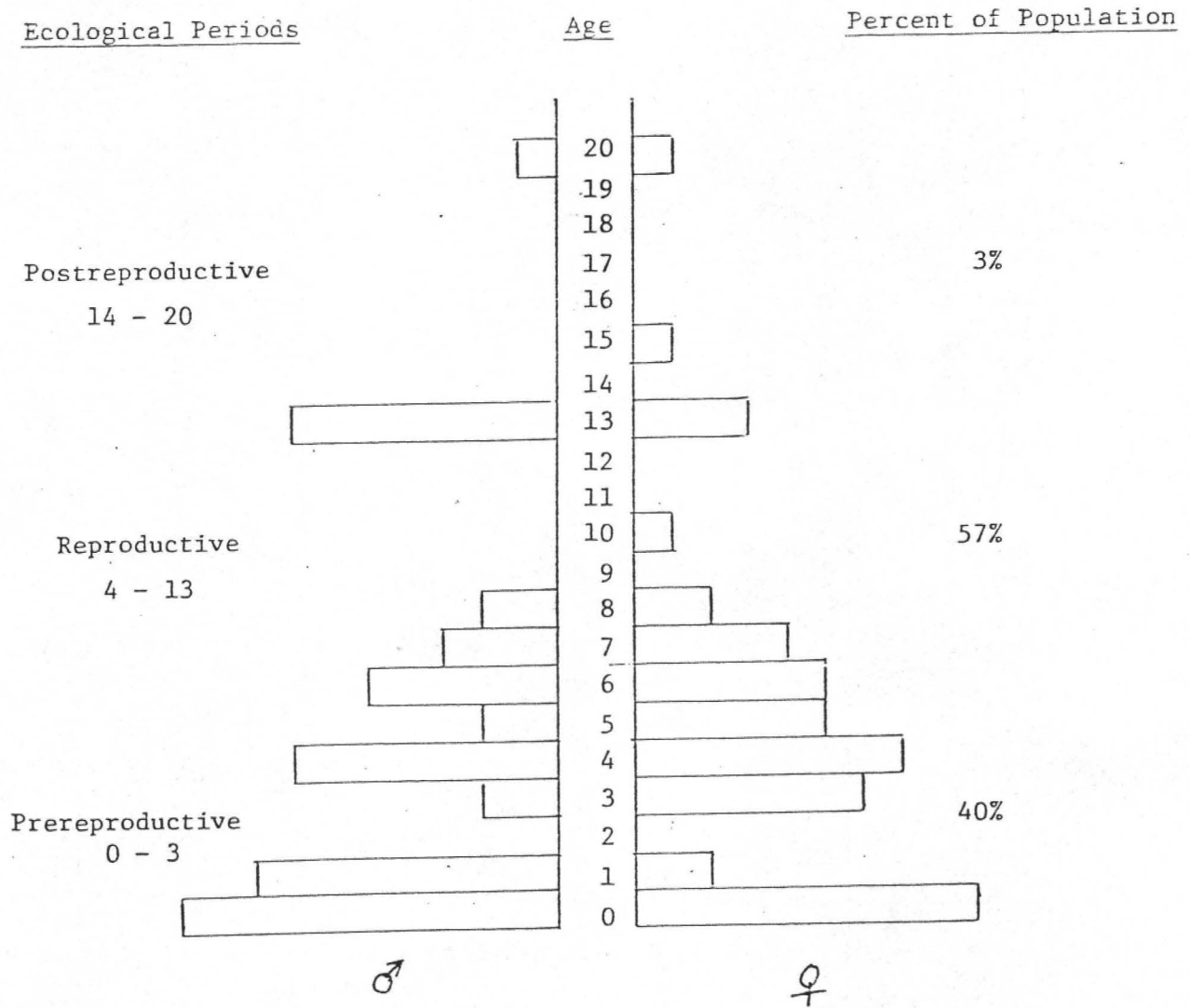
2) Age structure

Populations can be divided into three separate ecological periods; prereproductive, reproductive, and postreproductive (Smith 1974). Reproduction is restricted to particular age groups and mortality is most conspicuous in others. Therefore, ratio of age groups is important to future populations (Smith, 1974). Smith (1974) suggests constructing an age pyramid for presentation of the age structure and subsequent analysis of the age ratios. This technique was utilized for depiction of the Miller Flat WHMA population sample (Figure 1).

A narrow pyramid contains similar ratios from one age class to another with an adult to young ratio of nearly one. This type of pyramid suggest an aging population with low production (Smith, 1974). The age pyramid (Figure 1) portraying the Miller Flat WHMA population capture sample is comparable to the narrow pyramid discussed by Smith (1974).

FIGURE 1

AGE PYRAMID



2) Mortality

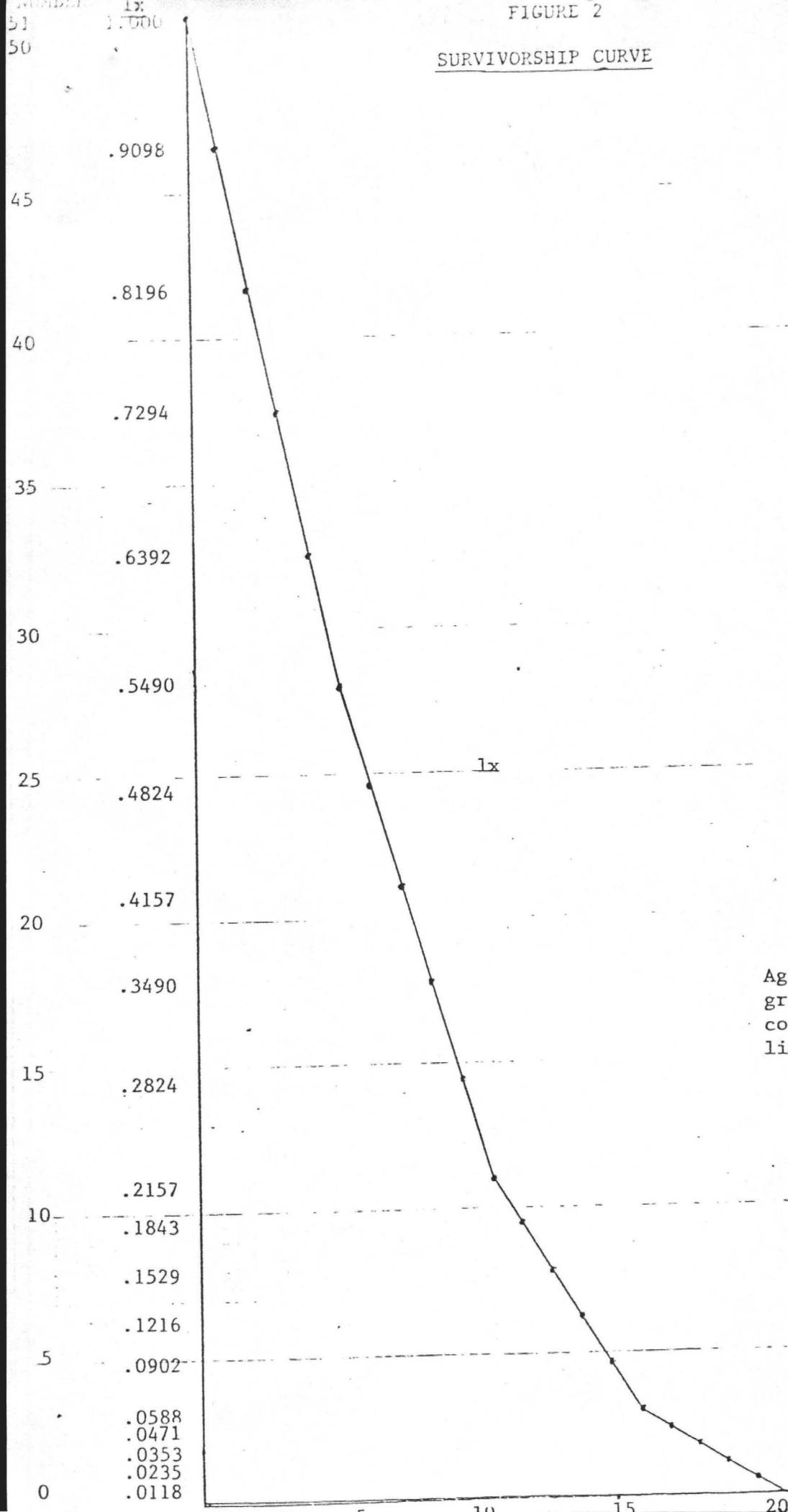
Populations have mortality patterns which can be expressed through an abstract but useful construct, whereas age-specific mortality rates are displayed as progressively depleting a group of animals born simultaneously (Caughley, 1977). A cohort is the term for such a group. Life tables are utilized to formally present the mortality patterns of a cohort (Caughley, 1977; Conley, 1978; Smith, 1974). Real cohorts are difficult to study due to funding and manpower restraints experienced. Therefore, mortality rates are calculated indirectly and applied to imaginary cohorts. An imaginary cohort consists of real animals. However, their births were not simultaneous. The 93 wild horses captured from the Miller Flat WHMA is such a cohort.

Mortality of a true cohort is progressively depleting through time and can be presented thus in a life table (Caughley, 1977). Unfortunately, the Miller Flat WHMA imaginary cohort frustrates this pattern. Consequently, necessity dictated construction of a survivorship curve with a continuously descending line. This goal was accomplished by combining the age classes into groups of five. The results are presented in the succeeding graph (Figure 2).

A survivorship curve (l_x) depicts the probability of an individual of age zero surviving to enter the x th age class (Conley, 1978). Converting this information to number of individuals (n_x) alive at the beginning of each age class permits the construction of a Life History Table (Table 1).

FIGURE 2

SURVIVORSHIP CURVE



<u>Age</u>	<u>Number</u>	
0	19	
1	10	
2	0	51
3	8	
4	14	
5	7	
6	10	
7	7	28
8	4	
9	0	
10	1	
11	0	
12	0	11
13	10	
14	0	
15	1	
16	0	
17	0	3
18	0	
19	0	
20	2	

Age classes combined into groups of five to gain continuously descending line.

TABLE 1
LIFE HISTORY TABLE

x	nx	Dx	lx	dx	qx	px	mx	lxmx
0	51	4.60	1.000	.0902	.0902	.9098	0	0
1	46.40	4.60	.9098	.0902	.0991	.9009	0	0
2	41.80	4.60	.8196	.0902	.1101	.8899	0	0
3	37.20	4.60	.7294	.0902	.1237	.8763	.5	.3647
4	32.60	4.60	.6392	.0902	.1411	.8589	.5	.3196
5	28.00	3.40	.5490	.0666	.1213	.8787	.5	.2745
6	24.60	3.40	.4824	.0667	.1383	.8617	.5	.2412
7	21.20	3.40	.4157	.0667	.1605	.8395	.5	.2079
8	17.80	3.40	.3490	.0666	.1908	.8092	.5	.1745
9	14.40	3.40	.2824	.0667	.2362	.7638	.5	.1412
10	11.00	1.60	.2157	.0314	.1456	.8544	.5	.1079
11	9.40	1.60	.1843	.0314	.1704	.8296	.5	.0922
12	7.80	1.60	.1529	.0313	.2047	.7953	.5	.0765
13	6.20	1.60	.1216	.0314	.2582	.7418	.5	.0608
14	4.60	1.60	.0902	.0314	.3481	.6519	.5	.0451
15	3.00	.60	.0588	.0117	.1990	.8010	.5	.0294
16	2.40	.60	.0471	.0118	.2505	.7495	.5	.0236
17	1.80	.60	.0353	.0118	.3343	.6657	.5	.0177
18	1.20	.60	.0235	.0117	.4979	.5021	.5	.0118
19	.60	.60	.0118	.0118	1.000	00	.5	.0059
20	00							

GRR = 8.5

RO = 2.2

*Explanation of column contents (Conley, 1978).

- n_x - number of individuals that are alive at the beginning of the age interval x to $x + 1$.
- D_x - number of individuals that die during the age interval x to $x + 1$.
- l_x - probability that an individual of age zero will survive to enter the x th age class.
- dx - the death schedule, probability at $x = 0$ of dying during the age interval x to $x + 1$.
- q_x - age-specific death rate, probability that an individual that enters the x th age class will die before entering the $x + 1$ age class.
- p_x - age-specific survival, probability that an individual that enters the x th age class will survive to enter the $x + 1$ age class.
- m_x - expected number of females born to a female of age x to $x + 1$.
- $l_x m_x$ - age-specific, expected-reproduction column, with expectations based on an individual of age zero.
- GRR - gross reproductive rate would be realized if all females were to live to the maximum age, and breed at the expected rate throughout.
- R_0 - net reproductive rate reflects the average number of female offspring produced by the average female in the population.

When $R_0 = 1$ a stable population exists.

$R_0 > 1$ indicates a growing population and
 $R_0 < 1$ signifies a declining population
(Smith 1974).

Survival rates for the Miller Flat WHMA capture population of 91% for foals (0 age class) and a mean of 80% for adults (1-18 age classes) are delineated in the preceding Life History Table (column px). These survival rates are consistent with contemporary demographic research publications. Boyd, (1979) found foal survivorship on Wyoming's Red Desert to be 82% in 1978 and 98% in 1979. The 1980 foal survival in Nevada's Granite Basin herd was 100% compared to 75% in Nevada's Rock Creek herd (Berger, 1980). Realistic figures for adult survival probably range between 80 and 85% according to Wolfe (1980).

4) Productivity

Productivity or more specifically rate of increase in wild horse populations is a highly controversial and as yet unresolved issue. Since wild horses were afforded protection in 1971 their populations have been observed (aerial inventory) increasing at an annual rate of 20 to 25% (Blaisdell, 1977; Cook, 1975; Heady and Bartolome, 1977). Contemporary research (Conley, 1979; Wolfe, 1980) implies these projections are far too liberal. Population simulations developed by Conley (1979) and Wolfe (1980) purport 5 to 10% as a more realistic finite rate of increase (λ). Wolfe (1980) suggests the discrepancies between observed and predicted rates of increase are partially due to problems involved in aerial trend counts employed.

The Miller Flat WHMA population appears to have a finite rate of increase (λ) similar to those predicted by Conley (1979) and Wolfe (1980). Basic population projection tables (Conley, 1978; Smith, 1974) were constructed from survivorship information gained from the Life History Table (Table 1) and utilized in this determination. Considering, and including maximum age-specific fecundity (as described by the National Academy of Science, 1980) in projection table calculations, a 1.06 (6%) finite rate of increase (λ) is demonstrated (Table 2). Validity of this projection is contingent on several assumptions. Namely, mortality patterns for the Miller Flat WHMA

TABLE 2

POPULATION PROJECTION TABLE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	12.50	26.29	30.11	27.60	27.59	29.67	31.96	33.40	36.08	38.46	40.52	42.41	44.35	47.41	50.33
1		11.37	23.92	27.39	25.11	25.10	26.99	29.07	30.39	32.83	34.99	36.87	38.59	40.35	43.13
2			10.25	21.55	24.68	22.62	22.61	24.32	26.19	27.38	29.57	31.52	33.21	34.76	36.35
3	100.00			9.12	19.18	21.96	20.13	20.12	21.64	23.31	24.36	26.32	28.05	29.56	30.93
4		87.63			7.99	16.80	19.24	17.64	17.63	18.96	20.43	21.35	23.06	24.58	25.90
5			75.27			6.86	14.43	16.53	15.15	15.15	16.29	17.54	18.34	19.81	21.11
6				66.14			6.03	12.68	14.52	13.31	13.31	14.31	15.42	16.11	17.41
7					56.99			5.20	10.93	12.52	11.47	11.47	12.33	13.28	13.88
8						47.84			4.36	9.17	10.51	9.63	9.63	10.35	11.15
9							38.71			3.53	7.42	8.50	7.79	7.79	8.38
10								29.57			2.70	5.67	6.49	5.95	5.95
11									25.26			2.30	4.85	5.55	5.09
12										20.96			1.91	4.02	4.60
N	112.50	125.29	139.55	151.80	161.54	170.85	180.10	188.53	202.15	215.58	228.24	240.26	252.08	267.50	283.38
λ		1.11	1.11	1.09	1.06	1.06	1.05	1.05	1.07	1.07	1.06	1.05	1.05	1.06	1.06

* m_0 thru m_2 values are 0.0 and all other m_x values are .5.

** First breeding age at three years.

*** 25% of three-year-old mares foal, 60% of four-year-old mares and 80% of five thru 14-year-old mares foal.

**** Although portions of individuals do not survive in real populations, several decimal places were carried to avoid excessive rounding error accumulation.

***** N denotes population size.

***** λ was obtained from N_t/N_{t-1} where N_t is the population size in year t and N_{t-1} the size of the population of the previous year.

***** Only the female segment of the population is considered. For ease of calculation, the number 100 was used.

imaginary cohort and a true cohort are comparable; achievement of a stable age distribution; a sex ratio at birth of one thus a mx (expected number of females born annually to a female at a given age) value of .5; occurrence of first breeding at age three and extending beyond twelve; validity of age-specific fecundity estimates. Note: first year breeding at age four was demonstrated by the sample population. However, first year breeding at three is prevalent in wild horse populations (Boyd, 1979; Feist and McCullough, 1975; Berger, 1980; Don Pomi, Bureau of Land Management, Carson City District Office, pers. comm.).

A 1.06 (6%) finite rate of increase (λ) will be utilized for management of the Miller Flat wild horse population, as established by the Population Projection Table (Table 2).

The predicted finite rate of increase ($\lambda = 1.06$) incorporated into an exponential function of population growth (Caughley, 1977; Smith, 1974) can provide future population estimates:

$$N_t = N_0 e^{rt}$$

Where: N = population size
e = base of the natural logarithm
r = exponential rate of population increase

t = time interval (years)

Note: The finite rate of increase is equal to e^r . Utilization of an exponential growth model is predicated on the assumption that the Miller Flat WHMA population is below carrying capacity and density dependent effects are not a limiting factor (Wolfe, 1980).

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GLOSSARY

Age Structure. The ratio of one age class to another used in determining or understanding the population dynamics and identifying future or past problems in the herd.

Allotment. An area of land where one or more operators graze their livestock. It generally consists of public lands but may include parcels of private or state-owned lands. The number of livestock and season-of-use are stipulated for each allotment. An allotment may consist of several pastures or be only one pasture.

Allotment Management Plan (AMP). A livestock grazing management plan dealing with a specific unit of rangeland, based on multiple-use resource management objectives. The AMP considers livestock grazing in relation to other uses of the range and in relation to renewable resources—watershed, vegetation, and wildlife. An AMP establishes season-of-use, number of livestock to be permitted on the range, and rangeland developments needed.

Alluvial Fan. A sloping, fan-shaped mass of sediment deposited by a stream where it emerges from an upland onto a plain.

Alluvial Soil. A soil formed recently deposited alluvium and having essentially no horizon development no modification of recently deposited materials.

Act, The. The Wild Free-Roaming Horse and Burro Protection Act of December 15, 1971, 16 U.S.C. 1331-1431.

Animal Unit (AU). A measurement of animal numbers based on the equivalent of a mature cow with calf (800 pounds live weight); roughly one cow with calf, one horse, one mule, five sheep, five swine, six goats, or two burrows.

Animal Unit Month (AUM). Amount of feed or forage required by an animal-unit for one month.

Annual Plant. A plant that completes its life cycle and dies in one year or less.

Carrying Capacity. The maximum number of animals possible without inducing damage to vegetation or related resources. It may vary from year to year on the same area due to fluctuating forage production.

Climax. The highest ecological development of a plant community capable of perpetuation under the prevailing climatic and edaphic conditions.

Cohort. A group of animals born simultaneously.

Community. A group of plants and animals living in a specific region under relatively similar conditions.

Demography. The study of vital statistics of a population.

Ecological Density. The number of organisms (per unit area) occupying only those areas that can adequately meet their requirements.

Ecosystem. An ecological community together with its physical environment, considered as a unit.

Environment. The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Exclosure. A small area set aside and protected from grazing, either to preserve representative areas in excellent range condition or to allow observation of succession on depleted rangeland without grazing.

Fecundity. Rate at which an individual produces offspring, usually expressed only for females.

Finite Rate of Increase (λ). Factor by which the population increases during each time unit.

Forage. All browse and herbaceous food that is available to grazing animals.

Forbs. A herbaceous plant or annual plant species.

Graze. To feed on herbage.

Grazing System. A systematic application of grazing treatments to a management unit in a prescribed sequence over recurring periods of time; the manipulation of livestock to accomplish a desired result.

Habitat. A specific set of physical conditions that surround the single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Habitat Management Plan (HMP). A written and officially approved plan for a specific geographical area of public land that identifies wildlife habitat and related objectives, establishes the sequence of actions for achieving objectives, and outlines procedures for evaluating accomplishments.

Herbivore. An animal that feeds on plants.

Herd. A number of wild animals of one species that remain together as a group.

Herd Management Area (HMA). That area of wild horse habitat covered by HMAP.

Herd Management Area Plan (HMAP). A plan for management of the HMA.

Home Range. An area that an animal or group of animals travel in pursuit of their routine activity.

Key Management Area. These are areas that may be a relatively small portion of a range selected because of its location, use, or grazing value as a monitoring point for management decisions. It is assumed that key areas, if properly selected, will reflect the overall acceptability of current grazing management over all or part of the grazing unit.

Key Species. (1) Forage species whose use serves as an indicator to the degree of use of associated species; (2) those species which must, because of their importance, be considered in the management program.

Life Tables. A series of columns, headed by standard notations, each of which describes mortality relations within a population when age is considered. Life tables provide the vital statistics for calculating growth performance of a population.

Management Framework Plan (MFP). A planning decision document which establishes for a given area of land, land use allocations, coordination guidelines for multiple-use, and objectives to be achieved for each class of land use or protection. It is BLM's Land-Use Plan.

Mortality. Ratio of the number of deaths of individuals to the population, often described as a function of age.

ORV. Off-Road vehicle.

Perennial (Plant). A plant that has a life cycle of three or more years.

PH. A measure of the acidity or alkalinity of a solution, numerically equal to seven for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity.

Phenology. The study of periodic biological phenomenon such as flowering, seeding, etc., especially as related to climate.

Public Land. Tracts of land administered by the Bureau of Land Management.

Range Condition. The current productivity of a range relative to what the range is naturally capable of producing.

Range Inventory. An itemized list of resources of a management area such as range site; range condition classes; range condition trends; range use; estimated proper stocking rates; physical developments; and natural conditions such as water, barriers, etc.

Range Trend. Change in vegetation and soil characteristics as a direct result of environmental factors, primarily climate and grazing.

Reasonable Numbers. That number of animals which the wildlife management agency is striving to maintain within a given planning unit under a multiple-use concept on a sustained yield basis.

- Riparian. Of, on, or pertaining to the bank of a river, or a pond or small water source.
- Rock Outcrop. Bedrock exposures or patches of thin soil over bedrock.
- Runoff, Surface. Refers to the relative rate water is removed by flow over the surface of the soil. Rates are referred to as slow, medium, and rapid.
- Sex Ratio. The ratio existing between the number of male and female animals within a given herd, band, or population.
- Shrub. A relatively low-growing, much branched, many stemmed, woody, perennial plant.
- Soil. The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
- Soil Associations. A group of defined and named soil units occurring together in a characteristic pattern over a geographic region.
- Soil Family. In soil classification, one of the categories intermediate between the great soil group and the soil series. Families are defined largely on the basis of physical and mineralogical properties of importance to plant growth.
- Soil Moisture. Water stored within the soil, which is available for plant uptake (transpiration) and evaporation to the atmosphere. Each soil has a characteristic capacity for holding moisture. When this capacity is reached, water cannot infiltrate the soil but instead runs off, increasing the probability of flooding.
- Survivorship Curve. A graphical presentation of survival in a population of individuals from conception, or birth, to the maximum age attained by any member of the population.
- Threatened and Endangered Plants (T & E Plants). Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- Ungulates. A broad group of herbivorous hoofed mammals.
- Unit Resource Analysis (URA). A comprehensive display of physical resource data and an analysis of the current use, production, condition, and trend of the resource and the potentials and opportunities within a planning unit, including a profile of ecological values.
- Utilization (Range Utilization). A degree of use of current year's plant production made by grazing animals.
- Vegetative Type. A plant community with distinguishable characteristics, described by the dominant vegetation present.
- Watershed. The total area above a given point on a stream that contributes water to the flow at that point.

Wild, Free-Roaming Horse. Any and all unbranded and unclaimed horses and their progeny that have used public lands on or after December 15, 1971, or that do use these lands as all or part of their habitat.

Wildlife. All living fauna that exists or potentially exists in the area.