

Return to BLM

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WILD HORSES

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WILD HORSES

Present Situation
By Milton N. Frei

OVERLAY	Wild Horses Present Situation	OVERLAY 9-A
TABULATIONS	Wild Horse Numbers and Acreage by Herd Unit	TABLE 1
	AUMs Consumed by Existing Horse Numbers	TABLE 2
NARRATIVE	The following narrative is prepared to document available information on Wild Horses in the Duckwater Planning Unit. Subject headings considered are outlined in the preceding Table of Contents.	

HISTORY

Wild horses and burros have only recently been placed in a protection and management status. Protection was brought about by Public Law 92-195 signed into law on December 15, 1971.

Prior to this legislation, wild horses and burros were considered to be the property of the State of Nevada. Local County Commissioners were responsible for their regulation and issued permits for capture or killing of the animals in accordance with Nevada State Law. Permits were issued at the discretion of the County Commissioners, and were largely issued as the demand warranted. The responsibility for issuing permits in the Duckwater Planning Unit was held by the County Commissioners of Nye County. The Nye County Commissioners have indicated that no permits for capturing or killing wild horses have ever been issued in the Duckwater Planning Unit.

Although not presently available, other historic data should be included in this section. Some examples might be; when horses were first introduced to the area, the origin of those horses and a summary of historic horse use. This information could possibly be obtained from old-timers familiar with the area. An attempt should be made to collect this information and include it in the URA. Once collected, the information may be useful in determining future trends.

WILD HORSE INVENTORY

The Duckwater Planning Unit is the first area in Nevada in which an intensive inventory of wild horses has been attempted. On March 22, 1972 intensive observations of wild horses were begun, particularly in the areas near Sand Spring and Little Smoky Valleys. These observations consisted of sightings from vehicles and observations through a spotting scope at water sources. Observations of this type continued through the last part of January and the first of February, 1973. At this time a helicopter contract was issued and horses in the unit were inventoried with the use of a helicopter.

Inventory data collected from these efforts included the number of animals, color markings, age classes, sex and location where possible to determine. The results of this inventory indicate that at least 476 wild horses and four wild ^umales inhabit the unit at some time during the year.

It is interesting to note that in September, 1971, the BLM made aⁿ estimate of the total number of horses in the Duckwater Planning Unit. This estimate was based on casual observations by BLM personnel while doing other work in the area. At this time it was estimated that only about 185 head of horses were inhabiting the area. Thus, compared with the recent inventory discussed above, ~~this~~ shows the greater effectiveness of aerial inventory using a helicopter.

HERD UNITS

For the purpose of planning, wild horses in the Duckwater area have been separated into Herd Units. A Herd Unit is the maximum geographic limits used by a particular herd of horses over a period of years and under varying weather conditions.

A herd is composed of one or more individual bands which are generally categorized as harem bands or stud bands depending on composition. A harem band ususally contains one dominant stud, a lead mare and subordinate mares or offsprings. A stud band is a small loosely organized group of mares that have been previously ejected from a harem band.

At the present time, four possible Herd Units have been identified. These Herd Units are outlined on Duckwater URA Overlay No. 9A, and discussed briefly below. (See Table No. 1 for horse numbers and total acres by Herd Unit.)

Sand Spring Herd Unit

The Sand Spring Herd Unit involves the largest area and has the greatest number of wild horses of any area in the planning unit. It was identified as a Herd Unit because observations made up to this time indicate little horse use occurs outside the area. The only exception is a possible drift into the Pogues Herd Unit disussed below.

Wild horses in the Sand Spring Herd Unit extend over approximately 814,720 acres of BLM land including 389,163 acres in the Ely District and 425,557 acres in the Battle Mountain District. Although horses occasionally utilize large areas in both districts the majority of their use is confined to the Ely District. In fact, the largest concentration of wild horses tends to confine itself to approximately 268,586 acres in Little Smoky and Sand Spring Valleys as identified on Overlay No. 9A. It is estimated that 57 separate bands or 267 wild horses occupy this area on a year-round basis.

The reasons for concentrated horse use in this area are not known at this time but are believed to be related to isolation and forage conditions. The area is generally well isolated from intensive activities by man and encompasses a large area of open white sage flats. In contrast, many other areas in the Herd Unit are either located closer to intensive human activity or display a greater concentration of trees. Although trees are believed to be of some importance to wild horses, forage conditions in pinyon-juniper types are generally somewhat undesirable.

Pogues Herd Unit

The Pogues Herd Unit is located in the extreme north central portion of the planning unit. Although very few wild horse observations have been made in this area, it has been selected as a Herd Unit because of physical barriers on its east and west sides. These barriers are not completely impassible but are believed to be restrictive enough to prevent a significant amount of horse movement.

At the present time it is believed that horses in this Herd Unit inhabit the area primarily on an intermittent basis. When not inhabiting that portion of the Herd Unit shown on Overlay No. 9A, these horses probably utilize an undetermined area to the north in the southern part of Newark Valley during part of the year.

Because the size of Pogues' Herd Unit is limited by intense human activity, along U.S. Highway 50, located 9 miles north of the area, other possible patterns of habitation must be considered also. The first of these possibilities is that horses occupy this area only as the result of drift from the Sand Spring Herd Unit or the Bull Creek Herd Unit to the east. As already mentioned the physical barriers on either side of the Pogues Herd Unit are not entirely restrictive. Therefore, it is

entirely possible that horses observed in the Pogues Herd Unit are merely excess animals from the Sand Spring or Bull Creek Herd Units.

A second possibility is that wild horses inhabit the Pogues Herd Unit on a yearlong basis. If this is the case, occupancy of the undetermined area to the north in Newark Valley will be primarily on an intermittent basis.

Bull Creek Herd Unit

The Bull Creek Herd Unit has been identified because it is the only area between the Duckwater Indian Reservation and the White Pine Range where wild horses are known to occur. Although this Herd Unit is separated by a fence across its center, horses are still able to bypass the fence and occupy the entire area. For the most part; however, wild horses tend to stay in the southern half of the Herd Unit. This is probably the result of restricted horse movement created by the fence and the fact that the southern portion has poorly developed access making it a more isolated environment.

As already mentioned under Pogues Herd Unit, a certain amount of drift may occur between the Pogues and Bull Creek Herd Units. This possibility may change the boundaries of both Herd Units. In addition, a certain amount of drift may occur between the northern end of the Bull Creek Herd Unit and the southern end of Newark Valley.

White River Herd Unit

The White River Herd Unit has been identified even though no horses were seen in the area during the helicopter inventory. Horses were seen, however, 1 mile away and are known to utilize the area during portions of the year. This is especially true during the summer months when horses

obtain water at several locations within the Herd Unit.

This Herd Unit probably serves as a seasonal or occasional use area for wild horses which inhabit portions of the White River Valley. The horses in the White River Valley have not been inventoried at this time.

DESCRIPTION OF HORSES

Type

At the present time it is impossible to determine if wild horses bear any characteristics which resemble the Mustang type. This determination will have to be made by someone who is knowledgeable of the characteristics of the Mustang.

Color

For the most part, wild horses in the planning unit are dark, with the dominating color being bay. Sorrels, browns and blacks are abundant, but not to the same extent as bays. There are a few white horses and pintos seem to be relatively numerous near Portugese Mountain. There are no true buckskins, palominos or appaloosa.

Size

No size measurements have been taken of the Duckwater horses. It would be expected that wild horses are somewhat smaller than domestic ones due to environmental conditions encountered during growth. This cannot be verified because most wild horses in the Duckwater Unit appear to be equivalent in stature to domestic horses.

ANIMAL CONDITION

Present condition of wild horses can only be estimated from observations made during the past year. Generally speaking, the condition of animals in all Herd Units appeared to be good. The only exceptions were a few animals which were found intermixed with animals in good condition. It is believed the primary reason for some animals being in poor condition is related to the animal itself. Possibly the reason could be a result of inbreeding, old age, sickness, or in the case of mares, a result of nursing a foal.

The fact that most horses are in good condition is quite surprising, especially in view of the comments made under Habitat Problems, subsection Forage. As identified in this section, most of the Duckwater Unit is thought to be in a deteriorated state of range condition. As a result it would be expected that horses would show a corresponding decline in animal condition. This is especially true since livestock grazing privileges in the Duckwater Unit were reduced by 40% in 1967. Undoubtedly the need for this reduction was recognized prior to this time.

This particular situation, with wild horses in good condition and the range in poor condition, appears to be somewhat of a mystery. Although the mystery cannot be solved at this time, the answers are believed to be related to competing grazing pressure from domestic livestock and the foraging ability of the horse, himself.

During the past several years there has been very little domestic livestock use in the Sand Spring Herd Unit. Use by cattle has been ^{minimal} in much of the area and sheep use has been light during some years. As a result, it is highly probable that lack of competitive grazing has been made adequate forage available to maintain a healthy condition in wild horses. This may be further

verified by the fact that the summer of 1972 and the preceding winter were very dry. As a result, very little forage was produced during the spring and summer of 1972. Normally this would be expected to create a decline in animal condition but this was not the case. Wild horses came through this period in fairly good condition. The reason may be that because there was very little competitive livestock use most of the available forage was left for wild horses. If this assumption is true it may very well be that increased livestock grazing use will create a corresponding decline in the condition of wild horses.

The information presented above cannot be taken as fact because a somewhat opposite situation has been observed in the other Wild Horse Herd Units. Livestock grazing use in the remaining Herd Units has been somewhere near normal. Although fewer observations of wild horse condition were made in these areas, the condition of those horses that were seen was good. The explanation for this may be that the wild horse is a better forager than domestic livestock and, therefore, was able to seek out adequate forage to maintain body condition.

The primary thrust of this discussion is that horses in the Duckwater Unit are in fairly good body condition. As already mentioned, the reasons are not fully understood but could easily be the result of a combination of factors or even some unknown factors which have not yet been determined.

POPULATION DYNAMICS

As discussed under Wild Horse Inventory, there are at least 480 wild horses inhabiting the Duckwater Unit. At the present time only a limited amount of population data has been collected on these animals. As a result, the following discussion of population dynamics should be subject to constant revision should adequate data become available.

Band Size

The average size of each wild horse band in the Unit is 4.6 animals. This is approximately one more horse per band than is found in the Pryor Mountain wild horse herd in Billings, Montana (Hall, n.d.). In contrast, the average band size in the Steptoe Planning Unit, north of Ely, Nevada, is 10.7 animals. This is believed to be greatly related to the wildness of the horses involved and possibly, to the number of geldings in the area. The Steptoe Unit contains a considerable amount of branded horses and a number of these are probably geldings. These horses are not as antagonistic toward one another and, therefore, tend to form larger band associations.

Breeding and Foaling Seasons

Little is known about the reproductive habits of wild horses in the Duckwater Unit. However, the majority of colts seem to appear in the early spring. During 1973, the first colt was observed on April 7. On April 17 two more colts were observed which were estimated to be approximately two weeks old. This compares similarly with colt arrival in the Pryor Mountains.

Since the gestation period for horses is 340 days, the breeding season must begin sometime in May. A May breeding season follows slightly behind the green-up period for vegetation in the Unit. Therefore, it is very likely that mares, feeding on new green vegetation, attain an

improved nutritional state and in response, become physiologically prepared to enter estrus.

Age Class

No horses have been aged in the area. This would require capturing and examining the animals at close range.

The only available data on age classes was obtained from Duckwater Unit Wild Horse Inventory. This data only involved classification of horses into the categories of adult, yearling and young. It should be pointed out that in January, when much of this data was collected, it was difficult to accurately classify each animal. The horses which were classified as yearlings were almost 1 year old and the colts were almost yearlings. As a result some yearlings were undoubtedly classified as adults and some colts classified as yearlings.

With this information in mind the following age classes are presented:

	Adult	Yearling	Young
Number	388	34	58
Percent of Population	81%	7%	12%

Sex Ratio

Although several attempts have been made to determine sex ratios only one has been successful. During August, 1972 a total of 19 adult horses were classified as to sex at Tank Spring in the Park Range. The sex ratio of this sample was 58% males and 42% females.

Because these horses were separated into seven different bands they should theoretically represent an accurate reflection of sex ratios for the entire unit. However, because there was such a small number of animals involved, additional horses should be classified to determine if the figures are indeed representative.

It should be pointed out that these sex ratios are similar to those found in the Pryor Mountains. Before any population adjustments were undertaken, in the Pryors, the sex ratio was estimated to be 60% males and 40% females (Hall, n.d.).

Young/Adult and Young/Female Ratio

The number of young animals in relation to adults or females is generally used as a reflection of population viability.

Based on the age class and sex ratio data presented in preceding sections, the following ratios are calculated for the planning unit:

58 colts + 388 adult animals = 15% foal crop or 15 young/100 adults

388 adult animals X 42% female population = 163 females

58 colts + 163 females = 36% foal crop or 36 young/100 ^{Females} ~~adults~~.

If ^{these} ~~this~~ data are compared to the Pryor Mountains, it would appear that the viability of the Duckwater wild horse population is somewhat greater. This is especially true as it relates to the productivity of the females. Age ratios for the Pryors are as follows:

16 young/100 adults

24 young/100 females

Foal Survival

It is very difficult to determine mortality rates for horses in the planning unit. However, if we can assume that all of the horses classified as yearlings were colts the previous year and that a similar foal crop was produced that same year then we can calculate a survival rate for colts during the first year of life. This is done as follows:

34 yearlings + 58 colts = 59% survival rate or 41% ^{mortality}

Reproductive Capacity

It is impossible to construct an accurate picture of reproductive capacity because total mortality rates are not known. Until this information is available, it will be impossible to determine if, and to what extent, annual harvest of wild horses will be required.

For the present time, however, it is possible to calculate an annual wild horse increase, based on the number of new animals produced annually. This is done as follows:

480 total horses X 42% female sex ratio = 163 females

163 females X 36% foal crop = 78 foals produced annually

78 foals X 59% survival rate = 46 horses per year increase

ANIMAL PROBLEMS

Problems associated with the wild horse are expected to be related primarily to those aspects of population dynamics listed below. Other animal problems are bound to occur, however, and these should be considered as additional data become available.

Band Size

No problems have been identified in the planning unit. Although the average band in the Duckwater Unit contains one more horse than the average band in the Pryor Mountains, Montana, and the Wassuk Range, Nevada, this is not considered to be a problem (Hall n.d. and Pellegrini 1971).

Breeding and Foaling Season

No problems have been identified. Breeding and foaling are believed to occur at the same time as in the Pryor Mountains.

Age Classes

No problems have been identified. However, it may be that a problem exists, but has not yet been recognized.

Wild horse age classes in the Duckwater Unit are similar to those in the Pryor Mountains, as shown below:

	<u>Adult</u>	<u>Yearling</u>	<u>Young</u>
Pryor Mt.	75%	6%	19%
Duckwater	81%	7%	12%

This comparison would not appear to be irregular, except for the fact that the ratio in the Pryor Mountains is considered to be a reflection of deteriorated range conditions. Because of range conditions, young animals find it difficult to survive, especially the first year of life, and age classes become imbalanced toward a large proportion of old, nonproductive animals.

As already mentioned, no specific age data have been collected on the Duckwater horses. Therefore, it is impossible to determine if old animals dominate the population. However, the point is that the comparison of age classes presented above does show a certain similarity to the Pryors, and potential for a problem does exist.

Sex Ratio

Again no specific problems have been identified. However, if the sex ratio of horses in the Duckwater Unit is compared to that of the Pryors, it is found that they are very similar as shown below:

	<u>Males</u>	<u>Females</u>
Pryor Mt.	60	40
Duckwater	58	42

The problem with this sex ratio is that it is very similar to that of the Pryors before a population reduction program was undertaken. In the Pryors, this ratio was used as an adjustment factor and males were removed to make the ratio approximately 50-50. The 60-40 ratio was considered to be a reflection of deteriorated range conditions which had a detrimental impact on females during conception through weaning and resulted in a greater death loss in the mares.

As a result it is logical to assume that a similar situation may be occurring in the Duckwater Unit. This is especially true if it is reasonable to expect a 50-50 ratio of males and females at birth.

Foal Production

No problems have been identified concerning the current foal crop in the unit. However, under optimum forage conditions it would be expected that every mare capable of producing a foal would do so. Therefore, the present 36 percent foal crop may be a reflection of poor forage conditions which reduce the mare's ability to conceive and bear young.

Reproductive Capacity

The only problem which can be identified with reproductive capacity, is the need to maintain populations at existing levels. As discussed ^{in following section} earlier, two Herd Units are believed to be overpopulated to the extent that living space is restricted. Therefore, it is believed that further increases in these Herd Units will only further complicate overcrowded conditions.

The only other animal problem identified, is the presence of what are believed to be privately owned horses in the Bull Creek Herd Unit. It is felt that the majority of horses in this Herd Unit belong to local residents of Railroad Valley. These horses are definitely wild and will be very difficult to catch unless they can be trapped at some water source. They have apparently been allowed to run free under the guise of being unclaimed wild horses. In most cases, these are horses that are unauthorized under the Taylor Grazing Act.

The basic problem, with these horses, is that they are occupying an area which is definitely capable of supporting wild-free roaming horses. These horses must be removed before any wild horse management can take place. At some indefinite period of time in the future, the BLM will provide private parties with an opportunity to claim any horses they own, which are running wild on public lands. Hopefully, these horses will be removed when this claiming process takes place. If they are not claimed and are unbranded, they will have to be considered as wild horses.

HABITAT

SEASONAL USE AREAS

Information on seasonal use areas for wild horses in the Duckwater Planning Unit is based on observations made by the District Range Specialist between 3/22/72 and 9/14/72. These observations are discussed below.

Seasonal use areas do not appear to be well defined. The only area which may have distinct seasonal use boundaries is the west slope of the White Pine Range in the Bull Creek Herd Unit. This range has an extensive area of high elevation National Forest lands which probably serve as spring, summer and fall use areas. The lower elevations, on BLM land below the National Forest boundary, probably serve as winter range. Variations in use for the entire area will undoubtedly occur, depending on snow and other climatic conditions.

The remainder of the planning unit appears to have very indistinct seasonal use patterns. The primary reason for this is believed to be a general lack of higher elevation mountain ranges. Most of the mountain ranges are either too rugged and inaccessible, too low in elevation or so small in size that they provide very little of what is believed to be desirable summer habitat. The following observation seems to indicate that seasonal movement to higher elevations may not occur in some areas, even when desirable summer habitat is available.

During mid-May of 1972 a single observation was made near Mahogany Spring on Moody Mountain. Mahogany Spring is situated in a rather open valley near the 7,700 foot level of Moody Mountain. The area is characterized by a scattering of pinyon juniper trees with an understory of big sagebrush and a high percentage of cool season grasses such as needle and thread grass, bluebunch wheatgrass and Indian ricegrass. Water is located nearby and first impressions would indicate that the area would be a desirable spring and summer area for wild horses. The winter and spring of 1972 were very open seasons and access to this area by horses could have been gained at most anytime. However, on May 11, 1972

when this observation was made, and when horses would be expected to be feeding on the new green vegetation, no horses or sign of horses was observed. Horses and sign were seen about 5 miles south of Mahogany Spring at the 7,000 foot level but evidence of horse's use did not extend any closer than 4 miles from Mahogany Spring.

Any seasonal movement between areas other than that of high and low elevations has not been identified at the present time. The only movement which comes close to being similar, is a movement of several bands between the low flats of Sand Spring and Little Smoky Valleys and the adjacent foothills of the Park Range, Moody Mountain and Portugese Mountain. These mountain ranges seem to have a concentration of horses along their foothills during most periods of the year. Undoubtedly these horses are forced into the lower valley bottoms when heavy snows accumulate along the foothills.

FORAGE

Wild horse habitat is characterized by the following broad vegetative types:

The Northern Desert Shrub Type occupies approximately 49 percent of the planning unit. It occurs on the upland fans and benches, the low lying foothills and on up into the lower mountainous areas. Grasses and sagebrush species dominate. Species natural to the type include big sagebrush, Nevada ephedra, spiny hopsage, Sandberg's bluegrass, wildrye, bluebunch wheatgrass, squirreltail, needle and thread grass, Indian ricegrass and various forbs.

The Salt Desert Shrub Type makes up approximately 32 percent of the planning unit. This type is found largely on the bottom lands and alluvial fans where annual precipitation is less than 8 inches. Greasewood shadscale, fourwing saltbush, black sagebrush, horsebrush, and rabbitbrush are the principal shrubs. Winterfat occurs in fairly broad solid stands or intermixed with the shrub types. Great Basin wildrye, salt grass, galleta grass, alkali sacaton, Indian ricegrass, squirreltail and various forbs are also common to the type.

The Pinyon-Juniper Type is native to the higher mountainous areas and is spreading onto the lower bench areas. At present about 19 percent of the planning unit supports a growth of pinyon-juniper. Single leaf pinyon pine and Utah juniper are the two species represented. Other associated species include sagebrush, wheatgrasses, bluegrasses and various forbs.

For additional information on vegetative types, see the Livestock Forage portion of the Duckwater Unit Resource Analysis.

At present, very little is known about the foraging habits and food preferences of wild horses. Therefore, a brief discussion of observations made in the Duckwater Planning Unit is appropriate. A very limited number of feeding observations have been made since March 12, 1972. These observations are not sufficient to determine present foraging habits but may serve as an

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indication of what to look for in the future.

During March, 1972, observations indicated that wild horses were feeding primarily on cool season grasses such as Indian ricegrass, squirreltail, and needle and thread grass. Winterfat, a perennial shrub, was also being utilized in the valley bottoms. During this period, horses in Sand Spring Valley seemed to be concentrated along the west foothills of Portugese Mountain. This area contains a scattering of pinyon-juniper trees with an understory of perennial grasses. Needle and thread grass appeared to be the most frequently utilized species.

Observations made in the late spring and into the summer months were very spotty. However, there appeared to be a reduction in the concentration of animals around Portugese Mountain and more animals were seen in the flats. It appeared that these animals were feeding primarily on winterfat. Observations made in August and September indicated an increasing concentration of horses along the rolling hills on the west side of Sand Spring Valley. No feeding observations were made in this area, however, and no determination can be made as to what plant species were being utilized.

During this same period, observations were made on the east side of Sand Spring Valley. These observations showed that galleta grass had produced a considerable amount of new green growth as a result of late summer storms. It would seem that horses would be utilizing this new green vegetation but observations showed that, although horses were in the area, very little use of the galleta grass had been made. No determination was made as to what species were being used in lieu of the green vegetation (see Table No. 2 for estimate of AUMs used by horses).

COVER

The importance of cover to wild horses in the planning unit is not too distinguishable. Some horses rely on cover while others do not.

Horses observed in Little Smoky Valley rely quite heavily on the pinyon-juniper cover provided along the Park Range. In fact, horses in this area are seldom seen because of the dense cover of trees.

Horses observed near Moody Mountain also rely on pinyon-juniper cover quite heavily. These horses use the pinyon-juniper cover along the west side of Moody Mountain as a source of escape when encountered by man. However, horses in this area are also seen quite frequently in the flats west of Moody Mountain. When encountered in this area, they do not necessarily run for the mountain to escape. In this case they rely more on outrunning their intruders across the flats.

Horses in Sand Spring Valley rely on the pinyon-juniper cover of Portugese Mountain about 50 percent of the time. When horses are disturbed near the mountain they run north or south along the foothills until they find easier access into the dense cover higher on the mountain. When horses are encountered farther out in the flats of Sand Spring Valley they tend to try to outrun their intruder across the flats, similar to the horses observed near Moody Mountain.

The horses in the Bull Creek Herd Unit do not necessarily seek the pinyon-juniper cover of the White Pine Range when encountered by man. Instead, they tend to run ahead of their intruders in an effort to escape. This would seem quite strange except for the fact that the area just below the west foothills of the White Pine Range is deeply cut with large wide washes. Apparently these horses utilize the dissected topography as a form of cover.

In addition to the use of cover identified above, wild horses undoubtedly make considerable use of cover for the purpose of protection from environmental factors such as heat and wind. Although the importance or frequency of this

use has not been verified, initial observations made along horse trails through pinyon-juniper areas, indicate considerable use is being made of trees for shade and scratching. There may also be some use of the cooler tree covered areas as a retreat from summer insect pests. The use of cover for these purposes is believed to be similar to use of cover for escape. That is, horses use cover when it is near, but do not necessarily seek cover when it is not close by.

It is probably safe to say that cover does not appear to be a problem in the habitat. Future studies may prove this assumption wrong, but for the present it is believed that wild horses adapt to available cover quite readily.

WATER

Water for wild horses is primarily provided by springs, man-made reservoirs and snow. Springs are generally small and fluctuate greatly in flow with changing season and weather conditions. Reservoirs on the other hand, are almost entirely dependent on summer thundershowers and maintenance by man for continued effectiveness. As a result, water supplies are generally considered to be somewhat unreliable in the unit. This is especially true during the summer months when flow from springs is reduced and reservoirs wash out or dry up in response to weather. During the winter, snow is utilized which helps to relieve pressure on other water sources.

LIVING SPACE

Adequate living space is extremely important to wild horses. The importance of living space is exemplified by several behavioral characteristics of the wild horse. The first characteristic is associated with flight when escaping from enemies. The wild horse, like many large herbivores, relies on his long legs and associated high speed running to escape from danger. The wild horse relies more on his ability to outrun his enemies than on any of his other senses. Although some may argue this point, experiences gained by this writer, while observing wild horses, indicates they are quite easy to approach if movement and noise are kept to a minimum. I have walked right up to several wild horse bands and caused them to run only by making excessive noise and movements. This point is, that outrunning enemies is related very closely to living space. When startled into running, wild horses will often run as far as 6 or 7 miles before stopping. This distance is undoubtedly related to available cover and when trees or broken topography are encountered, running distances will be somewhat shorter. In any event, a large amount of living space is necessary to accommodate this behavior and any obstructions to normal flight will be detrimental to the wild horse.

Adequate living space is also related to the normal day to day movement patterns of wild horses. The wild horse is a very mobile animal and as a result, is capable of traveling large distances in the course of daily activities. The need for large areas in which to establish these daily movements is exemplified by the territorial limits of wild horse bands as identified by Pellegrini and discussed below. In addition to meeting daily needs, these areas must be large enough to meet the seasonal requirements of individual bands. If bands are expressing territorial instincts, each band will have specific areas which are required to meet daily as well as year-round needs.

A second behavioral characteristic is associated with the social nature of wild horse bands. As discussed under Herd Units, wild horses group together in small bands. In the case of bachelor bands the social structure of the band is not extremely rigid. In fact, it has been speculated that these bands are formed and held together merely out of convenience (Ryden 1972). In harem bands, however, the social structure of the band is held together by one dominant male horse. This animal is extremely possessive of the females he has gathered together and is generally intolerant of other males.

This behavior is believed to be the reason for some of the findings by Steven Pellegrini in his study of wild horses in the Wassuk Range, Nevada (Pellegrini 1971). Pellegrini's study indicated that wild horses have a natural desire to establish territories. That is, areas used by a specific group of animals mutually exclusive of other animals of the same species. It is believed that the intolerant nature of harem studs is the primary reason that wild horses establish territories.

Pellegrini also found that the territorial limits for wild horses in the Wassuk Range is 11 or 12 square miles per band. Because the horses in this study are establishing territories, it is logical to assume that 11 or 12 square miles is an optimum or desirable amount of living space for individual wild horse bands.

A third behavioral characteristic related to living space, is associated with wild horse's response to isolation. If one will make a quick mental reflection of all areas where really wild horses exist, he will recall that they are generally wide open spaces, relatively free from the intense activities of man. Although the wild horse can be found occupying areas receiving many types of human activity, this is only a reflection of the horse's ability to adapt to his environment. Adapability is undoubtedly a primary

reason horses were domesticated so easily in the first place. In any event, a true wild horse is generally found in the most isolated places he can find. This is especially true in the Duckwater Planning Unit since most of the area where wild horses occur is relatively free from significant human activity. This includes man-made structures as well as the presence of man himself. Although there are a number of horses that inhabit areas within close proximity to humans, they also show a corresponding change in behavior. They are not nearly as wild and seem to tolerate man's presence when not being harassed. For the most part, however, horses in the Duckwater Unit are extremely wild and show little signs of significant influence from man's activities.

HABITAT PROBLEMS

Forage

At the present time, it is impossible to determine if the quantity and quality of forage in the unit is adequate for wild horse needs. This is because so little data are available concerning forage preferences for horses in a wild state. The fact that wild horses are abundant in the area would seem to indicate that food is not a greatly limiting item. However, professional opinions concerning forage conditions do not agree. Although no studies exist to document range conditions, professional judgment based on personal observations by Ely District employees indicate that forage conditions are somewhat undesirable. As an example, vegetative types composed of pinyon-juniper and big sagebrush are almost exclusively dominated by these species. There are very few understory species, such as perennial grasses and forbs, in the total composition. Likewise, the large white sage flats, which are believed to contribute greatly to wild horse forage needs, display a considerable lack of plant vigor.

Water

The unreliable nature of water creates a potential problem in the Unit. Undoubtedly there is an adequate supply of water for existing wild horse numbers. However, should horse populations increase significantly, it is entirely possible that water may become a scarce commodity during periods of drought. As a result it is entirely possible that when normal waters go dry, many wild horse bands will have to seek new sources of water. This will place increased pressure on remaining water sources and result in conflicts between wild horse bands as well as other animal species utilizing the same water. This situation is further compounded when it is considered that approximately 24 percent of the allowable livestock grazing use in the Duckwater Unit is not being utilized. Should livestock

operations suddenly begin to make full use of their grazing privileges, the consequences to wild horses could be drastic. This is especially true if the increased use was made by cattle. At the present time there are practically no cattle using the range in the Sand Spring Herd Unit. There is some sheep use in the spring and fall but these animals utilize snow or water if hauled to them. If cattle were brought into the area during the summer months, they would begin to utilize the same water sources as wild horses and it is doubtful if there would be enough water to go around.

The location of existing water does not appear to be a problem at the present time. This is probably the result of the large distances over which horses will trail to water. Observations made up to the present time have indicated that horses will trail as far as 7 or 8 miles to water. In fact, horses have pretty well distributed themselves among the existing waters in relation to these trailing limits.

Although horses are willing to trail 7 or 8 miles to water, it is estimated that 4 or 5 miles would be more favorable. A 4 or 5 mile trailing limit could be obtained by improving the distribution of existing waters. Besides reducing trailing limits improved water distribution would also aid in the distribution of the animals themselves.

There has been some speculation that wild horses contribute to the pollution of water sources. Observations made at Tank Spring in the Park Range seem to verify this to some extent. On one occasion, a dominant band stud was observed rolling in the water source. Other horses were seen pawing at the water with their front feet and many were observed walking through it. Studies by Pellegrini have indicated that horses may paw at a water hole in an effort to keep it from filling in with mud (Pellegrini 1971). In addition, it is entirely possible that rolling in mud or water serves some useful purpose such as elimination of or relief from parasites or insects.

Snow is undoubtedly of particular importance to horses during the winter months. During this period horses are able to expand their normal range and utilize areas not normally available to them. The problem with snow is that it is not dependable. Some years there will be absolutely no snow accumulation in the Duckwater Unit.

Living Space

Adequate living space is considered to be a problem in the planning unit. Because of the significant need for living space to accommodate wild horse behavior associated with flight and daily activities, it is believed that portions of the fences shown on Overlay 9A are detrimental to wild horses. This is especially true of that portion of the fence in the Bull Creek Herd Unit which cuts across the center of the area. Undoubtedly this fence has some restrictive influence on wild horses because the majority of their population is confined south of the fence. Although there are other factors which perpetuate this situation, the fence is believed to be most significant. It probably serves to further reduce available living space which is already a problem in the Herd Unit.

The portion of this same fence which runs north and south forming the Herd Unit boundary is not believed to have a significant influence on movement. The reason for this is based on the fact that horses are very seldom seen west of the fence, in spite of the fact that it is possible to find ways around or through it. It is doubtful if horses would utilize this area even if the fence was not present.

The fence on the west side of Pogues Herd Unit, near Pogues Station, has some restrictive effect on horse movement but is not believed to be critical. The only influence that this fence will have is a slight restriction of movement along the south one-half of its length. Horses

near the north one-half of the fence probably will not go any farther west due to the presence of the Fish Creek Ranch with its associated human activity.

Living space is also considered to be a problem as it relates to territorialism discussed under Living Space earlier. If the information presented in that section is applied to populations in the Duckwater Unit, a distinct possibility exists that certain portions of the area contain too many horses for free expression of territorialism. The following table shows the square miles of living space presently available to wild horse bands in each herd unit:

Herd Unit	Area in Square Miles	No. of Bands	Sq. Miles/Band
Bull Creek	117	16	7
Poques	100	4	25
White River	32	2	16
Sand Spring	1,273		
Ely & B.M. Districts	1,237	82	15
Ely District	608	67	9
Concentration Area	420	57	7

Based on a 11 or 12 square mile per band living space requirement, the Bull Creek and Sand Spring Herd Units have an excessive number of bands for territories to be established. Although a first glance would indicate the Sand Spring Herd Unit has adequate living space, with 15 square miles per band, this is not believed to be true. As discussed under Herd Units, wild horses in the Sand Spring Herd Unit do not distribute themselves evenly throughout the area. About one half of the Herd Unit, particularly that portion in the Battle Mountain District is utilized only part of the time or by a very small number of animals. In addition, horses further reduce available living space by concentrating themselves in Little Smoky and Sand Spring Valleys as shown on Overlay No. 9A. The reasons for this concentration are only speculative and were discussed under Herd Units above.

Although the reasons for concentration are not known, it is very apparent that concentration is detrimental to territorialism. This is best shown on the Wild Horse Inventory filed in the Ely District Office. This overlay is based on the intensive inventory of wild horses in the Duckwater Unit, discussed under Wild Horse Inventory above. Although by no means complete, preliminary inventory data shows quite clearly that wild horses are not establishing territories. Specific bands may confine the majority of their use to certain areas, but these areas are constantly being invaded by other bands. In some cases it cannot even be determined if a band confines itself to a specific area. Although this might be expected in bachelor bands, the occurrence in harem bands is not considered normal.

The Bull Creek Herd Unit is believed to have a greater concentration problem than the Sand Spring Herd Unit. This is because horses tend to confine themselves to the southern portion of the area as discussed under Herd Units above. Although horses utilize the National Forest lands to the east during the summer months, their habitat during the winter is almost exclusively confined to the area shown on Overlay No. 9A. Winter is probably the period of greatest stress created by overcrowding.

Because of insufficient living space in the Sand Spring and Bull Creek Herd Units, it is estimated that there are too many animals for available living space. Based on a 12 square mile per band requirement and the fact that the average band consists of 4.7 animals, it is estimated that there are 28 excess animals in the Bull Creek Herd Unit and at least 100 excess animals in the concentration area of the Sand Spring Herd Unit. It should

be pointed out that should 100 horses be removed from the concentration area in Sand Spring Valley, it is entirely possible that horses previously forced to occupy outside areas, may shrink their habitat to include only the concentration area. This would again create an overcrowded situation and as a result the only method of providing adequate living space may be for horses to occupy the concentration area only. If this should occur, it may be logical to assume that the total population of the Sand Spring Herd Unit should be somewhere in the neighborhood of 165 horses.

At this point it may be well to stop and speculate as to why the instinct to express territorialism in wild horses, is breaking down and, therefore, not serving as a basis for stabilizing the population. In many wild animal species, territorial spacing serves as a mechanism to prevent overcrowding of the habitat, thereby insuring every group an adequate amount of living space (Dasmann 1966). As already discussed this is not true in the Duckwater Unit. Perhaps the reason is related to the fact that the majority of these horses are believed to be not too far removed from their domestic counterparts. This writer believes that most of these animals returned to the wild around the time when machines began to replace them in work. If this amount of time is compared to the time required to breed the domestic horse into what he is today, it may be logical to speculate that the wild horse has not had adequate time to redevelop his primitive habits. In other words wild horses may desire to be territorial but the instinct isn't strong enough that it dominates the animal's total behavior.

CRUCIAL AREAS

At the present time it is not possible to positively identify wild horse crucial areas in the planning unit. In fact it is not even known if such a thing as crucial area exists for wild horses. However, there is one area in the unit which comes as close to being a crucial area as anything that can be identified at this time. This area is identified on Overlay No. 9A.

The reason this area has been identified is because it receives a considerable amount of use by horses throughout much of the year. The reasons for this intensive use are not known, but are believed to be related to the combination of vegetation and cover components which are significant on the site.

The area is characterized by rolling foothills covered with a scattering of pinyon-juniper trees and a high proportion of perennial grasses such as needle and thread grass and Indian ricegrass. The perennial grasses probably provide considerable forage during the growing seasons and the pinyon-juniper trees probably provide escape cover and protection from summer heat and winter winds.

Although the total role this area plays in the habitat of wild horses in the unit, is not known, it should be protected or left in an unchanged condition until its significance is identified.

PUBLIC INTEREST

General public interest in wild free-roaming horses and burros has become very widespread. Most of this interest is concentrated in the metropolitan areas of the eastern United States, but interest also runs high in highly populated areas of the west.

Public interest in wild horses and burros is largely the result of efforts by Mrs. Velma Johnson (Wild Horse Annie) who played a major role in obtaining support for the protection of these animals. As a result, Public Law 92-195, which provided for the protection and management of wild-free-roaming horses and burros, was signed into law by the President of the United States. The importance of this legislation to the American people is illustrated by the fact that it passed both the House and Senate without a single dissenting vote. The insurance of wild horse survival is a major concern of many people. These people want the assurance that wild free-roaming horses and burros are protected from death or harassment wherever they exist.

The extent of human interest connected specifically with wild horses in the Duckwater Planning Unit is not known at this time. The planning unit is situated close to both U.S. Highway 50 and U.S. Highway 6 but access from these highways is too poor to attract visitors. In addition, the average tourist has no way of knowing that wild horses inhabit the area (see Recreation portion of Duckwater URA).

The only known public interest related problems are associated with general public opinion. Many local residents feel that the wild horse and burro legislation is quite ridiculous. Their comments seem to follow a general pattern of "now that you've got them, what are you going to do with them."

Livestock oriented people seem to be the most outspoken in this regard.

Many ranchers are concerned with the possibility of over population now that horses are protected. It is interesting to observe the number of ranchers who have always had wild horses on their allotment, but are now beginning to complain about wild horse problems. This is especially interesting in view of the fact that wild horses have only been protected for slightly more than one year. One year is hardly long enough for wild horse populations to have increased significantly.

Public interest in ranching communities in Lincoln County has become so much in opposition that in November, 1972, the Lincoln County Commissioners adopted a resolution for repeal of the "Wild Horse Act." This resolution was initially published in the Lincoln County Record, a weekly newspaper originating in the town of Pioche, Nevada, and finally reached its way into newspapers in Utah and the Los Angeles Times in California. In defense of the wild horses and burros, people in large metropolitan areas in the east and west immediately responded with a deluge of letters strongly denouncing the action of the Commissioners. This specific example reflects the ever increasing interest that the public is developing concerning wild horses and burros.

Public opposition to the legislation has not been restricted to comment alone. During the spring of 1972, two wild horses in the Sand Spring Herd Unit were found dead and are believed to have been shot. These horses were found on the west side of Portugese Mountain south of Portugese Spring. It is estimated that one of these horses had been dead for approximately two weeks and the other for approximately four weeks. The horse that had been dead for two weeks had a small round hole in the lower portion of its neck. Both horses were located in a very unlikely spot for death to have occurred from natural causes.

Future problems arising as a result of public interest directed toward horses by people are difficult to identify at this time. However, it is

believed that increased visitor use to the unit will have a definite impact on the horses living there. It is almost certain that one of the primary reasons wild horses are so abundant is because of the remoteness of the area. Any increased visitor use will undoubtedly cause horses to move away from the areas of visitor concentration. This is especially true of the large open flat areas, where horses have no cover in which to hide and distance is the only means of escape.

Another possible problem is related to the intent of Public Law 92-195, itself. It is apparent that the intent of Public Law 92-195 was to protect wild horses and burros from harassment by man. It was also the intent of this law to maintain these animals in a wild free-roaming state. However, experience gained by the Bureau of Land Management while working with the wild horses of the Pryor Mountain Wild Horse Range in Billings, Montana, has indicated that when wild horses are protected from harassment by man they tend to lose their wild nature. When horses are closely associated with man, they lose their fear of him and begin to tolerate his presence without running. Although it is doubtful that these animals will allow themselves to be approached too closely, they still have lost a lot of the appeal they have as "wild" animals. In fact, some individuals would consider this to be a "ZOO-like" characteristic, which is undesirable from a wild horse standpoint.

TABLE 1
WILD HORSE NUMBERS AND ACREAGES
by HERD UNIT

Herd Unit	Approximate Numbers *					Acres		
	Male	Female	Yearling	Young	Total	BLM Ely	BLM Battle Mt.	Total
Sand Spring	175	127	27	53	382	389,163	425,557	814,720
Pogues	6	5	1	2	14	64,128	-	64,128
Bull Creek	35	26	5	11	77	74,746	-	74,746
White River	4	2		1	7	20,736	-	20,736
Total	220	160	33	67	480	548,773	425,557	97,330

*Numbers based on intensive inventory described under Wild Horse Inventory above. Estimate approximately 14 percent of horses were missed in helicopter survey.

- Dasmann, R.F., 1966, *Wildlife Biology* John Wiley & Sons, Inc., New York 231p.
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TABLE 2

AUMs CONSUMED BY EXISTING HORSE NUMBERS

Herd Unit	AUMs Currently Taken Annually*	AUMs Needed by 1980 w/o Population Control
Sand Spring	5,780	
Pogues	210	
Bull Creek	1,155	
White River	105	
Total	7,250	

*Estimate based on the assumption that horses consume forage at 1.25 times the rate of one cow or 1.25 AUMs per horse month; 1.25 AUMs per horse month is the figure presently being used by the Pryor Mountain Wild Horse Range in Billings, Montana.

Population Management

Opportunities for wild horse management in the Duckwater Planning Unit exist for expansion, reduction, maintenance and enhancement of wild horse populations. Because only limited data are presently available on all herd units and their associated bands, further investigation must be conducted to determine if the opportunities selected in this section are appropriate. A discussion of these opportunities is as follows.

Expansion of Present Populations

Opportunities to expand wild horse populations exist wherever the total area of individual herd units can support additional bands without creating concentrations detrimental to natural wild horse behavior pattern, i.e. territorialism, and where the habitat will support additional horses. In the planning unit, two herd units are considered capable of supporting additional horse numbers. These are the Pogues and White River Herd Units. Increased populations in these herd units may be encouraged to the point that each band of horses has approximately 11 or 12 square miles of living space in which to establish territories.

Population expansion can be achieved by improving herd composition and increasing survival rates.

Those factors of herd composition which can be adjusted to expand the population are age class ratios and sex ratios. By accomplishing one or more of the following actions, population expansion will occur.

- No. 1 - Remove a portion of the older animals.
- No. 2 - Remove a portion of the male animals.
- No. 3 - Introduce young female horses into the herd

The removal of older animals will tip the population scale in favor of a larger proportion of breeding animals. The removal of

males will result in larger proportion of productive females. In addition, the whole process can be speeded up by the introduction of additional females to further tip the scale toward animals capable of bearing young, thus increasing young/female ratios.

Those factors of survival which can be adjusted to help expand the population are predation and habitat conditions. Population expansion will occur if survival, especially of young animals, is increased. This can be accomplished by undertaking the following actions.

No. 1 - Begin an accelerated predator control program in appropriate herd units.

No. 2 - Improve habitat conditions, i.e. additional forage, to produce stronger, healthier populations capable of withstanding harsher environmental factors.

These actions will reduce mortality rates and result in an increased annual production of wild horse numbers. Additional discussion of habitat improvement is contained in following sections

Reduction of Present Populations

Opportunities to reduce wild horse populations exist wherever the total area of a herd unit is occupied by too many bands for free expression of natural behavior patterns i.e territorialism. In the planning unit, two herd units are suspected of containing excessive wild horse numbers. These are the ^{Ely District Portion of the} Sand Spring ^{Herd Unit} and Bull Creek Herd Units. Populations in these herd units, probably should be reduced to the point that each band of horses has approximately 11 or 12 square miles of living space in which to establish territories. Population reduction can be achieved by adjusting herd composition or decreasing survival rates.

Hb = Base level of population

Ho = Percent death loss of older animals

Hd = Death loss of older animals

Xp = Percent productivity

Xy = Number of young animals produced

Xo = Percent death loss of younger animals

Xd = Death loss of younger animals

Xr = Number of animals to remove each year

$$(Hb)(Ho) = Hd$$

$$(Xp)(Hb) = Xy$$

$$(Xy)(Xo) = Xd$$

$$Xy - (Hd + Xd) = Xr$$

Enhancement of Populations

Population enhancement is related very closely to population maintenance discussed earlier. Enhancement can largely be obtained by selectivity as to the type of animal removed under a maintenance program

Population enhancement is the most important part of a wild horse management program since this is where benefits to the animal can best be realized. The test of a maintenance program is whether it is beneficial to the animal

Before population enhancement can begin, objectives for the program must be defined. In the Duckwater Unit, it is recommended that removal of animals, in connection with a maintenance program, be accomplished in accordance with the following objectives.

1. Perpetuate an even age structure.
2. Improve physical appearance of the animals.
3. Maintain desirable sex ratios.

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The factors of herd composition which can be adjusted to reduce the population are age class ratios and sex ratios. Population reduction will be achieved if one or more of the following actions is accomplished.

No. 1 - Removal of a portion of the younger animals.

No. 2 - Removal of a portion of the female animals.

The removal of younger animals will tip the population scale in favor of a larger portion of non-breeding animals and the removal of females will result in a larger proportion of non-productive males.

The factors of survival which can be manipulated to reduce the population are limited to leaving predation and habitat conditions in their present status and condition. Increasing predation and deteriorating the habitat are totally unrealistic ventures.

Maintenance of Populations

As discussed in Step 3, Duckwater URA, the reasons wild horse populations do not stabilize in relation to habitat conditions, are not known. However, it is almost certain that populations do not maintain themselves in relation to available living space. As a result, maintenance of populations is a valid and necessary opportunity.

After wild horse populations have been adjusted to the level necessary to allow free expression of natural behavior, opportunities to maintain populations can be realized. These opportunities exist for all herd units in the Duckwater Planning Unit.

Maintenance of wild horse populations can be defined as the removal of annual population increases after allowances for normal mortality losses in all age classes. The following example is a formula which can be used to determine the number of animals to remove each year.

These objectives will help to maintain healthy, productive and aesthetically pleasing herds.

To accomplish the above objectives, specific actions should be undertaken. When managing ^{to} the perpetuate an even age structure, those animals which are 9 years of age or older should be removed regardless of other selection factors. In addition, those male animals 6 years of age or older that have not been able to obtain a harem should be removed. These actions will create age structures which favor younger, more reproductive animals.

When managing to improve the physical appearance of herds, those animals exhibiting poor conformation due to inbreeding or other factors should be removed. In addition, sick diseased or crippled animals should be considered for removal unless they can contribute to future beneficial characteristics of the herd.

Besides selection for physical appearance characteristics listed above, numerous opportunities are available for preserving the variety of colors now present and characteristics typical of a particular type of horse e.g. Andalusian and Barb. However, since the BLM is responsible for protection and management of all wild, free-roaming horses, regardless of color or type, these opportunities are actually immaterial. It will be up to the public to decide what type of horse they want to perpetuate in the planning unit.

In line with the objective of maintaining desirable sex ratios, such ratios should favor the female. As a population sex ratio, it has been suggested that the number of studs be reduced to approximately 1/5 the number of mares, with 10 additional studs left for replacement and competition. (Hall n.d.) Theoretically, this will reduce intense

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competition between groups and increase productivity.

In actual practice, a higher ratio of females to males will result in fewer bachelor studs_x harassing harem studs during the breeding season. Although somewhat beneficial, complete harassment should never be eliminated. This is one factor of natural selection which helps to prevent inbreeding and perpetuates the dominance of strong healthy animals in the breeding population. A certain amount of competition should always be maintained.

In addition to population enhancement, created through population manipulation discussed above, enhancement can be achieved by improving survival rates in wild horse herds. Although practically nothing is known about wild horse mortality, the primary causes are probably related to predation, disease and unsuitable habitat.

Since predation and disease are generally beneficial to natural populations in that they are selective for weaker or less fit animals, these two factors should be left alone to take their natural course. The only exceptions will be a significant increase in predators or threat of a disease of epidemic proportions. In this case the opportunity to intervene will arise and mortality should be reduced through accelerated predator control or wide spread disease prevention programs. Although disease prevention will be very difficult to accomplish, some techniques to consider are wide spread inoculations or immunization through oral intake at water sources.

Mortality losses resulting from unsuitable habitat conditions are generally related to starvation or poor body condition which makes the animal unable to withstand severe environmental factors. Since

forage conditions in the Duckwater Unit are generally considered to be unsuitable, excellent opportunities to improve the habitat for population enhancement are present. These opportunities involve the production of increased forage for wild horses and are discussed in greater detail in following sections. (See Overlay 9B. for specific opportunities).

Management Techniques

The above discussion has been directed toward methods of manipulating populations to benefit individual herds. In connection with these methods, numerous opportunities for techniques to capture and dispose of animals are available. These techniques will require handling of horses by man and will undoubtedly be used in a combined form or with other unidentified techniques as conditions warrant. In most cases there will be alternative methods available to accomplish these jobs. Some examples might be BLM projects, contracts to harvest or cooperative agreements with private organizations to harvest or maintain animals. A listing and description of capture and disposal techniques is as follows:

A. Capture of Animals

1. Water trapping - Trapping horses in a corral at water sources is a very effective capture method. It can best be accomplished during the dry season. June through September when water is scarce.

Water trapping can be best accomplished by sneaking up and closing a gate once horses are inside or by designing traps so that horses can enter but cannot exit.

It has been recommended that water traps be installed with holding pens so that trapped horses can be pushed into a

pen and the trap visited only once a day (Hall n.d.)

When water trapping, it will be necessary to provide food and water in the holding pen and all trapping must be initiated at all sources in the area to assure success

2. Dry Trapping - Pushing or enticing horses into a corral without water is another effective capture method. In the Pryor Mountains it was found that dry traps must be located so as to be invisible to the horses. In addition, the trap must be located on a natural trail and preferably, where many trails converge (Hall n.d).

Like water traps, dry traps should have a holding corral in which to hold horses. Food, and water will have to be provided if horses are not removed daily.

Placement of horses into a dry trap is difficult to obtain. The recommended method is to use helicopters. Two helicopters will probably have very good success in pushing horses into the trap. Horse back riders may have some success but will undoubtedly be less effective than helicopters.

If dry traps are located properly, food enticement may be an effective method. Hay, scattered along trails leading to the traps, may entice animals into trap entrances.

3. Roping - Roping can be used as a method of capturing individual animals. The greatest use of roping can be to select individual animals for removal. This will require experienced riders and selection criteria will have to be applied before the animal is caught.

Roping is not effective for large roundups as too many riders are required to get the animals in position for roping. However, as a method of handling horses, roping is very effecient. It is the most humane method of working horses in a corral.(Hall n.d.)

4. Immobilization - Immobilization is another method of capturing individual animals and can be used to remove select animals from the herd. Its greatest advantage is in country which is too rough for roping.

When adequate cover is available 2-3 horses can be captured per day (Hall n.d.). However, immobilization is a somewhat risky technique and must be used cautiously or serious death^{losses} can occur.

5. Biological - Biological control is the use of natural predators to control wild horse populations. As discussed earlier, Mountain Lion and Coyotes already inhabit the planning unit. Since predation is very difficult to control, it is recommended that predators be maintained in the unit but that no attempt be made to increase numbers. Predators should be allowed to seek a natural level in relation to horse populations. The only exception would be a serious increase in predator numbers which threaten the survival of the herd. However, this is a remote possibility.

B. Disposal of Animals

1. Private Maintenance - Once horses are removed, they can be turned over to private individuals for maintenance on private lands. This arrangement would require cooperative agreements between all parties involved to assure that horses are maintained in a humane manner

It should be pointed out that this type of venture has limited application. The reason is that there is not a substantial market for wild horses which cannot be sold for profit. In addition, what market there is, will be quickly filled after the first disposal program. Therefore, subsequent programs may not have the same opportunities. A somewhat larger market may exist for colts but under a population enhancement program, it is not desirable to remove numerous young animals.

2. Relocation - Wild horses can also be relocated into other less populated areas. Although relocation is limited by Public Law 92-195 to areas which are presently inhabited by wild horses, there may be lightly populated areas where excess animals could be introduced. Relocation into such areas could benefit the new herds by introducing new blood and possibly reducing the effects of inbreeding created by insufficient competition.

3. Permit System - A permit system would function similar to that used by many Fish and Game Departments. Permits could be issued to capture a wild horse ^{and} the BLM would specify the horse to be captured and the method of capture.

Since mustanging as a sport has thrived for many years, the most logical capture method would be roping. This would perpetuate the art of mustanging as well as remove a selected number of animals. Permit systems would have to be carefully supervised to assure that animals are treated humanely.

The ideal time for conducting permit captures would be when then the weather has cooled down in the fall. During October for example colts would generally be old enough to keep up with the mares and most horses would be at a physical peak. Mares would not be heavy with foal and the remaining horses would be in good physical condition as a result of summer grazing.

A secondary benefit of permit capture would be the maintenance of the wild nature in horses. As identified in Step 3, Duckwater URA, wild horses tend to loose their wild nature when protected from harassment by man. As a result running horses under permit would help to regain this wild nature.

4. Destruction - Although not an appealing term, destruction is an excellent method of disposing of excess animals. This technique can be very selective, is extremely economical and can be done in a very humane manner.

Although methods such as immobilization and subsequent destruction can be used, the most logical method would be to use high powered rifles. A good marksman could destroy selected animals in a manner that creates practically no suffering.

Habitat Management

Opportunities for wild horse habitat management in the Duckwater Planning Unit exist for improving forage, cover, water and living space conditions. However, since very little data are available as to the characteristics of a desirable wild horse habitat, further investigation should be conducted to determine if the opportunities identified in this section are appropriate. A discussion of these opportunities is as follows:

Forage

Forage conditions are extremely important to any grazing animal. Forage conditions can be improved by vegetative manipulation practices, improved grazing distribution and the alleviation of competitive grazing pressures. The end result will be healthier and more viable wild horse populations.

Vegetation Manipulation

The Duckwater Unit has the capability of producing additional forage for wild horses. This potential exists through the manipulation of pinyon-juniper and sagebrush vegetative types. (See overlay No. 9B-~~7~~ and Table No. _____). Before any such projects are initiated, however, research should be conducted to more closely determine the foraging preferences of wild horses so that seed mixture can be modified to contain the necessary forage species. In addition, no projects designed for total sagebrush eradication should be attempted until the importance of sagebrush in the winter diets of wild horses has been determined.

Grazing Distribution

Grazing management with domestic livestock has been used to bring about the improvement of many native ranges in the west. The type of management generally used to achieve these results is Rest Rotation Grazing. Without going into the details of "Rest Rotation", it is theoretically possible to achieve similar results in the Duckwater Unit by using wild horses instead of domestic livestock. This would require regulating wild horse distribution by adjusting the availability of water supplies or dividing the range into individual use areas.

Grazing distribution, resulting from regulating water sources, could be achieved by fencing all water sources in the unit and allowing

wild horse access only to those waters located in areas where horse use is desired. This would force horses to utilize certain areas and abandon others. ^{Paragraph} Although technically feasible, water regulation may not be a valid opportunity. During winter months or rainy periods, horses would be able to abandon all water sources and rely on snow or water pockets as a source of water. In addition, it was found in the Pryor Mountains that it may take two or three years for horses to adjust to a new source of water. As a result, if normal waters are shut off, the impact to wild horses may be disasterous. In any event any manipulation of wild horse water should be approached with extreme caution.

Regulation of distribution by dividing the range into pastures is also a technically feasible venture. In fact, it is a more realistic opportunity because more definite grazing distribution could be achieved.

When developing pastures for distribution, normal movement patterns of wild horses should be considered. In addition, fences should be constructed across water sources and major trails. This would allow the construction of traps at water sources and drop panels at trail intersections. With traps constructed at water sources, horses could be trapped as they approached from one pasture and then kicked out into the other. With drop panels at trail intersections, the panel could be closed after migration was completed thereby confining use to one side or the other.

Although technically feasible, wild horse pastures may also not be a realistic opportunity. Confining wild horses into pastures will almost

certainly have a detrimental impact on the expression of territorialism. Territorial expression should be one objective of wild horse management. The only possible way that confined pasture use will not be detrimental, is that due to increased forage production, the amount of living space necessary to establish territories may be lessened. If this happens, smaller areas will accommodate greater numbers and territories can continue to be established. If this does not happen, the only other alternative is to reduce population numbers. In addition, it may very well be that confining wild horses is contrary to the concept of preserving the free roaming nature of wild horses. In any event, it is impossible to presently determine the consequences of these actions and any such practice should be approached with extreme caution.

Grazing distribution may also be obtained by creating additional forage in adjacent areas through the vegetative manipulation practices discussed above. The establishment of additional wild horse forage may serve to attract horses into less utilized areas, thereby relieving grazing pressure on heavily utilized ranges. Although Rest Rotation management cannot be obtained by this method, the relief provided to intensive use areas may be of significant value. An opportunity for practical application of this method in the Duckwater Unit is discussed in a following section.

Competition Removal

Preliminary observations on food preferences of wild horses indicate that they utilize the same plant species as domestic livestock. As a result, removal of competitive livestock grazing use is an opportunity which can be used to improve forage conditions for wild horses.

As discussed under "Animal Condition", Step 3 Duckwater URA, the lack of domestic livestock grazing use in the Sand Spring Herd Unit is believed to be the primary reason for good body condition of wild horses. It is expected that an increase in livestock use in this area will create a corresponding decline in the condition of wild horses. Therefore, the opportunity to eliminate any increases in active livestock use in this herd unit should be strongly considered. In addition, opportunities for removal of competition should be considered in other herd units as the need is identified. This includes competition created by big game animals as well as domestic livestock.

Cover

No opportunities to develop additional cover are available in the planning unit. However, opportunities to maintain existing cover and expand horse distribution to increase utilization of cover, exist wherever pinyon-juniper vegetative types occur.

Existing cover can be maintained by leaving adequate escape cover when undertaking land treatment projects in Pinyon-Juniper vegetative types. Tree removal should be limited to small areas (1000 acres or less) with irregular boundaries provided throughout. Leaving unchained strips or islands of trees at intervals no more than 1/4 mile apart, should maintain adequate escape cover.

Increased utilization of cover can be accomplished by developing forage in areas which have dense stands of trees and receive little use by wild horses. Theoretically, if additional forage is developed in these areas, horses will be attracted to them and increased use of available cover will occur. Land treatment projects should follow the same guidelines identified for the areas above.

Water

Opportunities to improve water conditions for wild horses are available in the planning unit. These opportunities consist of improving water quantity, quality and availability.

Opportunities for improving the quantity of water are limited in the unit. (See overlay No. 9^BA-1). The primary reason is that very little live water is available in most of the area. Many of the water developments shown on overlay 9^BA-1 are water catchments or guzzlers, which are considerably less desirable than live waters.

The quantity of water can be increased by installing collection systems at springs and piping water to central non-evaporation storage areas. In addition, networks of pipelines can be constructed to distribute water to additional locations. This will increase the number of water sources. Increased waters can also be provided by constructing reservoirs or water catchments to capitalize on runoff from precipitation. It should be pointed out that the addition of new waters may create increased stress between individual horse bands by creating an opportunity for invasion of their territorial limits by other bands. Therefore, addition of new waters should be approached cautiously so that serious problems are not created.

Opportunities for improving the quality of water exist wherever water is available. The primary method of improving quality is to divert water into metal or concrete tanks which do not allow access for horses to roll or paw at the water. However, it is believed that if horses were restricted from any activities of this kind some detrimental effects might occur. There is some evidence that rolling in water is useful in obtaining relief from ecto-parasites.

Opportunities for improving the availability of water are the most significant in the unit. Water availability can be improved by providing additional waters as discussed under water quantity above. The establishment of new waters can be used to attract horses into lightly utilized areas thereby reducing grazing pressures on heavily utilized ranges. Improved availability through distribution can also be used to reduce trailing limits for wild horses. Although horses are known to trail seven or eight miles for water, four or five miles is considered to be more favorable. A four or five mile trailing limit can be achieved by improving the distribution of water. In addition, the distribution of horses themselves can be improved by proper distribution of water.

Availability of water can also be improved by decreasing the amount of water consumed by animals other than wild horses. As discussed in Step 3, Duckwater URA, it is believed that increases in actual livestock use could create a serious shortage of water for wild horses. Therefore, a valid opportunity is to restrict increases in actual livestock use so that adequate water is assured for consumption by horses.

Maintenance of water facilities is another important aspect of water availability. If all waters receive adequate maintenance, availability will be enhanced during periods of limited supply. A good example is the maintenance of existing reservoirs. If reservoirs are not kept in good condition they will not hold water. As a result, during periods of drought unmaintained reservoirs will not store adequate water to tide horses over through dry periods. The same principle applies to all other types of water developments.

Availability of water can also be improved by maintaining wild

horse numbers at levels consistent with existing water supplies. This practice will assure that every horse has an adequate supply of water to sustain life throughout an average year.

Living Space

Opportunities to improve or maintain living space conditions exist wherever wild horses occur in the planning unit.. Since wild horse habitat is limited, by P.L. 92-195, to that area occupied by horses on December 15, 1971, the primary opportunity is to provide sufficient living space for every band of horses to express natural behavior patterns through establishment of territories. Expression of territorialism can be complimented by accomplishing any one or a combination of the following actions.

Fence Removal

Opportunities to improve living space conditions through fence removal, are identified on overlay No. 9B2, Wild Horse Management Expansion Areas. The removal of these fences should have a beneficial influence on available living space by making areas available to utilization by horses on a more intensive basis.

The establishment of new fences will have the same detrimental effect on living space as existing fences. Therefore, it is recommended that no new fences be constructed within any of the herd units in the planning unit.

Habitat Improvement

Opportunities for utilizing habitat improvements to benefit living space conditions, exist in those herd unit where geographic or other features are such that adequate area is available for living space to be increased.

For example, habitat improvement in the Sand Spring Herd Unit could theoretically be used to improve living space conditions in that area. As discussed in Step 3, Duckwater URA, ^{the majority of} wild horses in this herd unit, presently have between 7 and 9 square miles of living space per band. The result is a break down in natural behavior patterns in that horses do not establish territories. Therefore, if after completion of habitat improvement projects, horses are attracted to the project areas and equal distribution occurs each band will have approximately 15 square miles to establish territories. This will be beneficial to living space conditions in the Sand Spring Herd Unit since wild horses are known to establish territories when 11 or 12 square miles of living space per band is available (Pellegrini 1971).

On the other hand, living space in the Bull Creek Herd Unit would probably not show any increase as a result of habitat improvement. Due to geographic features such as the White Pine Range to the east and Duckwater Indian Reservation to the west it is doubtful if living space could be increased.

These same principles can also be applied to other herd units where living space is a problem.

Population Reduction

Opportunities to increase available living space through population reduction, exist wherever the total number of wild horse bands in an area exceeds a level necessary to allow horses to establish territories. The key to providing adequate living space, is to reduce and maintain populations at levels which are consistent with natural behavior patterns of the animals.

In the Duckwater Unit, the Bullcreek Herd Unit shows the greatest potential for this type of living space enhancement. As discussed in Step 3, Duckwater URA, wild horses in this herd unit have only 7 square miles of living space for each band to establish territories. In addition, as discussed in the preceding section, habitat improvement is not a valid opportunity in this herd unit. Therefore, if territorialism is to be provided in the Bull Creek Herd Unit, populations will have to be reduced and maintained at a level which allows for expression natural behavior patterns.

Crucial Areas

As discussed in Step 3, Duckwater URA, it is impossible to identify wild horse crucial areas at this time. However one area has been identified on overlay 9A which may be a crucial area. The primary opportunity therefore, is to preserve and protect this area until its total significance can be determined.

Wild Horse Range

Opportunities to establish wild horse ranges exist in all areas where wild horses are known to exist. However, since the criteria to be used in the establishment of wild horse ranges has not been determined, no attempts to designate ranges in the planning unit should be made.

There is, however, one area where designation of a wild horse range may be desirable. This area is identified on overlay No. 9B2. Although not presently needed to assure the protection and survival of wild horses, the area has a unique potential for developmeent from a recreational standpoint. This area is characterized by a large valley which is bounded on the east by a large mountain range. This mountain range, commonly known as Portugese Mountain, is what makes the area so unique

Portugese Mountain offers an excellent opportunity for viewing wild horses in the valley below. The mountain is within 42 miles of U. S. Highway 50 and 14 miles of U. S. Highway 6. Because of this location, it is felt that some type of observation area could be constructed on the mountain with access to the site provided from both highways. Visitors could then travel to the site and observe wild horses in the valley below without causing any undue disturbance to the animals. In fact, it is doubtful if wild horses would even be aware of the existence of the site due to its height and subsequent distance from the valley.

Because of the opportunity to develop this area for public enjoyment of wild horses, it may be desirable to designate a yet undetermined portion of the area as a wild horse range. The area should definitely be designated as a range if a large recreational development is undertaken so that the survival of the wild horse population will be assured.

Public Enjoyment

Numerous opportunities to develop recreational use of wild horses are present in the planning unit. These opportunities have been identified in the recreation portion of the Duckwater URA because they are more closely related to the recreation activity.

It should be pointed out that before any type of improvement for recreational purposes is undertaken, a study should be made to determine the possible effects of such a venture on wild horses. It may very well be that increased human concentration to the area will only result in a decrease in wild horse populations. It is almost definite, that one of the reasons there are wild horses in the area at all, is because of the lack of human concentration. Therefore, extreme caution will be required to assure that recreational use does not conflict with wild horse requirements.

Studies and Research

Study and research on wild horses in the Duckwater Unit is not only

an opportunity, but is absolutely essential, if adequate management of the wild horse resource is to be accomplished.

Studies, and a research in the following areas are needed as soon as possible. These studies are listed in the order of importance or priority.

1. Reproductive Rates (Accomplished by conducting adult/young ratio surveys each spring).
2. Mortality rates of young (Accomplished by conducting adult/yearling ratio surveys in the spring and adult/young ratios in the fall each year).
3. Mortality rates of animals one year old and older. (Accomplished by conducting annual population counts during ^{same} ~~some~~ season of year and weather conditions, to determine population trend^d).
4. Foraging habits and food preferences of wild horses (Accomplished by observing horses feeding as often as possible).
5. Competition for forage with other animal species (Accomplished by observing feeding habits and comparing with feeding habits of other animals)
6. Crucial area identification (Accomplished by observing horses as much as possible to determine what areas are crucial and what factors make them so)
7. Disease and predation (Accomplished by conducting research on these items).