DEPARTMENT OF THE INTERIOR

ENVIRONMENTAL ASSESSMENT

Proposed
Feral Horse Reduction
Theodore Roosevelt National Memorial
Park

Prepared by
Theodore Roosevelt National Memorial Park
National Park Service
Rocky Mountain Region

4/19/78
Date

Acting Regional Director, Rocky Mountain Region

ENVIRONMENTAL ASSESSMENT
Feral Horse Reduction

1. Statement of the Problem: A small population of feral horses inhabit the southeastern section of the 40,000 acre, fenced South Unit of Theodore Roosevelt National Memorial Park. These animals are descendent from domestic horses that escaped or were released from neighboring ranches in the late 1940's or early to mid-1950's. Since the horses cannot be classified as a native wildlife species, they are managed as a livestock display, significant because of the presence of feral horses in this area during Theodore Roosevelt's time. The Resource Management Plan for feral horses provides for the maintenance and management of about 40-horse herd. While this number may seem arbitrary, when factors such as competition with native wildlife species, impacts to the vegetative and water resources, and associated damage to fences and dish tanks are considered, it appears to be reasonable. At the present time there are between 70-75 horses in the herd. In order to maintain the herd at the prescribed number of approximately 40, and to prevent the populations from increasing to a point that would be more difficult to manage, it is now necessary to reduce the number by some 30 to 35 animals, and to periodically reduce their numbers in future years.

2. Description of the Environment: From the description of terrain and soils taken from the park's Master Plan, "The Park terrain consists of badlands, river bottom lands, and flattish uplands, all of which are drained by the Little Missouri River. The badlands extend back to the headwaters of the tributary streams. These streams have cut through the soft strata, dissecting the region into a network of canyons, ravines, and gullies, which are nearly continuous along both sides of the river. There are occasional grass-covered plateaus left between some of the streams. At the edge of the badlands, the park extends into rolling grass-covered plains". As previously stated, the horse herd seems to have established its home range next to Interstate 94 in the southeast section of the park. This area can best be described as the "rolling grass-covered plains" mentioned in the Master Plan description. The animals do spend a sizeable percentage of their time in the badlands terrain to the west, however, and during the winter months extend their range as far west as the Paddock Creek drainage. The horses water almost exclusively at four locations: Olson Well, Southeast Corner Spring, Biocourt Springs, and Sheep Butte Springs. Three of these springs (Sheep Butte, Southeast Corner, and Biocourt) are developed dish tanks located between the east boundary and the park's scenic loop drive. The fourth, Olson Well, is located on a grass plateau between the east boundary and Painted Canyon, and is not developed.

3. Alternatives Considered: Options considered in the park's Resource Management Plan for feral horse management are: 1) herd removal, 2) no action and 3) comprehensive management, which includes maintenance of population numbers at a prescribed level. Milton Frei, a Bureau of Land

Management Range Conservationist who evaluated the park's feral horse herd in the spring of 1977, suggested the following alternatives for reduction: 1) direct control (trapping, herd relocation, destruction and immobilization), and 2) indirect control (fertility control and population manipulation).

4. Environmental Impacts of Alternatives: Since feral horses cannot be considered a native wildlife species, negative environmental impacts resulting from herd reduction or even removal would be negligible. Alternative #1 of the park's Resource Management Plan for feral horses discusses the option of removing all horses from the park. While this idea may be environmentally sound, plans to remove horses from the park in the mid-60's were met with very strong public disapproval. In addition, a small display herd adds authenticity and flavor to the historical interpretation of the park. Alternative #2 of the Plan is essentially a "no action" option. Environmental impacts that would result from this course of action are certain. If the herd size is allowed to grow unchecked at the 1976 rate of increase of 26%, horses would soon have very definite influences on other wildlife species through competition for range and available water. In addition, as horse numbers increase, the frequency of animals escaping through the park fence and trespassing onto neighboring ranchlands will correspondingly increase. Other factors to consider with this alternative are increased erosion due to heavily used trails, the possibility of stallions rounding up domestic "harems" from neighboring ranches, and overgrazing and ecological disruption in certain sections of the park. Alternative #3 proposes comprehensive management of the herd. This option recognized the feral horse as a non-wildlife animal and discusses the management of a display herd only. The maintenance of a 40-horse herd is recommended because of its manageability, and because, from a biological standpoint, age and sex classes can be properly represented in a group of this size. This option also recognized the potential ecological impacts of an uncontrolled or large horse population. Alternative #4 proposes rounding up horses and relocating several bands in other areas of the park. This action would contribute to the idea that the animals are wild and free-roaming, and would increase their visibility to the visiting public, but it would also compound the problems of maintaining the herd at any given size. In addition, the potential problems associated with competition with other wildlife species, especially the Bighorn Sheep, in the western portion of the park would have to be considered with this option. Alternatives presented in Mr. Frei's report of April, 1977 cover only methods of reduction, and do not suggest management choices.

Even though two methods for reduction (water and dry traps) require a certain amount of facility construction on the horse range, environmental impacts resulting from their use would be minimal. Perhaps the only alternative for reduction that would result in deleterious impacts to the environment would be that of herd dispersal and relocation. This option does not consider competition with other wildlife species, the likelihood of animals returning to their home range, or the maintenance of a predetermined population number.

5. Mitigating Measures for All Alternatives: In the case of herd reduction by roundup, all efforts will be made to handle animals in a humane manner. Horses will be held at the buffalo corral facility on the park's north boundary where water and feed will be provided. Hopefully, the sorting and loading operations at the corral area will be completed within an 8-hour time period which will further minimize physical and emotional stress to the animals. Other alternatives for reduction such as direct reduction, fertility control, and immobilization would be accomplished on a very limited scale with direct impact on only the affected animals. No other environmental impacts are visualized as a result of these options. Should the herd size be allowed to grow unchecked, as suggested in the "no action" alternative, park resource managers will attempt to monitor associated range impacts and other impacts to native wildlife species.

6. Unavoidable Adverse Impacts for all Alternatives: As previously stated, the horse herd is managed as a livestock display. Therefore, the only unavoidable adverse impacts that can be assured are those that would result from the alternative of "no action". No action would result in over-competition with native wildlife (buffalo, deer, antelope, Bighorn Sheep) for water and forage; increased damage to boundary fence due to trespass from bachelor stallions onto neighboring ranchlands; heavy impacts with resulting site deterioration around dish tanks, and heavy range impacts resulting in the possiblity of increased erosional processes in the southeast section of the park.

7. Short-term/long-term relationships: Covered under #6, Unavoidable Adverse Impacts for all Alternatives.

8. Irreversible and Irretrievable Commitments of Resources: None

9. Consultation and Coordination with Others, if applicable: Copy of Bureau of Land Management's Range Conservationist Milton Frei's evaluation of the park's feral horse herd attached.

CORRECTIONS TO ORIGINAL DRAFT ARE UNDERLINED.

WILDLIFE - FERAL HORSES

Resource Description

At the present time there are 65-70 feral horses in the fenced South Unit of the park. Even though it is difficult to positively identify the ancestry of the herd, historical records indicate that most of the horses may be descendants of two mares that escaped from the Barnhart ranch in the mid-1950's, and a white stud of unknown origin. With the exception of two mares and one gelding that escaped from the park concessioner and local ranchers, all of the present horses in the park were probably born within its boundaries. For the most part, the animals restrict themselves to the southeastern section of the South Unit. They can usually be seen from Interstate 94 in this area, and are often mistakenly identified as domestic horses. As near as can be determined, the animals are divided into at least five separate subgroups each led by a dominant stallion, and one "bachelor" group composed of 6-10 young stallions. In addition, there are several old stallions that are loners and, for the most part, do not associate with other horse individuals or groups. The ages of the horses range from new foal to several animals that are over 15 years old, with the median age being slightly over 5.

Present Management Action

These animals are protected by virtue of Title 36 of the Code of Federal Regulations. No other management plan is currently in effect. The 1971 Wild Horse and Burro Act does not apply to feral horses that range on lands administered by the National Park Service. Interpretation of this resource is, at the present time, limited to occasional mention at evening programs. When completed, the visitor contact station at Painted Canyon will have fixed displays that will briefly explain the history of the feral horse in the badlands.

Results of Current Action

There are several problems with current management action that seem to be apparent. Generally, they are associated with genetic trends of a small, enclosed population, and the tendency of the herd to inhabit a very limited portion of the total available range. Several colts have been observed as being unusually small and with crooked legs which may be a result of in-breeding. Other indicators which would support this idea, are horses with poor overall conformation, "jugheads", and a predominance of similar color patterns (blues, greys, and mixtures thereof). Of equal concern is the tendency for the herd(s) to use only the eastern and southeastern section of the south district as range. As the herd size has increased over the past ten to twelve years, a corresponding increase in fence damage, over-grazing, deleterious impact around dish tanks, and erosion due to a wide-spread, heavily-used trail system has been noted. The usually severe

winters that are typical of North Dakota are possibly the only natural factor that limits the population growth of the herd. Since winter conditions during the past several years have been relatively mild, mortality due to this factor has been negligible. A few animals, usually colts, die as a result of falls into potholes or deep coulees, but this number is also insignificant. At the 1976 rate of increase, which is thought to be near maximum, there will be 16-17 foal born in the spring of 1977, bringing the total herd number to 80-87 animals.

Alternatives

1. Herd Removal: In 1964-65, plans were made to remove feral horses from the park. It was thought that they were not appropriate to the park scene. However, due to the strong local pressure and unfavorable publicity against the proposal, the decision was made to maintain a maximum 40-horse herd. Because of this precedent, herd removal at this time is not recommended. Perhaps the main reason for managing a feral horse herd, however, is that wild horses were part of the badlands scene during Theodore Roosevelt's time here. Roosevelt wrote in Ranch Life and the Hunting Trail, "In a great many...indeed, in most...localities there are wild horses being either themselves runaways from some ranch or Indian outfit, or else claiming such for their sires and dams, yet are quite as wild as the antelope on whose domain they have intruded..." Thus, the present herd adds authenticity to the historical interpretation of the park.

2. No Change: This alternative is not recommended because it does not provide for the problems associated with inbreeding, overgrazing and other range impacts and competition with other wildlife species. Additionally, present management does not address itself to the maintenance of a 40-horse herd, which includes provisions for the disposition of surplus animals.

3. Comprehensive Management: This option recognizes the problems of herd dynamics, range impacts, competition with other wildlife species, and the maintenance of a healthy herd. Since the horses inhabit and show preference to a rather limited section of range, their numbers must be restricted to prevent overgrazing and associated site impacts. As mentioned in Alternative #1, a decision was made in the late 1960's to maintain the herd size at approximately 40 horses. Even though this number may be somewhat arbitrary, it appears to be reasonable when other use factors are considered. Such management factors are competition with other species for forage and water, damage to fences and dish tanks from large numbers of horses and increased difficulty in handling larger numbers of horses

during reduction efforts. Included in consideration for holding the herd size at forty head is the as yet unknown methods of disposal of the animals after capture. It would seem likely that with periodic

reduction of 30-40 animals, disposal would be simpler than letting the herd build to a size that requires the disposal of a hundred or more animals. It has also been determined that with a herd of not less than 35-40 head, representative sexes and age classes can be displayed. To maintain the herd at any predetermined level, some means of capturing and disposing of surplus animals must be arrived at. Methods of capture that may be considered are trapping, round-up, tranquilizing, and direct reduction (shooting). 10-238 Package Number 168, dated 12/13/74, calls for the construction of six horse traps near watering holes in the eastern portion of the park. Apparently the trapping method has been proved effective by other agencies that manage wild horses. Local ranchers who have been associated with the park's wild horse herd for many years, believe that the most effective method of capture would be to set up at least two portable corrals on main travel routes where they could be hidden. This could be accomplished during one day, and the following day the animals could be rounded-up and herded (run) into the enclosures. This method would be effective only if the animals have no knowledge of the corral location. Otherwise, they will resist all efforts to be driven towards the traps. Options for disposal of captured animals include sale at auction to retrieve a percentage of round-up expenditures, and direct reduction. In judging popular sentiment towards the latter alternative, it appears that sale of surplus stock at auction would be the most sensible choice at this time.

To maintain a healthy, aesthetically pleasing herd, it will be necessary to minimize inbreeding. In this respect, it may be desirable to introduce one or more mares or studs procured from an outside source. The need for local research is indicated to determine how best this can be accomplished.

4. Herd Dispersal: A round-up and subsequent relocation of small "family" groups of horses to the Plateau areas west of the Little Missouri River would both contribute to the idea that the animals are wild and free-roaming, and increase their visibility to the visiting public. In addition, range impact in any one area of the range would be minimized. This option, from a management standpoint, would be difficult however, because of the compounded problems of maintaining highly dispersed herds at predetermined levels. Too, it is impossible to be certain if horses moved from the east boundary of the park would establish permanent residency elsewhere. Like Bighorn Sheep, horses are reluctant to move from traditional range lands, and if moved, often return to their "home" range. Perhaps the most important consideration in herd relocation however, is the question of competition with other species. Of specific concern is potential negative impacts on the Bighorn Sheep population. If this alternative were to be seriously considered, an environmental assessment to determine range impacts and wildlife interrelationships would have to be undertaken.

Recommended Course of Action

Alternative Number 3, "Comprehensive Management" is recommended at this time. It is thought that the need for a small exhibition herd in the

park has been demonstrated by strong local support for such a herd, and the historical significance of wild (feral) horses in the badlands and throughout the West. Historically, inbreeding in feral horse herds was not commonly found. Herd members changed frequently as some animals were captured and removed from the herd that is representative of what was found here in the late 1800's, it will be necessary to prevent the herd from becoming inbred. Accordingly, a strong effort should be made to locate mares or studs to introduce into the park herd. Introduced animals should be of mixed colors to provide contrast within the herd. Specimens within the herd that are or will be of reproductive age, that show obvious signs of inbreeding should be culled during round-ups or otherwise destroyed. Essentially, the horse herd should be managed similarly to the Longhorn herd in the North Unit of the Park. Simply stated, the Longhorns and feral horses are historic livestock displays that should be managed separately and apart from native wildlife species.

ENVIRONMENTAL REVIEW

I. Proposed Action: Theodore Roosevelt National Memorial Park proposes to capture and dispose of 30-40 live horses from the feral display herd in the South Unit of the park. This reduction will leave 35-40 animals in the herd, a number representative of sexes, age classes, and color patterns. Subsequent reduction will be undertaken at intervals of from every two to four years to maintain the display herd at from 35-60 head.

II. Reduction Method:

A. The actual reduction will be accomplished by a roundup that will normally be conducted in the fall, September or October, a time of year when the colts are able to keep up with the herd. The procedure planned for this, the first reduction, will consist of using a combination of riders and a helicopter to drive the animals from their home range on the eastern end of the park and the Biocourt area, to the buffalo corral pasture. (Map attached.) Two to four riders will start the main herd from the southeast corner moving them across Talkington Bottom. More riders will join the drive at Talkington Bottom assisting in moving the herd north/northwest towards Biocourt. Here additional riders will join the drive, at the same time attempting to pick up the small herd ranging in that area. At this time and location, 12-15 riders will be pushing the animals west/northwest keeping the animals between themselves and the north boundary fence. Approximately 5 more riders will be strung out west of Biocourt to keep the animals from turning south and to join the drive as it passes. When the drive reaches the pasture gate, if all goes well, some 15-18 riders should be behind them for the final push.

The plan for the helicopter is to utilize it, not so much to drive the horses, but as an aerial observation and communication post and to deter the horses from breaking back, or through the left flank. Once the horses are inside the corral pasture entry wing, the helicopter will move in for the final push through the pasture gate. The helicopter will be in constant radio communications with the riders to assist them if necessary and to keep them informed of the herd's actions. The decision to use a helicopter is based on facts concerned with economics and safety, and the greater likelihood of success with it's use. A buffalo roundup in the North Unit during June of 1977 proved the value of using such an aircraft. The aircraft was indispensible in locating animals and during the drives it prevented many break-aways. With the helicopter locating animals and assuring their staying on the drive route, many manhours of horseback riding over rough terrain was prevented. The aircraft would also be available to respond should an injury to a rider occur.

The total length of the drive, depending on which routes the horses chose to follow, will be from 10-12 miles. It is hoped that the horse herd will set a pace that is not too tiring to itself and consequently to the riders driving them. Every attempt will be made to haze them along slowly, yet keep the herd intact. A few fresh saddle horses will be trailered along the north section of the scenic loop road to replace tired animals if the need and opportunity arises.

B. Sorting, Culling and Transporting: The sorting and culling operation will take place in the buffalo corral. This facility has the designed capabilities and strength to serve adequately for the horse reduction operation. The animals captured will first be evaluated in the pasture to determine what ages and sexes were captured to give some idea of what numbers by age and sex can be removed and yet leave a representative herd of animals. The herd will be culled to maintain a 1:1 sex ratio with ages ranging from 1 year through 16 years as suggested by BLM Range Conservationist Milton Frei in his 1977 evaluation of the Theodore Roosevelt National Memorial Park horse herd.

After the initial evaluation is made, the animals will be driven from the pasture into the corral complex for sorting and loading. At this location through the use of gates and sorting pens and perhaps some roping, the horses will be culled with those selected for disposal loaded on a possum-belly truck for transport.

C. Disposal: The animals selected for removal will be transported to a livestock auction facility. At this point they will be consigned to be sold at public auction by the head. That is to say, each animal will be sold individually or a mare/colt pairs. The horses will not be sold in lots. The auction will be well-advertised by the park in an effort to make all persons interested in purchasing one of these horses aware of the time and date of sale. Funds received from the sale of these animals will be deposited in the Federal Treasury.

D. Safety: Throughout the reduction operation safety will be a prime consideration. The park and most of the personnel have had considerable experience in buffalo reduction roundups, an operation very similar to the planned horse reduction.

The riders, both park and contracted, selected to work in the roundup, will be capable, experienced horsemen, familiar with the terrain, properly briefed on the action plan and mounted on sturdy, dependable horses. A radio will be provided to at least every two riders, not only to direct them in carrying out their tasks, but to be used to communicate accidents or emergencies should assistance be required.

If the drive takes an accelerated pace, it may be necessary to replace tired mounts. The condition of the saddle horse will be a major concern as the drive progresses.

A half dozen selected top hands will be used in the sorting and loading operation at the corral.

The helicopter will be operated only when safe flight conditions exist. No government employees will ride in the machine at anytime during the reduction operation.

E. Humane Consideration: All efforts will be made to insure the least possible stress on the horse herd. At the fall time of the year, most colts will be 4-5 months old. If we are able to maintain a reasonable pace, all the colts should arrive at the corral mothered up and in good shape. Should a colt drop back, an attempt will be made to leave it and the mare. If the mare won't stay with the colt, but travels with the herd to the corral, she will be returned to the range as soon as possible.

Should horses suffer injury during the corral operation, a veterinarian will be summoned to attend them. If an animal is injured during the drive, it will be later located and if the injury warrants, the animal will be humanely destroyed.

After culling and loading, those animals not selected for disposal will be released from the corral as a group and hazed east towards their preferred home range.

III. Areas of Environmental Impact:

A. Water: Water quality and quantity at the four springs within the horse range in the eastern portion of the South Unit should be positively affected as the use by horses is decreased.

B. Wildlife: Ungulates such as buffalo and deer that frequent the horse range will be affected to some small extent. Competition for available water and forage should be decreased.

C. Land Use Management: Reducing the number of horses will lessen the impact on the land. Trail use will lessen, decreasing the impact from the formation of trails that erode the land on the horses preferred range.

D. Historic Preservation: Maintaining a herd of not less than 35-40 head will provide a display of horses sufficient to present the public with an opportunity to see horses roaming free, much as they must have done during Roosevelt's time.

E. Soil and Plant Conservation and Hydrology: As mentioned in "B" and "C" the horse numbers must be controlled to prevent range and water source damage. Their preference for ranging in a specific section of the park has impacted this area as their numbers have grown. It is assumed that uncontrolled, the impact damage would increase.

F. Aesthetics: As mentioned in "D" the horse herd adds to the aesthetics and historical authenticity of this park area.

IV. Magnitude of the Project

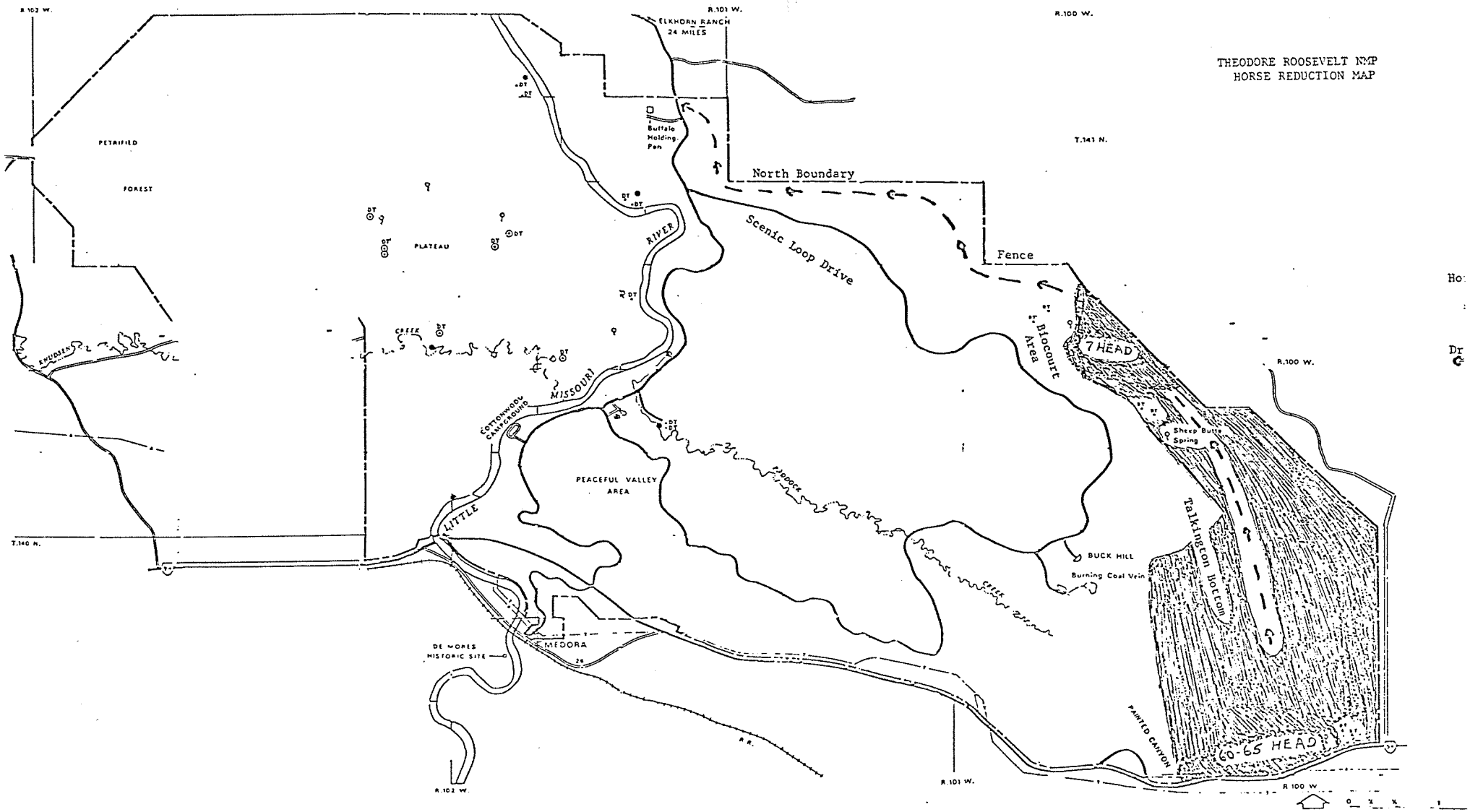
Major Action, Significant Effects	No
Federal	--
Substantive Adverse Impacts	No
Cumulative or Secondary Effects	No
Highly Controversial	No
First Time, Precedent Setting	Yes
Commits Service to Future Actions	No

V. Recommendation

Proposed action is not major with a potential for causing significant environmental impact or controversy. An Environmental Statement is not required.

RECOMMENDED 03/24/78 John O Lancaster
DATE SUPERINTENDENT, THEODORE ROOSEVELT NMP

APPROVED 4/19/78 Glen T Bean
DATE Acting REGIONAL DIRECTOR
ROCKY MOUNTAIN REGION

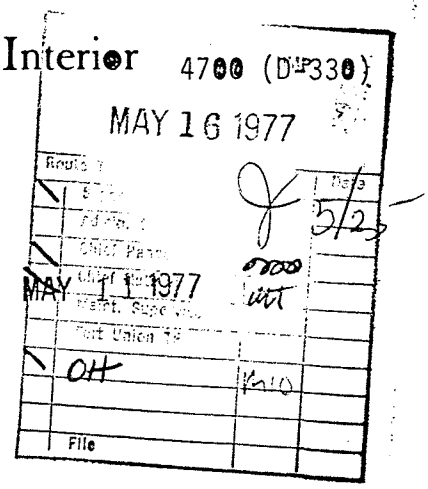

THEODORE ROOSEVELT NMP
HORSE REDUCTION MAP
R.102 W.
R.101 W.
R.100 W.
ELKHORN RANCH
24 MILES
Buffalo Holding Pen
T.141 N.
North Boundary
Fence
Scenic Loop Drive
PETRIFIED
FOREST
PLATEAU
RIVER
CREEK
MISSOURI
COTTONWOOD CAMPGROUND
Biocourt Area
7 HEAD
Sheep Butte Spring
PEACEFUL VALLEY AREA
LITTLE
T.140 N.
BUCK HILL
Burning Coal Vein
Talkington Hocum
DE MORES HISTORIC SITE
MEDORA
PAINTED CANYON
60-65 HEAD
R.102 W.
R.101 W.
R.100 W.

IN REPLY REFER TO

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
DENVER SERVICE CENTER
DENVER FEDERAL CENTER, BUILDING 50
DENVER, COLORADO 80225

4700 (D-330)



Memorandum

To: Superintendent, Theodore Roosevelt NMP

From: Director, Denver Service Center

Subject: Wild Horse Herd Evaluation

Enclosed is an evaluation of the Theodore Roosevelt NMP wild horse herd, prepared by Mr. Milton Frei, of this office.

Mr. Frei visited the Theodore Roosevelt NMP during the week of April 12-14, 1977, for the purpose of evaluating the wild horse herd and habitat and to document alternatives for a herd reduction.

Also enclosed for your information is a copy of two Technical Notes on wild horses which may be of value in your future management of these animals. If we can be of any further assistance, please feel free to contact us.

Richard K. Thomas

4 Enclosures
Encl. 1 - Wild Horse Herd Evaluation Report
Encl. 2 - Wild Horse Capture Techniques
Encl. 3 - T/N 294
Encl. 4 - T/N 295

WILD HORSE HERD EVALUATION REPORT
FOR
THEODORE ROOSEVELT NATIONAL MEMORIAL PARK

by Milton N. Frei
Range Conservationist
USDI, Bureau of Land Management
Denver Federal Center
Denver, Colorado 80225

During the period April 12-14, 1977 I visited the Theodore Roosevelt National Park for the purpose of evaluating the wild horse herd which resides within the park boundaries. The evaluation that follows, is addressed to three major areas of concern which the National Park Service expressed in the management of wild horses. These areas are: 1) the wild horse habitat; 2) the wild horse population; and 3) possible methods of population control.

1. Wild Horse Habitat

The habitat in Theodore Roosevelt National Park can best be described as excellent for wild horses. It should be obvious to even an untrained observer that the park could support a much larger population of wild horses without adverse impacts upon the soil or vegetative resources as well as other wildlife species. The only habitat problem that could be identified was associated with the use of trails by wild horses as they move to and from sources of water. These trails were most heavily used within two or three hundred yards from water at which point they may contribute slightly to soil erosion on the steeper slopes. However, this trailing will be just as severe as long as any wild horses, buffalo or other grazing animals are allowed within the park boundary.

2. Wild Horse Population

The subject of wild horse population can be divided into two main topics of discussion, inbreeding and population dynamics.

A. Inbreeding

In regards to the topic of inbreeding, the wild horse management plan for Theodore Roosevelt Memorial National Park identifies inbreeding as a problem based upon the presence of crooked legs, poor conformation, and a predominance of blue and grey horses.

While it is impossible to say for sure whether inbreeding is a problem, it is my opinion that inbreeding does not constitute a significant problem in wild horse populations. If the wild horses in Theodore Roosevelt National Park are compared with those on BLM administered lands, it is obvious that the TRNP horses are much superior in terms of conformation and condition. In many areas, the horses on BLM lands are too numerous for inbreeding to be a problem, and, like TRNP, there

exists an unusual number of animals with similar color patterns e.g., roans, greys, pintos. Furthermore, as Aldo Leopold once pointed out, "The work of geneticists on domesticated animals indicates no deterioration through inbreeding except where similar defects exist in both parents. Domestic varieties are often hybridized and seldom subjected to the rigorous selection incident to wild survival, therefore the frequency of variation (or defect) is greater than in wild species, therefore the probability of similar parental defects is greater than in wild species, therefore the probability of deterioration through inbreeding is greater than in wild species." 1/

Inbreeding in itself is not harmful. What inbreeding does is to increase rapidly the homozygosity of the population and to bring to light, any recessive genes which may have been carried in a heterozygous state.

Inbreeding does not create weaknesses or defects: it merely brings them to light. Crossbreeding, on the other hand, does not eliminate them; it merely covers them up while still carrying them along. Therefore, if inbreeding is occurring, the beneficial characters should be brought to light just as frequently as the non beneficial characters.

An important indicator to be used in determining whether inbreeding is becoming a problem would be a decline in vigor, fertility, and/or viability in the wild horse population. This is because many of the recessive genes brought to light by inbreeding have a pronounced affect on these factors. 2/

According to the management plan for wild horses, reproduction has increased from 15% in 1970 to 26% in 1977. As a result, it is questionable whether inbreeding is having much effect on the wild horse population within the park at this time.

It is my recommendation that the Theodore Roosevelt National Park give careful consideration of any proposals to introduce new blood lines into the wild horse population for the purpose of preventing inbreeding. This type of activity could be quite costly and will tend to interfere with the process of natural selection which rapidly produces animals

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1/ Aldo Leopold, Game Management, 1933, Charles Scribner's Sons

2/ Laurence H. Snyder and Paul R. David, The Principles of Heredity, 1957, D.C. Health & Co. Boston.

capable of surviving under existing environmental conditions. Depending upon the type of management selected for wild horses (i.e. sustained yield or control), it may be more desireable to selectively remove those animals which exhibit undesireable characteristcs.

B. Population Dynamics

In regards to the topic of population dynamics, there are several factors which need to be considered. The first consideration concerns the problem of "Optimum Numbers" or how many horses should be managed in TRNP.

Optimum Numbers - As previously mentioned, the habitat for wild horses could support many more wild horses than presently exists. As a result, the determination of "optimum numbers" of wild horses is, for the most part, an arbitrary and administrative decision which must be made by the National Park Service. However, in an unlimited habitat, there are some considerations which should be made when a minimum number of animals is all that is desired. These considerations revolve around the maintenance of a population of animals which is balanced from a biological standpoint i.e.,all age classes and sex ratios represented in proper proportions. For example, consider the data presented in the Appendix I.

If wild horse numbers are represented in a population at the percentages recommended in column c, (see footnote) it can be seen that a portion of the wild horse numbers in the age classes 9 years and younger will be represented in the population in fractional animals when less than 40 animals are involved. Since the most productive period for wild horses is from 3 to 9 years of age, it is probably biologically unsound not to have these age classes fully represented by animals. While it may be acceptable to maintain a minimum population of 30 animals, a total of 40 or more animals would be much better from a biological standpoint.

The second consideration concerns the problem of "rate of increase".

Rate of Increase - The wild horse management plan for TRNP discusses rate of increase for the animal population. This rate of increase is based upon the reproductive rate of horses which is estimated to be 26%. I have calculated the 1976 reproductive rate in several different ways (based on the 1976 inventory data) and am unable to arrive at a figure of 26%. The most commonly used method for expressing reproductive rate in animal populations, is young animals/100 adults. According to the 1976 inventory, there were 40 adults, 11 yearlings and 14 young present in the park. Therefore, the reproductive rate was: 14 young ÷ 40 adults or 35%. Likewise, the yearling/100 adult ratio was: 11 yearlings ÷ 40 adults or 27.5%. This difference between young/100 adults and yearlings/100 adults may indicate a 20% mortality loss of young animals through the first year of life.

The point to be made from the above discussion is that reproductive rates should not be confused with rate of increase. The rate of increase in any animal population is a function of fecundity interacting with mortality. As Mr. Graeme Caughley, in his eloquent book on the "Analysis of Vertebrate Populations" 3/ has pointed out--- "there is another rate, the maximum rate of increase, that is often mentioned but seldom defined. It lurks behind such statements as rabbits, if uncontrolled, will cover the surface of the earth in 8.3 years, and one pair of chipmunks in ideal conditions will give rise to 363,271,486 descendants in five years. . . This concept of maximum rate of increase may be quaint but it is certainly not harmless. It has been used to justify control measures of doubtful value, and ecological studies stressing reproduction while ignoring mortality. This is a convenient dereliction since fecundity is much easier to measure than is mortality. Reproduction is often thought of as the basic population process, to which mortality is subordinated. But dying is a biological process no more nor less real than reproduction. . . Fecundity alone tells nothing about a population's maximum rate of increase; mortality alone is equally reticent."

With this in mind, I have attempted to quantify mortality in the TRNP wild horse population. The "Life Table" in Appendix II, provides an estimate of age specific mortality and survival rates plus an estimate of the mean annual mortality rate.

Unfortunately, an accurate estimation of mortality through a "Life Table" is based on the assumption that the population has a stable age distribution and is not increasing in numbers. Based upon a comparison of the age distribution for the TRNP wild horse population and populations of wild horses on BLM administered lands, it is probably justifiable to assume that the age distribution in TRNP is stable. However, it is obvious that the population has been increasing at least for the past 3-4 years. As a result, the estimated 17% mean annual mortality rate will probably be higher than the actual mortality rate.

It should be pointed out that the above data does not reflect an absolute estimate of mortality in wild horses. What is reflected however, is a theoretical probability of death from all factors affecting the population throughout the year. In reality, none of the factors which cause mortality may actually come about during any particular year or years. The result will be that mortality may be insignificant in some years and high in other years.

3/ Graeme Caughley, Analysis of Vertebrate Populations, 1977, John Wiley & Sons

It is my recommendation that personnel from TRNP continue to conduct annual wild horse inventories of the same type obtained on June 1, 1976, i.e., the number of animals by age and sex plus age specific fecundity rates. This information will prove invaluable in the future management of wild horses regardless of the management direction chosen.

3. Methods of Population Control

Several methods for controlling wild horse population numbers are available and the selection of the method of combination of methods to be used is a decision which must remain with the National Park Service. In most instances, the method(s) selected will depend upon the management direction determined for the wild horse population. Basically, the methods of control can be divided into two main categories i.e., direct control and indirect control. A discussion of each control method is as follows:

A. Direct Control

(1) Water Trapping

The use of water traps for controlling wild horse numbers, has fair potential in TRNP. This potential is based upon the ability to control the use of water by wild horses at four primary sources of water.

In order to construct an effective water trap at Olsen Well or Southeast Corner Spring, it would be necessary to construct a barbed wire fence completely around the major spring area and channel the water into one specific point. A water trap could then be placed around the central watering area and used to trap horses as the need arises. In the case of Sheep Butte and Boicourt Springs, all that would be necessary would be to construct a water trap around the existing dish tanks. This is because the sources of these two springs are presently enclosed by a barbed wire fence. However, it may be more desireable to move the dish tanks at Boicourt Spring approximately 100 yards to the northeast where a more level area is available for trap construction.

An alternative to the construction of water traps on all four major springs used by wild horses would be to construct one water trap at Southeast Corner Spring or Olsen Well and one water trap at Sheep Butte or Boicourt Spring. The springs which are not used as trapping sites would then need to be controlled with a barbed wire fence so that horses could not use them as an alternative source of water during trapping opperations.

Some advantages associated with the use of water traps are that the major spring areas would be protected from the effects of trampling by wild horses and other animal species and the cost of constructing the facilities would be a one time venture. Some disadvantages are that the traps may introduce an undesireable intrusion onto the landscape and the possibility exists that horses may change their normal watering patterns to include the Missouri River. While I strongly doubt that horses will go to the Missouri for water, the possibility exists just the same.

Before selecting the use of water traps to control wild horses, the NPS should make a thorough investigation of the volume of flow from each of the four major springs. It may be that the volume of water produced by one or more of these springs is so abundant that it will never be possible to confine the entire amount within the water trap complex. This possibility would exclude the use of water traps for controlling wild horse numbers.

(2) Dry Traps or Wing Traps

The use of wing traps has good potential for controlling wild horse numbers. In fact, it is my recommendation that wing traps be used in the initial reduction of wild horse numbers in TRNP. This recommendation is based on the assumption that the Park Service intends to remove approximately 30 horses sometime within the next three or four months.

The use of wing traps has excellent applicability in areas such as TRNP where wild horses have well defined trail systems or movement patterns. Once these trails or movement patterns have been identified, all that is necessary is to place a well camouflaged trap in front of the animals and then move them at a moderate pace into the trap wings. Once inside the wings however, it is imperative that horseback riders be close behind the animals or when they sense that they are trapped they will double back and come out through the wings.

A total of three potential wing trap sites were observed during my visit to TRNP. The location of these trap sites are known to Mr. Marty Ott, TRNP. It is my opinion that all three of these sites could be successful in capturing wild horses. However, the site located in the SW¼, NE¼ Section 2, T. 140 N., R. 101 W. will probably be useful only for capturing wild horses which spend the majority of their time in the vicinity of Boicourt and Sheep Butte Springs.

It is my suggestion that prior to actual trap construction, an attempt should be made to drive wild horses in the direction of the potential traps. If this venture is successful, it may be possible to construct the traps the following day and capture the horses the day after. As a further suggestion, it may prove beneficial to construct the wings before the trap itself is constructed and allow the animals to become accustomed to their existance.

After considering the use of helicopters to drive horses toward the three trap sites discussed above, it is my opinion that a helicopter would cost too much to make its use advantageous. The maximum distance that horses will probably be moved, from the point of origin to the trap site, is only two or three miles.

Since horseback riders will be required to push the animals into the trap anyway, it is doubtful if a helicopter would add much to the success of capture, especially in view of the high costs of helicopter rental.

(3) Dispersal or Relocation

The wild horse management plan for TRNP analyses the alternative of dispersal as a technique for controlling excess wild horses. This analysis appears to cover all of the consequences of the alternative and therefore, its adoption can only be the result of an administrative decision by the NPS. However, since the dispersal of wild horses to other areas of the park would result in a greater expenditure of man-power and funds, probably at the expense of on-going programs, it is my recommendation that dispersal not be considered further until adequate manpower and funds for such activity become available.

(4) Destruction

The humane destruction of wild horses is undoubtedly the most effecient method of controlling horse numbers. Likewise, humane destruction is the most socially unacceptable of all alternative methods available. As a result, the selection of destruction as the control method to be used, is again, an administrative decision which must be made by the NPS.

(5) Immobilization

The technique of immobilization or chemical restraint can be an excellent tool for use in capturing wild horses, particularly when small numbers of animals are involved. However, when immobilizing wild horses, the problem always arises as to what to do with a captured animal when no handling facilities are available nearby. This problem can be overcome with hobbles or other devices which prevent the animal from running. The animal can be released wearing such devices and then picked up by horseback riders at a later date.

A publication entitled "Wild Horse Capture Techniques" has been attached to this report. This publication discusses immobilization as well as other capture techniques in greater detail. However, when using immobilization, particularly with the drug Succinylcholine chloride, a certain amount of training should be obtained to help minimize death losses. This training can be provided by BLM and if possible will be available upon request. Also, considerable experience with immobilization has been gained since this publication was printed. As a result the publication contains some misleading statements which are no longer applicable. For example, the color phase of horses no longer appears to have any relationship to tolerance levels of Succinylcholine chloride and artificial respiration for over dosed animals can now be provided through positive pressure ventilation.

B. Indirect Control

(1) Fertility Control

The technique of vasectomies for dominant stallions appears to have some potential for controlling the TRNP wild horse population. The concept to be employed would involve capturing dominant stallions and performing surgical vasectomies on the animals. Hopefully, these unfertile stallions would maintain their agressive behaviour and keep breeding by subdominant and non-harem (bachelor) stallions to a minimum.

An alternative to surgical vasectomies would involve the injection of a sclerosing agent such as iodine, into the epididymis, located at the base of the testes. However, this is not a proven technique and therefore cannot be recommended. If this alternative is used by TRNP they will be experimenting on their own initiative and the effectiveness of the vasectomy cannot be predicted.

A word of caution should probably be interjected in relation to fertility control. The use of vasectomies is a non-reversible process. Therefore, if vasectomies are successful in reducing foal production and if they are performed on all dominant stallions, the recruitment of young animals into the population could be severely limited. If this were to go on for many years, entire age classes of animals would be completely missing from the population. This is totally unacceptable from a biological standpoint and could result in total colapse of the herd after several years. It is my recommendation that the NPS approach this type of population control with considerable caution. Only a few dominant stallions should be vasectomized in the beginning and the results evaluated critically. If successful, additional stallions should be vasectomized, based upon a careful analysis of how many foals should be added to the population each year. Foal survival and overall mortality rates would be critical components of this analysis.

(2) Population Manipulation

The technique of population manipulation is a well established procedure which is commonly used in animal populations of all kinds. It has most often been used in both domestic and wild populations which have commercial value, to increase yield. The principles, however, can also be applied in reverse to create a decrease in yield, and therefore have a direct relationship to the control of wild horse numbers.

The basic principle involved with population manipulation is the selective harvest or removal of animals to meet specific management objectives. For example, if it is desirable to decrease the number of foals produced /100 adult horses, all that is necessary is to selectively remove a larger proportion of female animals than male animals. The following is an example of the difference in expected foal production between two populations with differing adult sex ratios.

Example 1. Unmanipulated Population

100 - total adults
50:50 - sex ratio
40 young/100 adult females-reproductive rate

This population will produce 20 foals or 20 young/100 adult animals.

Example 2. Manipulated Population

100 - total animals
70:30 - male:female ratio
40 young/100 adult females - reproductive rate

This population will produce 12 foals or 12 young/100 adult animals.

Unfortunately, the sex ratio at birth is not changed by population manipulation. Therefore, with time, the sex ratio will begin to converge back toward equilibrium or 50:50. This problem can be overcome however, by the selective removal on an annual or semi-annual basis, of young female horses. The result will be maintenance of 70:30 sex ratio and if properly calculated harvest rates have been used, the remaining foals can be allowed to move into the older age classes where normal mortality will harvest the remaining excess animals naturally. In other words, the extent of manmade harvest can be limited to young female horses which are the easiest animals to handle, as well as to sell or give away.

Conclusion

In concluding this evaluation, it is my opinion that a basic management decision is still needed for the TRNP wild horses. This decision should be concerned with establishing the overall management objectives for the wild horse herd. In other words, exactally what is it that is wanted from the wild horse population. Only when these objectives have been established, can a management and control scheme be devised which is appropriate for the animals. For example if it is important to maintain a population of horses which typify a particular type, color or confirmation, it may be necessary to perpetuate those characteristics by the introduction of animals which carry these same characters. Conversely, if this is not important, introduction of new animals need not be done.

As an additional example, a decision is needed as to whether wild horses should be managed under a "sustained yield", "natural" or a "minimal harvest" concept of management. Under a sustained yield concept, it may be desireable to increase reproduction of foals and harvest animals by the most efficient means i.e. permanent water traps. Under a natural concept, it may be desireable to leave the population alone, except for the periodic harvest of excess animals. The use of vasectomies may also be acceptable under this concept. Under the concept of minimal harvest, it may be necessary to employ population manipulation criteria, utilize vasectomies and/or destroy excess animals.

(a) Age	Percent of Total (b) Existing TRNP	(c) * Recommended	Number of Animals in Each Age Class: Total Existing Numbers TRNP 65 (d)	With Various Total "Optimum Numbers": 80(e)	70(f)	60(g)	50(h)	40(i)	30(j)	20(k)
0-1	21.5	25	14	20.0	17.5	15.0	12.5	10.0	7.5	5.0
1-2	16.9	14	11	11.2	9.8	8.4	7.0	5.6	4.2	2.8
2-3	12.3	13	8	10.4	9.1	7.8	6.5	5.2	3.9	2.6
3-4	9.2	12	6	9.6	8.4	7.2	6.0	4.8	3.6	2.4
4-5	6.1	8	4	6.4	5.6	4.8	4.0	3.2	2.4	1.6
5-6	1.5	7	1	5.6	4.9	4.2	3.5	2.8	2.1	1.4
6-7	6.1	5	4	4.0	3.5	3.0	2.5	2.0	1.5	1.0
7-8	4.6	4	3	3.2	2.8	2.4	2.0	1.6	1.2	.8
8-9	4.6	3	3	2.4	2.1	1.8	1.5	1.2	.9	.6
9-10	1.5	2	1	1.6	1.4	1.2	1.0	.8	.6	.4
10-11	1.5	2	1	1.6	1.4	1.2	1.0	.8	.6	.4
11-12	0	2	0	1.6	1.4	1.2	1.0	.8	.6	.4
12-13	0	1	0	.8	.7	.6	.5	.4	.3	.2
13-14	6.1	1	4	.8	.7	.6	.5	.4	.3	.2
14-15	1.5	1	1	.8	.7	.6	.5	.4	.3	.2
15-16	4.6	100	3	80	70	60	50	40	30	20
16-17	1.5		1							
	99.5		65							

* Note: These percentages are based upon data from wild horse populations on BLM administered lands and include populations which have not exploited by man for the past 40 years.

APPENDIX II

AGE	NUMBER OF ANIMALS OR FREQUENCY	ADJUSTED FREQUENCY (a)	SURVIVAL lx	MORTALITY dx	MORTALITY RATE qx	SURVIVAL RATE px
0-1	14	11	1.000	.091	.091	.909
1-2	11	10	.909	.091	.100	.900
2-3	8	9	.818	.182	.223	.777
3-4	6	7	.636	.091	.143	.857
4-5	4	6	.545	.090	.165	.835
5-6	1	5	.455	.091	.200	.800
6-7	4	4	.364	.091	.250	.750
7-8	3	3	.273	.091	.333	.667
8-9	3	2	.182	.091	.500	.500
9-10	1	1	.091	.909		
10-11	1	58	5.273			
11-12	0					
12-13	0					
13-14	4					
14-15	1					
15-16	3					
16-17	1					
	65					

Mean Annual Mortality Rate = $\frac{\Sigma\ dx}{\Sigma\ lx}$

or $\frac{.909}{5.273}$ = 17%

(a) Data smoothed by linear regression analysis